FANUC Series 30*i*-MODEL B
FANUC Series 31*i*-MODEL B
FANUC Series 32*i*-MODEL B

PARAMETER MANUAL

B-64490EN/04

The products in this manual are controlled based on Japan's "Foreign Exchange and Foreign Trade Law". The export of Series 30*i*-B, Series 31*i*-B5 from Japan is subject to an export license by the government of Japan. Other models in this manual may also be subject to export controls.
Further, re-export to another country may be subject to the license of the government of the country from where the product is re-exported. Furthermore, the product may also be controlled by re-export regulations of the United States government.
Should you wish to export or re-export these products, please contact FANUC for advice.

In this manual we have tried as much as possible to describe all the various matters.
However, we cannot describe all the matters which must not be done, or which cannot be done, because there are so many possibilities.
Therefore, matters which are not especially described as possible in this manual should be regarded as "impossible".

DEFINITION OF WARNING, CAUTION, AND NOTE

This manual includes safety precautions for protecting the user and preventing damage to the machine. Precautions are classified into Warning and Caution according to their bearing on safety. Also, supplementary information is described as a Note. Read the Warning, Caution, and Note thoroughly before attempting to use the machine.

> ⚠ **WARNING**
> Applied when there is a danger of the user being injured or when there is a danger of both the user being injured and the equipment being damaged if the approved procedure is not observed.

> ⚠ **CAUTION**
> Applied when there is a danger of the equipment being damaged, if the approved procedure is not observed.

> **NOTE**
> The Note is used to indicate supplementary information other than Warning and Caution.

- Read this manual carefully, and store it in a safe place.

PREFACE

Applicable models

The models covered by this manual, and their abbreviations are :

Model name	Abbreviation	
FANUC Series 30*i*–B	30*i* –B	Series 30*i*
FANUC Series 31*i*–B	31*i* –B	Series 31*i*
FANUC Series 31*i*–B5	31*i* –B5	
FANUC Series 32*i*–B	32*i* –B	Series 32*i*

NOTE

1. For an explanatory purpose, the following descriptions may be used according to the types of path control used:
   - T series: For the lathe system
   - M series: For the machining center system
2. Unless otherwise noted, the model names 31*i*-B, 31*i*-B5, and 32*i*-B are collectively referred to as 30*i*. However, this convention is not necessarily observed when item 3 below is applicable.
3. Some functions described in this manual may not be applied to some products. For details, refer to the DESCRIPTIONS (B-64482EN).

Related manuals of Series 30*i*- MODEL B Series 31*i*- MODEL B Series 32*i*- MODEL B

The following table lists the manuals related to Series 30*i*-B, Series 31*i*-B, Series 32*i*-B. This manual is indicated by an asterisk(*).

Table 1 Related manuals

Manual name	Specification number	
DESCRIPTIONS	B-64482EN	
CONNECTION MANUAL (HARDWARE)	B-64483EN	
CONNECTION MANUAL (FUNCTION)	B-64483EN-1	
OPERATOR’S MANUAL (Common to Lathe System/Machining Center System)	B-64484EN	
OPERATOR’S MANUAL (For Lathe System)	B-64484EN-1	
OPERATOR’S MANUAL (For Machining Center System)	B-64484EN-2	
MAINTENANCE MANUAL	B-64485EN	
PARAMETER MANUAL	B-64490EN	*
Programming		
Macro Executor PROGRAMMING MANUAL	B-63943EN-2	
Macro Compiler PROGRAMMING MANUAL	B-66263EN	
C Language Executor PROGRAMMING MANUAL	B-63943EN-3	
PMC		
PMC PROGRAMMING MANUAL	B-64513EN	
Network		
PROFIBUS-DP Board CONNECTION MANUAL	B-63993EN	
Fast Ethernet / Fast Data Server OPERATOR’S MANUAL	B-64014EN	
DeviceNet Board CONNECTION MANUAL	B-64043EN	
FL-net Board CONNECTION MANUAL	B-64163EN	
CC-Link Board CONNECTION MANUAL	B-64463EN	

Manual name	Specification number	
Operation guidance function		
MANUAL GUIDE *i* (Common to Lathe System/Machining Center System) OPERATOR'S MANUAL	B-63874EN	
MANUAL GUIDE *i* (For Machining Center System) OPERATOR'S MANUAL	B-63874EN-2	
MANUAL GUIDE *i* (Set-up Guidance Functions) OPERATOR'S MANUAL	B-63874EN-1	
Dual Check Safety		
Dual Check Safety CONNECTION MANUAL	B-644483EN-2	

Related manuals of SERVO MOTOR α*i*/β*i* series

The following table lists the manuals related to SERVO MOTOR α*i*/β*i* series

Table 2 Related manuals

Manual name	Specification number
FANUC AC SERVO MOTOR α*i* series DESCRIPTIONS	B-65262EN
FANUC AC SERVO MOTOR α*i* series / FANUC AC SERVO MOTOR β*i* series / FANUC LINEAR MOTOR L*i*S series / FANUC SYNCHRONOUS BUILT-IN SERVO MOTOR D*i*S series PARAMETER MANUAL	B-65270EN
FANUC AC SPINDLE MOTOR α*i* series DESCRIPTIONS	B-65272EN
FANUC AC SPINDLE MOTOR α*i*/β*i* series, BUILT-IN SPINDLE MOTOR B*i* series PARAMETER MANUAL	B-65280EN
FANUC SERVO AMPLIFIER α*i* series DESCRIPTIONS	B-65282EN
FANUC AC SERVO MOTOR α*i* series / FANUC AC SPINDLE MOTOR α*i* series / FANUC SERVO AMPLIFIER α*i* series MAINTENANCE MANUAL	B-65285EN

CNCs that are described in this manual can be connected to following servo motors and spindle motors. This manual mainly assumes that the FANUC SERVO MOTOR α*i* series of servo motor is used. For servo motor and spindle information, refer to the manuals for the servo motor and spindle that are actually connected.

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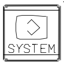
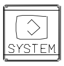
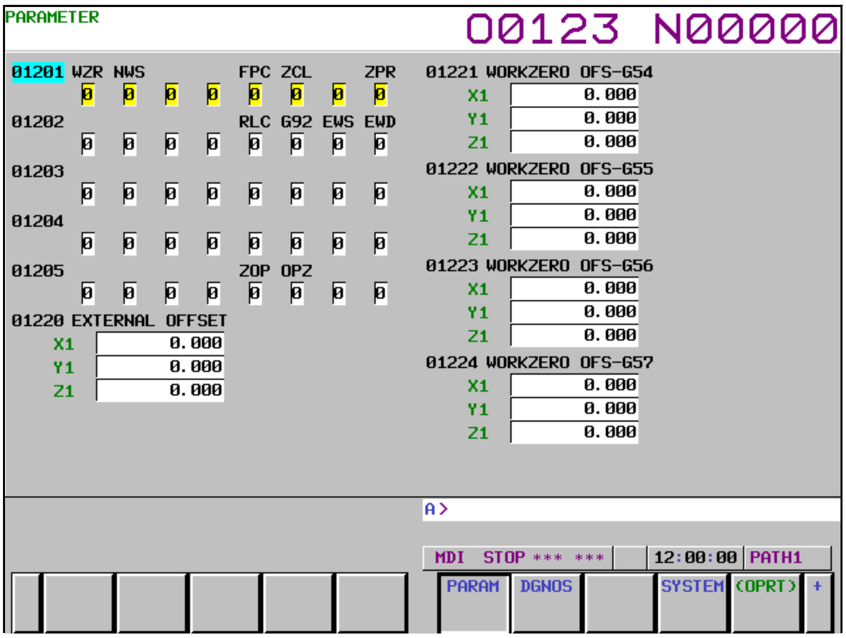
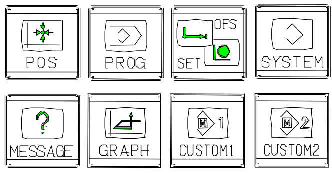
APPENDIX

1 DISPLAYING PARAMETERS

Follow the procedure below to display parameters.

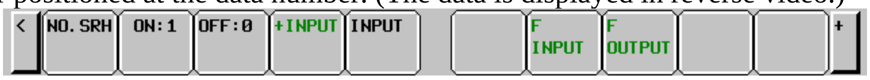
1 Press the function key  on the MDI unit as many times as required, or alternatively, press the function key  once, then the chapter selection soft key [PARAM]. The parameter screen is then selected.





Function keys

2 The parameter screen consists of multiple pages. Use step (a) or (b) to display the page that contains the parameter you want to display.
 (a) Use the page change keys or the cursor keys to display the desired page.
 (b) Enter the data number of the parameter you want to display from the keyboard, then press the soft key [NO.SRH]. The parameter page containing the specified data number appears with the cursor positioned at the data number. (The data is displayed in reverse video.)



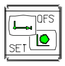
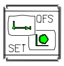
> **NOTE**
> If key entry is started with the chapter selection soft keys displayed, they are replaced automatically by operation selection soft keys including [NO.SRH]. Pressing the soft key [(OPRT)] can also cause the operation selection soft keys to be displayed.

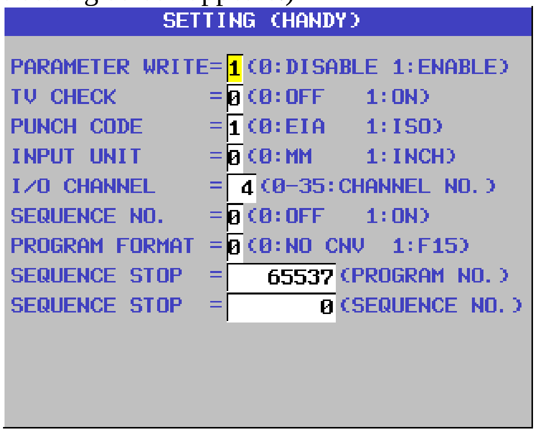
2 SETTING PARAMETERS FROM MDI

Follow the procedure below to set parameters.

1 Place the NC in the MDI mode or the emergency stop state.

2 Follow the substeps below to enable writing of parameters.

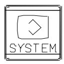
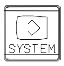
2-1 To display the setting screen, press the function key  as many times as required, or alternatively press the function key  once, then the chapter selection soft key [SETTING]. (The first page of the setting screen appears.)



2-2 Position the cursor on "PARAMETER WRITE" using the cursor keys.

2-3 Press the soft key [(OPRT)] to display operation selection soft keys.

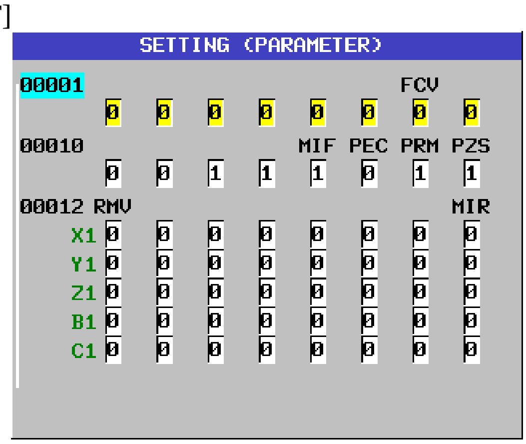
2-4 To set "PARAMETER WRITE=" to 1, press the soft key [ON:1], or alternatively enter 1 and press the soft key [INPUT]. From now on, the parameters can be set. At the same time an alarm SW0100, “PARAMETER WRITE ENABLE” occurs in the CNC.

3 To display the parameter screen, press the function key  as many times as required, or alternatively press the function key  once, then the chapter selection soft key [PARAM]. (See Chapter 1, "DISPLAYING PARAMETERS.")

4 Display the page containing the parameter you want to set, and position the cursor on the parameter. (See Chapter 1, "DISPLAYING PARAMETERS.")

5 Enter data, then press the soft key [INPUT]. The parameter indicated by the cursor is set to the entered data.

[Example] 12000 [INPUT]



Data can be entered continuously for parameters, starting at the selected parameter, by separating each data item with a semicolon (;).
[Example]
Entering 10;20;30;40 and pressing the soft key [INPUT] assigns values 10, 20, 30, and 40 to parameters in order starting at the parameter indicated by the cursor.

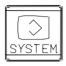
6 Repeat steps 4 and 5 as required.
7 If parameter setting is complete, set "PARAMETER WRITE=" to 0 on the setting screen to disable further parameter setting.
8 Reset the NC to release the alarm SW0100.
If an alarm PW0000, “POWER MUST BE OFF” occurs in the NC, turn it off before continuing operation.

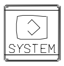
3 INPUTTING AND OUTPUTTING PARAMETERS THROUGH THE RS232C INTERFACE

This section explains the parameter input/output procedures for input/output devices connected to the RS232C interface.
The following description assumes the input/output devices are ready for input/output. It also assumes parameters peculiar to the input/output devices, such as the baud rate and the number of stop bits, have been set in advance. (See Section 4.5, "PARAMETERS OF RS232C INTERFACE.")

3.1 OUTPUTTING PARAMETERS THROUGH THE RS232C INTERFACE

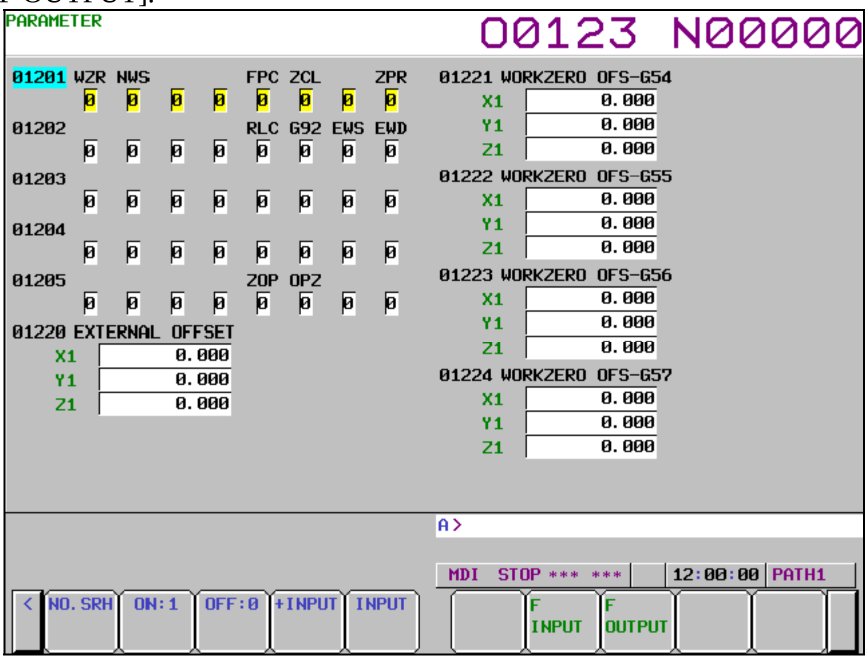
1 Select the EDIT mode or set to Emergency stop.

2 To select the parameter screen, press the function key 

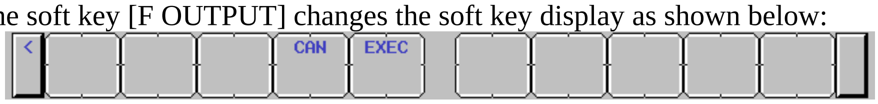
as many times as required, or alternatively press the function key 

once, then the chapter selection soft key [PARAM].

3 Press the soft key [(OPRT)] to display operation selection soft keys, then press the continuous menu key located at the right-hand side of the soft keys to display another set of operation selection keys including [F OUTPUT].



4 Pressing the soft key [F OUTPUT] changes the soft key display as shown below:



5 Press the soft key [EXEC] to start parameter output. When parameters are being output, "OUTPUT" blinks in the state display field on the lower part of the screen.

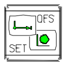
6 When parameter output terminates, "OUTPUT" stops blinking. Press the 

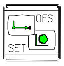
key to interrupt parameter output.

3.2 INPUTTING PARAMETERS THROUGH THE RS232C INTERFACE

1 Place the NC in the emergency stop state.

2 Enable parameter writing.

2-1 To display the setting screen, press the function key 

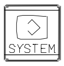
as many times as required, or alternatively press the function key 

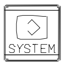
once, then the chapter selection soft key [SETTING]. The first page of the setting screen appears.

2-2 Position the cursor on "PARAMETER WRITE" using the cursor keys.

2-3 Press the soft key [(OPRT)] to display operation selection soft keys.

2-4 To set "PARAMETER WRITE=" to 1, press the soft key [ON:1], or alternatively enter 1, then press the soft key [INPUT]. From now on, parameters can be set.
At the same time an alarm SW0100, “PARAMETER WRITE ENABLE” occurs in the NC.

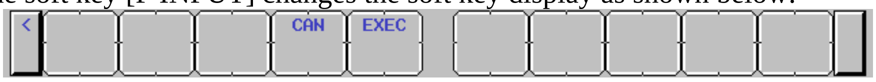
3 To select the parameter screen, press the function key 

as many times as required, or alternatively press the function key 

once, then soft key [PARAM].

4 Press the soft key [(OPRT)] to display operation selection keys, then press the continuous menu key located at the right-hand side of the soft keys to display another set of operation selection soft keys including [F INPUT].

5 Pressing the soft key [F INPUT] changes the soft key display as shown below:



6 Press the soft key [EXEC] to start inputting parameters from the input/output device. When parameters are being input, "INPUT" blinks in the state display field on the lower part of the screen. Press the 

key to interrupt parameter input.

7 When parameter read terminates, "INPUT" stops blinking, and an alarm PW0100 occurs in the NC. Turn it off before continuing operation.

3.3 I/O FORMATS

This section describes the I/O formats of parameters.
Parameters are classified by data format as follows:

Data format	Remarks
Bit	Data of these formats is represented by an 8-digit binary number, with each digit corresponding to a bit.
Bit machine group	
Bit path	
Bit axis	
Bit spindle	
Byte	The setting range of data varies from one parameter to another. For details, refer to the description of each parameter.
Byte machine group	
Byte path	
Byte axis	
Byte spindle	
Word	
Word machine group	
Word path	
Word axis	
Word spindle	
2-word	
2-word machine group	
2-word path	
2-word axis	
2-word spindle	
Real	
Real machine group	
Real path	
Real axis	
Real spindle	

3.3.1 Keywords

The alphabetic characters listed below are used as keywords.
A numeric value after each keyword has the following meaning:

Keyword	Meaning of a numeric value that follows
N	Parameter number
Q	Data identifier (1: Parameter data, 0: Pitch error compensation data)
T	Machine group number (1 and up) of a machine group type parameter
L	Path number (1 and up) of a path type parameter
A	Controlled axis number (1 and up) of an axis type parameter
S	Spindle number (1 and up) of a spindle type parameter
P	Value of a parameter independent of inch/metric switching
M	Metric input value of a parameter dependent on inch/metric switching
I	Inch input value of a parameter dependent on inch/metric switching

3.3.2 Inch/Metric Switching

For parameters dependent on inch/metric switching such as those for length and feedrate, whether data is inch data or metric data is specified by the input mode in the case of input from the MDI panel, or by the keyword I or M prefixed to the data in the case of input from an external I/O device. The keyword I or M is added also when data is output to an external I/O device.
If the input mode or keyword differs from the actually used mode as in a case where data input in the inch mode is used in the metric mode, the CNC performs automatic data conversion. So, data need not be converted according to a mode change. Moreover, when parameter data is displayed, the data is converted according to the display mode. However, when data is output to an external I/O device, the original data is output according to the original keyword.

3.3.3 Bit Format

N	*****	Q1	P	********	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
An 8-digit binary number after P represents the bit values (0/1) of a parameter, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example
N00010Q1P00000001;
Parameter No. 10
Parameter value Bit 0 is set to 1, and the other bits are set to 0.

3.3.4 Bit Machine Group Format

N	*****	Q1	T	**	P	********	T	**	P	********	·	· ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after T represents a machine group number (1 and up).
An 8-digit binary number after P represents the bit values (0/1) of a parameter for each machine group, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example
N01005Q1T1P10000001T2P10000001 ;
Parameter No. 1005
Parameter value
1st machine group: Bits 0 and 7 are set to 1, and the other bits are set to 0.
2nd machine group: Bits 0 and 7 are set to 1, and the other bits are set to 0.

3.3.5 Bit Path Format

N	*****	Q1	L	**	P	********	L	**	P	********	·	· ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after L represents a path number (1 and up).
An 8-digit binary number after P represents the bit values (0/1) of a parameter for each path, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01005Q1L1P10000001L2P10000001.......;
Parameter No. 1005
Parameter value
Path 1: Bits 0 and 7 are set to 1, and the other bits are set to 0.
Path 2: Bits 0 and 7 are set to 1, and the other bits are set to 0.

3.3.6 Bit Axis Format

N	*****	Q1	A	**	P	********	A	**	P	********	·	· ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after A represents a controlled axis number (1 and up).
An 8-digit binary number after P represents the bit values (0/1) of a parameter for each controlled axis, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01005Q1A1P10000001A2P10000001A3P10000001.......;
Parameter No. 1005
Parameter value
1st axis: Bits 0 and 7 are set to 1, and the other bits are set to 0.
2nd axis: Bits 0 and 7 are set to 1, and the other bits are set to 0.
3rd axis: Bits 0 and 7 are set to 1, and the other bits are set to 0.
▪

3.3.7 Bit Spindle Format

N	*****	Q1	S	**	P	********	S	**	P	********	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after S represents a spindle number (1 and up).
An 8-digit binary number after P represents the bit values (0/1) of a parameter for each spindle, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N05603Q1S1P00001000S2P00001000S3P00000000;
Parameter No. 5603
Parameter value
1st spindle: Bit 3 is set to 1, and the other bits are set to 0.
2nd spindle: Bit 3 is set to 1, and the other bits are set to 0.
3rd spindle: All bits are set to 0.

3.3.8 Byte/Word/Two-Word Format

N	*****	Q1	P	********	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after P represents a parameter value (integer).
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N00100Q1P31515;
Parameter No. 100
Parameter value 31515

3.3.9 Byte/Word/Two-Word Machine Group Format

N	*****	Q1	T	**	P	******	T	**	P	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after T represents a machine group number (1 and up).
A numeric value after P represents the value (integer) of a parameter for each machine group.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01020Q1T1P88T2P89......;
Parameter No. 1020
Parameter value 1st machine group: 88
2nd machine group: 89
▪

3.3.10 Byte/Word/Two-Word Path Format

N	*****	Q1	L	**	P	******	L	**	P	******	·	·	·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after L represents a path number (1 and up).
A numeric value after P represents the value (integer) of a parameter for each path.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01020Q1L1P88L2P89L3P90......;

Parameter No. 1020

Parameter value Path 1: 88
Path 2: 89
Path 3: 90
▪

3.3.11 Byte/Word/Two-Word Axis Format

N	*****	Q1	A	**	P	******	A	**	P	******	·	·	·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after A represents a controlled axis number (1 and up).
A numeric value after P represents the value (integer) of a parameter for each controlled axis.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01020Q1A1P88A2P89A3P90A4P66......;

Parameter No. 1020

Parameter value 1st axis: 88
2nd axis: 89
3rd axis: 90
4th axis: 66
▪

3.3.12 Byte/Word/Two-Word Spindle Format

N	*****	Q1	S	**	P	******	S	**	P	******	·	·	·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after S represents a spindle number (1 and up).
A numeric value after P represents the value (integer) of a parameter for each spindle.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example
N05680Q1S1P19S2P19S3P0S4P0;
Parameter No. 5680
Parameter value 1st spindle: 19
2nd spindle: 19
3rd spindle: 0
4th spindle: 0

3.3.13 Real Number Format

N	*****	Q1	P	******	;

N	*****	Q1	M	******	;

N	*****	Q1	I	******	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after each of P, M, and I represents the value (real number) of a parameter.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example
N01451Q1P5000.0;
Parameter No. 1451
Parameter value 5000.0

3.3.14 Real Number Machine Group Format

N	*****	Q1	T	**	P	******	T	**	P	******	· · ·	;

N	*****	Q1	T	**	M	******	T	**	M	******	· · ·	;

N	*****	Q1	T	**	I	******	T	**	I	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after T represents a machine group number (1 and up).
A numeric value after each of P, M, and I represents the value (real number) of a parameter for each machine group.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01220Q1T1M50.0T2M60.0........;
Parameter No. 1220
Parameter value 1st machine group: 50.0
2nd machine group: 60.0
▪

3.3.15 Real Number Path Format

N	*****	Q1	L	**	P	******	L	**	P	******	· · ·	;

N	*****	Q1	L	**	M	******	L	**	M	******	· · ·	;

N	*****	Q1	L	**	I	******	L	**	I	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after L represents a path number (1 and up).
A numeric value after each of P, M, and I represents the value (real number) of a parameter for each path.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01220Q1L1M50.0L2M60.0L3M70.0 ;
Parameter No. 1220
Parameter value Path 1: 50.0
Path 2: 60.0
Path 3: 70.0

3.3.16 Real Number Axis Format

N	*****	Q1	A	**	P	******	A	**	P	******	· · ·	;

N	*****	Q1	A	**	M	******	A	**	M	******	· · ·	;

N	*****	Q1	A	**	I	******	A	**	I	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after A represents a controlled axis number (1 and up).
A numeric value after each of P, M, and I represents the value (real number) of a parameter for each controlled axis.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01220Q1A1M50.0A2M60.0A3M70.0A4M0.0A5M0.0 ....;

Parameter No.	1220
Parameter value	1st axis: 50.0
	2nd axis: 60.0
	3rd axis: 70.0
	4th axis: 0.0
	5th axis: 0.0
	·

3.3.17 Real Number Spindle Format

N	*****	Q1	S	**	P	******	S	**	P	******	· · ·	;

N	*****	Q1	S	**	M	******	S	**	M	******	· · ·	;

N	*****	Q1	S	**	I	******	S	**	I	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after S represents a spindle number (1 and up).
A numeric value after each of P, M, and I represents the value (real number) of a parameter for each spindle.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N05898Q1S1P30.0S2P30.0S3P0.0S4P0.0;

Parameter No.	5898
Parameter value	1st spindle: 30.0
	2nd spindle: 30.0
	3rd spindle: 0.0
	4th spindle: 0.0

3.3.18 Start and End of a Record

A parameter record starts with "%" and ends with "%".

Example

```
%;          ......................................... Start of record
N00000Q1P00001100;
N00002Q1P00000000;
▪
▪
N09162Q1P00000000;
N09163Q1P00000000;
%           .......................................... End of record
```

When parameters and pitch error compensation data are included in a single file, the file starts with "%" and ends with "%".

4 DESCRIPTION OF PARAMETERS

4.1 INPUT TYPE

There are two input types for parameters depending on their usage.

Setting input

These parameters are set depending on NC programs or machining usage.
When the memory protection signal KEY is “1”, they can be input on SETTING screen.
They can also be input on PARAMETER screen.

Parameter input

These parameters are adjusted and set depending on each machine.
They can be input on PARAMETER screen.

> **NOTE**
> To make input on PARAMETER screen enable, it is needed that PARAMETER WRITE on SETTING screen is 1 or that parameter PWE (No.8900#0) is 1.

4.2 DATA TYPE

Parameters are classified by data type as follows:

Data type	Valid data range	Remarks
Bit Bit machine group Bit path Bit axis Bit spindle	0 or 1	
Byte Byte machine group Byte path Byte axis Byte spindle	-128 to 127 0 to 255	Some parameters handle these types of data as unsigned data.
Word Word machine group Word path Word axis Word spindle	-32768 to 32767 0 to 65535	Some parameters handle these types of data as unsigned data.
2-word 2-word machine group 2-word path 2-word axis 2-word spindle	0 to ±999999999	Some parameters handle these types of data as unsigned data.
Real Real machine group Real path Real axis Real spindle	See the Standard Parameter Setting Tables.	

NOTE

1 Each of the parameters of the bit, bit machine group, bit path, bit axis, and bit spindle types consists of 8 bits for one data number (parameters with eight different meanings).
2 For machine group types, parameters corresponding to the maximum number of machine groups are present, so that independent data can be set for each machine group.
3 For path types, parameters corresponding to the maximum number of paths are present, so that independent data can be set for each path.
4 For axis types, parameters corresponding to the maximum number of control axes are present, so that independent data can be set for each control axis.
5 For spindle types, parameters corresponding to the maximum number of spindles are present, so that independent data can be set for each spindle axis.
6 The valid data range for each data type indicates a general range. The range varies according to the parameters. For the valid data range of a specific parameter, see the explanation of the parameter.

4.3 REPRESENTATION OF PARAMETERS

Parameters of the bit type, bit machine group type, bit path type, bit axis type, and bit spindle type

	#7	#6	#5	#4	#3	#2	#1	#0
0000				EIA	NCR	ISP	CTV	TVC

Data No. Data (Data #0 to #7 are bit positions.)

Parameters other than the bit-type parameters above

1023	Number of the servo axis for each axis

Data No. Data

NOTE

1 The bits left blank in Chapter 4, “DESCRIPTION OF PARAMETERS” and parameter numbers that appear on the display but are not found in the parameter list are reserved for future expansion. They must always be 0.

2 A parameter usable with only one path control type, namely, the lathe system (T series) or the machining center system (M series), is indicated using two rows as shown below. When a row is blank, the parameter is not usable with the corresponding series.

[Example 1]

Parameter HTG is a parameter common to the M and T series, but Parameters RTV and ROC are parameters valid only for the T series.

	#7	#6	#5	#4	#3	#2	#1	#0	
1403	RTV		HTG	ROC					T series
			HTG						M series

[Example 2]

The following parameter is provided only for the M series.

1411		T series
	Cutting feedrate	M series

3 When "to" is inserted between two parameter numbers, there are parameters with successive numbers between the two starting and ending parameter numbers, but those intermediate parameter numbers are omitted for convenience.

4 The lower-case letter "x" or "s" following the name of a bit-type parameter indicates the following:

- ”□□□x” : Bit axis type parameters
- ”○○○s” : Bit spindle type parameters

4.4 STANDARD PARAMETER SETTING TABLES

Overview

This section defines the standard minimum data units and valid data ranges of the CNC parameters of the real type, real machine group type, real path type, real axis type, and real spindle type. The data type and unit of data of each parameter conform to the specifications of each function.

Explanation

(A) Length and angle parameters (type 1)

Unit of data	Increment system	Minimum data unit	Valid data range
mm deg.	IS-A	0.01	-999999.99 to +999999.99
	IS-B	0.001	-999999.999 to +999999.999
	IS-C	0.0001	-99999.9999 to +99999.9999
	IS-D	0.00001	-9999.99999 to +9999.99999
	IS-E	0.000001	-999.999999 to +999.999999
inch	IS-A	0.001	-99999.999 to +99999.999
	IS-B	0.0001	-99999.9999 to +99999.9999
	IS-C	0.00001	-9999.99999 to +9999.99999
	IS-D	0.000001	-999.999999 to +999.999999
	IS-E	0.0000001	-99.9999999 to +99.9999999

(B) Length and angle parameters (type 2)

Unit of data	Increment system	Minimum data unit	Valid data range
mm deg.	IS-A	0.01	0.00 to +999999.99
	IS-B	0.001	0.000 to +999999.999
	IS-C	0.0001	0.0000 to +99999.9999
	IS-D	0.00001	0.00000 to +9999.99999
	IS-E	0.000001	0.000000 to +999.999999
inch	IS-A	0.001	0.000 to +99999.999
	IS-B	0.0001	0.0000 to +99999.9999
	IS-C	0.00001	0.00000 to +9999.99999
	IS-D	0.000001	0.000000 to +999.999999
	IS-E	0.0000001	0.0000000 to +99.9999999

(C) Velocity and angular velocity parameters

Unit of data	Increment system	Minimum data unit	Valid data range
mm/min degree/min	IS-A	0.01	0.0 to +999000.00
	IS-B	0.001	0.0 to +999000.000
	IS-C	0.0001	0.0 to +99999.9999
	IS-D	0.00001	0.0 to +9999.99999
	IS-E	0.000001	0.0 to +999.999999
inch/min	IS-A	0.001	0.0 to +96000.000
	IS-B	0.0001	0.0 to +9600.0000
	IS-C	0.00001	0.0 to +4000.00000
	IS-D	0.000001	0.0 to +400.000000
	IS-E	0.0000001	0.0 to +40.0000000

If bit 7 (IESP) of parameter No. 1013 is set to 1, the valid data ranges for IS-C, IS-D, and IS-E are extended as follows:

Unit of data	Increment system	Minimum data unit	Valid data range
mm/min degree/min	IS-C	0.001	0.000 to +999000.000
	IS-D	0.0001	0.0000 to +99999.9999
	IS-E	0.00001	0.0000 to +99999.9999
inch/min	IS-C	0.0001	0.0000 to +9600.0000
	IS-D	0.00001	0.00000 to +4000.00000
	IS-E	0.00001	0.00000 to +4000.00000

(D)Acceleration and angular acceleration parameters

Unit of data	Increment system	Minimum data unit	Valid data range
mm/sec^2 deg./sec^2	IS-A	0.01	0.00 to +999999.99
	IS-B	0.001	0.000 to +999999.999
	IS-C	0.0001	0.0000 to +99999.9999
	IS-D	0.00001	0.00000 to +9999.99999
	IS-E	0.000001	0.000000 to +999.999999
inch/sec^2	IS-A	0.001	0.000 to +99999.999
	IS-B	0.0001	0.0000 to +99999.9999
	IS-C	0.00001	0.00000 to +9999.99999
	IS-D	0.000001	0.000000 to +999.999999
	IS-E	0.0000001	0.0000000 to +99.9999999

If bit 7 (IESP) of parameter No. 1013 is set to 1, the valid data ranges for IS-C, IS-D, and IS-E are extended as follows:

Unit of data	Increment system	Minimum data unit	Valid data range
mm/min degree/min	IS-C	0.001	0.000 to +999999.999
	IS-D	0.0001	0.0000 to +99999.9999
	IS-E	0.0001	0.0000 to +99999.9999
inch/min	IS-C	0.0001	0.0000 to +99999.9999
	IS-D	0.00001	0.00000 to +9999.99999
	IS-E	0.00001	0.00000 to +9999.99999

Notes

(1) Values are rounded up or down to the nearest multiples of the minimum data unit.
(2) A valid data range means data input limits, and may differ from values representing actual performance.
(3) For information on the ranges of commands to the CNC, refer to Appendix D, "RANGE OF COMMAND VALUE" in the "OPERATOR’S MANUAL" (B-64484EN).

4.5 PARAMETERS OF SETTING

	#7	#6	#5	#4	#3	#2	#1	#0
0000			SEQ			INI	ISO	TVC

[Input type] Setting input
[Data type] Bit path

#0 TVC TV check
0: Not performed
1: Performed

#1 ISO Code used for data output
0: EIA code
1: ISO code

> **NOTE**
> 1 The I/O setting of a memory card is made by bit 0 (ISO) of parameter No. 0139.
> 2 The I/O setting of an USB memory is made by bit 0 (ISU) of parameter No. 11505.
> 3 The I/O setting of a data server is made by bit 0 (ISO) of parameter No. 0908.
> 4 When EIA code is used for data output (ISO = 0), set bit 3 (ASI) of parameter No.101 and 111 and 121 to 0.

#2 INI Unit of input
0: In metrics
1: In inches

#5 SEQ Automatic insertion of sequence numbers
0: Not performed
1: Performed

	#7	#6	#5	#4	#3	#2	#1	#0
0001							FCV	

[Input type] Setting input
[Data type] Bit path

#1 FCV Program format
0: Series 16 standard format
1: Series 15 format

NOTE

1 Programs created in the Series 15 program format can be used for operation on the following functions:
   1 Subprogram call M98
   2 Thread cutting with equal leads G32 (T series)
   3 Canned cycle G90, G92, G94 (T series)
   4 Multiple repetitive canned cycle
      G71 to G76 (T series) / G71.7 to G71.6 (M series)
   5 Drilling canned cycle
      G83.1, G80 to G89 (T series) / G73, G74, G76, G80 to G89 (M series)

2 When the program format used in the Series 15 is used for this CNC, some limits may add. Refer to the Operator's Manual.

	#7	#6	#5	#4	#3	#2	#1	#0
0002	SJZ							

[Input type] Setting input
[Data type] Bit

#7 SJZ On an axis for which bit 3 (HJZx) of parameter No. 1005 is set:
0: If a reference position is not established yet, reference position return is performed with deceleration dogs.
If a reference position is already established, reference position return is performed at a parameter-set feedrate without using deceleration dogs.
1: Reference position return is performed with deceleration dogs at all times.

NOTE

SJZ is valid for an axis for which bit 3 (HJZx) of parameter No. 1005 is set to 1. When bit 1 (DLZx) of parameter No. 1005 is set to 1, however, manual reference position return after a reference position is set is performed at a parameter-set feedrate, regardless of the setting of SJZ.

	#7	#6	#5	#4	#3	#2	#1	#0
0010						PEC	PRM	PZS

[Input type] Setting input
[Data type] Bit path

#0 PZS When a part program is output, the O number is:
0: Not zero-suppressed.
1: Zero-suppressed.

#1 PRM When parameters are output, the parameters whose values are 0 are:
0: Output.
1: Not output.

#2 PEC When pitch error compensation data is output, the data whose value is 0 is:
0: Output.
1: Not output.

> **NOTE**
> This parameter is invalid for output of high-precision pitch error compensation data.

	#7	#6	#5	#4	#3	#2	#1	#0
0012	RMVx							MIRx

[Input type] Setting input
[Data type] Bit axis

#0 MIRx Mirror image for each axis
0: Mirror image is off. (Normal)
1: Mirror image is on. (Mirror)

#7 RMVx Releasing the assignment of the control axis for each axis
0: Not released
1: Released
(Equivalent to the control axis detachment signals DTCH1, DTCH2, and so forth <G0124>)

> **NOTE**
> RMVx is valid when bit 7 (RMBx) of parameter No. 1005 is set to 1.

4.6 PARAMETERS OF RS232C INTERFACE

To transfer data (programs, parameters, and so forth) to and from an external input/output device through the I/O device interface (RS-232-C serial interface), the parameters described below need to be set.
The input/output device connected to a channel (such as RS-232-C serial port 1 and RS-232-C serial port 2) can be selected by setting I/O CHANNEL (parameter No. 0020). The specifications (input/output specification number, baud rate, and the number of stop bits) of an input/output device connected to each channel must be set in the parameters corresponding to each channel beforehand.
For channel 1, two combinations of parameters to specify the input/output device data are provided.
The following shows the interrelation between the input/output device interface parameters for the channels.

0020 I/O CHANNEL or foreground input Set channels to be used for data input/output. I/O CHANNEL (0 to 5) =0 : Channel 1 =1 : Channel 1 =2 : Channel 2 =3 : Channel 3 : : : Input/output to and from the memory card interface, etc. is also possible. When IO4 is set 0021 Foreground output 0022 Background input 0023 Background input The channel setting is the same as No.0020.	Input/output channel number (parameter No.0020) ↓ I/O CHANNEL=0 (Channel 1): 0101 Stop bit and other data; 0102 Number specified for the input/output device; 0103 Baud rate I/O CHANNEL=1 (Channel 1): 0111 Stop bit and other data; 0112 Number specified for the input/output device; 0113 Baud rate I/O CHANNEL=2 (Channel 2): 0121 Stop bit and other data; 0122 Number specified for the input/output device; 0123 Baud rate : : : I/O CHANNEL=5

4.6.1 Parameters Common to All Channels

0020	**I/O CHANNEL : Input/output device selection, or interface number for a foreground input device**
0021	**Foreground output device setting**
0022	**Background input device setting**
0023	**Background output device setting**

[Input type] Setting input
[Data type] Byte
[Valid data range] 0 to 17

The CNC has the following interfaces for transferring data to and from an external input/output device and the host computer:

- Input/output device interface (RS-232-C serial ports 1 and 2)
- Memory card interface
- Data server interface
- Embedded Ethernet interface
- USB memory interface

By setting bit 0 (IO4) of parameter No. 0110, data input/output can be controlled separately. When IO4 is not set, data input/output is performed using the channel set in parameter No. 0020. When IO4 is set, a channel can be assigned to each of foreground input, foreground output, background input, and background output.

In these parameters, specify the interface connected to each input/output device to and from which data is to be transferred. See the table below for these settings.

Correspondence between settings and input/output devices	
Setting	**Description**
0,1	RS-232-C serial port 1
2	RS-232-C serial port 2

Correspondence between settings and input/output devices	
Setting	**Description**
4	Memory card interface of CNC Memory card/USB interface in the secondary display unit for Ethernet connection or the shared display unit for Ethernet connection
5	Data server interface
9	Embedded Ethernet interface
17	USB memory interface

0024	Setting of communication with the ladder development tool (FANUC LADDER-III, ladder editing package)

[Input type] Setting input
[Data type] Word
[Valid data range] 0 to 255

This parameter is used to enable or disable the PMC online connection function.
By specifying this parameter, the PMC online connection function can be enabled or disabled without displaying the PMC online setting screen.

Setting	RS-232-C	High-speed interface
0	The setting on the PMC online setting screen is not altered.	
1	To be used (channel 1)	Not to be used
2	To be used (channel 2)	Not to be used
10	Not to be used	To be used
11	To be used (channel 1)	To be used
12	To be used (channel 2)	To be used
255	Communication is terminated forcibly (as with the [FORCED STOP] soft key).	

NOTE
1. The setting of this parameter becomes valid when the power is turned on or this parameter is modified. After this parameter is set, the power need not be turned off then back on.
2. A setting modification made on the PMC online setting screen is not reflected in this parameter.
3. The communication settings of a baud rate and so forth for using RS-232-C made on the PMC online setting screen are valid. When no modification is ever made to the settings on the PMC online setting screen, the baud rate is 9600, parity is not used, and the number of stops bits is 2.
4. If you set this parameter to 1, 2, 11, or 12, the PMC online monitor occupies the specified RS232-C communications port. To use the communications port for the Handy File, for example, set the parameter to 255 to prevent the RS232-C port from being used by the PMC online monitor.

	#7	#6	#5	#4	#3	#2	#1	#0
0100	ENS	IOP			NCR	CRF	CTV	

[Input type] Setting input
[Data type] Bit

#1 CTV Character counting for TV check in the comment section of a program.
0: Performed
1: Not performed

#2 CRF Output of the end of block (EOB) in ISO code
0: Depends on the setting of bit 3 (NCR) of parameter No. 0100.
1: CR, LF are output.

#3 NCR Output of the end of block (EOB) in ISO code
0: LF, CR, CR are output.
1: Only LF is output.

#6 IOP Stopping a program output or input operation by a reset is:
0: Enabled
1: Disabled
(Stopping a program input/output operation with the soft key [STOP] is enabled at all times.)

#7 ENS Action taken when a NULL code is found during read of EIA code
0: An alarm is generated.
1: The NULL code is ignored.

	#7	#6	#5	#4	#3	#2	#1	#0
0110								IO4

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 IO4 Separate control of I/O channel numbers is:
0: Not performed.
1: Performed.
If the I/O channels are not separately controlled, set the input/output device in parameter No. 0020.
If the I/O channels are separately controlled, set the input device and output device in the foreground and the input device and output device in the background in parameters No. 0020 to No. 0023 respectively.
Separate control of I/O channels makes it possible to perform background editing, program input/output, and the like during the DNC operation.

	#7	#6	#5	#4	#3	#2	#1	#0
0138	MNC							MDP

[Input type] Parameter input
[Data type] Bit

#0 MDP To the extensions of input/output files, a path number is:
0: Not added.
1: Added.

> **NOTE**
> If a file name is specified by setting F, this parameter is ignored, and a path number is not added to the extension.

#7 MNC DNC operation from the memory card and external device subprogram call from the memory card are:
0: Not performed.
1: Performed.

	#7	#6	#5	#4	#3	#2	#1	#0
0139								ISO

[Input type] Setting input
[Data type] Bit

#0 ISO When a memory card is selected as an I/O device, data input/output is performed using
0: ASCII codes.
1: ISO codes.

> ⚠ **WARNING**
> 1 Unless data is input using ASCII codes, set this parameter to 1 to input or output data using ISO codes.
> 2 Data input/output with ASCII codes is dangerous because parity information is not included and a data error during the data input/output is not detected.
> 3 DNC operation from a memory card also must set the parameter to 1, and execute DNC operation by ISO code. ASCII code is dangerous because parity information is not included and a data error during the data input is not detected.

	#7	#6	#5	#4	#3	#2	#1	#0
0313							TFO	BOP

[Input type] Parameter input
[Data type] Bit

#0 BOP NC data output function is:
0: Disabled.
1: Enabled.

> **NOTE**
> If a file with the same name already exists in the external I/O device, the file is overwritten. It is recommended to clear the external I/O device before using this function.

#1 TFO On NC data output function, text data (such as parameter, program) is:
0: Output.
1: Not output.

	#7	#6	#5	#4	#3	#2	#1	#0
0908								ISO

[Input type] Setting input
[Data type] Bit

#0 ISO When a data server is selected as an I/O device, data input/output is performed using
0: ASCII codes.
1: ISO codes.

> ⚠ **WARNING**
> 1 Unless data is input using ASCII codes, set this parameter to 1 to input or output data using ISO codes.
> 2 Data input/output with ASCII codes is dangerous because parity information is not included and a data error during the data input/output is not detected.
> 3 DNC operation from a data server also must set the parameter to 1, and execute DNC operation by ISO code. ASCII code is dangerous because parity information is not included and a data error during the data input is not detected.

4.6.2 Parameters of Channel 1 (I/O CHANNEL=0)

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2

[Input type] Parameter input
[Data type] Bit

#0 SB2 The number of stop bits
0: 1
1: 2

#3 ASI Code used at data input/output
0: EIA or ISO code (input: automatically distinguished/output: decided by the setting parameter of bit 1 (ISO) of parameter No.0000)
1: ASCII code

> **NOTE**
> When ASCII code is used for data input/output (ASI = 1), set bit 1 (ISO) of parameter No.0000 to 1.

#7 NFD Feed before and after the data at data output
0: Output
1: Not output
When input/output devices other than the FANUC PPR are used, set NFD to 1.

0102	Number specified for the input/output device (when the I/O CHANNEL is set to 0)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 6
Set the specification number of the input/output device corresponding to I/O CHANNEL=0.
The following table lists the specification numbers and corresponding input/output device specifications.

Specification numbers and corresponding input/output device specifications

Specification number	Input/output device specification
0	RS-232-C (control codes DC1 to DC4 are used)
1	FANUC CASSETTE ADAPTOR 1(FANUC CASSETTE B1/B2)
2	FANUC CASSETTE ADAPTOR 3(FANUC CASSETTE F1)
3	FANUC PROGRAM FILE Mate、FANUC FA Card Adaptor, FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File FANUC SYSTEM P-MODEL H
4	RS-232-C (control codes DC1 to DC4 are not used)
5	Portable tape reader
6	FANUC PPR FANUC SYSTEM P-MODEL G, FANUC SYSTEM P-MODEL H

0103	Baud rate (when I/O CHANNEL is set to 0)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 1 to 12

Set the baud rate of the input/output device corresponding to I/O CHANNEL=0.
When setting this parameter, see the following table:

Baud rates and corresponding settings

Setting	Baud rate (bps)	Setting	Baud rate (bps)
1	50	8	1200
3	110	9	2400
4	150	10	4800
6	300	11	9600
7	600	12	19200

4.6.3 Parameters of Channel 1 (I/O CHANNEL=1)

	#7	#6	#5	#4	#3	#2	#1	#0
0111	NFD				ASI			SB2

[Input type] Parameter input
[Data type] Bit

#0 SB2 The number of stop bits
0: 1
1: 2

#3 ASI Code used at data input/output
0: EIA or ISO code (input: automatically distinguished/output: decided by the setting parameter of bit 1 (ISO) of parameter No.0000)
1: ASCII code

NOTE
When ASCII code is used for data input/output (ASI = 1), set bit 1 (ISO) of parameter No.0000 to 1.

#7 NFD Feed before and after the data at data output
0: Output
1: Not output

When input/output devices other than the FANUC PPR are used, set NFD to 1.

0112	Number specified for the input/output device (when the I/O CHANNEL is set to 1)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 6

Set the specification number of the input/output device corresponding to I/O CHANNEL=1.

0113	Baud rate (when I/O CHANNEL is set to 1)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 1 to 12

Set the baud rate of the input/output device corresponding to I/O CHANNEL=1.

4.6.4 Parameters of Channel 2 (I/O CHANNEL=2)

	#7	#6	#5	#4	#3	#2	#1	#0
0121	NFD				ASI			SB2

[Input type] Parameter input
[Data type] Bit

#0 SB2 The number of stop bits
0: 1
1: 2

#3 ASI Code used at data input/output
0: EIA or ISO code (input: automatically distinguished/output: decided by the setting parameter of bit 1 (ISO) of parameter No.0000)
1: ASCII code

> **NOTE**
> When ASCII code is used for data input/output (ASI = 1), set bit 1 (ISO) of parameter No.0000 to 1.

#7 NFD Feed before and after the data at data output
0: Output
1: Not output

0122	Number specified for the input/output device (when the I/O CHANNEL is set to 2)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 6

Set the specification number of the input/output device corresponding to I/O CHANNEL=2.

0123	Baud rate (when I/O CHANNEL is set to 2)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 1 to 12

Set the baud rate of the input/output device corresponding to I/O CHANNEL=2.

4.7 PARAMETERS OF CNC SCREEN DISPLAY FUNCTIONS

	#7	#6	#5	#4	#3	#2	#1	#0
0300								PCM

[Input type] Setting input
[Data type] Bit

#0 PCM If the CNC main unit has a memory card interface or if the FS30*i* /31*i* /32*i* is in use and connected to a PC via the HSSB or Ethernet interface, when the CNC screen display function is started:
0: The memory card interface on the CNC side is used.
1: The memory card interface on the PC side is used.
When the CNC screen dual display function is active, the data input source and output destination are linked to a key entry choice.
If the CNC main unit has no memory card interface, the memory card interface on the PC side is used regardless of the setting of this parameter. This parameter is valid only while the CNC screen display function is active.

4.8 PARAMETERS OF ETHERNET/DATA SERVER FUNCTIONS

	#7	#6	#5	#4	#3	#2	#1	#0
0901							EFT	

[Input type] Parameter input
[Data type] Bit Path

#1 EFT The FTP file transfer function by the Ethernet function is:
0: Not used.
1: Used.

NOTE
In a multi-path system, the setting of the parameter for path 1 is used throughout the system.

	#7	#6	#5	#4	#3	#2	#1	#0
0904	LCH	DHC	DNS	UNM				BWT

[Input type] Parameter input
[Data type] Bit

#0 BWT If FTP communication is behind data supply during DNC operation in the buffer mode of the Data Server function:
0: An error is caused.
1: No error is caused and DNC operation continues after waiting the completion of FTP communication.

#4 UNM The CNC Unsolicited Messaging function is:
0: Not used.
1: Used.

#5 DNS The DNS client function is:
0: Not used.
1: Used.

#6 DHC The DHCP client function is:
0: Not used.
1: Used.

#7 LCH In the LIST-GET service of the Data Server function, when a list file specifies 1025 or more files:
0: A check for duplicated file names is performed.
1: A check for duplicated file names is not performed.

	#7	#6	#5	#4	#3	#2	#1	#0
0905				UNS	DSF		PCH	DNE

[Input type] Parameter input
[Data type] Bit

#0 DNE During DNC operation using the FOCAS2/Ethernet functions, the termination of DNC operation is:
0: Waited.
1: Not waited. (FOCAS2/HSSB compatible specification)

#1 PCH At the start of communication of the Data Server function, FTP file transfer function, or machine remote diagnosis function, checking for the presence of the server using PING is:
0: Performed.
1: Not performed.

> **NOTE**
> Usually, set 0.
> If 1 is set not to check the presence of the server by using PING, it may take several tens of seconds to recognize an error when the server is not present in the network.
> For mainly security reasons, a personal computer may be set so that it does not respond to the PING command. To communicate with such a personal computer, set 1.

#3 DSF When an NC program is stored on the memory card of the Data Server:
0: The file name takes priority.
1: The program name in the NC program takes priority.

> **NOTE**
> Only when the file of the personal computer side is registered to the memory card of the data server by operating the CNC side, this parameter becomes effective.

#4 UNS In the CNC Unsolicited Messaging function, when the end of the function is requested by other than the CNC Unsolicited Messaging server currently connected:
0: The request for the end of the function is rejected.
1: The request for the end of the function is accepted.

	#7	#6	#5	#4	#3	#2	#1	#0
0906			SCM			OVW		

[Input type] Parameter input
[Data type] Bit

#2 OVW When the Data Server is working as an FTP server, if it receives a file having the same name as for an existing file in it from an FTP client:
0: An error occurs.
1: No error occurs, and the received file is written over the existing file.

> **NOTE**
> The data server Explorer connection function option is necessary to use this parameter.

#5 SCM Data Server function accesses its memory card with the forwarding mode:
0: A memory card-supported mode recognized by Data Server.
1: A traditional PIO mode2.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

0921	Selects the host computer 1 OS.
0922	Selects the host computer 2 OS.
0923	Selects the host computer 3 OS.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 2
Set the OS type of the host computer that is connected by Data Server function or FTP File Transfer function.
0: Windows.
1: UNIX, VMS.
2: Linux.

> **NOTE**
> Some FTP server software products do not depend on the OS. So, even when the above parameters are set, it is sometimes impossible to display a list of files properly.

0924	FOCAS2/Ethernet waiting time setting

[Input type] Parameter input
[Data type] Word
[Unit of data] millisecond
[Valid data range] 0 to 32767

When the FOCAS2/Ethernet and Data Server functions are used simultaneously, this parameter sets the FOCAS2/Ethernet function waiting time in milliseconds.
When a value of 0 is set, the functions operate with assuming that 1 millisecond is specified.

0929	File attribute specification during FTP server operation

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 2

This parameter sets whether to give priority to the file attribute specified in a TYPE command of FTP during operation as an FTP server.

0: Priority is given to the file attribute specified in a TYPE command from an FTP client.
1: Text files are always assumed.
2: Binary files are always assumed.

0930	Maximum number of files that can be registered to the memory card of the Data Server and maximum size per file that can be registered

[Input type] Parameter input
[Data type] Word
[Valid data range] 0, 10 to 15

No. 930	Maximum number of files	Maximum size per file
0	2047	512MB
10	511	2048MB
11	1023	1024MB
12	2047	512MB
13	4095	256MB
14	8191	128MB
15	16383	64MB

NOTE
1 When the memory card is formatted after this parameter is set, the maximum number of files and maximum size per file are changed.
2 Each folder is counted as one file.

4.9 PARAMETERS OF POWER MATE CNC

	#7	#6	#5	#4	#3	#2	#1	#0
0960				PPE	PMN	MD2	MD1	

[Input type] Parameter input
[Data type] Bit path

 # 1, 2 MD1,MD2 These parameters set a slave parameter input/output destination.

Parameter MD2	Parameter MD1	I/O destination
0	0	Program memory
0	1	Memory card

> **NOTE**
> The output destination depends on the setting for path 1.

#3 PMN The Power Mate CNC manager function is:
0: Enabled.
1: Disabled.
When priority is to be given to commands to slaves by a ladder (communication by the Power Mate CNC manager function is to be stopped) after necessary data setting and checking for each of the connected slaves are completed, set this bit to 1 for every path.

#4 PPE
0: The Power Mate CNC manager can set slave parameters at all times.
1: Slave parameter setting by the Power Mate CNC manager follows the setting of PWE for the host CNC. When PWE = 0, the setting of the I/O LINK β parameter is prohibited.

	#7	#6	#5	#4	#3	#2	#1	#0
0961					PMO			

[Input type] Parameter input
[Data type] Bit

#3 PMO The O number of a program for saving and restoring the I/O LINK β parameter is set based on:
0: Group number and channel number
1: Group number only

4.10 PARAMETERS OF ETHERNET/FL-net FUNCTIONS

0970	Select hardware that operates Ethernet or Data Server function

0971	Select hardware that operates first FL-net function

0972	Select hardware that operates second FL-net function

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] -1 to 6
Hardware that operates each function is selected.

Value	Hardware
-1	Not used
0	Unsetting (NOTE 1)
1	Multi-function Ethernet (NOTE 2)
2	(reserved)
3	Fast Ethernet board mounted in slot 1
4	Fast Ethernet board mounted in slot 2
5	Fast Ethernet board mounted in slot 3
6	Fast Ethernet board mounted in slot 4

NOTE

1. When one hardware option is mounted and the software option is uniquely decided, the function can run even if NC parameters No.970-972 are set to 0.
2. The Data Server function cannot be used on Multi-function Ethernet. If using the Data Server function, don't set 1 to NC parameter No.970.
3. When the Ethernet function and the FL-net function are available, these functions can operate on the same hardware by specifying the same hardware on the NC parameters No.970 and 971 as the FL-net/Ethernet coexisting function.
   And, each function can operate on the different hardware by specifying the different hardware.
   Please refer to "FL-net Board CONNECTION MANUAL" (B-64163EN) about FL-net/Ethernet coexisting function.
4. When the Ethernet function and the Data Server function are available, these functions must operate on the same hardware according to the NC parameter No.970.
   These functions cannot operate on the different hardware.
5. When the Ethernet function, the Data Server function, and the FL-net function are available, the NC parameters No.970 and 971 have to set the different hardware. In this case, the Ethernet function and the FL-net function cannot operate on the same hardware.
6. When EtherNet/IP Adapter function or EtherNet/IP Scanner function are available, these functions operate together with Ethernet function on the same hardware that is specified by parameter No.970.
7. EtherNet/IP Adapter function and EtherNet/IP Scanner function cannot be operated with Data Server function at the same time.
   In this case, EtherNet/IP Adapter function and EtherNet/IP Scanner function cannot be used.
8. EtherNet/IP Adapter function and EtherNet/IP Scanner function cannot be operated on the same hardware as the FL-net function. Therefore, if FL-net function is used with EtherNet/IP Adapter function or EtherNet/IP Scanner function, parameter No.970 and No.971, or No.970 and No.972 cannot be set to the same value.

4.11 PARAMETERS OF SYSTEM CONFIGURATION

0980	Machine group number to which each path belongs

NOTE

When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 3

Set the machine group number to which each path belongs.

> **NOTE**
> When 0 is set, each path is assumed to belong to machine group 1.

0981	Absolute path number to which each axis belongs

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 1 to 10

Set the path to which each axis belongs.

> **NOTE**
> When 0 is set, each axis is assumed to belong to path 1.

0982	Absolute path number to which each spindle belongs

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 1 to 10

Set the path to which each spindle belongs.

> **NOTE**
> When 0 is set, each spindle is assumed to belong to path 1.

0983	Path control type of each path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1

Set the path control type of each path.
The following two path control types are available:
T series (lathe system) : 0
M series (machining system) : 1

4.12 PARAMETERS OF AXIS CONTROL/INCREMENT SYSTEM (1 OF 3)

	#7	#6	#5	#4	#3	#2	#1	#0
1000								EEA

[Input type] Parameter input
[Data type] Bit

#0 EEA An extended axis name and extended spindle name are:
0: Invalid
1: Valid

	#7	#6	#5	#4	#3	#2	#1	#0
1001								INM

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 INM Least command increment on the linear axis
0: In mm (metric system machine)
1: In inches (inch system machine)

	#7	#6	#5	#4	#3	#2	#1	#0
1002	IDG			XIK	AZR			JAX

[Input type] Parameter input
[Data type] Bit path

#0 JAX Number of axes controlled simultaneously in jog feed, manual rapid traverse and manual reference position return
0: 1 axis
1: 3 axes

#3 AZR When no reference position is set, the G28 command causes:
0: Reference position return using deceleration dogs (as during manual reference position return) to be executed.
1: Alarm PS0304, "G28 IS COMMANDED WITHOUT ZERO RETURN" to be displayed.

> **NOTE**
> When reference position return without dogs is specified, (when bit 1 (DLZ) of parameter No. 1005 is set to 1) the G28 command specified before a reference position is set causes an alarm PS0304 to be issued, regardless of the setting of AZR.

#4 XIK When bit 1 (LRP) of parameter No. 1401 is set to 0, namely, when positioning is performed using non-linear type positioning, if an interlock is applied to the machine along one of axes in positioning,

0: The machine stops moving along the axis for which the interlock is applied and continues to move along the other axes.

1: The machine stops moving along all the axes.

#7 IDG When the reference position is set without dogs, automatic setting of the bit 0 (IDGx) of parameter No. 1012 to prevent the reference position from being set again is:

0: Not performed.

1: Performed.

NOTE

When this parameter is set to 0, bit 0 (IDGx) of parameter No. 1012 is invalid.

	#7	#6	#5	#4	#3	#2	#1	#0
1004	IPR							

[Input type] Parameter input
[Data type] Bit path

#7 IPR When a number with no decimal point is specified, the least input increment of each axis is:

0: Not 10 times greater than the least command increment

1: 10 times greater than the least command increment

When the increment system is IS-A, and bit 0 (DPI) of parameter No. 3401 is set to 1 (pocket calculator type decimal point programming), the least input increment cannot be 10 times greater than the least command increment.

	#7	#6	#5	#4	#3	#2	#1	#0
1005	RMBx	MCCx	EDMx	EDPx	HJZx		DLZx	ZRNx

[Input type] Parameter input
[Data type] Bit axis

#0 ZRNx If a move command other than G28 is specified by automatic operation when no reference position return is performed yet after the power is turned on:

0: The alarm PS0224, "ZERO RETURN NOT FINISHED." is issued.

1: Operation is performed without issuing an alarm.

NOTE

1 The state in which a reference position has not been established refers to the following state:
  - When an absolute position detector is not used and reference position return has not been performed even once after power-up
  - When an absolute position detector is used and the association of the machine position with the position detected with the absolute position detector has not been completed (See the description of bit 4 (APZx) of parameter No. 1815.)

2 When the Cs axis coordinates are to be set up, set ZRN to 0.

#1 DLZx Function for setting the reference position without dogs

0: Disabled

1: Enabled

#3 HJZx When a reference position is already set:

0: Manual reference position return is performed with deceleration dogs.

1: Manual reference position return is performed using rapid traverse without deceleration dogs, or manual reference position return is performed with deceleration dogs, depending on the setting of bit 7 (SJZ) of parameter No.0002.

When the function for setting the reference position without dogs (see the description of bit 1 (DLZx) of parameter No. 1005) is used, manual reference position return after a reference position is set is always performed at a parameter-set feedrate, regardless of the setting of HJZ.

#4 EDPx In cutting feed, an external deceleration signal in the + direction for each axis is:

0: Invalid

1: Valid

#5 EDMx In cutting feed, an external deceleration signal in the - direction for each axis is:

0: Invalid

1: Valid

#6 MCCx If a multi-axis amplifier is used, and another axis of the same amplifier is placed in the control axis detach state, the MCC signal of the servo amplifier is:

0: Turned off.

1: Not turned off.

NOTE

This parameter can be set for a control axis.

⚠ WARNING

When the servo motor of a controlled axis to be detached is connected to a multi-axis amplifier such as a two-axis amplifier, placing the axis in the control axis detach state causes the activating current in the amplifier to drop. As a result, alarm SV0401, "IMPROPER V_READY OFF" is issued in the other axes. This alarm can be suppressed by setting this parameter bit.

With this method, however, the target axis for the control axis detach operation is placed in the servo off state (the amplifier remains on, but no current flows through the motor). The torque of the target axis becomes 0, so care should be taken. For a vertical axis, in particular, it is necessary to prepare a sequence that starts operating the mechanical brake before the control axis detach operation. When this method is applied to a vertical axis, special care should be taken.

Even when a controlled axis has been detached, detaching a cable (a command cable or feedback cable) of the axis causes an alarm. In such applications, it is impossible to perform a control axis detach operation with a multi-axis amplifier by setting this parameter bit. (Prepare a single-axis amplifier.)

#7 RMBx The control axis detachment signal for each axis and the setting input bit 7 (RMV) of parameter No. 0012 are:
0: Invalid
1: Valid

	#7	#6	#5	#4	#3	#2	#1	#0
1006			ZMIx		DIAx		ROSx	ROTx
			ZMIx	TCHx	DIAx		ROSx	ROTx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 ROTx
#1 ROSx Setting linear or rotary axis.

ROSx	ROTx	Meaning
0	0	Linear axis (1) Inch/metric conversion is done. (2) All coordinate values are linear axis type. (Is not rounded in 0 to 360°) (3) Stored pitch error compensation is linear axis type (Refer to parameter No. 3624)
0	1	Rotary axis (A type) (1) Inch/metric conversion is not done. (2) Machine coordinate values are rounded in 0 to 360°. Absolute coordinate values are rounded or not rounded by bits 0 (ROAx) and 2 (RRLx) of parameter No. 1008. (3) Stored pitch error compensation is the rotation type. (Refer to parameter No. 3624) (4) Automatic reference position return (G28, G30) is done in the reference position return direction and the move amount does not exceed one rotation.
1	1	Rotary axis (B type) (1) Inch/metric conversion is not done. (2) Machine coordinate values, absolute coordinate values and relative coordinate values are linear axis type. (Is not rounded in 0 to 360°). (3) Stored pitch error compensation is linear axis type (Refer to parameter No. 3624) (4) Cannot be used with the rotary axis roll-over function and the index table indexing function (M series)
Except for the above.		Setting is invalid (unused)

#3 DIAx The move command for each axis is based on:
0: Radius specification
1: Diameter specification

#4 TCHx Specify whether each axis is a torch swing control axis for gas cutting machine or not.:
0: Not the torch swing control axis for gas cutting machine.
1: The torch swing control axis for gas cutting machine.

#5 ZMIx The direction of manual reference position return is:
0: + direction
1: - direction

	#7	#6	#5	#4	#3	#2	#1	#0
1007	**ZPAx**		**G90x**	**GRDx**	**RAAx**		**ALZx**	**RTLx**

[Input type] Parameter input
[Data type] Bit axis

#0 RTLx When manual reference position return is performed on a rotary axis (A type) with the deceleration dog pressed before a reference position is established:
0: A movement is made at the reference position return feedrate FL.
1: Until a servo motor grid is established, a movement is not made at the reference position return feedrate FL even if the deceleration dog is pressed, but a movement is made at the rapid traverse rate.

If the deceleration dog is released after a movement at the rapid traverse rate and the deceleration dog is then pressed again and released after the rotary axis makes one revolution, reference position return operation is completed.
When this parameter is set to 0, the alarm PS0090, "REFERENCE RETURN INCOMPLETE" is issued if the deceleration dog is released before a servo motor grid is established.
If this alarm is issued, start manual reference position return at a position sufficiently far away from the reference position.

#1 ALZx In automatic reference position return (G28):
0: Reference position return is performed by positioning (rapid traverse).
If no reference position return is performed after the power is turned on, however, reference position return is performed using the same sequence as for manual reference position return.
1: Reference position return is performed using the same sequence as for manual reference position return.

#3 RAAx Rotary axis control is:
0: Not performed.
1: Performed.
When an absolute programming is specified, the rotary axis control function determines the direction of rotation from the sign of the command value and determines an end coordinate from the absolute value of the command value.

NOTE
RAA is valid when bit 0 (ROA) of parameter No. 1008 is set to 1.
To use this function, the option for rotary axis control is required.

#4 GRDx When absolute position detection is performed for an axis and the correspondence between the machine position and the position on the absolute-position detector has not yet been established for the axis, reference position setting without digs is:
0: Not performed more than once.
1: Performed more than once.

#5 G90x A command for a rotary axis control is:
0: Regarded as an absolute/incremental programming according to the G90/G91 mode setting.
1: Regarded as an absolute programming at all times.

#7 ZPAx In automatic reference position return (G28), a coordinate system is:
0: Not preset.
1: Preset.

	#7	#6	#5	#4	#3	#2	#1	#0
1008		RRFx	RMCx	SFDx		RRLx	RABx	ROAx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 ROAx The rotary axis roll-over is
0: Invalid
1: Valid

> **NOTE**
> ROAx specifies the function only for a rotary axis (for which bit 0 (ROTx) of parameter No. 1006 is set to 1)

#1 RABx In the absolute programming, the axis rotates in the direction
0: In which the distance to the target is shorter.
1: Specified by the sign of command value.

> **NOTE**
> RABx is valid only when ROAx is 1.

#2 RRLx Relative coordinates are
0: Not rounded by the amount of the shift per one rotation
1: Rounded by the amount of the shift per one rotation

> **NOTE**
> 1 RRLx is valid only when ROAx is 1.
> 2 Assign the amount of the shift per one rotation in parameter No. 1260.

#4 SFDx In reference position return based on the grid method, the reference position shift function is:
0: Disabled
1: Enabled

#5 RMCx When machine coordinate system selection (G53) is specified, bit 1 (RABx) of parameter No. 1008 for determining the rotation direction of an absolute programming for the rotary axis roll-over function, and bit 3 (RAAx) of parameter No. 1007 for rotary axis control are:
0: Invalid
1: Valid

#6 RRFx When a reference position return command (G28) is specified, the rotation direction of an absolute command for the rotary axis roll-over function follows:

0: Up to the middle point, it depends on the setting of bit 1 (RAB) of parameter No. 1008. From the middle point to the origin, it depends on the setting of bit 5 (ZMI) of parameter No. 1006.

1: It depends on the setting of bit 1 (RAB) of parameter No. 1008.

When bit 1 (ALZ) of parameter No. 1007 is 1, reference position return is performed using the same sequence as for manual reference position return.

NOTE

The setting of bit 6 (RRF) of parameter No. 1008 to 1 is valid when all of the following conditions are met:

- Rotary axis (A type) (Bit 0 (ROT) of parameter No. 1006 = 1, bit 1 (ROS) of parameter No. 1006 = 0)
- Roll-over is enabled (Bit 0 (ROA) of parameter No. 1008 = 1)
- The reference position has been established.

	#7	#6	#5	#4	#3	#2	#1	#0
1012								IDGx

[Input type] Parameter input
[Data type] Bit axis

#0 IDGx The function for setting the reference position again, without dogs, is:

0: Not inhibited.

1: Inhibited.

(The alarm PS0301, “RESETTING OF REFERENCE RETURN IS INHIBITED” is issued.)

NOTE

IDGx is enabled when the bit 7 (IDG) of parameter No. 1002 is 1.
If the function for setting the reference position without dogs is used, and the reference position is lost in absolute position detection for a cause, the alarm DS0300, “APC ALARM: NEED REF RETURN” is issued when the power is turned on again.
If the operator performs reference position return, as a result of mistakenly identifying the alarm as that requesting the operator to perform a normal reference position return, an invalid reference position may be set. To prevent such an operator error, the IDGx parameter is provided to prevent the reference position from being set again without dogs.

(1) If the bit 7 (IDG) of parameter No. 1002 is set to 1, the bit 0 (IDGx) of parameter No. 1012 is automatically set to 1 when the reference position is set using the function for setting the reference position without dogs. This prevents the reference position from being set again without dogs.
(2) Once the reference position is prevented from being set for an axis again, without dogs, any attempt to set the reference position for the axis without dogs results in the output of an alarm PS0301.
(3) When the reference position must be set again without dogs, set bit 0 (IDGx) of parameter No. 1012 to 0 before setting the reference position.

	#7	#6	#5	#4	#3	#2	#1	#0
1013	IESPx				ISEx	ISDx	ISCx	ISAx

[Input type] Parameter input
[Data type] Bit axis

NOTE

When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 ISAx
#1 ISCx
#2 ISDx
#3 ISEx Increment system of each axis

Increment system	Bit 3 (ISE)	Bit 2 (ISD)	Bit 1 (ISC)	Bit 0 (ISA)
IS-A	0	0	0	1
IS-B	0	0	0	0
IS-C	0	0	1	0
IS-D	0	1	0	0
IS-E	1	0	0	0

#7 IESPx When the least input increment is C (IS-C), D(IS-D), or E(IS-E), the function to allow to set the larger value to the parameter of the speed and the acceleration:
0: Not used.
1: Used.

As for the axis which set this parameter when the least input increment is C (IS-C), D (IS-D), or E (IS-E), the larger value can be set to the parameter of the speed and the acceleration.
The valid data ranges of these parameters are indicated in the table of velocity and angular velocity parameters in (C) of the standard parameter setting tables and the table of acceleration and angular acceleration parameters in (D).
When this function is made effective, the digit number below the decimal point of the parameter on input screen is changed. The digit number below the decimal point decreases by one digit in case of the least input increment C (IS-C) or D (IS-D), and it decreases by two digits in case of the least input increment E (IS-E).

	#7	#6	#5	#4	#3	#2	#1	#0
1014	CDMx							

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#7 CDMx The Cs contour control axis is:
0: Not a virtual Cs axis
1: Virtual Cs axis

	#7	#6	#5	#4	#3	#2	#1	#0
1015	DWT	WIC		ZRL				

[Input type] Parameter input
[Data type] Bit path

#4 ZRL Positioning from an intermediate point to reference position in automatic reference position return(G28) when the reference position has been established, positioning from an intermediate point to 2nd, 3rd, or 4th reference position in 2nd, 3rd, or 4th reference position return, and machine coordinate positioning (G53) are:
0: Positioning of nonlinear interpolation type
1: Positioning of linear interpolation type

> **NOTE**
> This parameter is valid when bit 1 (LRP) of parameter No. 1401 is set to 1.

#6 WIC Workpiece origin offset measurement value direct input is:
0: (M series) Performed without considering the external workpiece origin offset value.
(T series) Valid only in the currently selected workpiece coordinate system.
1: (M series) Performed considering the external workpiece origin offset value.
(T series) Valid in all coordinate systems.

NOTE

In the T series, if this parameter bit is set to 0, workpiece origin offset measurement value direct input is enabled only in the currently selected workpiece coordinate system or an external workpiece coordinate system. If an attempt is made to perform workpiece origin offset measurement value direct input in a workpiece coordinate system other than these workpiece coordinate systems, warning "WRITE PROTECTED" is displayed.

#7 DWT When time for dwell per second is specified by P, the increment system:
0: Depends on the increment system
1: Does not depend on the increment system (1 ms)

1020	Program axis name for each axis

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 65 to 67, 85 to 90

An axis name (axis name 1: parameter No. 1020) can be arbitrarily selected from A, B, C, U, V, W, X, Y, and Z. (When G code system A is used with the lathe system, however, U, V, and W are not selectable.) When bit 0 (EEA) of parameter No. 1000 is set to 1, the length of an axis name can be extended to three characters by setting axis name 2 (parameter No. 1025) and axis name 3 (parameter No. 1026) (extended axis name).
For axis names 2 and 3, a character from 0 to 9 and A to Z of ASCII code can be arbitrarily selected. However, the setting of axis name 3 for each axis is invalid if axis name 2 is not set. Moreover, if a character from 0 to 9 is set as axis name 2, do not use a character from A to Z as axis name 3.

(Tip) ASCII code

Axis name	X	Y	Z	A	B	C	U	V	W
Setting	88	89	90	65	66	67	85	86	87

When G code system A is used with the lathe system, and the character X, Y, Z, or C is used as axis name 1 of an axis, a command with U, V, W, or H specified for axis name 1 represents an incremental programming for the axis.

NOTE

1 When a multiple repetitive canned cycle for turning is used, no character other than X, Y, and Z can be used as the address of the axis.
2 An address other than addresses A, B, and C cannot be used as the address of a rotary axis used for the function for tool length compensation in a specified direction or the tool center point control function.
3 When the custom macro function is enabled, the same extended axis name as a reserved word cannot be used. Such an extended axis name is regarded as a reserved word.
Because of reserved words of custom macros, extended axis names that start with the following two characters cannot be used:
AB, AC, AD, AN, AS, AT, AX, BC, BI, BP, CA, CL, CO, US, WH, WR, XO, ZD, ZE, ZO, ZW

NOTE

4 In a macro call, no extended axis name can be used as an argument.

1022	Setting of each axis in the basic coordinate system

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 7

To determine a plane for circular interpolation, cutter compensation, and so forth (G17: Xp-Yp plane, G18: Zp-Xp plane, G19: Yp-Zp plane) and a 3-dimensional tool compensation space (XpYpZp), specify which of the basic three axes (X, Y, and Z) is used for each control axis, or a parallel axis of which basic axis is used for each control axis.

A basic axis (X, Y, or Z) can be specified only for one control axis.

Two or more control axes can be set as parallel axes for the same basic axis.

Setting	Meaning
0	Rotary axis (Neither the basic three axes nor a parallel axis)
1	X axis of the basic three axes
2	Y axis of the basic three axes
3	Z axis of the basic three axes
5	Axis parallel to the X axis
6	Axis parallel to the Y axis
7	Axis parallel to the Z axis

In general, the increment system and diameter/radius specification of an axis set as a parallel axis are to be set in the same way as for the basic three axes.

1023	Number of the servo axis for each axis

NOTE

When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 80

This parameter associates each control axis with a specific servo axis. Specify values 1+8n, 2+8n, 3+8n, 4+8n, 5+8n, and 6+8n (n = 0, 1, 2, …, 9) like 1, 2, 3, 4, 5, …, 77, and 78.

The control axis number is the order number that is used for setting the axis-type parameters or axis-type machine signals

- With an axis for which Cs contour control/spindle positioning is to be performed, set -(spindle number) as the servo axis number.
  Example)
  When exercising Cs contour control on the fourth controlled axis by using the first spindle, set -1.
- For tandem controlled axes or electronic gear box (EGB) controlled axes, two axes need to be specified as one pair. So, make a setting as described below.
  Tandem axis: For a master axis, set an odd (1, 3, 5, 9, ...) servo axis number. For a slave axis to be paired, set a value obtained by adding 1 to the value set for the master axis.

EGB axis: For a slave axis, set an odd (1, 3, 5, 9, ...) servo axis number. For a dummy axis to be paired, set a value obtained by adding 1 to the value set for the slave axis.

1025	Program axis name 2 for each axis
1026	Program axis name 3 for each axis

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 48 to 57, 65 to 90

When axis name extension is enabled (when bit 0 (EEA) of parameter No. 1000 is set to 1), the length of an axis name can be extended to a maximum of three characters by setting axis name 2 and axis name 3.

NOTE
If program axis name 2 is not set, program axis name 3 is invalid.

1031	Reference axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes

The unit of some parameters common to all axes such as those for dry run feedrate and single-digit F1 feedrate may vary according to the increment system. An increment system can be selected by a parameter on an axis-by-axis basis. So, the unit of those parameters is to match the increment system of a reference axis. Set which axis to use as a reference axis.
Among the basic three axes, the axis with the finest increment system is generally selected as a reference axis.

NOTE
When this parameter is set to 0, the reference axis is 1'st axis.

4.13 PARAMETERS OF COORDINATE SYSTEM (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
1201	WZR	NWS			FPC	ZCL		ZPR
	WZR				FPC	ZCL		ZPR

[Input type] Parameter input
[Data type] Bit path

#0 ZPR Automatic setting of a coordinate system when the manual reference position return is performed
0: Not set automatically
1: Set automatically

> **NOTE**
> ZPR is valid while a workpiece coordinate system function is not provided. If a workpiece coordinate system function is provided, making a manual reference position return always causes the workpiece coordinate system to be established on the basis of the workpiece zero point offset (parameters Nos. 1220 to 1226), irrespective of this parameter setting.

#2 ZCL Local coordinate system when the manual reference position return is performed
0: The local coordinate system is not canceled.
1: The local coordinate system is canceled.

> **NOTE**
> ZCL is valid when the workpiece coordinate system option is specified. In order to use the local coordinate system (G52), the workpiece coordinate system option is required.

#3 FPC When a floating reference position is set with a soft key, the relative position indication is:
0: Not preset to 0 (The relative position indication remains unchanged.)
1: Preset to 0.

#6 NWS The workpiece coordinate system shift amount setting screen is:
0: Displayed
1: Not displayed

> **NOTE**
> When the workpiece coordinate shift amount setting screen is not displayed, a workpiece coordinate system shift amount modification using G10P0 cannot be made.

#7 WZR If the CNC is reset by the RESET key on the MDI unit, external reset signal, reset and rewind signal, or emergency stop signal when bit 6 (CLR) of parameter No. 3402 is set to 0, the G code of group number 14 (workpiece coordinate system) is:
0: Placed in the reset state (not returned to G54).
1: Placed in the cleared state (returned to G54).

> **NOTE**
> 1 When the 3-dimensional conversion mode is set, and bit 2 (D3R) of parameter No. 5400 is set to 1, the G code is placed in the reset state, regardless of the setting of this parameter.
> 2 When bit 6 (CLR) of parameter No. 3402 is set to 1, whether to place the G code in the reset state depends on bit 6 (C14) of parameter No. 3407.

	#7	#6	#5	#4	#3	#2	#1	#0
1202					RLC	G92	EWS	EWD
					RLC	G92		EWD

[Input type] Parameter input
[Data type] Bit path

#0 EWD The shift direction of the workpiece coordinate system is:
0: The direction specified by the external workpiece zero point offset value
1: In the opposite direction to that specified by the external workpiece zero point offset value

#1 EWS The external workpiece zero point offset is made:
0: Valid
1: Invalid

#2 G92 When the CNC has commands G52 to G59 specifying workpiece coordinate systems (optional function), if the G command for setting a coordinate system (G92 for M series, G50 for T series (or the G92 command in G command system B or C)) is specified,
0: G command is executed and no alarm is issued.
1: G command is not executed and an alarm PS0010, “IMPROPER G-CODE” is issued.

#3 RLC Local coordinate system is
0: Not cancelled by reset
1: Cancelled by reset

NOTE
1 When bit 6 (CLR) of parameter No. 3402 is set to 0, and bit 7 (WZR) of parameter No. 1201 is set to 1, the local coordinate system is cancelled, regardless of the setting of this parameter.
2 When bit 6 (CLR) of parameter No. 3402 is set to 1, and bit 6 (C14) of parameter No. 3407 is set to 0, the local coordinate system is cancelled, regardless of the setting of this parameter.
3 When the 3-dimensional coordinate system conversion mode is set, and bit 2 (D3R) of parameter No. 5400 is set to 1, the local coordinate system is not cancelled, regardless of the setting of this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
1203								EMS

[Input type] Parameter input
[Data type] Bit path

#0 EMS The extended external machine zero point shift function is:
0: Disabled.
1: Enabled.

NOTE
1 To use the extended external machine zero point shift function, the external machine zero point shift function or the external data input function is required.
2 When the extended external machine zero point shift function is enabled, the conventional external machine zero point shift function is disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
1205	WTC	3TW	R2O	R1O				

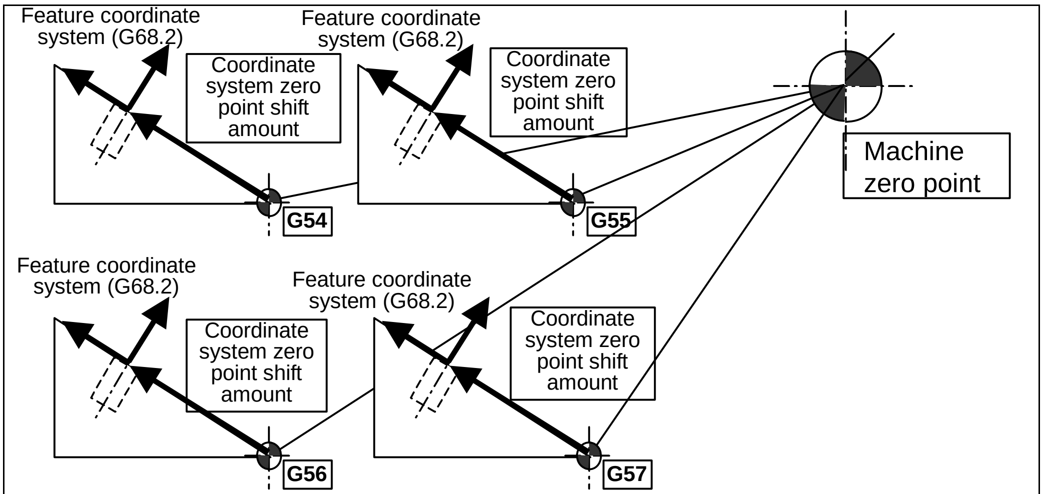
[Input type] Parameter input
[Data type] Bit path

#4 R1O The output of the signal for the reference position is:
0: Disabled.
1: Enabled.

#5 R2O The output of the signal for the second reference position is:
0: Disabled.
1: Enabled.

#6 3TW When workpiece coordinate system selection is specified with G code in tilted working plane indexing mode:
0: The alarm PS5462, "ILLEGAL COMMAND (G68.2/G69)" is issued.
1: Workpiece coordinate system selection is executed.

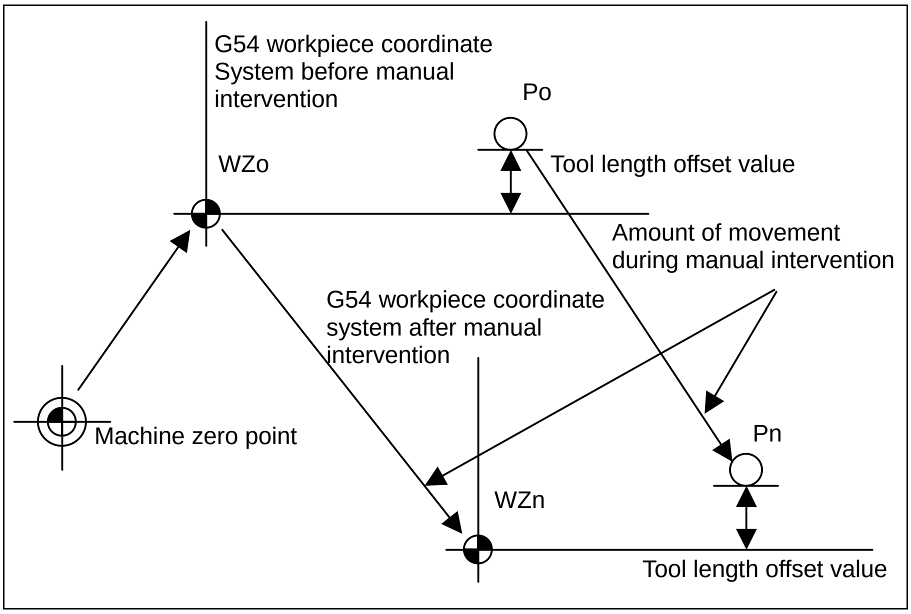
> ⚠ **CAUTION**
> When this parameter is 1, only G54 to G59 or G54.1 can be specified. Specifying G52 or G92 causes alarm PS5462. Specifying G54 to G59 or G54.1 suppresses buffering.



Program example
```
G90 G17
G54
G68.2 X_Y_Z_ I_ J_ K_
G53.1
G43H_
G55 X_Y_Z_
G56 X_Y_Z_
G57 X_Y_Z_
G49
G69
```
X_Y_Z_: Coordinate system zero point shift amount

#7 WTC When workpiece coordinate system preset is done, actual tool length offset is:
0: Not considered.
1: Considered.

When this parameter is set 1, it is possible to preset the workpiece coordinate system by G-code, MDI operation or the each axis workpiece coordinate system preset signals WPRST1 to WPRST8 <Gn358> without canceling the tool length compensation modes. The compensation vector is kept as the below figure when the workpiece coordinate system preset is done to the coordinate shifted by amount of movement during manual intervention.



	#7	#6	#5	#4	#3	#2	#1	#0
1206							**HZP**	

[Input type] Parameter input
[Data type] Bit path

#1 HZP At high-speed manual reference position return, presetting the coordinate system is:
0: Performed.
1: Not performed.

> **NOTE**
> This parameter is valid when no workpiece coordinate system exists with bit 0 (ZPR) of parameter No. 1201 set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
1207								**WOL**

[Input type] Parameter input
[Data type] Bit path

#0 WOL The calculation method for workpiece origin offset measurement value direct input is as follows:

0: In a machine that requires that the difference from the reference tool be set as the tool length compensation amount, the workpiece origin offset is measured and set with the reference tool mounted on the machine.
(The tool length of the reference tool is assumed to be 0.)

1: In a machine that requires that the tool length itself be set as the tool length compensation amount, the workpiece origin offset is measured and set considering the tool length when the tool length compensation for the mounted tool is enabled.

> **NOTE**
> The setting of this parameter is valid only when the system used is the M series and bit 6 (DAL) of parameter No. 3104 is set to 1. If this parameter is set to 1 in other than the above conditions, the system operates as if this parameter bit were set to 0.

1220	External workpiece zero point offset value in each axis

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This is one of the parameters that give the position of the zero point of workpiece coordinate system (G54 to G59). It gives an offset of the workpiece zero point common to all workpiece coordinate systems. In general, the offset varies depending on the workpiece coordinate systems. The value can be set from the PMC using the external data input function.

1221	Workpiece zero point offset value in workpiece coordinate system 1 (G54)
1222	Workpiece zero point offset value in workpiece coordinate system 2(G55)
1223	Workpiece zero point offset value in workpiece coordinate system 3(G56)
1224	Workpiece zero point offset value in workpiece coordinate system 4 (G57)
1225	Workpiece zero point offset value in workpiece coordinate system 5 (G58)
1226	Workpiece zero point offset value in workpiece coordinate system 6 (G59)

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

The workpiece zero point offset values in workpiece coordinate systems 1 to 6 (G54 to G59) are set.

1240	Coordinate value of the reference position in the machine coordinate system

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate values of the reference position in the machine coordinate system.

1241	Coordinate value of the second reference position in the machine coordinate system
1242	Coordinate value of the third reference position in the machine coordinate system
1243	Coordinate value of the fourth reference position in the machine coordinate system

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate values of the second to fourth reference positions in the machine coordinate system.

1244	Coordinate value of the floating reference position in the machine coordinate system

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate values of the floating reference position in the machine coordinate system.

1250	Coordinate system of the reference position used when automatic coordinate system setting is performed

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate system of the reference position on each axis to be used for performing automatic coordinate system setting.

1260	The shift amount per one rotation of a rotary axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the shift amount per one rotation of a rotary axis.
For the rotary axis used for cylindrical interpolation, set the standard value.

1280	Start address of signals used with the extended external machine zero point shift function

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] Even number from 0 to 59999

Set the start address of signals used with the extended external machine zero point shift function. If a nonexistent address value is specified, this function is disabled.
If 100 is set, for example, this function uses R100 and up. The last R address to be used depends on the number of controlled axes. When eight controlled axes are used, R100 to R115 are used.

NOTE
If a nonexistent R address or an address in the system area is set, this function is disabled.

1290	Distance between two opposite tool posts in mirror image

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the distance between two opposite tool posts in mirror image.

4.14 PARAMETERS OF STORED STROKE CHECK

	#7	#6	#5	#4	#3	#2	#1	#0
1300	BFA	LZR	RL3			LMS	NAL	OUT

[Input type] Setting input
[Data type] Bit path

#0 OUT The area inside or outside of the stored stroke check 2 is set as an inhibition area
0: Inside
1: Outside

#1 NAL When the tool enters the inhibition area of stored stroke limit 1:
0: The overtravel alarm signals +OT1 to +OT8<Fn124>, -OT1 to -OT8<Fn126> are not output.
1: The overtravel alarm signals are output, and the tool is decelerated to a stop.
If manual operation is in progress at this time, the alarm is not output.

> **NOTE**
> Even if this parameter is set to 1, an alarm is displayed and the tool is decelerated to a stop when a move command issued during automatic operation causes the tool to get in a parameter-specified inhibition area. Also in this case, the overtravel alarm signals are output for the PMC.

#2 LMS The stored stroke check 1 select signal EXLM (EXLM3, EXLM2, or EXLM when stored stroke check 1 area expansion is used) for switching stored stroke check
0: Disabled
1: Enabled

> **NOTE**
> When bit 0 (DLM) of parameter No. 1301 is set to 1, the stored stroke check 1 select signal EXLM <Gn007.6> (EXLM3 <Gn531.7>, EXLM2 <Gn531.6>, or EXLM <Gn007.6> when stored stroke check 1 area expansion is used) is made invalid.

#5 RL3 Stroke check 3 release signal RLSOT3 <Gn007.4> is
0: Disabled
1: Enabled

#6 LZR When the stored stroke check immediately after power-on is enabled (bit 0 (DOT) of parameter No. 1311 is set to 1), the stored stroke check is:
0: Performed even before a manual reference position return is made.
1: Not performed until a manual reference position return is made.

#7 BFA When the stored stroke check 1, 2, or 3 alarm is issued, an interference alarm is issued with the inter-path interference check function (T series), or a chuck/tail stock barrier (T series) alarm is issued:
0: The tool stops after entering the prohibited area.
1: The tool stops before the prohibited area.

	#7	#6	#5	#4	#3	#2	#1	#0
1301	PLC	OTS		OF1		NPC	LMA	DLM

[Input type] Setting input
[Data type] Bit path

#0 DLM The axis direction dependent stored stroke check 1 switch signals +EXLx <Gn104> and –EXLx <Gn105> are:
0: Disabled.
1: Enabled.

When this parameter is set to 1, the stored stroke check 1 select signal EXLM <Gn007.6> is made invalid.

#1 LMA When the stored stroke check 1 select signal EXLM <Gn007.6> is 1 with bit 2 (LMS) of parameter No. 1300 set to 1, the movable area for stored stroke check 1 is:

0: The inside area set for stored stroke check 1-II.
1: The inside area set for stored stroke check 1-I and the inside area set for stored stroke check 1-II as well.

#2 NPC As part of the stroke limit check performed before movement, the movement specified in G31 (skip) and G37 (automatic tool length measurement) blocks is:

0: Checked
1: Not checked

> **NOTE**
> This parameter is valid only when the option for stroke limit check before movement is selected.

#4 OF1 If the tool is moved into the range allowed on the axis after an alarm is raised by stored stroke check 1,

0: The alarm is not canceled before a reset is made.
1: The OT alarm is immediately canceled.

> **NOTE**
> In the cases below, the automatic release function is disabled. To release an alarm, a reset operation is required.
> 1 When a setting is made to issue an alarm before a stored stroke limit is exceeded (bit 7 (BFA) of parameter No. 1300 is set to 1)
> 2 When an another overtravel alarm (such as stored stroke check 2, stored stroke check 3, and interference check) is already issued
> 3 When an overtravel alarm is already issued with the chopping function

#6 OTS When the overtravel alarm is issued:

0: The overtravel alarm signals +OT1 to +OT8<Fn124>, -OT1 to -OT8<Fn126> are not output to the PMC.
1: The overtravel alarm signals are output to the PMC.

#7 PLC Stroke check before movement is:

0: Not performed
1: Performed

> **NOTE**
> This parameter is valid only when the option for stroke limit check before movement is selected.

	#7	#6	#5	#4	#3	#2	#1	#0
1310							OT3x	OT2x

[Input type] Setting input
[Data type] Bit axis

#0 OT2x Stored stroke check 2 for each axis is :
0: Disabled
1: Enabled

#1 OT3x Stored stroke check 3 for each axis is :
0: Disabled
1: Enabled

	#7	#6	#5	#4	#3	#2	#1	#0
1311								**DOTx**

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 DOTx Stored stroke limit check immediately after power-on is:
0: Disabled.
1: Enabled.

If the stored stroke check is enabled, the machine coordinate value present immediately before the power is turned off is stored.
The machine coordinate value is set immediately after the power is turned on.
Based on the machine coordinate value, absolute coordinate and relative coordinate values are set.

> **NOTE**
> Because this function uses software to store machine coordinates, the function puts an extra load on the system. So, this function should not be set for axes that do not require this function. The amount of a movement made while the power is off is not reflected in machine coordinates immediately after the power is turned on.

	#7	#6	#5	#4	#3	#2	#1	#0
1312								**SLM**

[Input type] Parameter input
[Data type] Bit

#0 SLM The stroke limit area changing function is:
0: Disabled.
1: Enabled.

1320	**Coordinate value I of stored stroke check 1 in the positive direction on each axis**
1321	**Coordinate value I of stored stroke check 1 in the negative direction on each axis**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate value of stored stroke check 1 on each axis in the + or - direction in the machine coordinate system.

> **NOTE**
> 1 Specify diameter values for any axes for which diameter programming is specified.
> 2 The area outside the area set by parameters Nos. 1320 and 1321 is a prohibited area.

1322	Coordinate value of stored stroke check 2 in the positive direction on each axis
1323	Coordinate value of stored stroke check 2 in the negative direction on each axis

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate value of stored stroke check 2 on each axis in the + or - direction in the machine coordinate system.

> **NOTE**
> 1 Specify diameter values for any axes for which diameter programming is specified.
> 2 Whether the inside area or outside area is a prohibited area is set using bit 0 (OUT) of parameter No. 1300.

1324	Coordinate value of stored stroke check 3 in the positive direction on each axis
1325	Coordinate value of stored stroke check 3 in the negative direction on each axis

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate value of stored stroke check 3 on each axis in the + or - direction in the machine coordinate system.

> **NOTE**
> 1 Specify diameter values for any axes for which diameter programming is specified.
> 2 The area inside the area set by parameters Nos. 1324 and 1325 is a prohibited area.

1326	Coordinate value II of stored stroke check 1 in the positive direction on each axis
1327	Coordinate value II of stored stroke check 1 in the negative direction on each axis

1350	Coordinate value III of stored stroke check 1 in the positive direction on each axis
1351	Coordinate value III of stored stroke check 1 in the negative direction on each axis
1352	Coordinate value IV of stored stroke check 1 in the positive direction on each axis
1353	Coordinate value IV of stored stroke check 1 in the negative direction on each axis
1354	Coordinate value V of stored stroke check 1 in the positive direction on each axis
1355	Coordinate value V of stored stroke check 1 in the negative direction on each axis
1356	Coordinate value VI of stored stroke check 1 in the positive direction on each axis
1357	Coordinate value VI of stored stroke check 1 in the negative direction on each axis
1358	Coordinate value VII of stored stroke check 1 in the positive direction on each axis
1359	Coordinate value VII of stored stroke check 1 in the negative direction on each axis
1360	Coordinate value VIII of stored stroke check 1 in the positive direction on each axis
1361	Coordinate value VIII of stored stroke check 1 in the negative direction on each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the coordinate value of stored stroke check 1 on each axis in the + or - direction in the machine coordinate system.

The stored stroke check 1 select signals EXLM3<Gn531.7>, EXLM2<Gn531.6>, EXLM<Gn007.6> and the stroke parameter to be selected have the following relationships:

EXLM3	EXLM2	EXLM	Stroke parameter to be selected
0	0	0	Coordinate value I (No. 1320 / No. 1321)
0	0	1	Coordinate value II (No. 1326 / No. 1327)
0	1	0	Coordinate value III (No. 1350 / No. 1351)
0	1	1	Coordinate value IV (No. 1352 / No. 1353)
1	0	0	Coordinate value V (No. 1354 / No. 1355)
1	0	1	Coordinate value VI (No. 1356 / No. 1357)
1	1	0	Coordinate value VII (No. 1358 / No. 1359)
1	1	1	Coordinate value VIII (No. 1360 / No. 1361)

NOTE

1. Specify diameter values for any axes for which diameter programming is specified.
2. The outside of the area set with each parameter is treated as the inhibition area.
3. The stored stroke check 1 select signal (EXLM3, EXLM2, EXLM) is valid only when bit 2 (LMS) of parameter No. 1300 is 1.
4. When axis direction dependent stored stroke check 1 is enabled (with bit 0 (DLM) of parameter No. 1301 set to 1), stroke parameter switching by the stored stroke check 1 select signal (EXLM3, EXLM2, EXLM) is disabled.

4.15 PARAMETERS OF THE CHUCK AND TAIL STOCK BARRIER

1330	Profile of a chuck

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1

Select a chuck figure.

0 : Chuck which holds a workpiece on the inner surface
1 : Chuck which holds a workpiece on the outer surface

1331	Dimensions of the claw of a chuck (L)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

Set the length (L) of the claw of the chuck.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1332	Dimensions of the claw of a chuck (W)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

Set the width (W) of the claw of the chuck.

> **NOTE**
> Specify this parameter by using a radius value at all times.

1333	Dimensions of the claw of a chuck (L1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the length (L1) of the claw of the chuck.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1334	Dimensions of the claw of a chuck (W1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the width (W1) of the claw of the chuck.

> **NOTE**
> Specify this parameter by using a radius value at all times.

1335	X coordinate of a chuck (CX)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the chuck position (X coordinate) in the workpiece coordinate system.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1336	Z coordinate of a chuck (CZ)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the chuck position (Z coordinate) in the workpiece coordinate system.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1341	Length of a tail stock (L)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the length (L) of the tail stock.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1342	Diameter of a tail stock (D)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the diameter (D) of the tail stock.

> **NOTE**
> Specify this parameter by using a diameter value at all times.

1343	Length of a tail stock (L1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the length (L1) of the tail stock.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1344	Diameter of a tail stock (D1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the diameter (D1) of the tail stock.

> **NOTE**
> Specify this parameter by using a diameter value at all times.

1345	Length of a tail stock (L2)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the length (L2) of the tail stock.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1346	Diameter of a tail stock (D2)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the diameter (D2) of the tail stock.

> **NOTE**
> Specify this parameter by using a diameter value at all times.

1347	Diameter of a tail stock (D3)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the diameter (D3) of the tail stock.

> **NOTE**
> Specify this parameter by using a diameter value at all times.

1348	Z coordinate of a tail stock (TZ)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the tail stock position (Z coordinate) in the workpiece coordinate system.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

4.16 PARAMETERS OF FEEDRATE

	#7	#6	#5	#4	#3	#2	#1	#0
1401		RDR	TDR	RF0		JZR	LRP	RPD

[Input type] Parameter input
[Data type] Bit path

#0 RPD Manual rapid traverse during the period from power-on time to the completion of the reference position return.
0: Disabled (Jog feed is performed.)
1: Enabled

#1 LRP Positioning (G00)
0: Positioning is performed with non-linear type positioning so that the tool moves along each axis independently at rapid traverse.
1: Positioning is performed with linear interpolation so that the tool moves in a straight line.
When using 3-dimensional coordinate system conversion, set this parameter to 1.

#2 JZR The manual reference position return at jog feedrate
0: Not performed
1: Performed

#4 RF0 When cutting feedrate override is 0% during rapid traverse,
0: The machine tool does not stop moving.
1: The machine tool stops moving.

#5 TDR Dry run during threading or tapping (tapping cycle G74 or G84, rigid tapping)
0: Enabled
1: Disabled

#6 RDR Dry run for rapid traverse command
0: Disabled
1: Enabled

	#7	#6	#5	#4	#3	#2	#1	#0
1402				JRV	OV2		JOV	NPC

[Input type] Parameter input
[Data type] Bit path

#0 NPC Feed per revolution without the position coder (function for converting feed per revolution F to feed per minute F in the feed per revolution mode (G95)) is:
0: Not used
1: Used

#1 JOV Jog override is:
0: Enabled
1: Disabled (tied to 100%)

#3 OV2 Signals used for 2nd feedrate override are
0: *AFV0 to AFV7 <Gn013> (specified every 1%)
1: *APF00 to *APF15 <Gn094, Gn095> (specified every 0.01%)

#4 JRV Jog feed or incremental feed is
0: Performed at feed per minute.
1: Performed at feed per rotation.

> **NOTE**
> 1 Specify a feedrate in parameter No. 1423.
> 2 For the machining center system, the option for threading/synchronous feed is required.

	#7	#6	#5	#4	#3	#2	#1	#0
1403	RTV		HTG	ROC				
	RTV		HTG	ROC	EDT			

[Input type] Parameter input
[Data type] Bit path

#3 EDT The function for corner control by feedrate (for a gas cutting machine) is:
0: Disabled.
1: Enabled.

When the feedrate has reduced to the feedrate set in parameter No. 1474, from which the system regards the number of accumulated pulses as being 0, the next block is executed.

#4 ROC In the threading cycles G92 (T series), G76 (T series), and G76.7 (M series), rapid traverse override for retraction after threading is finished is:
0: Effective
1: Not effective (Override of 100%)

#5 HTG The feedrate for helical interpolation/helical involute interpolation/3-dimensional circular interpolation is:
0: Specified using the feedrate along the tangent to an arc/involute curve/3-dimensional arc
1: Specified using the feedrate along axes including a linear axis (specified axes other than the circular interpolation axis in the case of 3-dimensional circular interpolation)

#7 RTV Rapid traverse override while the tool is retracting in threading
0: Rapid traverse override is effective.
1: Rapid traverse override is not effective.

	#7	#6	#5	#4	#3	#2	#1	#0
1404	FC0					FM3	DLF	
	FC0						DLF	

[Input type] Parameter input
[Data type] Bit path

#1 DLF After a reference position is set, manual reference position return performed at:
0: Rapid traverse rate (parameter No. 1420)
1: Manual rapid traverse rate (parameter No. 1424)

NOTE
This parameter selects a feedrate for reference position return performed without dogs. This parameter also selects a feedrate when manual reference position return is performed according to bit 7 (SJZ) of parameter No.0002 using rapid traverse without deceleration dogs after a reference position is set.

#2 FM3 The increment system of an F command without a decimal point in feed per minute is:
0: 1 mm/min (0.01 inch/min for inch input)
1: 0.001 mm/min (0.00001 inch/min for inch input)

#7 FC0 Specifies the behavior of the machine tool when a block (G01, G02, G03, etc.) containing a feedrate command (F command) that is 0 is issued during automatic operation, as follows:
0: An alarm PS0011, “FEED ZERO (COMMAND)” occurs.
1: An alarm PS0011 does not occur, and the block is executed.

NOTE
1 In inverse time feed (G93) mode, the alarm PS1202, "NO F COMMAND AT G93" is issued irrespective of the setting of this parameter.

> **NOTE**
> 2 This parameter is set from 1 to 0, if a bit 6 (CLR) of parameter No. 3402 is 1, reset the CNC. Or if CLR is 0, turn off and on the CNC.

	#7	#6	#5	#4	#3	#2	#1	#0
1405			EDR		HFR	PCL		
			EDR		HFR	PCL	FR3	

[Input type] Parameter input
[Data type] Bit path

#1 FR3 The increment system of an F command without a decimal point in feed per revolution is:
0: 0.01 mm/rev (0.0001 inch/rev for inch input)
1: 0.001 mm/rev (0.00001 inch/rev for inch input)

#2 PCL The function for constant surface speed control without the position coder is:
0: Not used.
1: Used.

> **NOTE**
> The option for constant surface speed control without the position coder is required.

#3 HFR Feedrate command in rapid traverse is:
0: A value of set in parameter.
1: Synchronized with handle pulse by the handle-synchronous feed function.

> **NOTE**
> This parameter is available when the handle-synchronous feed function is available.

#5 EDR As the external deceleration rate for positioning of linear interpolation type:
0: The external deceleration rate for cutting feed is used.
1: The external deceleration rate in rapid traverse for the first axis of path 1 is used.
Let us use external deceleration 1 as an example.
When this parameter bit is set to 0, the value of parameter No. 1426 is used as the external deceleration rate for external deceleration 1.
When this parameter bit is set to 1, the value of axis 1 of parameter No. 1427 is used as the external deceleration rate for external deceleration 1.

	#7	#6	#5	#4	#3	#2	#1	#0
1406							EX3	EX2
	F1O						EX3	EX2

[Input type] Parameter input
[Data type] Bit path

#0 EX2 External deceleration function setting 2 is:
0: Invalid
1: Valid

#1 EX3 External deceleration function setting 3 is:
0: Invalid
1: Valid

#7 F1O For the cutting feedrate specified by a single-digit F code (F1 to F9), feedrate override, second feedrate override, and override cancellation are:
0: Disabled.
1: Enabled.

> **NOTE**
> For the F0 feedrate, rapid traverse override is enabled regardless of the setting of this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
1408					IRCx			RFDx

[Input type] Parameter input
[Data type] Bit axis

#0 RFDx Feedrate control on a rotary axis is exercised using:
0: Conventional method
1: Method that specifies a feedrate on the virtual circle of the rotary axis

#3 IRCx The least input increment of the maximum cutting feedrates set in parameters Nos. 1430 and 1432 is:
0: Not multiplied by ten.
1: Multiplied by ten.
Set this parameter for the following axes, which are operated by the following functions:
- Spindle control axis by servo motor
- Tool rotary axis in the polygon turning function
- Tool rotary axis in interpolation type rigid tapping

If a rotation speed of 1000 (1/min) (=360000 (deg/min)) is to be used when this parameter is set to 1, set 36000.0 in parameter No. 1430/1432.

1410	Dry run rate

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set the dry run rate at the 100% position on the jog feedrate specification dial. The unit of data depends on the increment system of the reference axis. Setting this parameter to 0 results in alarm PS5009, "PARAMETER ZERO (DRY RUN)", being issued.

1411	
	Cutting feedrate

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Setting input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

A cutting feedrate can be specified with this parameter for a machine which does not have to change the cutting feedrate frequently during machining. This eliminates the need to specify a cutting feedrate (F code) in the NC program.

1414	Feedrate for retrace

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

Set a cutting feedrate for retrace operation. When 0 is set, a retrace operation is performed at a programmed feedrate.

1415	Manual synchronous feedrate for manual linear/circular interpolation continuous feed at override 100%

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

NOTE

This parameter is valid only when bit 4 (JRV) of parameter No. 1402 is 1 (manual per revolution feed is enabled). If manual per revolution feed is disabled, the manual linear/circular interpolation continuous feedrate follows the dry run rate (parameter No. 1410). For a machining center system, the manual linear/circular interpolation continuous feedrate follows the dry run rate (parameter No. 1410) (feed per minute) even though bit 4 (JRV) of parameter No. 1402 is set to 1 when the threading/synchronous feed option is not specified.

1420	Rapid traverse rate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

Set the rapid traverse rate when the rapid traverse override is 100% for each axis.

1421	F0 rate of rapid traverse override for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set the F0 rate of the rapid traverse override for each axis.

1423	Feedrate in manual continuous feed (jog feed) for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
(1) When bit 4 (JRV) of parameter No. 1402 is set to 0 (feed per minute), specify a jog feedrate (feed per minute) under an override of 100%.
(2) When bit 4 (JRV) of parameter No. 1402 is set to 1 (feed per revolution), specify a jog feedrate (feed per revolution) under an override of 100%.

NOTE
This parameter is clamped to the axis-by-axis manual rapid traverse rate (parameter No. 1424).

1424	Manual rapid traverse rate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set the rate of manual rapid traverse when the rapid traverse override is 100% for each axis.

NOTE
1 If 0 is set, the rate set in parameter No. 1420 (rapid traverse rate for each axis) is assumed.
2 When manual rapid traverse is selected (bit 0 (RPD) of parameter No. 1401 is set to 1), manual feed is performed at the feedrate set in this parameter, regardless of the setting of bit 4 (JRV) of parameter No. 1402.

1425	FL rate of the reference position return for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set feedrate (FL rate) after deceleration when the reference position return is performed for each axis.

1426	External deceleration rate of cutting feed

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set an external deceleration rate for cutting feed or positioning of linear interpolation type (G00).

1427	External deceleration rate of rapid traverse for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set the external deceleration rate of rapid traverse for each axis.

1428	Reference position return feedrate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

This parameter sets a rapid traverse rate for reference position return operation using deceleration dogs, or for reference position return operation before a reference position is set.
This parameter is also used to set a feedrate for the rapid traverse command (G00) in automatic operation before a reference position is set.

NOTE

1 To this feedrate setting 100%, a rapid traverse override (F0, 25, 50, or 100%) is applicable.
2 For automatic return after completion of reference position return and machine coordinate system establishment, the normal rapid traverse rate is used.
3 As a manual rapid traverse rate before machine coordinate system establishment by reference position return, the jog feedrate or manual rapid traverse rate can be selected with bit 0 (RPD) of parameter No. 1401.

	Before coordinate system establishment	After coordinate system establishment
Automatic reference position return (G28)	No. 1428	No. 1420
Automatic rapid traverse (G00)	No. 1428	No. 1420
Manual reference position return *1	No. 1428	No. 1428 *3
Manual rapid traverse	No. 1423 *2	No. 1424

4 When parameter No. 1428 is set to 0, the following parameter-set feedrates are applied.

	Before coordinate system establishment	After coordinate system establishment
Automatic reference position return (G28)	No. 1420	No. 1420
Automatic rapid traverse (G00)	No. 1420	No. 1420
Manual reference position return *1	No. 1424	No. 1424 *3
Manual rapid traverse	No. 1423 *2	No. 1424

No. 1420: Rapid traverse rate
No. 1423: Jog feedrate
No. 1424: Manual rapid traverse rate
*1 : By using bit 2 (JZR) of parameter No. 1401, the jog feedrate can be used for manual reference position return at all times.
*2 : When bit 0 (RPD) of parameter No. 1401 is set to 1, the setting of parameter No. 1424 is used.
*3 : When rapid traverse is used for reference position return without dogs or manual reference position return after reference position establishment, regardless of the deceleration dog, the feedrate for manual reference position return based on these functions is used (the setting of bit 1 (DLF) of parameter No. 1404 is followed).

1430	Maximum cutting feedrate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Specify the maximum cutting feedrate for each axis.

1432	Maximum cutting feedrate for all axes in the acceleration/deceleration before interpolation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

Set a maximum cutting feedrate for each axis in the acceleration/deceleration before interpolation mode such as AI contour control. When the acceleration/deceleration before interpolation mode is not set, the maximum cutting feedrate set in parameter No. 1430 is used.

1434	Maximum manual handle feedrate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set a maximum manual handle feedrate for each axis in case of maximum manual handle feedrate switch signal HNDLF<Gn023.3>=”1”.

1440	External deceleration rate setting 2 in cutting feed

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set external deceleration rate 2 for cutting feed or positioning of linear interpolation type (G00).

1441	External deceleration rate setting 2 for each axis in rapid traverse

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set external deceleration rate 2 for each axis in rapid traverse.

1442	Maximum manual handle feedrate setting 2 for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set a maximum manual handle feedrate 2 for each axis.

1443	External deceleration rate setting 3 in cutting feed

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

Set external deceleration rate 3 for cutting feed or positioning of linear interpolation type (G00).

1444	External deceleration rate setting 3 for each axis in rapid traverse

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set external deceleration rate 3 for each axis in rapid traverse.

1445	Maximum manual handle feedrate setting 3 for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set a maximum manual handle feedrate 3 for each axis.

1446	Adjusting parameter 1 for threading start position compensation in changing spindle speed function (multiplier)

[Data type] Word path
[Unit of data] 1/10000
[Valid data range] -32768 to 32767 (Assumed to be 10000 when the setting is 0.)
This parameter sets a multiplier for finely adjusting the NC-calculated offset value (NC-internal delay of acceleration/deceleration after interpolation).

1448	Adjusting parameter 2 for threading start position compensation in changing spindle speed function (multiplier)

[Data type] Word path
[Unit of data] 1/10000
[Valid data range] -32768 to 32767 (Assumed to be 10000 when the setting is 0.)
This parameter sets a multiplier for finely adjusting the NC-calculated offset value (servo delay).

1449	Adjusting parameter 3 for threading start position compensation in changing spindle speed function (multiplier)

[Data type] Word path
[Unit of data] 1/10000
[Valid data range] -32768 to 32767 (Assumed to be 10000 when the setting is 0.)
This parameter sets a multiplier for finely adjusting the NC-calculated offset value (delay in one-rotation signal detection).

When the NC-calculated offset value is 1280, the multiplier is assumed to be 10000 if this parameter is set to 0, where 1280*10000/10000=1280 leads to a shift of 1280/4096*360=112.500[deg]. If the parameter is set to 12000, however, 1280*12000/10000=1536 leads to a shift of 1536/4096*360=135.000[deg].

1450	Change of feedrate for one graduation on the manual pulse generator during one-digit F feed code

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 127

Set the constant that determines the change in feedrate as the manual pulse generator is rotated one graduation during one-digit F feed code.

$$\Delta F = \frac{F\max i}{100n} \quad \text{(where, i=1 or 2)}$$

In the above equation, set n. That is, the number of revolutions of the manual pulse generator, required to reach feedrate Fmaxi is obtained. Fmaxi refers to the upper limit of the feedrate for a one-digit F code feed command, and set it in parameter No. 1460 or 1461.

Fmax1: Upper limit of the feedrate for F1 to F4 (parameter No. 1460)
Fmax2: Upper limit of the feedrate for F5 to F9 (parameter No. 1461)

1451	Feedrate for F1
to	to
1459	Feedrate for F9

[Input type] Setting input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

These parameters set the feedrates for one-digit F code feed commands F1 to F9. When a one-digit F code feed command is specified, and the feedrate is changed by turning the manual pulse generator, the parameter-set value also changes accordingly.

1460	Upper limit of feedrate for F1 to F4
1461	Upper limit of feedrate for F5 to F9

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

Set the upper limit of feedrate for the one-digit F code feed command.
As the feedrate increases by turning the manual pulse generator, the feedrate is clamped when it reaches the upper limit set. If a one-digit F feed command F1 to F4 is executed, the upper limit is that set in parameter No. 1460. If a one-digit F code feed command F5 to F9 is executed, the upper limit is that set in parameter No. 1461.

1465	Radius of a virtual circle when a feedrate is specified on the virtual circle of a rotary axis

[Input type] Parameter input
[Data type] Real axis

[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (B)

Set the radius of a virtual circle when a feedrate on the virtual circle of a rotary axis is specified.
If 0 is set for a rotary axis, the axis is excluded from feedrate calculation.
If the input unit is the inch, enter a value in inches.
The data is then converted to a millimeter value and displayed.

1466	Feedrate for retraction in threading cycle G92 or G76
	Feedrate for retraction in threading cycle G76.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

When threading cycle G92, G76 or G76.7 is specified, retraction is performed after threading. Set a feedrate for this retraction.

> ⚠ **WARNING**
> When the manual handle interruption is valid, set the same value as the parameter No.1430 to the parameter No.1466.

> **NOTE**
> When this parameter is set to 0 or bit 1 (CFR) of parameter No. 1611 is set to 1, the rapid traverse rate set in parameter No. 1420 is used.

1474	
	Feedrate regarded as accumulated pulse 0. (corner control by feedrate (for gas cutting machine))

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, deg/min (machine unit)
[Valid data range] 0 to 32767

When a cutting feed block (block A) is followed by another cutting feed block (block B), execution proceeds to block B if the feedrate in the automatic acceleration/deceleration circuit for each axis is reduced to the setting of this parameter, and the number of accumulated pulses in the automatic acceleration/deceleration circuit is assumed to be 0.
This setting is used for corner control by feedrate (for a gas cutting machine).

	#7	#6	#5	#4	#3	#2	#1	#0
1490	PGF					LMV	TOV	

[Input type] Parameter input
[Data type] Bit path

#1 TOV The threading start position compensation in changing spindle speed function is:
0: Disabled.
1: Enabled.

#2 LMV The offset value for Z-axis threading start position at a spindle speed change is set:
0: By spindle resolution (lead/4096).
1: In Z-axis least command increments.

#7 PGF The feedrate specified for circular interpolation, involute interpolation, spiral/conical interpolation, and NURBS interpolation in the high-speed program check mode is:
0: The dry run feedrate.
At this time, manual feedrate override signals *JV0 to *JV15 <Gn010 to Gn011> can be used.
1: The maximum feedrate specified by the CNC.

> ⚠ **CAUTION**
> If this parameter is set to 1, feedrate clamp, override, and dry run for circular interpolation, involute interpolation, spiral/conical interpolation, and NURBS interpolation are disabled. If a movement around a stroke limit is specified, therefore, a stroke limit check cannot sometimes be made correctly.

1495	Torch swing feedrate of the torch control axis for gas cutting machine

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set the swing feedrate of the torch control axis for gas cutting machine.

1496	Critical angle of automatic exact stop check

[Input type] Parameter input
[Data type] Word path
[Unit of data] degree
[Valid data range] 0 to 179
Set the critical internal angle of a corner in 1-degree steps to cause an exact stop in the automatic exact stop check. If 0 is set, the automatic exact stop check is disabled.

1497	The amount of Minute block movement of automatic exact stop check

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (Refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the amount of Minute block movement of automatic exact stop check. If the amounts of movements along the two axes of the currently selected plane in a specified block are both smaller than the setting of this parameter, the automatic exact stop check for that block is disabled.

4.17 PARAMETERS OF ACCELERATION/DECELERATION CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
1601			NCI	RTO				

[Input type] Parameter input
[Data type] Bit path

#4 RTO Block overlap in rapid traverse
0: Blocks are not overlapped in rapid traverse.
1: Blocks are overlapped in rapid traverse.

#5 NCI An in-position check:
0: Confirms that the specified feedrate becomes 0 (the acceleration/deceleration delay becomes 0) at deceleration time and that the machine position has reached a specified position (the servo positional deviation is within the in-position width set by parameter No. 1826).
1: Confirms only that the specified feedrate becomes 0 (the acceleration/deceleration delay becomes 0) at deceleration time.

	#7	#6	#5	#4	#3	#2	#1	#0
1602		LS2			BS2	CAF		

[Input type] Parameter input
[Data type] Bit path

#2 CAF In cutter compensation mode or tool nose radius compensation mode, the circular cutting point feedrate change is;
0: Performed on the inner arc only.
1: Performed on the inner and outer arcs.

#3 BS2 Acceleration/deceleration after interpolation for cutting feed in a mode of acceleration/deceleration before look-ahead interpolation such as the AI contour control mode:
0: Exponential acceleration/deceleration or linear acceleration/ deceleration is used.
(The setting of bit 6 (LS2) of parameter No. 1602 is followed.)
1: Bell-shaped acceleration/deceleration is used.
(The bell-shaped acceleration/deceleration after cutting feed interpolation option is required.)

#6 LS2 Acceleration/deceleration after interpolation for cutting feed in a mode of acceleration/deceleration before interpolation such as the AI contour control mode:
0: Exponential acceleration/deceleration is used.
1: Linear acceleration/deceleration is used.

	#7	#6	#5	#4	#3	#2	#1	#0
1603				PRT				

[Input type] Parameter input
[Data type] Bit path

#4 PRT For positioning of linear interpolation type:
0: Acceleration/deceleration of acceleration fixed type is used.
1: Acceleration/deceleration of time fixed type is used.

	#7	#6	#5	#4	#3	#2	#1	#0
1604								SHP

[Input type] Parameter input
[Data type] Bit path

#0 SHP When automatic operation is started, the state equivalent to the specification of G5.1Q1 for AI contour control is:
0: Not set
1: Set
Upon reset, the state where G5.1Q1 is specified is set.

	#7	#6	#5	#4	#3	#2	#1	#0
1605						EST		

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#2 EST Axis immediate stop function is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
1606								MNJx

[Input type] Parameter input
[Data type] Bit axis

#0 MNJx In manual handle interrupt or automatic manual simultaneous operation (interrupt type):
0: Only cutting feed acceleration/deceleration is enabled, and jog feed acceleration/deceleration is disabled.
1: Both cutting feed acceleration/deceleration and jog feed acceleration/deceleration are applied.

	#7	#6	#5	#4	#3	#2	#1	#0
1610			THLx	JGLx			CTBx	CTLx

[Input type] Parameter input
[Data type] Bit axis

#0 CTLx Acceleration/deceleration in cutting feed or dry run during cutting feed
0: Exponential acceleration/deceleration is applied.
1: Linear acceleration/deceleration after interpolation is applied.

#1 CTBx Acceleration/deceleration in cutting feed or dry run during cutting feed
- 0: Exponential acceleration/deceleration or linear acceleration/ deceleration is applied. (depending on the setting in bit 0 (CTLx) of parameter No. 1610)
- 1: Bell-shaped acceleration/deceleration is applied.

#4 JGLx Acceleration/deceleration in jog feed
- 0: Exponential acceleration/deceleration is applied.
- 1: The same acceleration/deceleration as for cutting feedrate is applied. (Depending on the settings of bits 1 (CTBx) and 0 (CTLx) of parameter No. 1610)

#5 THLx Acceleration/deceleration in threading cycles
- 0: Exponential acceleration/deceleration is applied.
- 1: The same acceleration/deceleration as for cutting feedrate is applied. (Depending on the settings of bits 1 (CTBx) and 0 (CTLx) of parameter No. 1610) As the time constant and FL rate, however, the settings of parameters Nos. 1626 and 1627 for threading cycles are used.

	#7	#6	#5	#4	#3	#2	#1	#0
1611					TCO	AOFF	THA	CFR

[Input type] Parameter input
[Data type] Bit path

#0 CFR For retraction after threading in the threading cycles G92 (T series), G76 (T series), and G76.7 (M series):
- 0: The type of acceleration/deceleration after interpolation for threading is used together with the threading time constant (parameter No. 1626) and FL rate (parameter No. 1627).
- 1: The type of acceleration/deceleration after interpolation for rapid traverse is used together with the rapid traverse time constant.

NOTE
If this parameter is set to 1, a check is made before a retraction to see that the specified feedrate has become 0 (the delay in acceleration/deceleration has become 0). For retraction, the rapid traverse rate (parameter No. 1420) is used, regardless of the setting of parameter No. 1466. When this parameter is set to 0, parameter No. 1466 is used as the feedrate for retraction. As acceleration/deceleration used for retraction, only acceleration/deceleration after interpolation is used. Rapid traverse before look-ahead interpolation and optimum torque acceleration/deceleration are disabled.

#1 THA When a threading command is specified in AI contour control mode:
- 0: An alarm is issued.
- 1: AI contour control mode is temporarily canceled and the command is executed.

NOTE
If acceleration/deceleration before interpolation is enabled by the command following or followed by a threading command with this parameter set to 1, the tool is decelerated to a stop at the joint of the relevant block.

#2 AOFF When AI contour control mode is off and the parameter of the advanced-preview feed forward function is valid, the advanced-preview feed forward function is:
0: Enabled.
1: Disabled.

> **NOTE**
> This parameter is valid when bit 0 (SHP) of parameter No. 1604 is 0 with none of G05.1Q1, G05P10000, and G08P1 specified.

#3 TCO Blocks in a threading cycle are:
0: Not overlapped in rapid traverse.
1: Overlapped in rapid traverse.
In a threading cycle that is a turning canned cycle, the rapid traverse overlap function can perform rapid traverse overlap between a retract operation and return operation and between a return operation and a positioning operation for the next threading cycle.
The rapid traverse deceleration ratio in an overlap between blocks is set in parameter No. 1726.

> **NOTE**
> When this function is used, threading cycle retraction is disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
1612						TOD	AIR	PRO

[Input type] Parameter input
[Data type] Bit path

#0 PRO The feedrate reduction ratio for rapid traverse overlap is specified by :
0: The parameter No. 1722
1: The system variables #100851[#_ROVLP[1]]-#100874[#_ROVLP[24]]
This function is available in following conditions.
Rapid traverse block overlap disable signal ROVLP<Gn053.5>=”0” and bit 4 (RTO) of parameter No. 1601=1(Blocks are overlapped in rapid traverse).

#1 AIR The status display and mode signal in AI contour control mode is:
0: Enabled only when the conditions for executing AI contour control are satisfied.
1: Enabled always in AI contour control mode.
If this parameter is set to 1, in-mode blinking display and the AI contour control mode signal AICC <Fn062.0> remain enabled in the AI contour control mode.

> **NOTE**
> The parameter is invalid during a stop on feed hold or a single-block stop.

#2 TOD Rapid traverse overlap in threading cycle is:
0: Invalid.
1: Valid.
In threading cycle of canned cycle, rapid traverse overlap at the following corners.
- Between the retraction of X-axis and the return to the cycle start point of Z-axis
- Between the return to the cycle start of Z-axis and positioning to the threading start point of X-axis

Distances of overlap are specified with parameter No.1728 and No.1729.

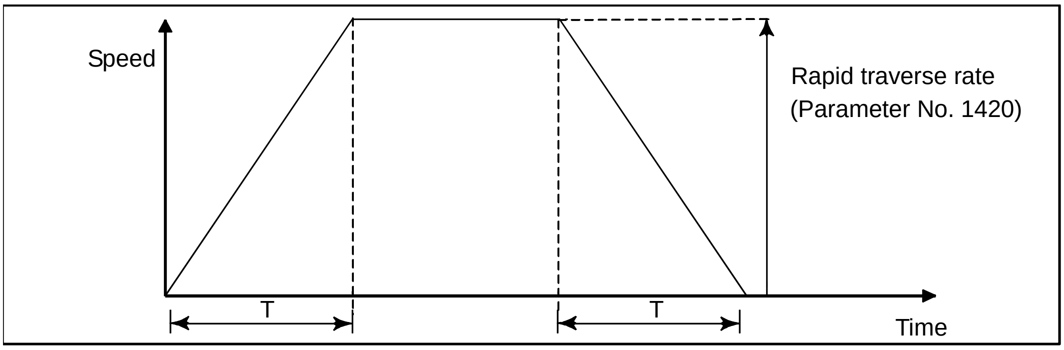
1620	Time constant T or T1 used for linear acceleration/deceleration or bell-shaped acceleration/deceleration in rapid traverse for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

Specify a time constant used for acceleration/deceleration in rapid traverse.

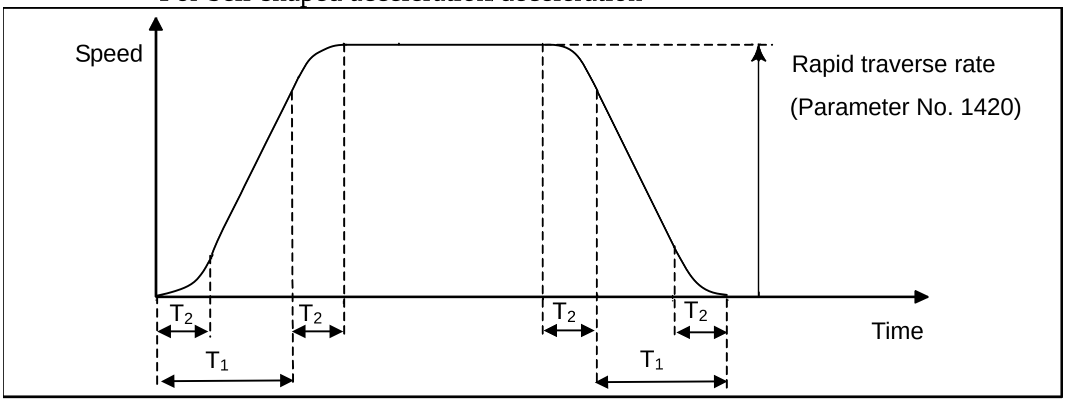
[Example]

For linear acceleration/deceleration



T : Setting of parameter No. 1620

For bell-shaped acceleration/deceleration



T_1 : Setting of parameter No. 1620
T_2 : Setting of parameter No. 1621
(However, $T_1 \geq T_2$ must be satisfied.)

Total acceleration (deceleration) time : $T_1 + T_2$
Time for linear portion : $T_1 - T_2$
Time for curve portion : $T_2 \times 2$

1621	Time constant T_2 used for bell-shaped acceleration/deceleration in rapid traverse for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 1000

Specify time constant T_2 used for bell-shaped acceleration/ deceleration in rapid traverse for each axis.

1622	Time constant of acceleration/deceleration in cutting feed for each axis

[Input type] Parameter input
[Data type] Word axis

[Unit of data] msec
[Valid data range] 0 to 4000

Set the time constant used for exponential acceleration/deceleration in cutting feed, bell-shaped acceleration/deceleration after interpolation or linear acceleration/deceleration after interpolation in cutting feed for each axis. Which type to use is selected with bits 1 (CTBx) and 0 (CTLx) of parameter No. 1610. Except for special applications, the same time constant must be set for all axes in this parameter. If the time constants set for the axes differ from each other, proper straight lines and arcs cannot be obtained.

1623	FL rate of exponential acceleration/deceleration in cutting feed for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

Set the lower limit (FL rate) of exponential acceleration/deceleration in cutting feed for each axis.

1624	Time constant of acceleration/deceleration in jog feed for each axis.

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

Set the time constant used for acceleration/deceleration in jog feed for each axis.

1625	FL rate of exponential acceleration/deceleration in jog feed for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

Set the FL rate of exponential acceleration/deceleration in jog feed for each axis.
This parameter allows only the exponential type.

1626	Acceleration/deceleration time constant in threading cycles for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

Set a time constant for acceleration/deceleration after interpolation in the threading cycles G92 (T series), G76 (T series), and G76.7 (M series) for each axis.

1627	FL rate for acceleration/deceleration in threading cycles for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set an FL rate for acceleration/deceleration after interpolation in the threading cycles G92 (T series), G76 (T series), and G76.7 (M series) for each axis. Set 0 at all times except in a special case.

1650	Timer for the acceleration/deceleration signal

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767
Set the output duration of the acceleration/deceleration signal.

1660	Maximum allowable acceleration rate in acceleration/deceleration before interpolation for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)
Set a maximum allowable acceleration rate in acceleration/ deceleration before interpolation for each axis.
If a value greater than 100000.0 is set, the value is clamped to 100000.0.
If 0 is set, the specification of 100000.0 is assumed. If 0 is set for all axes, however, acceleration/deceleration before interpolation is not performed.

If a maximum allowable acceleration rate set for one axis is greater than a maximum allowable acceleration rate set for another axis by a factor or 2 or more, the feedrate at a corner where the direction of travel abruptly changes can decrease temporarily.

1671	Maximum allowable acceleration rate in acceleration/deceleration before interpolation for linear rapid traverse for each axis, or maximum allowable reference acceleration rate in optimum torque acceleration/deceleration

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)

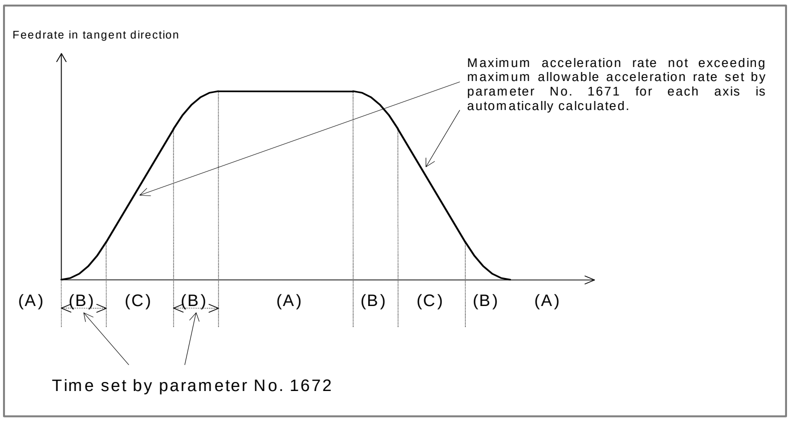
(1) Set a maximum allowable acceleration rate in acceleration/ deceleration before interpolation for linear rapid traverse.
If a value greater than 100000.0, the value is clamped to 100000.0.
If 0 is set, the specification of the following is assumed:
1000.0 mm/sec^2
100.0 inch/sec^2
100.0 degrees/sec^2
If 0 is specified for all axes, however, acceleration/deceleration before interpolation is not performed.

(2) Maximum allowable reference acceleration rate in optimum torque acceleration/deceleration

1672	Acceleration change time of bell-shaped acceleration/deceleration before interpolation for linear rapid traverse, or acceleration change time of bell-shaped acceleration/deceleration in optimum torque acceleration/deceleration

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 200

(1) Set an acceleration change time of bell-shaped acceleration/ deceleration for linear rapid traverse (time for changing from the state of constant feedrate (A) to the state of constant acceleration/deceleration (C) at the acceleration rate calculated from the acceleration rate set in parameter No. 1671: time of (B) in the figure below).
(2) Set an acceleration change time of bell-shaped acceleration/ deceleration in optimum torque acceleration/deceleration (time for changing from the state of constant feedrate (A) to the state of acceleration/deceleration (C) at the acceleration rate calculated from optimum torque acceleration/deceleration: time of (B) in the figure).



1673	Maximum allowable acceleration rate in tangent direction at axis immediate stop

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (D)

(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)
This parameter sets the maximum allowable acceleration rate in the tangent direction for acceleration/deceleration before interpolation at a feed axis immediate stop.
If the parameter is set to a value equal to or greater than 100000.0, the value is clamped to 100000.0.
If a value lower than the acceleration of acceleration/deceleration before interpolation is set, the tool stops by using the current setting without making the following changes:

- Change to the acceleration of acceleration/deceleration before interpolation.
- Change to the acceleration/deceleration type from bell-shaped acceleration/deceleration before interpolation to linear acceleration/deceleration before interpolation.

1710	Minimum deceleration ratio (MDR) for inner circular cutting feedrate change by automatic corner override

[Input type] Parameter input

[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100

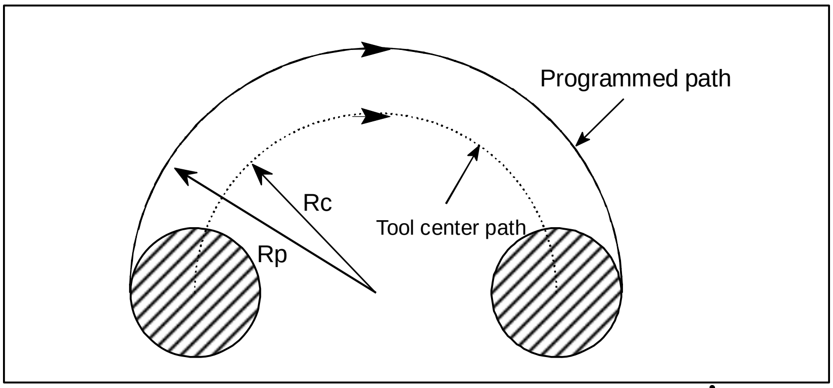
Set a minimum deceleration ratio (MDR) for an inner circular cutting feedrate change by automatic corner override.

In the case of circular cutting offset inward, the actual feedrate is determined by a specified feedrate (F) as follows:

$$F \times \frac{Rc}{Rp}$$

(Rc: Radius of tool center path
Rp: Programmed radius)

Thus, the feedrate along the programmed path satisfies the specified value of F.



However, if Rc is too small when compared with Rp, Rc/Rp ≒ 0 results to stop the tool. So, a minimum deceleration ratio (MDR) is set, and the feedrate of the tool is set to F×(MDR) when Rc/Rp ≤ MDR.
When this parameter is 0, the minimum deceleration ratio (MDR) is 100%.

1711	Inner determination angle (θp) for inner corner override

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 2 to 178

Set an inner determination angle for inner corner override in automatic corner overriding.

1712	Override value for inner corner override

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 1 to 100

Set an inner corner override value in automatic corner overriding.

1713	Start distance (Le) for inner corner override

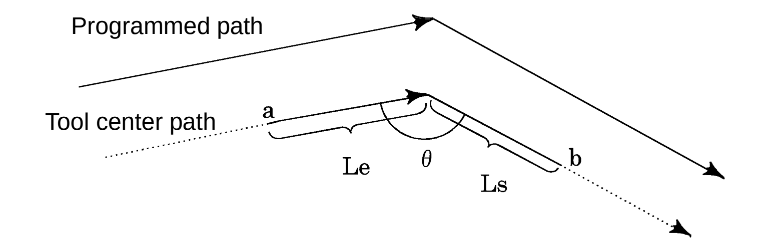
[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set a start distance for inner corner override in automatic corner overriding.

1714	End distance (Ls) for inner corner override

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set an end distance for inner corner override in automatic corner overriding.

When θ ≤ θp, an inner corner is assumed. (Parameter No. 1711 is used to set θp.)
When a corner is determined to be an inner corner, an override is applied to the feedrate in the range of Le in the previous block from the intersection of the corner and in the range of Ls in the next block from the intersection of the corner.
Distances Le and Ls represent linear distances from the intersection of a corner to points on the tool center path.
Le and Ls are set in parameters Nos. 1713 and 1714.



An override is applied to the range from point a to point b.

1722	Rapid traverse feedrate reduction ratio for overlapping rapid traverse blocks

[Input type] Parameter input
[Data type] Byte axis
[Unit of data] %
[Valid data range] 0 to 100
This parameter is used when rapid traverse blocks are arranged successively, or when a rapid traverse block is followed by a block that does not cause, movement. When the feedrate for each axis of a block is reduced to the ratio set in this parameter, the execution of the next block is started.

NOTE
The parameter No. 1722 is effective when bit 4 (RTO) of parameter No. 1601 is set to 1.

1726	Rapid traverse rate reduction ratio for overlapping threading cycle blocks

[Input type] Parameter input
[Data type] Byte axis
[Unit of data] %
[Valid data range] 0 to 100

In a threading cycle that is a turning canned cycle, when the feedrate for each axis is reduced to the deceleration ratio set in this parameter between a retraction and a return to the cycle start point or between a return to the cycle start point and a movement to the threading start point, the execution of the next block is started.

> **NOTE**
> The parameter No. 1726 is valid when bit 3 (TCO) of parameter No. 1611 is set to 1.

1728	Distance of rapid traverse overlap between retraction and return in threading cycle

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999000.0)
In threading cycle of canned cycle, return to the cycle start point of Z-axis starts when the delay of X-axis by acceleration/deceleration control is the distance of this parameter or below.

> **NOTE**
> 1 Set radius value in this parameter.
> 2 This parameter is valid on condition that parameter TOD (bit 2 of No.1612) is 1.

1729	Distance of rapid traverse overlap between return and positioning of the next block in threading cycle

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999000.0)
In threading cycle of canned cycle, positioning to the threading start point of X-axis starts when the delay of Z-axis by acceleration/deceleration control is the distance of this parameter or below.

> **NOTE**
> 1 Set radius value in this parameter.
> 2 This parameter is valid on condition that parameter TOD (bit 2 of No.1612) is 1.

1732	Minimum allowable feedrate for the deceleration function based on acceleration in circular interpolation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis

[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
With the deceleration function based on acceleration in circular interpolation, an optimum feedrate is automatically calculated so that acceleration produced by changing the move direction in circular interpolation does not exceed the maximum allowable acceleration rate specified in parameter No. 1735.
If the radius of an arc is very small, a calculated feedrate may become too low.
In such a case, the feedrate is prevented from decreasing below the value specified in this parameter.

NOTE
During involute interpolation, the minimum allowable feedrate of "clamping of acceleration near a basic circle" in involute interpolation automatic feedrate control is used.

1735	Maximum allowable acceleration rate for the deceleration function based on acceleration in circular interpolation for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)
Set a maximum allowable acceleration rate for the deceleration function based on acceleration in circular interpolation.
Feedrate is controlled so that acceleration produced by changing the move direction in circular interpolation does not exceed the value specified in this parameter.
For an axis with 0 set in this parameter, the deceleration function based on acceleration is disabled.
If a different value is set in this parameter for each axis, a feedrate is determined from the smaller of the acceleration rates specified for the two circular axes.

NOTE
During involute interpolation, the minimum allowable feedrate of "clamping of acceleration near a basic circle" in involute interpolation automatic feedrate control is used.

1737	Maximum allowable acceleration rate for the deceleration function based on acceleration in AI contour control for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)
Set a maximum allowable acceleration rate produced by changing the tool move direction.
For an axis with 0 set in this parameter, the deceleration function based on acceleration is disabled. If 0 is set for all axes, the deceleration function based on acceleration is not performed.

In circular interpolation, however, the deceleration function based on feedrate control using acceleration in circular interpolation (parameter No. 1735) is enabled.

1738	Minimum allowable feedrate for the deceleration function based on acceleration in AI contour control

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
With the deceleration function based on acceleration in AI contour control, a feedrate most suitable for a desired figure is automatically calculated.
Depending on the figure, however, the calculated feedrate may become too low.
In such a case, the feedrate is prevented from decreasing below the value specified in this parameter.
If overriding using the deceleration function based on cutting load is enabled, a feedrate lower than the minimum allowable feedrate may be used.

1763	FL rate for acceleration/deceleration after cutting feed interpolation for each axis in the acceleration/deceleration before interpolation mode

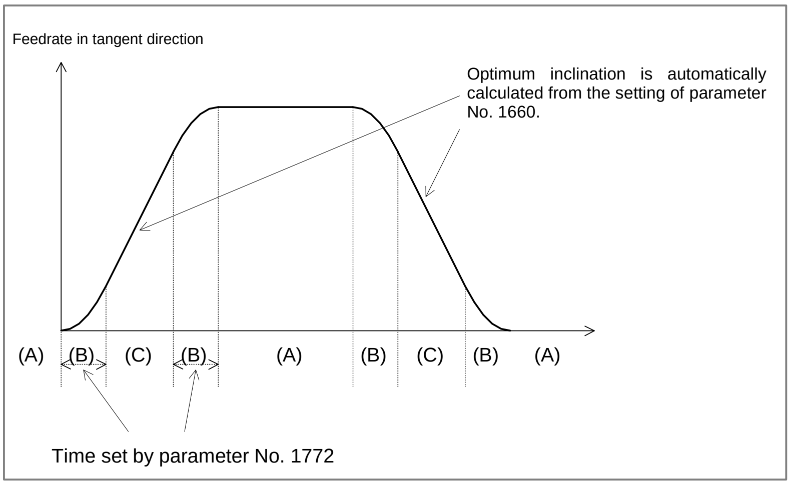
[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set a minimum allowable feedrate (FL rate) for acceleration/ deceleration after cutting feed interpolation in acceleration/deceleration before interpolation as in AI contour control.

1769	Time constant for acceleration/deceleration after cutting feed interpolation in the acceleration/deceleration before interpolation mode

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000
In the acceleration/deceleration before interpolation mode as in AI contour control, not the ordinary time constant (parameter No. 1622) but the value of this parameter is used.
Be sure to specify the same time constant value for all axes except for a special application. If different values are set, correct linear and circular figures cannot be obtained.

1772	Acceleration change time of bell-shaped acceleration/deceleration before interpolation

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 200
Set an acceleration change time of bell-shaped acceleration/ deceleration before interpolation (time for changing from the state of constant feedrate (A) to the state of constant acceleration/deceleration (C) at the acceleration rate calculated from the acceleration rate set in parameter No. 1660: time of (B) in the figure).



1783	Maximum allowable feedrate difference for feedrate determination based on corner feedrate difference

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

If a feedrate component change for each axis exceeding the value set in this parameter occurs at the joint of blocks, the feedrate determination function based on corner feedrate difference finds a feedrate not exceeding the set value and performs deceleration by using acceleration/deceleration before interpolation. Thus, a shock to the machine and machining error at a corner can be reduced.

1788	Maximum allowable acceleration change rate in feedrate determination based on acceleration change for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)

Set a maximum allowable acceleration change rate for each axis in feedrate control based on acceleration change under control on the rate of change of acceleration.

For an axis with 0 set in this parameter, feedrate control based on acceleration change is disabled.

If 0 is set for all axes, feedrate control based on acceleration change is not exercised.

1789	Maximum allowable acceleration change rate in feedrate determination based on acceleration change for each axis (linear interpolation)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)
Set a maximum allowable acceleration change rate for each axis in feedrate control based on acceleration change under control on the rate of change of acceleration in successive linear interpolation operations.
In feedrate control based on acceleration change at a corner between linear interpolation operations, the maximum allowable acceleration change rate not set in parameter No. 1788 but set in this parameter is valid.
For an axis with 0 set in this parameter, the maximum allowable acceleration change rate set in parameter No. 1788 is valid.
Feedrate control based on acceleration change is disabled for an axis with 0 set in parameter No. 1788, so that the setting of this parameter for such an axis is ignored.

1790	Ratio of change time of the rate of change of acceleration in smooth bell-shaped acceleration/deceleration before interpolation

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 50
Set the ratio of the change time of the rate of change of acceleration to the change time of acceleration(*1) by percentage (%) in smooth bell-shaped acceleration/deceleration before look-ahead interpolation.
If 0 is set in this parameter or a value not within the valid data range is specified in this parameter, smooth bell-shaped acceleration/ deceleration before look-ahead interpolation is not performed.

(*1) Parameter No. 1772 for acceleration/deceleration before look-ahead interpolation (cutting feed).
Parameter No. 1672 for acceleration/deceleration before interpolation in linear rapid traverse, or for optimum torque acceleration/ deceleration.

1791	Acceleration rate on each axis for the outage-time deceleration stop function

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(0.0 to +100000.0 for the metric system, 0.0 to +10000.0 for the inch system)
Set an acceleration rate for deceleration on an axis on which the tool is decelerated to a stop at the time of power outage.
On an axis for which this parameter is set to 0, deceleration based on the outage-time deceleration signal is not performed.

In synchronization control or tandem control, set the same parameter for the master axis and slave axis.

4.18 PARAMETERS OF SERVO (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
1800				RBK	FFR		CVR	

[Input type] Parameter input
[Data type] Bit path

#1 CVR When velocity control ready signal VRDY is set ON before position control ready signal PRDY comes ON
0: A servo alarm is generated.
1: A servo alarm is not generated.

#3 FFR Feed-forward control in rapid traverse is:
0: Disabled
1: Enabled
Feed-forward is enabled only in normal cutting feed. When this parameter is set to 1, feed-forward is enabled in rapid traverse as well. This capability reduces the servo positional deviation, thus reducing the time required to enter the in-position width at the time of positioning.

> **NOTE**
> The parameter setting becomes valid after reference position return is completed.

#4 RBK Backlash compensation applied separately for cutting feed and rapid traverse
0: Not performed
1: Performed

	#7	#6	#5	#4	#3	#2	#1	#0
1801			CIN	CCI				

[Input type] Parameter input
[Data type] Bit path

#4 CCI As the in-position width for cutting feed:
0: The parameter No. 1826 applicable to rapid traverse as well is used.
1: The parameter No. 1827 dedicated to cutting feed is used.
This parameter enables the in-position width for cutting feed (parameter No. 1827) to be set instead of the in-position width for rapid traverse (parameter No. 1826).
By setting bit 4 (CCI) of parameter No. 1801, choose whether to use this function or the conventional in-position check function.
This function, when specified, is enabled for all axes. So, for an axis that does not require this function, set the same data in parameters Nos. 1826 and 1827.

#5 CIN When parameter CCI is set to 1, the dedicated parameter for specifying an in-position width for cutting feed is used:
0: Only when the next block specifies cutting feed.
1: Regardless of the next block.
The table indicates the relationships between the parameters for cutting feed and rapid traverse.

		Bit 5 (CIN) of parameter No. 1801			
		0		1	
Bit 4 (CCI) of parameter No. 1801	0	Rapid traverse → Rapid traverse	No. 1826	Rapid traverse → Rapid traverse	No. 1826
		Rapid traverse → Cutting feed	No. 1826	Rapid traverse → Cutting feed	No. 1826
		Cutting feed → Cutting feed	No. 1826	Cutting feed → Cutting feed	No. 1826
		Cutting feed → Rapid traverse	No. 1826	Cutting feed → Rapid traverse	No. 1826
	1	Rapid traverse → Rapid traverse	No. 1826	Rapid traverse → Rapid traverse	No. 1826
		Rapid traverse → Cutting feed	No. 1826	Rapid traverse → Cutting feed	No. 1826
		Cutting feed → Cutting feed	No. 1827	Cutting feed → Cutting feed	No. 1827
		Cutting feed → Rapid traverse	No. 1826	Cutting feed → Rapid traverse	No. 1827

The parameters CCI and CIN can also be applied to a Cs axis.

	#7	#6	#5	#4	#3	#2	#1	#0
1802				BKL15		DC2x	DC4x	

[Input type] Parameter input
[Data type] Bit axis

#1 DC4x When the reference position is established on the linear scale with reference marks:
0: An absolute position is established by detecting three reference marks.
1: An absolute position is established by detecting four reference marks.

#2 DC2x Reference position establishment operation for a linear scale with reference marks is performed as follows:
0: The setting of bit 1 (DC4) of parameter No. 1802 is followed.
1: An absolute position is established by detecting two reference marks.

NOTE
1 When this parameter is set to 1, specify the direction of the scale zero point by setting bit 4 (SCP) of parameter No. 1817.
2 When a rotary encoder with absolute address reference marks is used, this parameter is invalid. Even when this parameter is set to 1, the setting of bit 1 (DC4) of parameter No. 1802 is followed.

#4 BKL15x When the direction of a movement is determined in backlash compensation:
0: The compensation amount is not considered.
1: The compensation amount (pitch error, straightness, external machine coordinate system shift, etc.) is considered.

	#7	#6	#5	#4	#3	#2	#1	#0
1803	NFP			TQF			TQA	TQI

[Input type] Parameter input
[Data type] Bit path

#0 TQI Within a torque limit, an in-position check is:
0: Made.
1: Not made.

#1 TQA Within a torque limit, an excessive stop-time/move-time error is:
0: Checked.
1: Not checked.

#4 TQF When torque control is performed by the PMC axis control, follow-up operation is:
0: Not performed.
1: Performed.

#7 NFP If position matching between the machine position and absolute position detector is not performed even once, follow-up operation is:
0: Not performed.
1: Performed.

	#7	#6	#5	#4	#3	#2	#1	#0
1804		SAK	ANA	IVO				

[Input type] Parameter input
[Data type] Bit path

#4 IVO When an attempt is made to release an emergency stop while the VRDY OFF alarm ignore signal is 1:
0: The emergency stop state is not released until the VRDY OFF alarm ignore signal is set to 0.
1: The emergency stop state is released.

NOTE
When a reset is issued while the VRDY OFF alarm ignore signal is set to 1 and the motor activating current is low, the reset state can also be released, provided this parameter is set to 1.

#5 ANA When an unexpected disturbance torque is detected for an axis:
0: Movement along all axes is stopped, and a servo alarm is output.
1: No servo alarm is output, and movement along only the axes of the group containing the axis with the an unexpected disturbance torque is stopped in interlock mode. (The group number of each axis is set in parameter No. 1881.)

#6 SAK When the VRDY OFF alarm ignore signal IGNVRY is “1”, or when the VRDY OFF alarm ignore signals IGNVRYn are “1”:
0: Servo ready signal SA is set to “0”.
1: Servo ready signal SA remains set to “1”.

	#7	#6	#5	#4	#3	#2	#1	#0
1805				TSM	TSA		TRE	

[Input type] Parameter input
[Data type] Bit path

#1 TRE When bit 4 (TQF) of parameter No. 1803 is set to 0 (not to perform follow-up operation with a torque control command in PMC axis control), the servo error counter is:

0: Updated.
When the error count exceeds the maximum allowable cumulative travel value (parameter No. 1885), the alarm SV0423, “EXCESS ERROR IN TORQUE” is issued.

1: Not updated.
No errors are accumulated, so that the alarm SV0423 is not issued. When the maximum allowable feedrate is exceeded, however, the alarm SV0422, “EXCESS VELOCITY IN TORQUE” is issued.

To return to position control when this parameter bit is set to 1, a reference position return operation needs to be performed.

#3 TSA As the unexpected disturbance torque detection level during dwell, M code execution, and automatic operation halt state:

0: The threshold value for rapid traverse is used. (parameter No. 2142)

1: The threshold value for cutting feed is used. (parameter No. 2104)

If this parameter is set 1, the parameters ABGO (bit 3 of No.2200) and ABT (bit 7 of No.2215) need to be set 1.

#4 TSM As the unexpected disturbance torque detection level in the jog feed mode (excluding manual rapid traverse) and manual handle feed mode:

0: The threshold value for rapid traverse is used. (parameter No. 2142)

1: The threshold value for cutting feed is used. (parameter No. 2104)

This parameter is valid when bit 3 (ABGO) of parameter No. 2200 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
1807						SWP		

[Input type] Parameter input
[Data type] Bit path

#2 SWP This parameter specifies the operation of the α*i* series servo amplifier in its warning state (for example, with the fan stopped).

0: An alarm is issued when the amplifier is placed in the warning state. Automatic operation enters the feed hold state and the servo axis is decelerated to a stop.

1: An alarm is not issued even when the amplifier is placed in the warning state. Automatic operation is kept. The servo is deactivated if the amplifier shifts from the warning state to the alarm state.

> ⚠ **CAUTION**
> If operation is continued with the external fan stopped while bit 2 (SWP) of parameter No. 1807 is set to 1, the servo amplifier may be overheated and "overheat alarm", "IPM alarm", or "VRDY off alarm" may be issued depending on the operating conditions. If such an alarm is issued, the amplifier is deactivated and the servo motor is stopped by the dynamic brake, involving a risk of breaking the workpiece or tool as the stop from high-speed rotation requires an extended distance. The user should therefore understand that the operation with bit 2 (SWP) of parameter No. 1807 set to 1 is a temporary step to take before fan replacement. Once the fan has stopped, be sure to replace the fan immediately and set bit 2 (SWP) of parameter No. 1807 back to 0.
>
> If bit 2 (SWP) of parameter No. 1807 is set to 1, the warning text "FAN" blinks on the NC screen to show that the external fan has been stopped. Also on the machine side, monitor the warning signal output to the PMC and remind the operator of the operation with the fan stopped.

	#7	#6	#5	#4	#3	#2	#1	#0
1814	ALGx							

[Input type] Parameter input
[Data type] Bit axis

#7 ALGx The servo axis loop gain in the Cs contour control mode is:
0: Not matched with the Cs contour control loop gain.
1: Matched with the Cs contour control loop gain.

	#7	#6	#5	#4	#3	#2	#1	#0
1815		RONx	APCx	APZx	DCRx	DCLx	OPTx	RVSx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 RVSx When the scale without rotary data is used:
0: The CNC does not maintain the rotary data.
1: The CNC maintains the rotary data.
This parameter is effective in the axis that satisfies either of the following conditions.
- The axis is rotary axis B type and the movable range is more than one rotation.
- The parameter RVL(No.11802#6)=1.

> **NOTE**
> 1 In the case of a rotary axis B type whose movable range is over one rotation, a rotary scale with rotary data had better be used.

NOTE

2 This parameter is available for the rotary axis B type or the axis of RVL(No.11802#6)=1. This parameter is available for the axis with an absolute position detector (absolute Pulsecoder) or a rotary scale with distance-coded reference marks (serial). This function cannot be used for distance coded rotary scale interface (phase A/B).

3 If this parameter is available, the machine coordinate value just before CNC turns off is saved. In the case of moving over the following amounts during turning off or before reference position return, a machine coordinate value may get out over a rotation because CNC saves a machine coordinate value just before CNC turns off and in following turning on get from the value.
In case of the rotary axis B type :
Over 180 degree
In case of the linear axis type :
Over 1/4 of values set to parameter No.11810.

4 If this parameter is changed, the correspondence between the machine position and the absolute position detector is lost. Bit 4 (APZ) of parameter No.1815 is set to 0, and an alarm DS0300, “APC ALARM: NEED REF RETURN” is issued. The cause that sets bit 4 (APZ) of parameter No.1815 to 0 is indicated in diagnosis data No.310#0.

5 Absolute coordinate value is set by machine coordinate value. However, after CNC turns on, the workpiece offset such as G92 and G52 executed before CNC turns off is not set.

6 This function cannot be used together with the bit 3 (SCRx) of parameter No. 1817 that convert scale data.

7 In case of the rotary axis B type and the amount of one rotation of rotary axis is 360, set the parameter No.1869 to 0. Moreover, set the parameter No.1240 to 0 because the reference position must be 0 degree.

8 In case of the rotary axis B type and the amount of one rotation of rotary axis is not 360, set the parameter No.1869 to the amount of one rotation. Moreover, set the parameter No.1240 to 0 because the reference position must be 0 degree.

9 In case of the linear axis type, set the amount of the movement per one motor rotation to the parameter No.11810.

10 This parameter cannot be used together with the stored stroke limit check immediately after power-on (parameter DOT(No.1311#0)).

#1 OPTx Position detector

0: A separate Pulsecoder is not used.
1: A separate Pulsecoder is used.

NOTE

Set this parameter to 1 when using a linear scale with reference marks or a linear scale with an absolute address zero point (full-closed system).

#2 DCLx As a separate position detector, a linear scale with reference marks or a linear scale with an absolute address zero point is:
0: Not used.
1: Used.

#3 DCRx As a scale with absolute address reference marks:
0: A rotary encoder with absolute address reference marks is not used.
1: A rotary encoder with absolute address reference marks is used.

> **NOTE**
> When using a rotary encoder with absolute address reference marks, set also bit 2 (DCLx) of parameter No. 1815 to 1.

#4 APZx Machine position and position on absolute position detector when the absolute position detector is used
0: Not corresponding
1: Corresponding
When an absolute position detector is used, after primary adjustment is performed or after the absolute position detector is replaced, this parameter must be set to 0, power must be turned off and on, then manual reference position return must be performed. This completes the positional correspondence between the machine position and the position on the absolute position detector, and sets this parameter to 1 automatically.

#5 APCx Position detector
0: Other than absolute position detector
1: Absolute position detector (absolute Pulsecoder)

#6 RONx With a rotary axis A type, an absolute position detector (absolute Pulsecoder) using a scale without rotary data is:
0: Not used.
1: Used.

> **NOTE**
> 1 This parameter is available for only the rotary axis A type with an absolute position detector (absolute Pulsecoder). This function cannot be used for a rotary scale with distance-coded reference marks (serial) or for a distance coded rotary scale interface (phase A/B).
> 2 Set it to a rotary axis A type using a scale without rotary data.
> 3 Do not set it to a rotary axis A type using a scale with rotary data.
> 4 When this parameter is set, machine position and position on absolute position detector become uncorresponding. Consequently, the bit 4 (APZ) of parameter No. 1815 (indicating that the correspondence is established) is set to 0, alarm DS0300. Why the bit 4 (APZ) of parameter No. 1815 is set to 0 can be checked using diagnosis data No. 310#0.

	#7	#6	#5	#4	#3	#2	#1	#0
1816		DM3x	DM2x	DM1x				

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#4 DM1x
#5 DM2x
#6 DM3x By using DM1x, DM2x, and DM3x, a detection multiplication factor (DMR) is set.
This parameter is valid when a separate position detector (AB phase) is used and parameter No. 2084 and No. 2085 are not set.

DM3x	DM2x	DM1x	DMR
0	0	0	1/2
0	0	1	1
0	1	0	3/2
0	1	1	2
1	0	0	5/2
1	0	1	3
1	1	0	7/2
1	1	1	4

	#7	#6	#5	#4	#3	#2	#1	#0
1817		TANx		SCPx	SCRx	SBLx		

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#2 SBLx Smooth backlash compensation is :
0: Disabled.
1: Enabled.

#3 SCRx Specifies whether to convert scale data by using threshold position (parameter No. 1868) so that rotary axis B type is available, in the case of the axis B type that use a rotary scale without data (the number of rotation), whose movable range is under one rotation:
0 : Not to convert.
1 : To convert.

> **NOTE**
> 1 This parameter is available for only the rotary axis B type with an absolute position detector (absolute Pulsecoder) or a rotary scale with distance-coded reference marks (serial). This function cannot be used for distance coded rotary scale interface (phase A/B).
> 2 Don't set this parameter in the case of no uncontinuous point within movable range of rotary axis even if the rotary axis B type.
> 3 When this parameter is set, machine position and position on absolute position detector become uncorresponding. Consequently, the bit 4 (APZ) of parameter No. 1815 (indicating that the correspondence is established) is set to 0, alarm DS0300. Why the bit 4 (APZ) of parameter No. 1815 is set to 0 can be checked using diagnosis data No. 310#0.

NOTE

4 This function cannot be used together with the bit 0 (RVSx) of parameter No. 1815 that save rotary data by CNC, in the case of a rotary axis B type whose movable range is over one rotation.

5 In this function, the amount of one rotation of rotary axis assumes 360, and the machine position 0 assumes the reference position. It is not possible to apply to a rotary axis other than the above-mentioned setting.

6 Set the parameter No. 1240 to 0.

#4 SCPx For two-point measurement (when bit 2 (DC2) of parameter No. 1802 is set to 1), the scale zero point direction is:

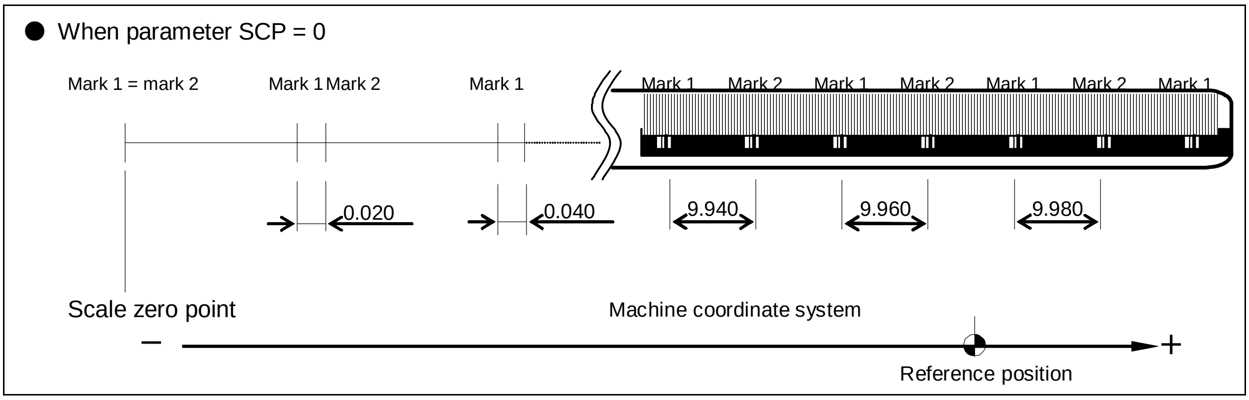
0: On the minus side. (The reference position is located in the plus direction when viewed from the scale zero point.)

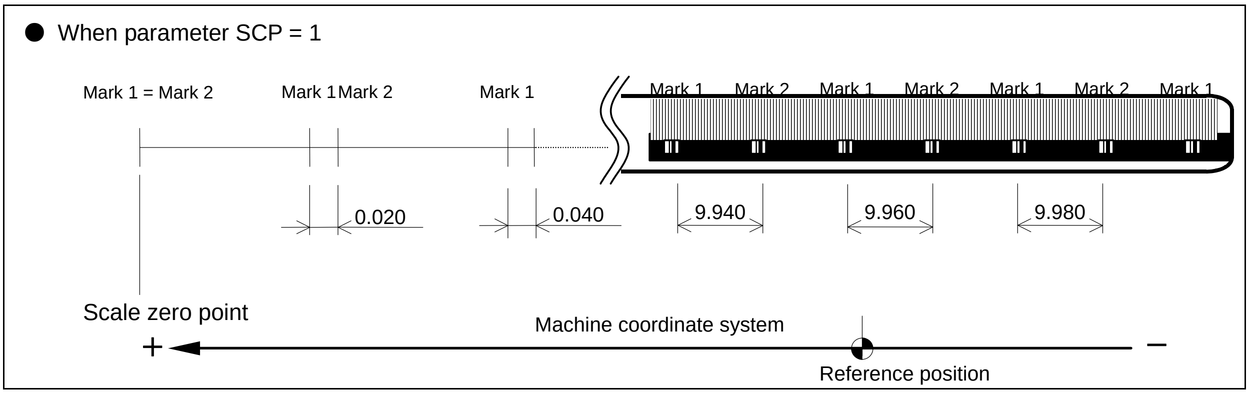
1: On the plus side. (The reference position is located in the minus direction when viewed from the scale zero point.)

NOTE

1 This parameter is valid when bit 2 (DC2) of parameter No. 1802 is set to 1.

2 If this parameter is set to an incorrect value, an incorrect coordinate system is established. In such a case, reverse the setting then perform reference position establishment operation again.





#6 TANx Tandem control

0: Not used

1: Used

> **NOTE**
> Set this parameter to both master axis and slave axis.

	#7	#6	#5	#4	#3	#2	#1	#0
1818					SDC	DG0	RF2x	RFSx

[Input type] Parameter input
[Data type] Bit axis

#0 RFSx If G28 is specified for an axis for which a reference position is not established (Reference position establishment signal ZRFx <Fn120.0 to 7> = “0”) when a linear scale with an absolute address zero point or a linear scale with absolute address reference marks is used:
0: A movement is made to the reference position after reference position establishment operation.
1: No movement is made after reference position establishment operation, but the operation is completed.

> **NOTE**
> This parameter disables movement based on the G28 command to a reference position. So, use this parameter only in special cases.

#1 RF2x If G28 is specified for an axis for which a reference position is already established (Reference position establishment signal ZRFx <Fn120.0 to 7> = “1”) when a linear scale with an absolute address zero point or a linear scale with absolute address reference marks is used:
0: A movement is made to the reference position.
1: No movement is made to the intermediate position and reference position, but the operation is completed.

> **NOTE**
> This parameter disables movement based on the G28 command to a reference position. So, use this parameter only in special cases.

#2 DG0 When the linear scale function with absolute address reference marks is used, reference position establishment operation based on the G00 command and jog feed is:
0: Disabled.
1: Enabled.

#3 SDCx A linear scale with an absolute address zero point is:
0: Not used.
1: Used.

	#7	#6	#5	#4	#3	#2	#1	#0
1819	NAHx					DATx	CRFx	FUPx

[Input type] Parameter input
[Data type] Bit axis

#0 FUPx To perform follow-up when the servo is off is set for each axis.

0: The follow-up signal, *FLWU<Gn007.5>, determines whether follow-up is performed or not.
When *FLWU<Gn007.5> is "0", follow-up is performed.
When *FLWU<Gn007.5> is "1", follow-up is not performed.

1: Follow-up is not performed.

> **NOTE**
> When using the index table indexing function, set FUPx to 1 for a control axis subject to index table indexing.

#1 CRFx When the servo alarm SV0445, "SOFT DISCONNECT ALARM", SV0447, "HARD DISCONNECT(EXT)", or SV0421, "EXCESS ERROR(SEMI-FULL)" is issued:

0: The reference position established state is not affected.

1: The reference position unestablished state is assumed. (Bit 4 (APZ) of parameter No. 1815 is set to 0.)

#2 DATx When a linear scale with an absolute address zero point or a linear scale with absolute address reference marks is used, the automatic setting of parameters Nos. 1883 and 1884 at manual reference position return time is:

0: Not performed.

1: Performed.

The automatic setting procedure is as follows:

<1> Set an appropriate value in parameters Nos. 1815, 1821, and 1882.

<2> Position the machine at the reference position by manual operation.

<3> Set this parameter to 1.
Alarm PS5520, "REFERENCE POINT ADJUSTMENT MODE", occurs.

<4> Perform a manual reference position return operation. Upon completion of manual reference position return operation, parameters Nos. 1883 and 1884 are set, and this parameter is automatically set to 0.
Make a reset to release alarm PS5520.

#7 NAHx In the advanced preview control mode, advanced preview feed-forward is:

0: Used

1: Not used

1820	Command multiplier for each axis (CMR)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] See below :

Set a command multiplier indicating the ratio of the least command increment to the detection unit for each axis.
Least command increment = detection unit × command multiplier

Relationship between the increment system and the least command increment

(1) T series

			Least input increment	Least command increment
IS-B	Millimeter machine	Millimeter input	0.001 mm (diameter specification)	0.0005 mm
			0.001 mm (radius specification)	0.001 mm
		Inch input	0.0001 inch (diameter specification)	0.0005 mm
			0.0001 inch (radius specification)	0.001 mm
	Inch machine	Millimeter input	0.001 mm (diameter specification)	0.00005 inch
			0.001 mm (radius specification)	0.0001 inch
		Inch input	0.0001 inch (diameter specification)	0.00005 inch
			0.0001 inch (radius specification)	0.0001 inch
	Rotary axis		0.001 deg	0.001 deg

			Least input increment	Least command increment
IS-C	Millimeter machine	Millimeter input	0.0001 mm (diameter specification)	0.00005 mm
			0.0001 mm (radius specification)	0.0001 mm
		Inch input	0.00001 inch (diameter specification)	0.00005 mm
			0.00001 inch (radius specification)	0.0001 mm
	Inch machine	Millimeter input	0.0001 mm (diameter specification)	0.000005 inch
			0.0001 mm (radius specification)	0.00001 inch
		Inch input	0.00001 inch (diameter specification)	0.000005 inch
			0.00001 inch (radius specification)	0.00001 inch
	Rotary axis		0.0001 deg	0.0001 deg

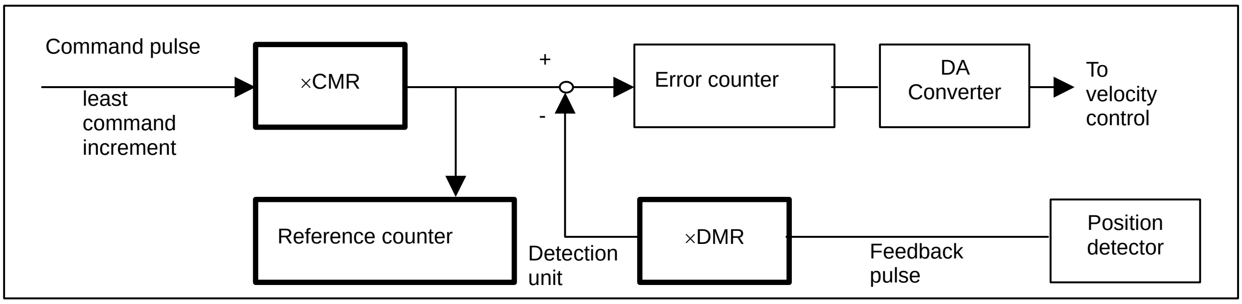
			Least input increment	Least command increment
IS-D	Millimeter machine	Millimeter input	0.00001 mm (diameter specification)	0.000005 mm
			0.00001 mm (radius specification)	0.00001 mm
		Inch input	0.000001 inch (diameter specification)	0.000005 mm
			0.000001 inch (radius specification)	0.00001 mm
	Inch machine	Millimeter input	0.00001 mm (diameter specification)	0.0000005 inch
			0.00001 mm (radius specification)	0.000001 inch
		Inch input	0.000001 inch (diameter specification)	0.0000005 inch
			0.000001 inch (radius specification)	0.000001 inch
	Rotary axis		0.00001 deg	0.00001 deg

			Least input increment	Least command increment
IS-E	Millimeter machine	Millimeter input	0.000001 mm (diameter specification)	0.0000005 mm
			0.000001 mm (radius specification)	0.000001 mm
		Inch input	0.0000001 inch (diameter specification)	0.0000005 mm
			0.0000001 inch (radius specification)	0.000001 mm
	Inch machine	Millimeter input	0.000001 mm (diameter specification)	0.00000005 inch
			0.000001 mm (radius specification)	0.0000001 inch
		Inch input	0.0000001 inch (diameter specification)	0.00000005 inch
			0.0000001 inch (radius specification)	0.0000001 inch
	Rotary axis		0.000001 deg	0.000001 deg

(2) M series

Increment system	Least input increment and least command increment					
	IS-A	IS-B	IS-C	IS-D	IS-E	Unit
Millimeter machine	0.01	0.001	0.0001	0.00001	0.000001	mm
Millimeter input	0.001	0.0001	0.00001	0.000001	0.0000001	inch
Rotary axis	0.01	0.001	0.0001	0.00001	0.000001	deg

Setting command multiply (CMR), detection multiply (DMR), and the capacity of the reference counter



Set CMR and DMR so that the pulse weight of + input (command from the CNC) into the error counter matches the pulse weight of -input (feedback from the position detector).

[Least command increment]/CMR=[Detection unit]=
[Feedback pulse unit]/DMR

[Least command increment]
Minimum unit of commands issued from the CNC to the machine
[Detection unit]
Minimum unit for machine position detection

The unit of feedback pulses varies, depending on the type of detector.
[Feedback pulse unit]=
[Amount of travel per rotation of the Pulsecoder]/
[Number of pulses per rotation of the Pulsecoder]

As the size of the reference counter, specify the grid interval for the reference position return in the grid method.
[Size of the reference counter]=[Grid interval]/[Detection unit]
[Grid interval]=[Amount of travel per rotation of the Pulsecoder]

The setting of a command multiplier is as follows:
(1) When command multiplier is 1 to 1/27
Set value = 1 / command multiplier + 100
Valid data range : 101 to 127
(2) When command multiply is 0.5 to 48
Set value = 2 × command multiplier
Valid data range : 1 to 96

NOTE
If a feedrate exceeding the feedrate found by the expression below is used, an incorrect travel amount may result or a servo alarm may be issued. Be sure to use a feedrate not exceeding the feedrate found by the following expression:
Fmax[mm/min] = $196602 \times 10^4 \times$ least command increment / CMR

1821	Reference counter size for each axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis

[Unit of data] Detection unit
[Valid data range] 0 to 999999999

Set a reference counter size.
As a reference counter size, specify a grid interval for reference position return based on the grid method.
When a value less than 0 is set, the specification of 10000 is assumed.
When a linear scale with absolute address reference marks is used, set the interval of mark 1.

1822	Value of the numerator of arbitrary command multiplier n/m

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 9999

Set the value of the numerator of the arbitrary command multiplier n/m.
The arbitrary command multiplier option is required.
When a value other than 0 is set in parameters Nos. 1822 and 1823, the setting of the arbitrary command multiplier n/m (n: No. 1822, m: No. 1823) becomes valid.

1823	Value of the denominator of arbitrary command multiplier n/m

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 9999

Set the value of the denominator of the arbitrary command multiplier n/m.
The arbitrary command multiplier option is required.
When a value other than 0 is set in parameters Nos. 1822 and 1823, the setting of the arbitrary command multiplier n/m (n: No. 1822, m: No. 1823) becomes valid.

1825	Servo loop gain for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] 0.01/sec
[Valid data range] 1 to 9999

Set the loop gain for position control for each axis.
When the machine performs linear and circular interpolation (cutting), the same value must be set for all axes. When the machine requires positioning only, the values set for the axes may differ from one another. As the loop gain increases, the response by position control is improved. A too large loop gain, however, makes the servo system unstable.
The relationship between the positioning deviation (the number of pulses counted by the error counter) and the feedrate is expressed as follows:

Positioning deviation = Feedrate / (60 × Loop gain)

Unit : Positioning deviation mm, inch or deg
Feedrate mm/min, inch/min, or deg/min
Loop gain 1/sec

1826	In-position width for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

The in-position width is set for each axis.

When the deviation of the machine position from the specified position (the absolute value of the positioning deviation) is smaller than the in-position width, the machine is assumed to have reached the specified position. (The machine is in the in-position state.)

1827	In-position width in cutting feed for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Set an in-position width for each axis in cutting feed. This parameter is used when bit 4 (CCI) of parameter No. 1801=1.

1828	Positioning deviation limit for each axis in movement

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Set the positioning deviation limit in movement for each axis.

If the positioning deviation exceeds the positioning deviation limit during movement, a servo alarm SV0411, "EXCESS ERROR (MOVING)" is generated, and operation is stopped immediately (as in emergency stop).

Generally, set the positioning deviation for rapid traverse plus some margin in this parameter.

1829	Positioning deviation limit for each axis in the stopped state

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Set the positioning deviation limit in the stopped state for each axis.

If, in the stopped state, the positioning deviation exceeds the positioning deviation limit set for stopped state, a servo alarm SV0410, "EXCESS ERROR (STOP)" is generated, and operation is stopped immediately (as in emergency stop).

1830	Axis-by-axis positional deviation limit at servo-off time

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter is used to set a positional deviation limit at servo-off time, on an axis-by-axis basis.

If the value specified with this parameter is exceeded at servo-off time, a servo alarm is issued to cause an immediate stop (same as an emergency stop). Usually, set the same value as a positional deviation at stop time.

1832	Feed stop positioning deviation for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Set the feed stop positioning deviation for each axis.
If the positioning deviation exceeds the feed stop positioning deviation during movement, pulse distribution and acceleration/ deceleration control are stopped temporarily. When the positioning deviation drops to the feed stop positioning deviation or below, pulse distribution and acceleration/deceleration control are resumed.
The feed stop function is mainly used to reduce overshoot in acceleration/ deceleration with large machines and so on.
Generally, set the middle value between the positioning deviation limit during movement and the positioning deviation at rapid traverse as the feed stop positioning deviation.

1836	Servo error amount where reference position return is possible

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a servo error used to enable reference position return.
In general, set this parameter to 0. (When 0 is set, 128 is assumed as the default.)
When the servo error amount never exceeds this parameter value before leaving the limit switch for the deceleration (Reference position return deceleration signal *DEC <Gn196>) in reference position return, alarm (PS0090) "REFERENCE RETURN INCOMPLETE" occurs.

1838	
1842	

These parameters are related to Dual Check Safety.
See Dual Check Safety CONNECTION MANUAL (B-64483EN-2) for details.

1844	Distance to the first grid point when the reference position shift amount in the reference position shift function is 0 or when a reference position return is made by grid shift

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999999999 to 999999999

(1) When the reference position shift function is enabled (when bit 4 (SFDx) of parameter No. 1008 is set to 1)

Set the distance (detection unit) to the first grid point from a point at which the deceleration dog is released when the reference position shift (parameter No. 1850) is set to 0.

(2) When a reference position return is made by grid shift with a setting not to use reference position setting without dogs (when bit 4 (SFDx) of parameter No. 1008 is set to 0, and bit 1 (DLZx) of parameter No. 1005 is set to 0)
Set the distance to the first grid point from a point at which the deceleration dog is released. (Detection unit)

(3) When a reference position return is made by grid shift with a setting to use reference position setting without dogs (when bit 4 (SFDx) of parameter No. 1008 is set to 0, and bit 1 (DLZx) of parameter No. 1005 is set to 1)
Set the distance from the start position for reference position setting without dogs to the first grid point. (Detection unit)

NOTE

1 When the reference position shift function is enabled (when bit 4 (SFDx) of parameter No. 1008 is set to 1)
When bit 4 (SFDx) of parameter No. 1008 is set to 1, the distance from a point at which the deceleration dog is released to the first grid point (parameter No. 1844) is set to 0, and reference position shift (parameter No. 1850) is set to 0, a manual reference position return allows this parameter to be set automatically. Do not change an automatically set value.

2 When a reference position return is made by grid shift with a setting not to use reference position setting without dogs (when bit 4 (SFDx) of parameter No. 1008 is set to 0, and bit 1 (DLZx) of parameter No. 1005 is set to 0)
When a manual reference position return using deceleration dogs is made, this parameter is set automatically.

3 When a reference position return is made by grid shift with a setting to use reference position setting without dogs (when bit 4 (SFDx) of parameter No. 1008 is set to 0, and bit 1 (DLZx) of parameter No. 1005 is set to 1)
When a reference position setting without dogs is made, this parameter is set automatically.

1846	Distance for starting the second stage of smooth backlash compensation

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

For each axis, set the distance from the point where the axis movement direction is reversed to the point where the second stage of smooth backlash compensation is started.

1847	Distance for ending the second stage of smooth backlash compensation

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

For each axis, set the distance from the point where the axis movement direction is reversed to the point where the second stage of smooth backlash compensation is ended.

1848	Value of the first stage of smooth backlash compensation

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -9999 to 9999

Set the value of the first stage of smooth backlash compensation for each axis.

1850	Grid shift and reference position shift for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -99999999 to 99999999

To shift the reference position, the grid can be shifted by the amount set in this parameter. Up to the maximum value counted by the reference counter can be specified as the grid shift.

In case of bit 4 (SFDx) of parameter No. 1008 is 0: Grid shift
In case of bit 4 (SFDx) of parameter No. 1008 is 1: Reference point shift

> **NOTE**
> For setting the reference position without dogs, only the grid shift function can be used.
> (The reference position shift function cannot be used.)

1851	Backlash compensating value for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -9999 to 9999

Set the backlash compensating value for each axis.
When the machine moves in a direction opposite to the reference position return direction after the power is turned on, the first backlash compensation is performed.

1852	Backlash compensating value used for rapid traverse for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -9999 to 9999

Set the backlash compensating value used in rapid traverse for each axis. (This parameter is valid when bit 4 (RBK) of parameter No. 1800 is set to 1.) More precise machining can be performed by changing the backlash compensating value depending on the feedrate, the cutting feed or the rapid traverse positioning. Let the measured backlash at cutting feed be A and the measured backlash at rapid traverse be B. The backlash compensating value is shown below depending on the change of feedrate (cutting feed or rapid traverse) and the change of the direction of movement.

Change of feedrate / Change of direction of movement	Cutting feed to cutting feed	Rapid traverse to rapid traverse	Rapid traverse to cutting feed	Cutting feed to rapid traverse
Same direction	0	0	±α	±(-α)
Opposite direction	±A	±B	±(B+α)	±(B+α)

NOTE
1 α=(A-B)/2
2 The positive or negative direction for compensating values is the direction of movement.

1868	Threshold position for converting scale data (each axis)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (Refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to ++999999.999)
In the case that scale data of a rotary scale without rotary data is larger than the scale data of the threshold position (this parameter value), it is converted to be continuous data in movable range by subtracting data of one rotation. The position out of movable range (angle from an uncontinuous point) must be set as threshold position. As for the axis for which this parameter is set to 0, conversion of scale data is not performed.

NOTE
1 This parameter is available for only the rotary axis B type with an absolute position detector (absolute Pulsecoder) or a rotary scale with distance-coded reference marks (serial), for which the bit 3 (SCRx) of parameter No. 1817 is set to 1.This function cannot be used for distance coded rotary scale interface (phase A/B).
2 Don't set this parameter in the case of no uncontinuous point within movable range of rotary axis even if the rotary axis B type.
3 When this parameter is set, machine position and position on absolute position detector become uncorresponding. Consequently, the bit 4 (APZ) of parameter No. 1815 (indicating that the correspondence is established) is set to 0, alarm DS0300, “APC ALARM: NEED REF RETURN”. Why the bit 4 (APZ) of parameter No. 1815 is set to 0 can be checked using diagnosis data No. 0310#0.

1869	The amount of one rotation of rotary axis B type (each axis)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (Refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to ++999999.999)
Normally, the amount of one rotation of rotary axis is 360, and the machine position 0 is the reference position.
In this case, this parameter is set to 0.

For instance, when this parameter is set to 523.000, the amount of one rotation become 523.000 (in the case of IS-B), if it is necessary to set it arbitrarily.

> **NOTE**
> 1 This parameter is available for only the rotary axis B type with an absolute position detector (absolute Pulsecoder) or a rotary scale with distance-coded reference marks (serial), as for the bit 3 (SCRx) of parameter No. 1817 is set to 1 or the bit 0 (RVS) of parameter No. 1815 is set to 1.
> 2 In the case that the amount of one rotation of rotary axis is 360, this parameter is set to 0.If it is necessary to set an amount of one rotation of rotary axis arbitrarily, this parameter is set to the amount of one rotation.
> 3 When this parameter is set, machine position and position on absolute position detector become uncorresponding. Consequently, the bit 4 (APZ) of parameter No. 1815 (indicating that the correspondence is established) is set to 0, alarm DS0300, “APC ALARM: NEED REF RETURN”. Why the bit 4 (APZ) of parameter No. 1815 is set to 0 can be checked using diagnosis data No. 0310#0.
> 4 This parameter No. 1869 is common in movable range that is under one rotation (the bit 3 (SCRx) of parameter No. 1817 is set to 1) and movable range that is over one rotation (the bit 0 (RVS) of parameter No. 1815 is set to 1).

1874	Numerator of the flexible feed gear for the built-in position detector
1875	Denominator of the flexible feed gear for the built-in position detector

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis

[Valid data range] 1 to 32767

When using temporary absolute coordinate setting, set the flexible feed gear for the built-in position detector on each axis. The settings are as follows:

$$\frac{\text{No.1874}}{\text{No.1875}} = \frac{\text{Number of position feedback pulses per motor revolution}}{1{,}000{,}000}$$

1880	Abnormal load detection alarm timer

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767
This parameter sets the time from the detection of an unexpected disturbance torque until a servo alarm is issued.
When 0 is set, however, the specification of 200 msec is assumed.

1881	Group number when an unexpected disturbance torque is detected

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 32
Set the group number on each axis when an unexpected disturbance torque is detected.
When an unexpected disturbance torque is detected on an axis, only the movements on those axes that belong to the same group as the axis are stopped.
If 0 is set for an axis, the movement on the axis is stopped when an unexpected disturbance torque is detected on any other axis.
This parameter is valid when bit 5 (ANA) of parameter No. 1804 is set to 1.
[Example]
When the settings indicated below are made, and an unexpected disturbance torque is detected on the 6th axis, the movements on the 2nd axis, 4th axis, 6th axis, and 7th axis are stopped. When an unexpected disturbance torque is detected on the 4th axis, the movements on the 4th axis and the 7th axis are stopped.

Parameter No. 1881	Setting value
(1st axis)	1
(2nd axis)	2
(3rd axis)	1
(4th axis)	0
(5th axis)	3
(6th axis)	2
(7th axis)	0

1882	Interval of mark 2 of a linear scale with absolute address reference marks

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

Set the interval of mark 2 of a linear scale with absolute address reference marks.

1883	Distance 1 from the scale zero point to reference position (linear scale with absolute address reference marks) or distance 1 from the base point to reference position (linear scale with an absolute address zero point)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999999999 to 999999999

1884	Distance 2 from the scale zero point to reference position (linear scale with absolute address reference marks) or distance 2 from the base point to reference position (linear scale with an absolute address zero point)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999 to 999

When a linear scale with absolute address reference marks is used, set the distance from the scale zero point to reference position in parameter Nos. 1883 and 1884).

Distance from the zero point to the reference position of a linear scale
= No. 1884 × 1,000,000,000 + No. 1883

The scale zero point represents a point where mark 1 and mark 2 match. Usually, this point is a virtual point that does not physically exist on the scale. (See the Fig. 4.18 (a).)

If the reference position is placed in the + direction when viewed from the scale zero point, set a positive value. If the reference position is placed in the - direction when viewed from the scale zero point, set a negative value.

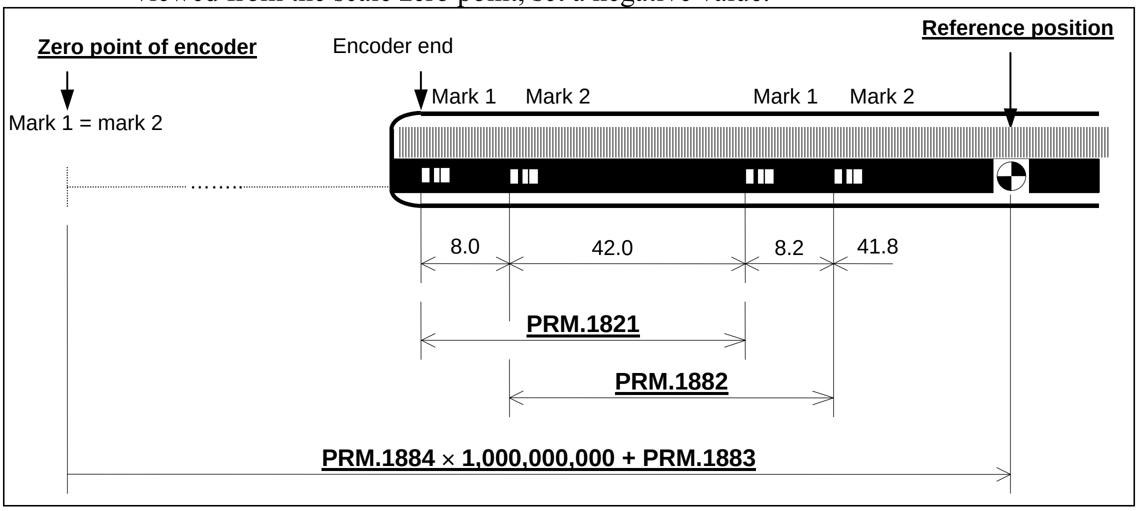
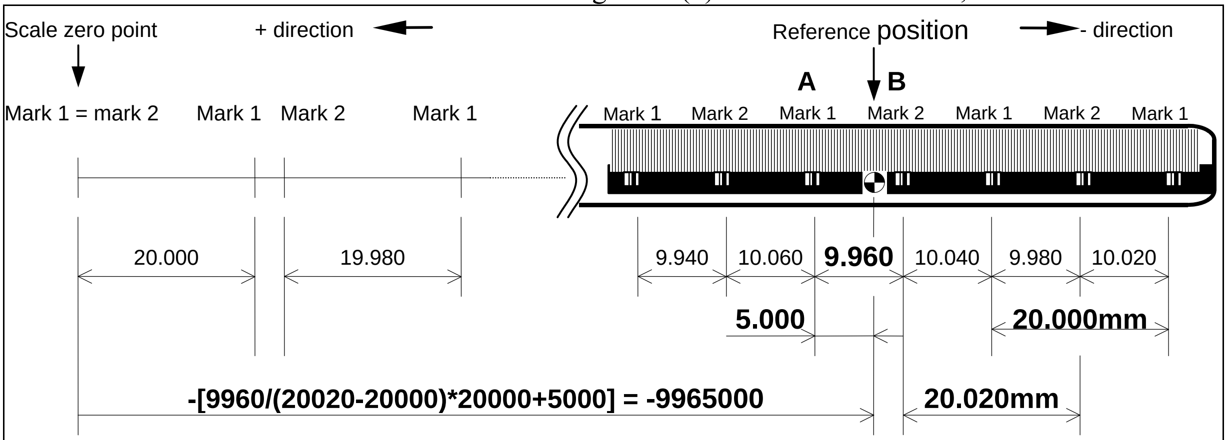


Fig. 4.18 (a)

[Example of parameter settings]

When an encoder as shown Fig. 4.18 (b) is used with an IS-B, millimeter machine:



Parameters

No.1821 (interval of mark 1) = 20000

No.1882 (interval of mark 2) = 20020

No.1883 (reference position) = position of point A + 5.000

= distance between A and B/(mark 2 − mark 1) × mark 1 + 5000

= 9960/(20020-20000) × 20000 + 5000

= 9965000

= -9965000 (the reference position is on the negative side)

Fig. 4.18 (b)

[Setting parameter No. 1883]

When it is difficult to measure the distance from the scale zero point to the reference position (parameter No. 1883), the method described below can be used to find the distance.

<1> Set parameter No. 1815 to enable this function.
Set an appropriate value in parameter No. 1821 and No. 1882.
Set 0 in parameter No. 1240.
Set 0 in parameter No. 1883 and No. 1884.

<2> At an appropriate position, establish a reference position.
(As a result, the machine coordinate represents the distance from the scale zero point to the current position.)

<3> By jog feed or handle feed, place the machine at the accurate reference position.

<4> In parameter No. 1883, set the machine coordinate of that time converted to the detection unit (machine coordinate × CMR).

<5> If necessary, set parameter No. 1240.

When a linear scale with an absolute address zero point is used, set the distance from the base point to the reference position in parameter Nos. 1883 and 1884. The base point is a point at a scale end as shown Fig. 4.18 (c).

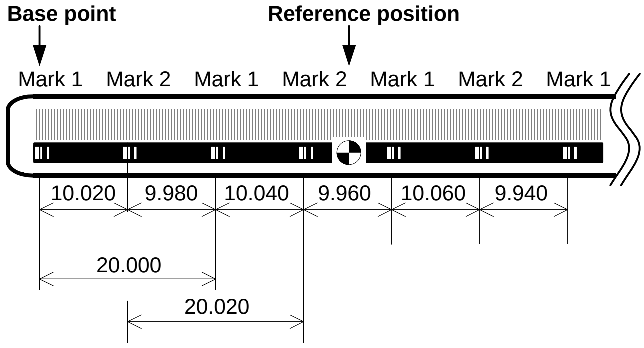


Fig. 4.18 (c)

If the reference position is located in the positive direction when viewed from the base point, set a positive value; if the reference position is located in the negative direction, set a negative value. Set the value by following the steps explained below.

<1> Set bit 1 (OPT) of parameter No. 1815 , bit 2 (DCL) of parameter No. 1815, and bit 3 (SDC) of parameter No. 1818 to enable this function.
Set 0 in parameter No. 1240.
Set 0 in parameter Nos. 1883 and 1884.

<2> At an appropriate position, establish a reference position.
(Consequently, the machine coordinate value indicates the distance from the base point to current position.)

<3> By jog feed or handle feed, place the machine at the accurate reference position.

<4> In parameters Nos. 1883 and 1884, set the machine coordinate of that time converted to the detection unit (machine coordinate × CMR).
If necessary, set parameter No. 1240.

NOTE

1 Set parameter Nos. 1883 and 1884 so that the distance from the scale zero point (for a linear scale with absolute address reference marks) or the base point (for a linear scale with an absolute address zero point) to the reference position is within the range from -999,999,999,999 to +999,999,999,999. If a value beyond this range is set, an alarm DS0016 or DS1448 is issued.

2 The scale area on the scale cannot be extended across the scale zero point or base point. Make parameter settings not to cause the scale area to extend beyond the scale zero point or base point.

1885	Maximum allowable value for total travel during torque control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

Set a maximum allowable cumulative travel value (error counter value) during torque control. If the cumulative travel value exceeds the set value, the servo alarm SV0423 is issued.

NOTE

This parameter is enabled when the bit 4 (TQF) of parameter No. 1803 is 0 (follow-up is not performed during torque control).

1886	Positional deviation when torque control is canceled

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 1 to 32767

Set a positional deviation value when torque control is canceled to return to positional deviation. After the positional deviation has fallen to the parameter-set value, switching to position control is performed.

> **NOTE**
> This parameter is enabled when the bit 4 (TQF) of parameter No. 1803 is 0 (follow-up is not performed during torque control).

1895	Servo motor axis number used for a milling tool

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

This parameter sets the servo motor axis number used for displaying the speed of a milling tool that incorporates a servo motor.

1898	Number of gear teeth on the servo motor axis side

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 1 to 9999

This parameter sets the number of servo motor axis gear teeth used for displaying the speed of a milling tool that incorporates a servo motor.

> **NOTE**
> This parameter is valid when a non-zero value is set in parameter No. 1895.

1899	Number of gear teeth on the milling axis side

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 1 to 9999

This parameter sets the number of milling axis gear teeth used for displaying the speed of a milling tool that incorporates a servo motor.

> **NOTE**
> This parameter is valid when a non-zero value is set in parameter No. 1895.

	#7	#6	#5	#4	#3	#2	#1	#0
1902							ASE	FMD

[Input type] Parameter input
[Data type] Bit

NOTE
When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 FMD The FSSB setting mode is:
0: Automatic setting mode.
(When the relationship between an axis and amplifier is defined on the FSSB setting screen, parameters Nos. 1023, 2013#0, 2014#0, 3717, 11802#4, 24000 to 24103 are automatically set.
1: Manual setting 2 mode.
(Parameters Nos. 1023, 2013#0, 2014#0, 3717, 11802#4, 24000 to 24103 are to be manually set.)

#1 ASE When automatic setting mode is selected for FSSB setting (when the bit 0 (FMD) parameter No. 1902 is set to 0), automatic setting is:
0: Not completed.
1: Completed.
This bit is automatically set to 1 upon the completion of automatic setting.

	#7	#6	#5	#4	#3	#2	#1	#0
1902		DCE						
1904		DCN						

These parameters are related to Dual Check Safety.
See Dual Check Safety CONNECTION MANUAL (B-64483EN-2) for details.

1945	
1946	
1948	
1950	

These parameters are related to Dual Check Safety.
See Dual Check Safety CONNECTION MANUAL (B-64483EN-2) for details.

Parameters Nos. 2000 to 2999 are for digital servo, The following parameters are not explained in this manual. Refer to FANUC AC SERVO MOTOR αi series PARAMETER MANUAL (B-65270EN)

No.	Data type	Contents							
2000	Bit axis				PGEX			DGPR	PLC0
2001	Bit axis		AMR6	AMR5	AMR4	AMR3	AMR2	AMR1	AMR0
2002	Bit axis					PFSE			
2003	Bit axis		OVSC	BLEN	NPSP	PIEN	OBEN	TGAL	
2004	Bit axis					TRW1	TRW0	TIB0	TIA0
2005	Bit axis	SFCM	BRKC					FEED	
2006	Bit axis								FCBL
2007	Bit axis	FRCA						IGNV	ESP2
2008	Bit axis	LAXD					VFBA	TNDM	
2009	Bit axis	BLST	BLCU						SERD
2010	Bit axis	POLE		HBBL	HBPE	BLTE	LINE		
2011	Bit axis	XIAx		RCCL				FFAL	EGB
2012	Bit axis	STNG		VCM2	VCMD1			MSFE	

No.	Data type	Contents							
2013	Bit axis	APTG							HRV3
2014	Bit axis		SPCTRF	SPF					HRV4
2015	Bit axis	BZNG	BLAT	TDOU				SSG1	PGTW
2016	Bit axis					PK2VDN			ABNT
2017	Bit axis	PK2V25			HTNG	COMSRC			DBST
2018	Bit axis	PFBCPY					OVR8	MOVOBS	RVRSE
2019	Bit axis	DPFB	SLEN	INVSYS		LBUFEX		TANDMP	
2020	Word axis	Motor number							
2021	Word axis	Load inertia ratio							
2022	Word axis	Direction of motor rotation							
2023	Word axis	Number of velocity pulses							
2024	Word axis	Number of position pulses							
2028	Word axis	Position gain switching speed							
2029	Word axis	Effective speed for integral acceleration at low speed							
2030	Word axis	Effective speed for integral deceleration at low speed							
2031	Word axis	Torque command difference threshold of torque difference alarm							
2034	Word axis	Damping control gain							
2036	Word axis	Damping compensation gain (main axis) and damping compensation phase coefficient (sub-axis) for tandem control							
2039	Word axis	Second-stage acceleration for two-stage backlash acceleration							
2040	Word axis	Current loop integral gain (PK1)							
2041	Word axis	Current loop proportional gain (PK2)							
2042	Word axis	Current loop gain (PK3)							
2043	Word axis	Velocity loop integral gain (PK1V)							
2044	Word axis	Velocity loop proportional gain (PK2V)							
2045	Word axis	Velocity loop incomplete integral gain (PK3V)							
2046	Word axis	Velocity loop gain (PK4V)							
2047	Word axis	Observer parameter (POA1)							
2048	Word axis	Backlash acceleration							
2049	Word axis	Maximum amplitude for dual position feedback							
2050	Word axis	Observer parameter (POK1)							
2051	Word axis	Observer parameter (POK2)							
2053	Word axis	Current dead-band compensation (PPMAX)							
2054	Word axis	Current dead-band compensation (PDDP)							
2055	Word axis	Current dead-band compensation (PHYST)							
2056	Word axis	Variable current gain during deceleration							
2057	Word axis	Phase-D current at high speed							
2058	Word axis	Phase-D current limit at high speed							
2060	Word axis	Torque limit							
2062	Word axis	Overload protection coefficient (OVC1)							
2063	Word axis	Overload protection coefficient (OVC2)							
2064	Word axis	Soft disconnection alarm level							
2065	Word axis	Overload protection coefficient (OVCLMT)							
2066	Word axis	Acceleration feedback gain							
2067	Word axis	Torque command filter							
2068	Word axis	Feed forward coefficient							
2069	Word axis	Velocity feed forward coefficient							
2070	Word axis	Backlash acceleration timing							
2071	Word axis	Backlash acceleration effective duration, number of times static friction compensation is performed							
2072	Word axis	Static friction compensation							
2073	Word axis	Parameter for determining stop of static friction compensation							
2074	Word axis	Current-dependent current loop gain							
2077	Word axis	Overshoot compensation counter							
2078	Word axis	Conversion coefficient for dual position feedback (numerator)							

No.	Data type	Contents
2079	Word axis	Conversion coefficient for dual position feedback (denominator)
2080	Word axis	First-order lag time constant for dual position feedback
2081	Word axis	Zero width for dual position feedback
2082	Word axis	Backlash acceleration stop amount
2083	Word axis	Brake control timer (ms)
2084	Word axis	Flexible feed gear (numerator)
2085	Word axis	Flexible feed gear (denominator)
2086	Word axis	Rated current parameter
2087	Word axis	Torque offset
2088	Word axis	Machine velocity feedback coefficient gain
2089	Word axis	Second-stage end magnification for two-stage backlash acceleration
2090	Word axis	Torque characteristic for spindle use: coefficient A
2092	Word axis	Advanced preview feed forward coefficient
2093	Word axis	Torque characteristic for spindle use: coefficient B
2094	Word axis	Backlash acceleration amount in the negative direction
2095	Word axis	Feed-forward timing adjustment coefficient
2096	Word axis	Machining point control: Timing adjustment parameter
2097	Word axis	Static friction compensation stop parameter
2099	Word axis	N-pulse suppression level
2101	Word axis	Overshoot compensation effective level
2102	Word axis	Final clamp value for actual current limit
2103	Word axis	Amount of track back upon detection of unexpected disturbance torque
2104	Word axis	Unexpected disturbance torque detection alarm level (for cutting when switching is used)
2105	Word axis	Torque constant for torque control
2107	Word axis	Velocity loop gain override during cutting
2110	Word axis	Magnetic saturation compensation (base/coefficient)
2111	Word axis	Deceleration torque limit (base/coefficient)
2112	Word axis	AMR conversion coefficient 1
2113	Word axis	Resonance elimination filter 1 : Attenuation center frequency
2114	Word axis	Acceleration amount override for backlash acceleration
2116	Word axis	Unexpected disturbance torque detection, dynamic friction compensation value
2118	Word axis	Excessive error level between semi-closed and closed loops for dual position feedback
2119	Word axis	Stop level with variable proportional gain
2126	Word axis	Tandem control, time constant for switching position feedback
2127	Word axis	Non-interacting control coefficient
2128	Word axis	Weak magnetic flux compensation (coefficient)
2129	Word axis	Weak magnetic flux compensation (base/limit)
2130	Word axis	Two smooth compensations per magnetic pole pair
2131	Word axis	Four smooth compensations per magnetic pole pair
2132	Word axis	Six smooth compensations per magnetic pole pair
2133	Word axis	Deceleration phase delay compensation coefficient (PHDLY1)
2134	Word axis	Deceleration phase delay compensation coefficient (PHDLY2)
2137	Word axis	Stage 1 acceleration amount override for two-stage backlash acceleration
2138	Word axis	AMR conversion coefficient 2
2139	Word axis	AMR offset
2142	Word axis	Alarm level for detecting unexpected disturbance torque during rapid traverse
2144	Word axis	Position feed forward coefficient for cutting
2145	Word axis	Velocity feed forward coefficient for cutting
2146	Word axis	Two-stage backlash acceleration end timer
2156	Word axis	Torque command filter (during rapid traverse)
2161	Word axis	OVC magnification at stop time (OVCSTP)
2162	Word axis	Second overload protection coefficient (POVC21)
2163	Word axis	Second overload protection coefficient (POVC22)
2164	Word axis	Second overload protection coefficient (POVCLMT2)

No.	Data type	Contents							
2165	Word axis	Maximum amplifier current							
2167	Word axis	Stage 2 acceleration amount offset for two-stage backlash acceleration							
2173	Word axis	Distance to lift for the lifting function against gravity at emergency stop							
2177	Word axis	Resonance elimination filter 1 : Attenuation band width							
2179	Word axis	Reference counter capacity (denominator)							
2182	Word axis	Current A for pole detection							
2185	Word axis	Position pulse conversion coefficient							
2198	Word axis	Current B for pole detection							
2199	Word axis	Current C for pole detection							
2200	Bit axis		P2EX			ABGO	IQOB		OVSP
2201	Bit axis		CPEE					RNLV	CROF
2202	Bit axis				DUAL	OVS1	PIAL	VGCCR	
2203	Bit axis				FRC2AX2		CRPI		
2204	Bit axis	DBS2		PGTWN2				HSTP10	
2205	Bit axis				HDIS	HD2O	FULDMY		
2206	Bit axis				HBSF				
2207	Bit axis					PK2D50			
2209	Bit axis				HCNGL				
2210	Bit axis		ESPTM1	ESPTM0			PK12S2		
2211	Bit axis	PLW4	PLW2					PHCP	
2212	Bit axis	OVQK							
2213	Bit axis	OCM							
2214	Bit axis				FFCHG				
2215	Bit axis	ABT2						TCPCLR	
2220	Bit axis			P16					DECAMR
2221	Bit axis						VFFNCH	LNOTCH	
2223	Bit axis	BLCUT2							DISOBS
2226	Bit axis	MEMCLR	PRFCLR						QUCKST
2227	Bit axis			ANGLNG	ANGREF		GOKAN	ERRCHK	PARTLN
2229	Bit axis	TAWAMI	STPRED						ABSEN
2265	Word axis	Machining point control: gain 2							
2266	Word axis	Machining point control: gain 1							
2268	Word axis	Allowable travel distance magnification/stop speed decision value							
2270	Bit axis	DSTIN	DSTTAN	DSTWAV		ACREF			AMR60
2271	Bit axis		2NDTMG				RETR2		
2273	Bit axis	DBTLIM	EGBFFG	EGBEX	POA1NG			WSVCPY	
2274	Bit axis		DD2048						HP2048
2275	Bit axis							RCNCLR	800PLS
2277	Bit axis	ACC1ON	ACC2ON	ACC3ON	ACCNEG				
2278	Bit axis				PM2ACC	PM2SCB	PM1SCB	PM2TP	PM1TP
2279	Bit axis								DMCON
2281	Bit axis							RDPMU2	RDPMU1
2282	Bit axis			FSAQS		ISE64			
2283	Bit axis	BLSTP2							NOG54
2288	Bit axis	MCPEF							
2290	Bit axis						ACCMON	ACCHLD	ACCOUT
2292	Bit axis	MOVAXS	MV1IFC				IFC1ON	C1TYP1	C1TYP0
2293	Bit axis		MV2IFC				IFC2ON	C2TYP1	C2TYP0
2300	Bit axis	CKLNOH				THRMO	DD		HRVEN
2301	Bit axis	TQCT10							
2304	Word axis	Acceleration torque limit 1							
2305	Word axis	Acceleration torque limit 2							
2310	Word axis	Phase-D current at high-speed: voltage coefficient							
2315	Word axis	Servo check interface unit output signal setting							

No.	Data type	Contents
2318	Word axis	Gain of disturbance elimination filter
2319	Word axis	Inertia ratio of disturbance elimination filter
2320	Word axis	Inverse function gain of disturbance elimination filter
2321	Word axis	Filter time constant of disturbance elimination filter
2322	Word axis	Acceleration feedback limit of disturbance elimination filter
2323	Word axis	Variable current PI ratio
2324	Word axis	Optional magnification at stop of cutting for stop-time variable proportional gain function
2325	Word axis	Integral gain (main axis) and phase coefficient (sub-axis) for tandem damping control
2326	Word axis	Disturbance input gain
2327	Word axis	Start frequency of disturbance input
2328	Word axis	End frequency of disturbance input
2329	Word axis	Number of disturbance input measurement points
2333	Word axis	Incomplete integral gain (main axis) for tandem camping control
2334	Word axis	Current loop gain magnification (valid only during high-speed HRV current control)
2335	Word axis	Velocity loop gain magnification (valid only during high-speed HRV current control)
2338	Word axis	Limit of acceleration amount for backlash acceleration Second-stage acceleration limit for two-stage backlash acceleration
2339	Word axis	Second-stage acceleration amount (negative direction) for two-stage backlash acceleration
2340	Word axis	Acceleration amount override (negative direction) for backlash acceleration Second-stage acceleration override (negative direction) for two-stage backlash acceleration
2341	Word axis	Limit of acceleration amount (negative direction) for backlash acceleration Second-stage acceleration limit (negative direction) for two-stage backlash acceleration
2345	Word axis	Dynamic friction compensation amount at stop for disturbance estimation function
2346	Word axis	Limit of dynamic friction compensation amount for disturbance estimation function
2347	Word axis	Static friction compensation amount (negative direction)
2352	Word axis	Adaptive damping filter detection level
2355	Word axis	Machining point control: Center frequency of band-pass filter
2356	Word axis	Resonance elimination filter L: Feed-forward filter exclusion rate
2357	Word axis	Tandem speed difference alarm threshold
2358	Word axis	Unexpected disturbance torque detection: Post-acceleration timer
2359	Word axis	Resonance elimination filter 1 : Damping
2360	Word axis	Resonance elimination filter 2 : Attenuation center frequency
2361	Word axis	Resonance elimination filter 2 : Attenuation band width
2362	Word axis	Resonance elimination filter 2 : Damping
2363	Word axis	Resonance elimination filter 3 : Attenuation center frequency
2364	Word axis	Resonance elimination filter 3 : Attenuation band width
2365	Word axis	Resonance elimination filter 3 : Damping
2366	Word axis	Resonance elimination filter 4 : Attenuation center frequency
2367	Word axis	Resonance elimination filter 4 : Attenuation band width
2368	Word axis	Resonance elimination filter 4 : Damping
2369	Word axis	Two smooth compensations per magnetic pole pair (negative direction)
2370	Word axis	Four smooth compensations per magnetic pole pair (negative direction)
2371	Word axis	Six smooth compensations per magnetic pole pair (negative direction)
2373	Word axis	Pull-up amount for vertical axis pull-up function for emergency stop
2374	Word axis	Pull-up time for vertical axis pull-up function for emergency stop
2375	Word axis	Torque limit magnification during brake control
2377	Word axis	Smoothing compensation performed 1.5 times per pole pair
2378	Word axis	Smoothing compensation performed 1.5 times per pole pair (negative direction)
2380	Word axis	Smoothing compensation performed three times per pole pair
2381	Word axis	Smoothing compensation performed three times per pole pair (negative direction)
2382	Word axis	Torsion preview control: maximum compensation value
2383	Word axis	Torsion preview control: acceleration 1
2384	Word axis	Torsion preview control: acceleration 2
2385	Word axis	Torsion preview control: acceleration 3
2386	Word axis	Torsion preview control: acceleration torsion compensation value K1

No.	Data type	Contents
2387	Word axis	Torsion preview control: acceleration torsion compensation value K2
2388	Word axis	Torsion preview control: acceleration torsion compensation value K3
2389	Word axis	Torsion preview control: torsion delay compensation value KD
2390	Word axis	Torsion preview control: torsion delay compensation value KDN
2391	Word axis	Torsion preview control: acceleration torsion compensation value K1N
2392	Word axis	Torsion preview control: acceleration torsion compensation value K2N
2393	Word axis	Torsion preview control: acceleration torsion compensation value K3N
2394	Word axis	Number of data mask digits
2402	Word axis	Torsion preview control: torsion torque compensation coefficient
2403	Word axis	Synchronous axes automatic compensation: coefficient
2404	Word axis	Synchronous axes automatic compensation: maximum compensation value (sub-axis), dead-band width (main-axis)
2405	Word axis	Synchronous axes automatic compensation : filter coefficient
2455	Word axis	Integral part (α) of the number of pulses for one rotation
2456	Word axis	Exponential part (β) of the number of pulses for one rotation
2463	Word axis	Power consumption monitor: common power loss coefficient C
2468	Word axis	Power consumption monitor: motor winding resistance
2469	Word axis	Power consumption monitor: servo amplifier loss coefficient A
2478	Word axis	Interactive force compensation: Angle data offset (for the first moving axis)
2479	Word axis	Interactive force compensation: Angle data offset (for the first moving axis)
2480	Word axis	Interactive force compensation: Angle data offset (for the second moving axis)
2481	Word axis	Interactive force compensation: Angle data offset (for the second moving axis)
2482	Word axis	Speed arrival detection level
2483	Word axis	Speed zero detection level
2490	Word axis	Power consumption monitor: servo amplifier loss coefficient B
2491	Word axis	Power consumption monitor: common power loss coefficient D
2606	Word axis	Interactive force compensation: moving axis configuration

	#7	#6	#5	#4	#3	#2	#1	#0
2008						VFA	TDM	

[Input type] Parameter input
[Data type] Bit axis

#1 TDM This bit is automatically set to 1 when bit 6 (tandem axis) of parameter No. 1817 is set to 1.
This bit cannot be directly set.

#2 VFA In tandem control, the feedrate feedback average function is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
2011	XIAx							SYNx

[Input type] Parameter input
[Data type] Bit axis

#0 SYNx When the electronic gear box function (EGB) is used, this bit sets the axis to be synchronized.
0: Axis not synchronized by EGB
1: Axis synchronized by EGB
Set 1 for both of the slave and dummy axes of EGB.

NOTE The setting of this parameter becomes valid after the power is turned off then back on.

#7 XIAx Temporary absolute coordinate setting is:
0: Not used.
1: Used.

NOTE 1 When temporary absolute coordinate setting is used, bit 1 (OPTx) of parameter No. 1815, bit 5 (APCx) of parameter No. 1815, parameter No. 1874, and parameter No. 1875 must be set. 2 The setting of this parameter becomes effective after the power is turned off then back on.

2021	Load inertia ratio

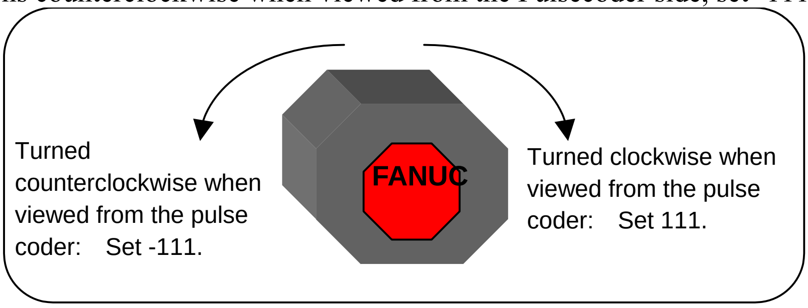
[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 32767
(Load inertia)/(motor inertia) × 256

For tandem control:
(Load inertia)/(motor inertia) × 256/2
Set the same value for the master axis and slave axis.

2022	Direction of motor rotation

NOTE When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] -111,111
Set the direction of motor rotation.
If the motor turns clockwise when viewed from the Pulsecoder side, set 111. If the motor turns counterclockwise when viewed from the Pulsecoder side, set -111.



2031	Torque command difference threshold of torque difference alarm

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 14564

If the absolute value of the torque command difference between two axes exceeds the value set in this parameter, an alarm is issued.
Set the same value for two axes that are placed under axis synchronous control.
The servo axis numbers of the synchronized master axis and slave axis must be assigned so that an odd number is assigned to the master axis and the next axis number is assigned to the slave axis. Examples are (1,2) and (3,4).

2087	Preload value for each axis (Tcmd offset)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] (Ampere limit)/7282
[Valid data range] -1821 to 1821
An offset is applied to a torque command to suppress backlash.
Set a value much greater than the friction.
As a guideline, specify a value that is about one-third of the rated torque.

[Example]
To set a torque equivalent to 3 A in the opposite directions:
When the ampere limit is 40 A
3/(40/7282) = 546
Master side = 546
Slave side = -546

	#7	#6	#5	#4	#3	#2	#1	#0
2282					ISE64			

[Input type] Parameter input
[Data type] Bit axis

#3 ISE64 To feed forward (bit 1 (FEED) of parameter No. 2005 is set to 1):
0: Normal feedrate limits are applied.
1: Extended feedrate limits are applied.
When feed forward is enabled, bit 7 of parameter No. 1013 is set to 1, and this parameter is set for an axis, feedrate limits for the axis are extended as following table if the increment system is IS-C, IS-D, or IS-E:

[Normal position control]

Functions used when Normal position control is used		Permissible feedrate			
High-speed, high-precision	Feed forward	Detection unit: 1μm	Detection unit: 0.1μm	Detection unit: 0.01μm	Detection unit: 0.001μm
None	Not used/used (advanced preview type)	IS-B:999m/min IS-C:999m/min	IS-B:196m/min IS-C:999m/min	IS-D:10m/min →100m/min	IS-E:1m/min →100m/min
AI contour control I AI contour control II	Not used/used (advanced preview type)				
Electronic gear box	Used (conventional type)	$\boxed{\text{IS-B:240m/min}}$ IS-C:100m/min	$\boxed{\text{24m/min}}$	2.4m/min →100m/min	0.24m/min →100m/min

[When spindle control with servo motor is used]

Functions used when Normal position control is used		**Permissible rotation speed**			
Extended permissible feedrate	**Feedrate limit multiplied by 10**	**Detection unit: 1/1000deg**	**Detection unit: 1/10000deg**	**Detection unit: 1/100000deg**	**Detection unit: 1/1000000deg**
Disabled (No.1013#7=0)	Disabled (No.1408#3=0)	IS-B:2777min^{-1} IS-C: 277min^{-1}	IS-B:2777min^{-1} IS-C: 277min^{-1}	IS-D:27min^{-1}	IS-E:2min^{-1}
	Enabled (No.1408#3=1)	IS-B:27777min^{-1} IS-C: 2777min^{-1}	IS-B:27777min^{-1} IS-C: 2777min^{-1}	IS-D:277min^{-1}	IS-E:27min^{-1}
Enabled (No.1013#7=1) (No.2282#3=1)	Disabled (No.1408#3=0)	IS-B:2777min^{-1} IS-C: 277min^{-1}	IS-B:2777min^{-1} IS-C: 277min^{-1}	IS-D:277min^{-1}	IS-E:27min^{-1}
	Enabled (No.1408#3=1)	IS-B:27777min^{-1} IS-C: 27777min^{-1}	IS-B:27777min^{-1} IS-C: 2777min^{-1}	IS-D:2777min^{-1}	IS-E:349min^{-1}

- The values enclosed by a rectangle in the table are limits imposed by internal processing of the servo software. As CMR is increased to make the detection unit smaller, the permissible feedrate limited by the internal processing of the servo software lowers in proportion to the detection unit (when a detection unit of 0.1 μm is changed to 0.05μm, the permissible feedrate is halved).
- In a semi-closed loop system using a high-resolution detector (a rotary motor or linear motor), use of nano interpolation allows the maximum resolution of the detector to be used for position control without using a smaller detection unit.
- Even when a large detection unit is to be used because the feedrate is limited by detection unit as mentioned above, feedrate feedback data that significantly affects velocity loop control is controlled by using a maximum resolution of the detector.

4.19 PARAMETERS OF DI/DO (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
3001	MHI	PGS				RWM	SON	

[Input type] Parameter input
[Data type] Bit path

#1 SON Automatic operation is started:
0: On the falling edge ("1" → "0") of the automatic operation start signal ST <Gn007.2>
1: On the rising edge ("0" → "1") of the of the automatic operation start signal ST <Gn007.2>

#2 RWM While a program in the program memory is being searched for, the rewind signal RWD <Fn000.0> is:
0: Not output.
1: Output.

#6 PGS In the high speed program check mode, M, S, T, and B codes are:
0: Not output.
1: Output.

> ⚠ **CAUTION**
> 1 If this parameter is set to 1, M, S, T, and B codes are neither saved nor restored at the start and end of the high speed program check mode.
> Accordingly, M, S, T, and B codes output in the high speed program check mode remain valid even after the high speed program check mode ends.
> 2 If this parameter is set to 1, M, S, T, and B codes are output to the PMC in the high speed program check mode.
> Therefore, when M, S, T, and B commands need not be executed in the high speed program check mode, create a ladder sequence that references the high speed program check mode signal <Fn290.5> and suppresses the execution of any of the M, S, T, and B codes.
> 3 If this parameter is set to 1, the operation of the M, S, T, and B codes depends on the status of auxiliary function lock signal AFL <Gn005.6>.
> 4 In the high speed program check mode, an attempt to rewrite this bit parameter by using G10 results in an alarm PS5364, "ILLEGAL COMMAND IN PROGRAM CHECK".

#7 MHI Exchange of strobe and completion signals for the M, S, T, and B
0: Normal
1: High-speed

	#7	#6	#5	#4	#3	#2	#1	#0
3002	OVM	POV		IOV		MFD		CHM

[Input type] Parameter input

[Data type] Bit path

#0 CHM For high-speed M/S/T/B, the distribution end signal DEN <Fn001.3> and an auxiliary function code signal M00 to M31 <Fn010 to Fn013> are:
0: Not turned off even upon completion of the execution of the auxiliary function.
1: Turned off upon completion of the execution of the auxiliary function.

#2 MFD When the high-speed M/S/T/B interface is used, if a block specifying an M, S, T, or B code does not contain a move command or dwell command, the distribution end signal DEN <Fn001.3> and the strobe signal (MF<Fn007.0>, SF<Fn007.2>, TF<Fn007.3>, or BF<Fn007.7>) for the function are:
0: Output conventionally (the output of the distribution end signal is delayed).
1: Output at the same time.

#4 IOV Override-related signal logic is:
0: Used without modification
(A signal of negative logic is used as a negative logic signal, and a signal of positive logic is used as a positive logic signal.)
1: Inverted
(A signal of negative logic is used as a positive logic signal, and a signal of positive logic is used as a negative logic signal.)

The signals indicated below are affected.
Signal of negative logic:
- Feedrate override signals *FV0 to *FV7<Gn012>
- Second feedrate override signals*AFV0 to *AFV7<Gn013>
- Feedrate override signals (for PMC axis control)
  *EFOV0g to *EFOV7g<G0151/G0163/G0175/G0187>
- Software operator's panel signals *FV0O to *FV7O<Fn078>

Signals of positive logic:
- Rapid traverse override signals ROV1,ROV2<G0014.0, G0014.1>
- Software operator's panel signals ROV1O,ROV2O<F0076.4, F0076.5>
- Rapid traverse override signals (for PMC axis control)
  EROV1g,EROV2g<G0150.0, G0150.1/G0162.0, G0162.1/G0174.0, G0174.1/G0186.0, G0186.1>

The signals indicated below are not affected.
- 1% step rapid traverse override selection signal HROV <Gn096.7>
- 1% step rapid traverse override signals *HROV0 to *HROV6 <Gn096.0 to Gn096.6>
- 0.1% step rapid traverse override selection signal FHROV <Gn353.7>
- 0.1% step rapid traverse override signals *FHRO0 to *FHRO9 <Gn352.0 to Gn352.7, Gn353.0 to Gn353.1>

#6 POV Dwell/Auxiliary function time override function is:
0: Invalid.
1: Valid.

#7 OVM In Dwell/Auxiliary function time override function, override function for M02,M30 is:
0: Invalid.
1: Valid.

	#7	#6	#5	#4	#3	#2	#1	#0
3003			DEC	DAU	DIT	ITX		ITL
			DEC		DIT	ITX		ITL

[Input type] Parameter input
[Data type] Bit path

#0 ITL Interlock signal for all axes
0: Enabled
1: Disabled

#2 ITX Interlock signals for each axis
0: Enabled
1: Disabled

#3 DIT The interlock signal for each axis direction is:
0: Valid.
1: Invalid.

#4 DAU When bit 3 (DIT) of parameter No. 3003 is set to 0, the interlock signal for each axis direction is:
0: Valid only in manual operation, and invalid in automatic operation.
1: Valid in either manual operation or automatic operation.

#5 DEC Deceleration signal (*DEC1 to *DEC8 <Gn196.0…Gn196.7>) for reference position return
0: Deceleration is applied when the signal is “0”.
1: Deceleration is applied when the signal is “1”.

	#7	#6	#5	#4	#3	#2	#1	#0
3004			OTH				BCY	BSL

[Input type] Parameter input
[Data type] Bit path

#0 BSL The block start interlock signal *BSL <Gn008.3> and cutting block start interlock signal *CSL <Gn008.1> are:
0: Disabled.
1: Enabled.

#1 BCY When more than one operation is performed by one block command such as a canned cycle, the block start interlock signal *BSL <Gn008.3> is:
0: Checked only at the beginning of the first cycle.
1: Checked at the beginning of every cycle.

#5 OTH The overtravel limit signal is:
0: Checked
1: Not checked

> ⚠ **WARNING**
> For safety, usually set 0 to check the overtravel limit signal.

	#7	#6	#5	#4	#3	#2	#1	#0
3006		WPS				EPS	EPN	GDC

[Input type] Parameter input
[Data type] Bit

#0 GDC As the deceleration signal for reference position return *DEC:
0: <Xn009> is used.
1: <Gn196> is used. (<Xn009> is disabled.)

#1 EPN As signals for specifying workpiece numbers for external workpiece number search:
0: The external workpiece search signals (PN1 to PN16) are used. (A number from 1 to 31 can be specified.)
1: The extended external workpiece number search signals (EPN0 to EPN13) are used. (A number from 1 to 9999 can be specified.)

#2 EPS As the signal for starting external workpiece number search:
0: The automatic operation start signal ST is used. When automatic operation (memory operation) is started, a search is made.
1: The external workpiece number search start signal EPNS is used. ST does not start a search.

#6 WPS Each axis workpiece coordinate system preset signal:
0: Disabled.
1: Enabled.
When this parameter is set to 1, a workpiece coordinate system is preset after the end of the high speed program check mode.

	#7	#6	#5	#4	#3	#2	#1	#0
3008						XSG		

[Input type] Parameter input
[Data type] Bit path

NOTE
When this parameter is set, the power must be turned off before operation is continued.

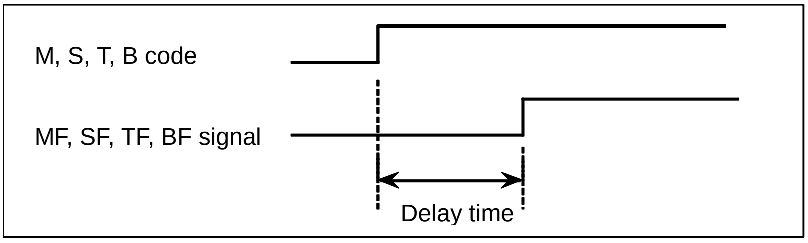
#2 XSG A signal assigned to an X address is:
0: Fixed at the address.
1: Able to be reassigned to an arbitrary X address.

NOTE
When this parameter is set to 1, set parameter No. 3013, No. 3014, No. 3012, and No. 3019. If parameter No. 3013 and No. 3014 are not set, the deceleration signal for reference position return *DEC is assigned to bit 0 of <Xn000>. If parameter No. 3012 and No. 3019 are not set, the skip signal, the PMC axis control skip signal, the measurement position arrival signal, the manual feed interlock signal for each axis direction, and the tool compensation value write signal are assigned to <X n000>.

3010	Time lag in strobe signals MF, SF, TF, and BF

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767

The time required to send strobe signals MF<Fn007.0>, SF<Fn007.2>, TF<Fn007.3>, and BF<Fn007.7> after the M, S, T, and B codes are sent, respectively.



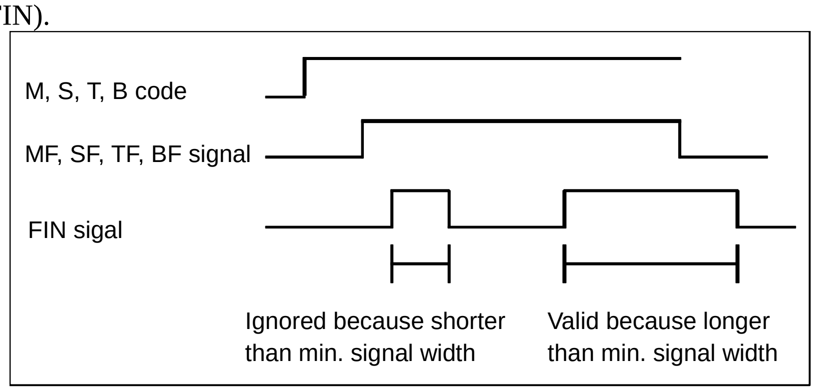
NOTE

The time is counted in units of 4 ms. If the set value is not a multiple of four, it is raised to the next multiple of four
Example
When 30 is set, 32 ms is assumed.
When 0 is set, 4 ms is assumed.
The time count period may change, depending on the system.

3011	Acceptable width of M, S, T, and B function completion signal (FIN)

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767

Set the minimum signal width of the valid M, S, T, and B function completion signal (FIN).



NOTE

The time is counted in units of 4 ms. If the set value is not a multiple of four, it is raised to the next multiple of four
Example
When 30 is set, 32 ms is assumed.
When 0 is set, 4 ms is assumed.
The time count period may change, depending on the system.

3012	Skip signal assignment address

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 727
Set an X address to which the skip signal SKIPn is to be assigned.

NOTE
This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.
Depending on the configuration of the I/O Link, the actually usable X addresses are:
<X0000 to X0127>, <X0200 to X0327>, <X0400 to X0527>, <X0600 to X0727>

3013	X address to which the deceleration signal for reference position return is assigned

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 727
Set an address to which the deceleration signal *DECn for reference position return for each axis is to be assigned.

NOTE
This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.
Depending on the configuration of the I/O Link, the actually usable X addresses are:
<X0000 to X0127>, <X0200 to X0327>, <X0400 to X0527>, <X0600 to X0727>

3014	Bit position of an X address to which the deceleration signal for reference position return is assigned

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 7
Set a bit position to which the deceleration signal for reference position return *DECn for each axis is to be assigned.

> **NOTE**
> This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.

3017	Output time of reset signal RST

[Input type] Parameter input
[Data type] Word path
[Unit of data] 16msec
[Valid data range] 0 to 255

When the output time of the reset signal RST is to be extended, set an extended time.
(RST signal output time) =
(Time required for reset processing) + (Parameter setting) × 16 msec

3018	Percentage assumed when the 1% rapid traverse override signal indicates 0% during execution of an auxiliary function

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100

When the 1% rapid traverse override signal indicates 0% in the dwell/auxiliary function time override function, this parameter sets the percentage for calculating an insufficient time.
0% is assumed to be 10%.

3019	Address to which the PMC axis control skip signal, measurement position arrival signal, and tool offset write signals are assigned

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 727

Set an X address to which the PMC axis control skip signal ESKIP, measurement position arrival signals (XAE, YAE, and ZAE (M series) or XAE and ZAE (T series)), and tool offset write signals (±MIT1 and ±MIT2 (T series)) are to be assigned.

Example 1. When parameter No. 3012 is set to 5 and parameter No. 3019 is set to 6

When bit 2 (XSG) of parameter No. 3008 is 1, the PMC axis control skip signal, and measurement position arrival signal are allocated to X0006 and the skip signal is allocated to X0005.

	#7	#6	#5	#4	#3	#2	#1	#0	
X0005	SKIP	SKIP6	SKIP5	SKIP4	SKIP3	SKIP2	SKIP8	SKIP7	(T series)
	SKIP	SKIP6	SKIP5	SKIP4	SKIP3	SKIP2	SKIP8	SKIP7	(M series)

	#7	#6	#5	#4	#3	#2	#1	#0	
X0006		ESKIP	-MIT2	+MIT2	-MIT1	+MIT1	ZAE	XAE	(T series)
		ESKIP				ZAE	YAE	XAE	(M series)

Example 2. When parameter No. 3012 is set to 5 and parameter No. 3019 is set to 5

When bit 2 (XSG) of parameter No. 3008 is 1, the PMC axis control skip signal, measurement position arrival signal, and skip signal are allocated to X0005.

	#7	#6	#5	#4	#3	#2	#1	#0	
X0005	SKIP	ESKIP	-MIT2	+MIT2	-MIT1	+MIT1	ZAE	XAE	(T series)
		SKIP6	SKIP5	SKIP4	SKIP3	SKIP2	SKIP8	SKIP7	

#7	#6	#5	#4	#3	#2	#1	#0	
SKIP	ESKIP	SKIP5	SKIP4	SKIP3	ZAE	YAE	XAE	(M series)
	SKIP6				SKIP2	SKIP8	SKIP7	

NOTE

This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.
Depending on the configuration of the I/O Link, the actually usable X addresses are:
<X0000 to X0127>, <X0200 to X0327>, <X0400 to X0527>, <X0600 to X0727>

3020	Correspondence between workpiece numbers and program numbers in external workpiece number search (PN)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] -1 to 99

This parameter has the following meaning according to the value set.

- When a value from 0 to 99 is set
  (Program number) = (setting)*100+(workpiece number)
  This means that the setting specifies the higher 2 digits of a program number.
- When the value -1 is set
  The higher 2 digits of a program number represent the minimum of the existing program numbers.

Example

When workpiece number 21 is specified, program numbers such as O0021, O0121, and O0221 are searched for. If O0021 is not found, but O0121 and O0221 are found, O0121 is selected as the program number.

NOTE

This parameter is valid when a workpiece number is specified using the PN1 to PN16 signals (when bit 1 (EPN) of parameter No. 3006 is set to 0).

3021	Address to which an axis signal is assigned

NOTE

When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 7, 10 to 17, 20 to 27, ... , 90 to 97

For each axis of the CNC, set a PMC interface address.
Set a value according to the tables below.

Value of parameter No. 3021 (the second digit)

Setting value	Input signal address	Output signal address
0	G0000 to G0767	F0000 to F0767
1	G1000 to G1767	F1000 to F1767
	:	
9	G9000 to G9767	F9000 to F9767

Value of parameter No. 3021 (the first digit)

Setting value	Input signal address	Output signal address
0	0	0
1	1	1
	:	
7	7	7

[Example of setting]

Axis number	No. 3021	Signal allocation
1	0	+J1<G0100.0>, -J1<G0102.0>, ZP1<F0090.0>, ...
2	1	+J2<G0100.1>, -J2<G0102.1>, ZP2<F0090.1>, ...
3	2	+J3<G0100.2>, -J3<G0102.2>, ZP3<F0090.2>, ...
4	10	+J4<G1100.0>, -J4<G1102.0>, ZP4<F1090.0>, ...
5	11	+J5<G1100.1>, -J5<G1102.1>, ZP5<F1090.1>, ...

If eight or less axes are used per path, the following signal allocation results when 0 is set for all axes:

Axis 1 of path 1 = Setting equivalent to 0
Axis 2 of path 1 = Setting equivalent to 1
:
Axis 1 of path 2 = Setting equivalent to 10
:

> **NOTE**
> Set this parameter when more than eight axes are used per path.
> The valid data range varies, depending on the system software.

3022	Address to which a spindle signal is assigned

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to 3, 10 to 13, 20 to 23, ... , 90 to 93

For each axis of the CNC, set a PMC interface address.
Set a value according to the tables below.

Value of parameter No. 3022 (the second digit)

Setting value	Input signal address	Output signal address
0	G0000toG0767	F0000toF0767
1	G1000toG1767	F1000toF1767
	:	
9	G9000toG9767	F9000toF9767

Value of parameter No. 3022 (the first digit)

Setting value	Input signal address	Output signal address
0	Bit position A	Bit position A
1	Bit position B	Bit position B
2	Bit position C	Bit position C
3	Bit position D	Bit position D

(The bit positions A, B, C, and D vary, depending on the type of signal.)

[Example of setting]

Spindle number	No. 3022	Signal allocation
1	0	TLMLA<G0070.0>, TLMHA<G0070.1>, ALMA<F0045.0>, ...
2	1	TLMLB<G0074.0>, TLMHB<G0074.1>, ALMB<F0049.0>, ...
3	10	TLMLA<G1070.0>, TLMHA<G1070.1>, ALMA<F1045.0>, ...
4	11	TLMLB<G1074.0>, TLMHB<G1074.1>, ALMB<F1049.0>, ...

If four or less axes are used per path, the following signal allocation results when 0 is set for all axes:

Axis 1 of path 1 = Setting equivalent to 0
Axis 2 of path 1 = Setting equivalent to 1
:
Axis 1 of path 2 = Setting equivalent to 10
:

> **NOTE**
> The valid data range varies, depending on the system software.

3030	Allowable number of digits for the M code
3031	Allowable number of digits for the S code
3032	Allowable number of digits for the T code

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 8

Set the allowable numbers of digits for the M, S, and T codes.
When 0 is set, the allowable number of digits is assumed to be 8.

3033	Allowable number of digits for the B code (second auxiliary function)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 8

Set the allowable number of digits for the second auxiliary function.
When 0 is set, the allowable number of digits is assumed to be 8.
To enable a decimal point to be specified, bit 0 (AUP) of parameter No. 3450 must be set to 1. In this case, the allowable number of digits set in this parameter includes the number of decimal places.
If a value exceeding the allowable number of digits is specified, the alarm PS0003, “TOO MANY DIGIT” is issued.

3037	Address to which the individual setting signal for peripheral axis control group 1 is assigned
3038	Address to which the individual setting signal for peripheral axis control group 2 is assigned
3039	Address to which the individual setting signal for peripheral axis control group 3 is assigned

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 2 to 4

Set an address to which the individual setting signal for peripheral axis control group 1 to 3 is assigned.
Signals whose addresses are Gn000 to Gn999, Fn000 to Fn999 are used (n = setting value - 1).
If the setting value is out of range, or the setting value has already been set, the peripheral axis control group is disabled.

Example 1)
If the setting value is set to 3, signals whose addresses are G2000 to G2999, F2000 to F2999 are used.

Example 2)
In 2-path system, the setting value of parameters Nos.3037 to 3039 is 3 or more.

> **NOTE**
> 1 Valid data range depends on the system software series.
> 2 Address arranged for the path which main program is operated cannot be specified.
> 3 Clear the program files when this parameter is changed.

3040	Path number whose parameter and DI/DO apply to peripheral axis control group 1
3041	Path number whose parameter and DI/DO apply to peripheral axis control group 2
3042	Path number whose parameter and DI/DO apply to peripheral axis control group 3

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 1 to the number of path

Path type parameter and path type DI/DO whose path is set by these parameters apply to peripheral axis control group 1 to 3. Some DI/DO such as reset are set by the parameters Nos.3037 to 3039. If the setting value is out of range, the peripheral axis control group is disabled.

NOTE
Clear the program files when this parameter is changed.

4.20 PARAMETERS OF DISPLAY AND EDIT (1 OF 5)

	#7	#6	#5	#4	#3	#2	#1	#0
3100							CEM	

[Input type] Parameter input
[Data type] Bit

#1 CEM On the help and operation history screens, CE-marked MDI keys are displayed with:
0: Key names.
1: Symbols.

	#7	#6	#5	#4	#3	#2	#1	#0
3101							KBF	

[Input type] Parameter input
[Data type] Bit

#1 KBF When the screen or mode is changed, the contents of the key-in buffer are:
0: Cleared.
1: Not cleared.

	#7	#6	#5	#4	#3	#2	#1	#0
3103						NMH		

[Input type] Parameter input
[Data type] Bit

#2 NMH System alarm history screen is:
0: Not displayed.
1: Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3104	DAC		DRC		PPD			MCN
	DAC	DAL	DRC	DRL	PPD			MCN

[Input type] Parameter input
[Data type] Bit path

#0 MCN Machine position
0: Regardless of whether input is made in mm or inches, the machine position is displayed in mm for millimeter machines, or in inches for inch machines.
1: When input is made in mm, the machine position is displayed in mm, and when input is made in inches, the machine position is displayed in inches accordingly.

#3 PPD Relative position display when a coordinate system is set
0: Not preset
1: Preset

> **NOTE**
> If any of the following is executed when PPD is set to 1, the relative position display is preset to the same value as the absolute position display:
> (1) Manual reference position return
> (2) Coordinate system setting based on G92 (G50 for G code system A on the lathe system)
> (3) Workpiece coordinate system presetting based on G92.1 (G50.3 for G code system A on the lathe system)
> (4) When a T code for the lathe system is specified.

#4 DRL Relative position
- 0: The actual position displayed takes into account tool length offset.
- 1: The programmed position displayed does not take into account tool length offset.

#5 DRC When relative positions are displayed:
- 0: Values not excluding the amount of travel based on cutter compensation and tool nose radius compensation are displayed.
- 1: Values excluding the amount of travel based on cutter compensation and tool nose radius compensation (programmed positions) are displayed.

#6 DAL Absolute position
- 0: The actual position displayed takes into account tool length offset.
- 1: The programmed position displayed does not take into account tool length offset.

> **NOTE**
> In lathe systems, whether to exclude a tool offset when displaying the absolute position is determined by the setting of bit 1 (DAP) of parameter No. 3129.

#7 DAC When an absolute position are displayed:
- 0: Values not excluding the amount of travel based on cutter compensation and tool nose radius compensation are displayed.
- 1: Values excluding the amount of travel based on cutter compensation and tool nose radius compensation (programmed positions) are displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3105						DPS	PCF	DPF

[Input type] Parameter input
[Data type] Bit path

#0 DPF The actual speed is:
- 0: Not displayed
- 1: Displayed

#1 PCF Addition of the movement of the PMC-controlled axes to the actual speed display
- 0: Added
- 1: Not added

#2 DPS The actual spindle speed is:
- 0: Not displayed
- 1: Displayed

	#7	#6	#5	#4	#3	#2	#1	#0
3106		DAK	SOV	OPH				DHD

[Input type] Setting input
[Data type] Bit

#0 DHD On the program screen:
0: Only a selected path can be edited and displayed.
1: Multiple paths can be edited and displayed at the same time.

#4 OPH The operation history screen is:
0: Not displayed.
1: Displayed.

#5 SOV A spindle override value is:
0: Not displayed.
1: Displayed.

> **NOTE**
> This parameter is valid only when bit 2 (DPS) of parameter No. 3105 is set to 1.

#6 DAK Specifies whether to display coordinates in the program coordinate system or workpiece coordinate system as absolute coordinates when the 3-dimensional coordinate conversion mode, the tilted working plane indexing command mode or the workpiece setting error compensation mode is set.
0: Display coordinates in the program coordinate system.
1: Display coordinates in the workpiece coordinate system.

	#7	#6	#5	#4	#3	#2	#1	#0
3107	MDL			SOR	GSC			

[Input type] Setting input
[Data type] Bit path

#3 GSC The feedrate to be displayed:
0: Is a feedrate per minute.
1: Follows the setting of bit 5 (FSS) of parameter No. 3191.

#4 SOR Display of the program directory
0: Programs are listed in the order of registration.
1: Programs are listed in the order of name.

> **NOTE**
> In the file list on the data server, the programs are displayed in the order of program number with zeros suppressed if the parameter is 0.

#7 MDL Display of the modal state on the program edit screen in 8.4” display unit
0: Not displayed.
1: Displayed (only in the MDI mode).

	#7	#6	#5	#4	#3	#2	#1	#0
3108	JSP	SLM		WCI		PCT		

[Input type] Parameter input
[Data type] Bit path

#2 PCT For modal T display on the program check screen:
0: A specified T value is displayed.
1: HD.T and NX.T are displayed.
Values displayed follow bit 1 of parameter No. 13200.

#4 WCI On the workpiece coordinate system screen, a counter input is:
0: Disabled.
1: Enabled.

#6 SLM On the current position display screen, if the spindle speed S is displayed (bit 2 (DSP) of parameter No. 0.3105 = 1), the spindle load meter is:
0: Not displayed.
1: Displayed.

> **NOTE**
> This parameter is valid only when bit 2 (DPS) of parameter No. 3105 is set to 1.

#7 JSP On the current position display screen and program check screen, jog feed is:
0: Not displayed.
1: Displayed.
In manual operation mode, the jog feedrate is displayed. In automatic operation mode, the dry run feedrate is displayed. In each case, the feedrate to which a manual feedrate override has been applied is displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3109						IKY	DWT	

[Input type] Parameter input
[Data type] Bit path

#1 DWT Characters G and W in the display of tool wear/geometry compensation amount
0: The characters are displayed at the left of each number.
1: The characters are not displayed.

#2 IKY On the tool offset screen and workpiece shift screen (T series), soft key [INPUT] is:
0: Displayed.
1: Not displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3110								OFA

[Input type] Parameter input
[Data type] Bit path

#0 OFA The axis names on the offset screen and fourth-axis/fifth-axis offset screen are:
0: Fixed to be "X", "Z", and "Y" ("E" and "5" on the fourth-axis/fifth-axis offset screen).
1: Parameter-set axis names.

	#7	#6	#5	#4	#3	#2	#1	#0
3111	NPA	OPS	OPM			SVP	SPS	SVS

[Input type] Setting input
[Data type] Bit path

#0 SVS Servo setting screen and servo tuning screen
0: Not displayed
1: Displayed

#1 SPS Spindle tuning screen
0: Not displayed
1: Displayed

#2 SVP Spindle synchronization errors displayed on the spindle tuning screen
0: Instantaneous values are displayed.
1: Peak-hold values are displayed.
Spindle synchronization errors are displayed on the side of the spindle that functions as a slave axis in spindle synchronization control.

#5 OPM Operating monitor
0: Not displayed
1: Displayed

#6 OPS The speedometer on the operating monitor screen indicates:
0: Spindle motor speed
1: Spindle speed

#7 NPA Action taken when an alarm is generated or when an operator message is entered
0: The display shifts to the alarm or message screen.
1: The display does not shift to the alarm or message screen.

> **NOTE**
> When MANUAL GUIDE *i* is provided, bit 7 (NPA) of parameter No. 3111 must be set to 0. (If this bit is set to 1, a warning message is issued at power-on.)

	#7	#6	#5	#4	#3	#2	#1	#0
3112					EAH	OMH		

[Input type] Parameter input
[Data type] Bit

#2 OMH The external operator message history screen is:
0: Not displayed.
1: Displayed.

#3 EAH Messages of the external alarm/macro alarm in alarm or operation history:
0: Not recorded
1: Recorded

> **NOTE**
> This parameter is valid when bit 7 (HAL) of parameter No. 3196 is set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
3113	MS1	MS0	DCL					HMC

[Input type] Parameter input
[Data type] Bit

#0 HMC The contents of the external operator message history:
0: Cannot be erased.
1: Can be erased.

> **NOTE**
> This parameter is valid when bit 3 (SOH) of parameter No. 11354 is set to 1.

#5 DCL The touch panel compensation screen is:
0: Disabled.
1: Enabled.
Set this parameter to 0 usually. Touch panel compensation becomes necessary only when the panel is replaced or memory all clear operation is performed. Set this parameter to 1 only when performing touch panel compensation. Upon completion of compensation, set this parameter to 0.

#6 MS0
#7 MS1 Set the combination of the number of characters and the number of messages to be preserved in the external operator message history.

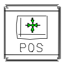
Parameter		Maximum number of characters	Number of messages
MS0=0	MS1=0	255	8
MS0=1	MS1=0	200	10
MS0=0	MS1=1	100	18
MS0=1	MS1=1	50	32

> **NOTE**
> 1 Although up to 255 characters can be specified for each external operator message, you can use the combination of bits 6 (MS0) and 7 (MS1) of parameter No. 3113 to limit the number of characters and select the number of messages to be preserved in the external operator message history.
> 2 The settings of bits 6 (MS0) and 7 (MS1) of parameter No. 3113 take effect the next time the power is turned on. The external operator message history is erased at that time.

NOTE
3 Even though you change the settings of bits 6 (MS0) and 7 (MS1) of parameter No. 3113, the alarm PW0000, "POWER MUST BE OFF" is not issued. You must however turn on the power again before the new settings can take effect.
4 If text (such as single-byte katakana or kanji characters) is entered in character code, the number of characters recorded in the external operator message history may be smaller than the maximum number of characters set by bits 6 (MS0) and 7 (MS1) of parameter No. 3113.

	#7	#6	#5	#4	#3	#2	#1	#0
3114		**ICU**	**IGR**	**IMS**	**ISY**	**IOF**	**IPR**	**IPO**

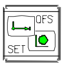
[Input type] Parameter input
[Data type] Bit

#0 IPO When the 

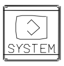
function key is pressed while the position display screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

#1 IPR When the 

function key is pressed while the program screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

#2 IOF When the 

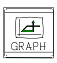
function key is pressed while the offset/setting screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

#3 ISY When the 

function key is pressed while the system screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

#4 IMS When the 

function key is pressed while the message screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

#5 IGR When the 

function key is pressed while the custom or graphic screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

#6 ICU When the 

function key is pressed while the custom screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

	#7	#6	#5	#4	#3	#2	#1	#0
3115			APLx	PGA	NDFx		NDAx	NDPx

[Input type] Parameter input
[Data type] Bit axis

#0 NDPx The current position is:
0: Displayed.
1: Not displayed.

> **NOTE**
> When using the electronic gear box (EGB) function, set 1 for the EGB dummy axis to disable current position display.

#1 NDAx The current position and the amount of the movement to be made in absolute and relative coordinates are:
0: Displayed.
1: Not displayed. (The machine coordinates are displayed.)

#3 NDFx In calculation for actual cutting feedrate display, the feedrate of a selected axis is:
0: Considered.
1: Not considered.

#4 PGAx In the high speed program check mode, the machine position on each axis is:
0: Displayed according to the setting of bit 7 (PGM) of parameter No. 11320.
1: Displayed with machine coordinates used for program checking.

> **NOTE**
> 1 When PMC axis select signal EAX*<G0136> is set to “1” for an axis, the actual machine coordinate value on the axis is indicated regardless of the settings of bit 7 (PGM) of parameter No. 11320 and bit 4 (PGA) of parameter No. 3115.
> 2 In diagnostic data No. 301 (machine position), actual machine coordinates are always displayed regardless of the settings of bit 7 (PGM) of parameter No. 11320 and bit 4 (PGA) of parameter No. 3115.

#5 APLx When the active offset value modification mode based on manual feed is selected, the relative position display is automatically:
0: Not preset.
1: Preset.
Use this parameter when returning a modified offset value to the original value before modification in the active offset value modification mode based on manual feed. The offset value can be returned to the original value by making a movement on the axis by manual feed so that the relative position display (counter) indicates the position 0.

	#7	#6	#5	#4	#3	#2	#1	#0
3116	MDC					PWR		

[Input type] Setting input
[Data type] Bit path

#2 PWR Alarm SW0100, “PARAMETER ENABLE SWITCH ON”, which is issued when bit 0 (PWE) of setting parameter No. 8900 is set to 1, is cleared by:

0: CAN + RESET.

1: RESET or turning on the external reset.

#7 MDC Maintenance information data:

0: Cannot be erased entirely.

1: Can be erased entirely.

	#7	#6	#5	#4	#3	#2	#1	#0
3117							**SPP**	

[Input type] Parameter input

[Data type] Bit path

#1 SPP When a serial spindle is used, the position coder signal pulse data based on the one-rotation signal is:

0: Not displayed on diagnosis data No. 445.

1: Displayed on diagnosis data No. 445.

> **NOTE**
> 1 For a spindle not connected, 0 is indicated.
> 2 To display this data, the following conditions must be met:
> <1> Serial spindle is used.
> <2> The parameter is valid when the one-rotation signal is detected.
>
> To detect the one-rotation signal, perform spindle orientation.
> To determine whether the one-rotation signal has been detected or not, check the serial spindle status signals (PC1DTA<F0047.0>, PC1DTB<F0051.0>, PC1DTC<F0170.0>, and PC1DTD<F0268.0>).

	#7	#6	#5	#4	#3	#2	#1	#0
3119					**TPA**	**DDS**		

[Input type] Parameter input

[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#2 DDS The touch panel is:

0: Enabled.

1: Disabled.

Set this parameter to 1 when disabling the touch panel temporarily, for example, at start-up time.

#3 TPA When the option for the external touch panel interface is selected, the external touch panel interface connection is:
0: Valid.
1: Invalid.
For an external touch panel (called ETP hereinafter), the RS-232C serial port 2 (JD36A or JD54) on the main board of the CNC is used.
When using ETP, set bit 3 (TPA) of parameter No. 3119 to 0.
By this setting, JD36A or JD54 is used for ETP, regardless of the setting of I/O CHANNEL（I/O device selection）of the existing parameters Nos. 0021 to 0023.
For other I/O devices, use JD56A and so forth.
By the setting above, the settings of the existing parameters Nos. 0100 and 0121 to 0123 become invalid for channel 2 (JD36A or JD54), and the following settings are applied at all times:
- Baud rate : 19200 bps
- Stop bit : 1 bit
- Parity check : Even parity

3122	Time interval used to record time data in operation history

[Input type] Parameter input
[Data type] Word path
[Unit of data] min
[Valid data range] 0 to 1440
When history data is recorded within a set time period, the time for each set time period is recorded in the history data.
When 0 is set, the specification of a time period of 10 minutes is assumed.

3123	Time required before a screen saver is activated

[Input type] Setting input
[Data type] Byte path
[Unit of data] min
[Valid data range] 0 to 127
After a time (in minutes) set in parameter No. 3123 passes without key operation, the NC screen is erased automatically. Pressing a key causes the NC screen to reappear.

NOTE
1 Setting 0 disables automatic screen erasure.
2 This function cannot be used together with manual screen erasure. If 1 or a larger value is set in this parameter, manual screen erasure is disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3124	D08	D07	D06	D05	D04	D03	D02	D01
3125	D16	D15	D14	D13	D12	D11	D10	D09
3126	D24	D23	D22	D21	D20	D19	D18	D17
3127	D32	D31	D30	D29	D28	D27	D26	D25

[Input type] Parameter input

[Data type] Bit path

D01 to D32 Set a group of G codes to be displayed on the program check screen.
The table below indicates the correspondence between bits and G code groups.
The setting of a bit has the following meaning:
0: Displays the G code group corresponding to a bit.
1: Does not display the G code group corresponding to a bit.

Parameter	G code group
D01	01
D02	02
D03	03
:	:
D32	32

3128	Retracement time for deleting alarm data from the alarm history

[Input type] Parameter input
[Data type] Word path
[Unit of data] sec
[Valid data range] 0 to 255
From the alarm history, the alarm data that occurred during a set period of time back from the power-off time is deleted.
When 0 is set, a retracement time of 1 second is assumed to be specified.

	#7	#6	#5	#4	#3	#2	#1	#0
3129				RPP		MRE	DAP	DRP
				RPP		MRE		

[Input type] Parameter input
[Data type] Bit path

#0 DRP For relative coordinate display:
0: The actual position considering a tool offset (tool movement) is displayed.
1: The programmed position excluding a tool offset (tool movement) is displayed.

#1 DAP For absolute coordinate display:
0: The actual position considering a tool offset (tool movement) is displayed.
1: The programmed position excluding a tool offset (tool movement) is displayed.

NOTE
In machining center systems, whether to exclude the tool length offset when displaying the absolute position is determined according to the setting of bit 6 (DAL) of parameter No. 3104.

#2 MRE When mirror image is used, relative coordinates are:
0: Updated with respect to the machine coordinates.
1: Updated with respect to the absolute coordinates.

Set this parameter to 1 when handling relative coordinates in the same way as for the lathe system of the FS16*i*/18*i*/21*i*.

#4 RPP To the value of the preset(or origin) of relative coordinates, the difference below the least input increment between absolute coordinate point and relative coordinate point is:
0: Not corrected.
1: Corrected.

3130	Axis display order for current position display screens

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 32
Set the order in which axes are displayed on current position display screens.

3131	Subscript of axis name

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 9, 65 to 90
In order to distinguish axes under parallel operation, synchronization control, and tandem control, specify a subscript for each axis name.

Setting value	Meaning
0	Each axis is set as an axis other than a parallel axis, synchronization control axis, and tandem control axis.
1 to 9	A set value is used as a subscript.
65 to 90	A set letter (ASCII code) is used as a subscript.

[Example] When the axis name is X, a subscript is added as indicated below.

Setting value	Axis name displayed on a screen such as the position display screen
0	X
1	X1
77	XM
83	XS

If a multi-path system is used, no extended axis name is used within a path, and no subscript is set for the axis names, then the path number is automatically used as the subscript for the axis names. To disable the display of axis name subscripts, set a blank (32) of ASCII code in the parameter for specifying an axis name subscript.

NOTE
If even one axis in a path uses an extended axis name when bit 2 (EAS) of parameter No. 11308 is set to 0, subscripts cannot be used for axis names in the path.

3132	Axis name (absolute coordinate) for current position display

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 255
These parameters set the axis name for current position display.
When G code system B or C is used, the axis name set in parameter No. 3132 is used for both absolute and relative coordinate axes.
The values set in these parameters are used only for display.
When 0 is set in this parameter, the setting of parameter No. 1020 is used.
When an extended axis name is used, only the first character displayed is replaced.

3133	Axis name (relative coordinate) for current position display

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 255

These parameters set the axis name for current position display.
When G code system B or C is used, the axis name set in parameter No. 3132 is used for both absolute and relative coordinate axes.
The values set in these parameters are used only for display.
When 0 is set in this parameter, the setting of parameter No. 1020 is used.
When an extended axis name is used, only the first character displayed is replaced.

3134	Data display order of each axis on the workpiece coordinate system setting screen and workpiece coordinate system shift amount setting screen

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to Number of controlled axes

Set the data display order of each axis on the workpiece coordinate system setting screen (M series/T series) and workpiece coordinate system shift amount setting screen (T series).
No data is displayed for an axis with 0 set in this parameter.

3135	Number of decimal places in actual feedrate display

[Input type] Setting input
[Data type] Byte path
[Valid data range] 0 to 3

Set the number of decimal places in actual feedrate display.
In the case of inch input, the number of decimal places is a set value plus 2.

[Setting value]
0 : Metric input Displayed without a decimal point
Inch inputDisplayed using the second decimal place
1 : Metric input Displayed using the first decimal place
Inch inputDisplayed using the third decimal place
2 : Metric input Displayed using the second decimal place
Inch inputDisplayed using the fourth decimal place
3 : Metric input Displayed using the third decimal place
Inch inputDisplayed using the fifth decimal place

	#7	#6	#5	#4	#3	#2	#1	#0
3137	EAC							

[Input type] Parameter input
[Data type] Bit

#7 EAC The PMC axis status display screen is:
0: Not displayed.
1: Displayed.

> **NOTE**
> This parameter is valid if the PMC axis control option is set.

3141	Path name (1st character)
3142	Path name (2nd character)
3143	Path name (3rd character)
3144	Path name (4th character)
3145	Path name (5th character)
3146	Path name (6th character)
3147	Path name (7th character)

[Input type] Parameter input
[Data type] Word path
[Valid data range] See the character-code correspondence table.
Specify a path name with codes.
Any character string consisting of alphanumeric characters, katakana characters, and special characters with a maximum length of seven characters can be displayed as a series name.

NOTE
1 For characters and codes, see Appendix A, "CHARACTER CODE LIST".
2 When 0 is set in parameter No. 3141, PATH1(,PATH2...) are displayed as path names.
3 When optional path name display is enlarged (with bit 2 (PNE) of parameter No. 11350 set to 1), only alphanumeric characters are displayed. If any other type of characters are set, spaces are displayed instead.

3160	Setting of MDI unit type

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 4
Set the type of an MDI unit when the type of an MDI unit is not automatically identified.

Setting value	Type
0	Depends on the system type and indicator type.
1	Standard MDI unit for the lathe system
2	Standard MDI unit for the machining center system
3	Small MDI unit for the lathe system
4	Small MDI unit for the machining center system

When 0 is set in this parameter, the type of a MDI unit is determined as follows:

Type of path control	Type of indicator	Type
When the type for the lathe system is used with path 1	Type of 12 horizontal soft keys	Standard MDI unit for the lathe system
	Type of 7 horizontal soft keys	Small MDI unit for the lathe system
When the type for the machining center system is used with path 1	Type of 12 horizontal soft keys	Standard MDI unit for the machining center system
	Type of 7 horizontal soft keys	Small MDI unit for the machining center system

		#7	#6	#5	#4	#3	#2	#1	#0
3191				FSS		SSF	WSI		

[Input type] Parameter input
[Data type] Bit path

#2 WSI On the workpiece zero point offset screen, the soft key [INPUT] is:
0: Displayed.
1: Not displayed.

#3 SSF On the setting screen, the soft key for confirming data input is:
0: Not displayed.
1: Displayed.

#5 FSS Feedrate display is:
0: Switched between feedrate per minute and feedrate per revolution depending on the operating state.
1: Fixed to feedrate per revolution irrespective of the operating state.

		#7	#6	#5	#4	#3	#2	#1	#0
3192		PLD					TRA	T2P	

[Input type] Parameter input
[Data type] Bit

#1 T2P When more than one point is pressed on the touch panel:
0: The position at the center of gravity is obtained.
1: The point pressed first is obtained.

> **NOTE**
> 1 Even when bit parameter T2P is set to 1, the position at the center of gravity is assumed to be pressed if two or more points are pressed within a scan period (32 ms) of the touch panel.
> 2 If a C executer application or the like has a touch panel drag (move in pressed state) function, set parameter T2P to 0.

#2 TRA If a point on the touch panel is kept pressed for a time specified in parameter No. 3197 or longer,
0: An alarm is not raised.
1: An alarm SR5303, "TOUCH PANEL ERROR" is raised.

> **NOTE**
> 1 If an C executer application or the like has a touch panel repeat (continue pressing) function, set parameter TRA to 0.
> 2 In PC functions, the parameter is valid just for the CNC screen display function.

#7 PLD When the current position is indicated for a path, and when the program check screen is displayed in a two- or three-path system, the function for displaying servo load meters and spindle load meters is :
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3194					DPM	DPA		

[Input type] Parameter input
[Data type] Bit path

#2 DPA The absolute coordinates, relative coordinates, and remaining move amount during diameter/radius specification switching are displayed:
0: According to the specification during switching.
1: According to the setting of bit 3 (DIAx) of parameter No. 1006.

#3 DPM The machine coordinates during diameter/radius specification switching are displayed:
0: According to the setting of bit 3 (DIAx) of parameter No. 1006.
1: According to the specification during switching.

	#7	#6	#5	#4	#3	#2	#1	#0
3195	EKE	HDE	HKE					

[Input type] Parameter input
[Data type] Bit

#5 HKE A key operation history is:
0: Recorded.
1: Not recorded.

#6 HDE A DI/DO history is:
0: Recorded.
1: Not recorded.

#7 EKE The [ALL CLEAR] soft key for clearing all history data is:
0: Not displayed.
1: Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3196	HAL	HOM	HOA		HMV	HPM	HWO	HTO

[Input type] Parameter input
[Data type] Bit

#0 HTO A modification history of tool offset data is:
0: Not recorded.
1: Recorded.

#1 HWO A modification history of workpiece offset data/extended workpiece offset data/workpiece shift (T series) is:
0: Not recorded.
1: Recorded.

#2 HPM A modification history of parameters is:
0: Not recorded.
1: Recorded.

#3 HMV A modification history of custom macro common variables is:
0: Not recorded.
1: Recorded.

#5 HOA When an external operator message is issued, additional information (modal data, absolute coordinates, and machine coordinates present at the issuance of the external operator message) is:
0: Not recorded in the operation history and message history.
1: Recorded in the operation history and message history.

#6 HOM A history of external operator messages and macro messages (#3006) is:
0: Recorded.
1: Not recorded.

#7 HAL When an alarm is issued, additional information (modal data, absolute coordinates, and machine coordinates present at the issuance of the alarm) is:
0: Recorded in the operation history and alarm history.
1: Not recorded in the operation history and alarm history.
To record as many alarm history items as possible, rather than detailed alarm information, set 1.

3197	Detection time of continuous pressing on touch panel

[Input type] Parameter input
[Data type] Word
[Unit of data] sec
[Valid data range] 0 to 255
Set a period of continuous pressing on the touch panel which causes alarm to be raised. When 0 is set, it is equivalent to 20.

> **NOTE**
> This parameter is valid when bit 2 (TRA) of parameter No. 3192 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
3201		NPE	N99			REP	RAL	RDL

[Input type] Parameter input
[Data type] Bit path

#0 RDL When a program is registered by input/output device external control
0: The new program is registered following the programs already registered.
1: All registered programs are deleted, then the new program is registered. Note that programs which are protected from being edited are not deleted.

> **NOTE**
> Registered programs are placed in the background default folder set in the program list screen. Before manipulating this signal, set the default folder in the background correctly.

#1 RAL When programs are registered by external I/O device control:
0: All programs are registered.
1: Only one program is registered.

> **NOTE**
> Registered programs are placed in the background default folder set in the program list screen. Before manipulating this signal, set the default folder in the background correctly.

#2 REP Action in response to an attempt to register a program whose number is the same as that of an existing program
0: An alarm is generated.
1: The existing program is deleted, then the new program is registered. Note that if the existing program is protected from being edited, it is not deleted, and an alarm is generated.

#5 N99 With an M99 block, when bit 6 (NPE) of parameter No. 3201 is set to 0, program registration is assumed to be:
0: Completed
1: Not completed

#6 NPE With an M02, M30, or M99 block, program registration is assumed to be:
0: Completed
1: Not completed

	#7	#6	#5	#4	#3	#2	#1	#0
3202		PSR		NE9				NE8

[Input type] Parameter input
[Data type] Bit path

#0 NE8 Editing of subprograms with program numbers 8000 to 8999
0: Not inhibited
1: Inhibited
When this parameter is set to 1, the following editing operations are disabled:
(1) Program deletion (Even when deletion of all programs is specified, programs with program numbers 8000 to 8999 are not deleted.)
(2) Program output (Even when outputting all programs is specified, programs with program numbers 8000 to 8999 are not output.)
(3) Program number search
(4) Program editing of registered programs
(5) Program registration
(6) Program collation
(7) Displaying programs

> **NOTE**
> 1 If parameter DMP (No.11375#0) is effective, this parameter is applied to the program in the data server. However, the prohibited content is different. Refer to NC parameter DMP (No.11375#0) for details.
> 2 This parameter setting does not affect the programs for running and editing memory card programs on a memory card.

#4 NE9 Editing of subprograms with program numbers 9000 to 9999
0: Not inhibited
1: Inhibited
When this parameter is set to 1, the following editing operations are disabled:

(1) Program deletion (Even when deletion of all programs is specified, programs with program numbers 9000 to 9999 are not deleted.)
(2) Program output (Even when outputting all programs is specified, programs with program numbers 9000 to 9999 are not output.)
(3) Program number search
(4) Program editing of registered programs
(5) Program registration
(6) Program collation
(7) Displaying programs

> **NOTE**
> 1 If parameter DMP (No.11375#0) is effective, this parameter is applied to the program in the data server. However, the prohibited content is different. Refer to NC parameter DMP (No.11375#0) for details.
> 2 This parameter setting does not affect the programs for running and editing memory card programs on a memory card.

#6 PSR Search for the program number of a protected program
0: Disabled
1: Enabled

> **NOTE**
> If this parameter is set to 1, the protected programs are also displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3203	MCL	MER	MZE					

[Input type] Parameter input
[Data type] Bit path

#5 MZE After MDI operation is started, program editing during operation is:
0: Enabled
1: Disabled

#6 MER When the last block of a program has been executed at single block operation in the MDI mode, the executed block is:
0: Not deleted
1: Deleted

> **NOTE**
> When MER is set to 0, the program is deleted if the end-of-record mark (%) is read and executed. (The mark % is automatically inserted at the end of a program.)

#7 MCL Whether a program prepared in the MDI mode is cleared by reset
0: Not deleted
1: Deleted

	#7	#6	#5	#4	#3	#2	#1	#0
3204		MKP	SPR	P9E	P8E		OPC	PAR

[Input type] Parameter input
[Data type] Bit path

#0 PAR When a small MDI unit is used, characters "[" and "]" are:
0: Used as "[" and "]".
1: Used as "(" and ")".

> **NOTE**
> When a multi-path system is used, the setting for path 1 is followed.

#1 OPC In MEM/EDIT/RMT mode, a program search or cueing operation:
0: Causes a warning when automatic operation has been started (automatic operation start signal STL = “1”) or paused (feed hold signal SPL = “1”).
1: Causes a warning during automatic operation (automatic operation signal OP = “1”).

#3 P8E Editing of subprograms with program numbers 80000000 to 89999999
0: Not inhibited.
1: Inhibited.

#4 P9E Editing of subprograms with program numbers 90000000 to 99999999
0: Not inhibited.
1: Inhibited.

#5 SPR A particular program number in the nine thousands is
0: Not assumed to be a number obtained by adding 90000000.
1: Assumed to be a number obtained by adding 90000000.

#6 MKP When M02, M30, or EOR(%) is executed during MDI operation, the created MDI program is:
0: Erased automatically.
1: Not erased automatically.

> **NOTE**
> If the bit 6 (MER) of parameter No. 3203 is set to 1, executing the last block provides a choice of whether to automatically erase a created program.

	#7	#6	#5	#4	#3	#2	#1	#0
3205				OSC				

[Input type] Parameter input
[Data type] Bit

#4 OSC On the offset screen, offset value erasure by a soft key is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3206	NS2		S2K	PHS			MIF	

[Input type] Parameter input
[Data type] Bit

#1 MIF Editing of the maintenance information screen is:
0: Not prohibited.
1: Prohibited.

#4 PHS Operation history signal selection:
0: Does not interact with parameters.
Operation history signal selection is added or deleted on the operation history signal selection screen.
Changing the settings of parameters Nos. 24901 to 24920, Nos. 12801 to 12820, Nos. 12841 to 12860, or Nos. 12881 to 12900 has no effect on operation history signal selection.
Changes to the signals of the addresses specified by parameters Nos. 24901 to 24920, Nos. 12801 to 12820, Nos. 12841 to 12860, or Nos. 12881 to 12900 are not recorded in the history.
1: Interacts with parameters.
Operation history signal selection can be performed either on the operation history signal selection screen or by setting parameters.

> **NOTE**
> Setting this parameter to 1 reflects the current operation history signal selection data on parameters Nos. 24901 to 24920 and Nos. 12801 to 12900.

#5 S2K In CNC screen dual display function,
0: Key control is selected by DI signal <G0295.7>.
1: Key control is selected by pushing at left upper corner on the screen. (Touch panel only)

#7 NS2 CNC screen dual display function or twin display function with Ethernet is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3207		TPP	VRN				EXS	

[Input type] Parameter input
[Data type] Bit

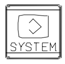
#1 EXS Soft key expansion of the machine menu function is:
0: Disabled.
1: Enabled.

#5 VRN On the custom macro variable screen, the variable names of common variables #500 to #549 are:
0: Not displayed.
1: Displayed.

#6 TPP When a virtual MDI key is pressed, signal TPPRS <F0006.0> is
0: Not output.
1: Output

	#7	#6	#5	#4	#3	#2	#1	#0
3208			**PSC**	**OFY**	**NOS**			**SKY**

[Input type] Setting input
[Data type] Bit

#0 SKY The function key  on the MDI unit is:
0: Enabled.
1: Disabled.

#3 NOS The one-touch menu is
0: Displayed.
1: Not displayed.

#4 OFY The offset screen can be used to display and enter:
0: Only conventional offset values.
1: Y-axis offset values as well.
The conventional Y-axis offset screen cannot be displayed.
Only the 10.4/15/19” screen is acceptable; the setting of this parameter is invalid to the 9” screen.
For both of the T series and M series, the parameter setting is valid when the option for tool position compensation (machining center system) is enabled (the option for offset memory C is also required).

#5 PSC When the path is switched based on the path switch signal:
0: The screen display is switched to the last selected screen of the path.
1: The same screen as for the path before switching is displayed.

3210	**Program protection (PSW)**

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 99999999
This parameter sets a password for protecting program Nos. 9000 to 9999. When a value other than zero is set in this parameter and this value differs from the keyword set in parameter No. 3211, bit 4 (NE9) of parameter No. 3202 for protecting program Nos. 9000 to 9999 is automatically set to 1.
This disables the editing of program Nos. 9000 to 9999. Until the value set as the password is set as a keyword, NE9 cannot be set to 0 and the password cannot be modified.

NOTE
1 The state where password ≠ 0 and password ≠ keyword is referred to as the locked state. When an attempt is made to modify the password by MDI input operation in this state, the warning message "WRITE PROTECTED" is displayed to indicate that the password cannot be modified. When an attempt is made to modify the password with G10 (programmable parameter input), alarm PS0231, “ILLEGAL FORMAT IN G10 L52” is issued.

> **NOTE**
> 2 When the value of the password is not 0, the parameter screen does not display the password. Care must be taken in setting a password.

3211	Program protection key (KEY)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 99999999

When the value set as the password (set in parameter No. 3210) is set in this parameter, the locked state is released and the user can now modify the password and the value set in bit 4 (NE9) of parameter No. 3202.

> **NOTE**
> The value set in this parameter is not displayed. When the power is turned off, this parameter is set to 0.

3216	Increment in sequence numbers inserted automatically

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 99999999

Set the increment for sequence numbers for automatic sequence number insertion (when bit 5 (SEQ) of parameter No. 0000 is set to 1.)

3220	Password (PSW)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 99999999

This parameter sets a password (PSW). When a value other than 0 is set, a password is set. When a password is set, a blank is displayed in this parameter, and the state (locked state) where an operation such as program editing is locked is set. When password (PSW) = 0, namely, in the normal state, or when password (PSW) = keyword (KEY), namely, in the unlock state, this parameter can be set.

3221	Keyword (KEY)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 99999999

When the same value as the password (PSW) is set in this parameter, the lock is released (unlock state). The value set in this parameter is not displayed.
The value of this parameter is initialized to 0 automatically when the power is turned on. So, if the power is turned off in the unlock state then is turned on again, the lock state is automatically set.

3222	Program protection range (minimum value) (PMIN)
3223	Program protection range (maximum value) (PMAX)

[Input type] Parameter input
[Data type] 2-word

[Valid data range] 0 to 99999999

The programs in a range set here can be locked. Set the minimum program number and maximum program number of a desired range.

Set these parameters to satisfy PMAX > PMIN.

These parameters can be set when password (PSW) = 0, namely, in the normal state, or when password (PSW) = keyword (KEY), namely in the unlock state.

[Example] Parameter No. 3222 = 7000

Parameter No. 3223 = 8499

When the values above are set, the programs from O7000 to O8499 can be locked.

When PMIN = 0, the specification of PMIN = 9000 is assumed. When PMAX = 0, the specification of PMAX = 9999 is assumed. So, when these parameters are set to the defaults, the programs from O9000 to O9999 are locked.

NOTE

1 Parameters Nos. 3220 to 3223 are neither file output nor file input.
2 Parameters Nos. 3220 to 3223 are not cleared even when a parameter file clear operation is performed in the IPL state.
3 The values of a password (PSW) and keyword (KEY) are not displayed. When password (PSW) = 0, 0 is displayed in parameter No. 3220 to indicate that the normal state is set.
4 When a password (PSW) or keyword (KEY) is set, [+INPUT] has the same effect as [INPUT]. For example, if the input operation "1[+INPUT]" is performed when 99 is set in the keyword (KEY) parameter, 1 is set.
5 This parameter setting does not affect the following programs:
   - Programs on the Data Server
   - Programs saved in program storage files on a memory card

3225	
3226	

These parameters are related to Dual Check Safety.

See Dual Check Safety CONNECTION MANUAL (B-64483EN-2) for details.

3227	Selection of a block number of machine operation menu data (horizontal soft keys)
3228	Selection of a block number of machine operation menu data (vertical soft keys)

[Input type] Parameter input

[Data type] Byte

[Valid data range] 0 to 98

These parameters select a block number of machine operation menu data stored in the FROM for soft key expansion in the machine operation menu function.

When a 10.4-inch display is used, set a value in the parameter for the vertical or horizontal soft keys that are to be used for displaying a machine operation menu. In the parameter for the vertical or horizontal soft keys that are not to be displayed, set 0.

When values are input in both parameters, parameter No. 3227 takes priority, and the machine operation menu is displayed in the horizontal soft keys.

When a 15/19-inch display is used, set 0 in parameter No. 3227, and set the block number of a machine operation menu to be displayed in the vertical soft keys in parameter No. 3228.

		#7	#6	#5	#4	#3	#2	#1	#0
3233							RKB	PDM	PCE

[Input type] Parameter input
[Data type] Bit

#0 PCE Program editing is:
0: Performed in the word edit mode.
1: Performed in the character edit mode.

#1 PDM On the Data Server file list screen:
0: M198 operation folders and DNC operation files can be set.
1: Folders in the Data Server can be set as the foreground folder and background folder.

> **NOTE**
> When an M198 external subprogram call or DNC operation is performed on the Data Server, set this bit to 0.
> For the foreground and background folders, refer to Chapter, "PROGRAM MANAGEMENT" in the OPERATOR’S MANUAL (B-64484EN).

#2 RKB By the reset operation, the content of the key-in buffer is:
0: Deleted.
1: Not deleted.

> **NOTE**
> When RKB is 1, the content of the key-in buffer can be deleted at a time by pushing <CAN> key following <SHIFT> key.

3241	Character blinking in the AI contour control I mode (first character)
3242	Character blinking in the AI contour control I mode (second character)
3243	Character blinking in the AI contour control I mode (third character)
3244	Character blinking in the AI contour control I mode (fourth character)
3245	Character blinking in the AI contour control I mode (fifth character)
3246	Character blinking in the AI contour control I mode (sixth character)
3247	Character blinking in the AI contour control I mode (seventh character)

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 95

Set the first to seventh blinking characters in the AI contour control I mode by using ASCII codes represented as decimal numbers.
When 0 is set in all of these parameters, "AICC 1" blinks.
Code numbers 032 to 095 in the Appendix A, "CHARACTER CODE LIST" can be set.

3251	Character blinking in the AI contour control II mode (first character)
3252	Character blinking in the AI contour control II mode (second character)
3253	Character blinking in the AI contour control II mode (third character)
3254	Character blinking in the AI contour control II mode (fourth character)
3255	Character blinking in the AI contour control II mode (fifth character)
3256	Character blinking in the AI contour control II mode (sixth character)
3257	Character blinking in the AI contour control II mode (seventh character)

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 95

Set the first to seventh blinking characters in the AI contour control II mode by using ASCII codes represented as decimal numbers.
When 0 is set in all of these parameters, "AICC 2" blinks.
Code numbers 032 to 095 in the Appendix A, "CHARACTER CODE LIST" can be set.

	#7	#6	#5	#4	#3	#2	#1	#0
3280								NLC

[Input type] Parameter input
[Data type] Bit

#0 NLC Dynamic display language switching is:
0: Enabled.
1: Disabled.
When dynamic display language switching is disabled, the language setting screen is not displayed. In this case, change the setting of parameter No. 3281 on the parameter screen then turn on the power again to switch the display language.

3281	Display language

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 21

Select a display language from the following:
0 : English
1 : Japanese
2 : German
3 : French
4 : Chinese(traditional characters)
5 : Italian
6 : Korean
7 : Spanish
8 : Dutch
9 : Danish
10 : Portuguese
11 : Polish
12 : Hungarian
13 : Swedish
14 : Czech
15 : Chinese(simplified characters)

16 : Russian
17 : Turkish
18 : Bulgarian
19 : Rumanian
20 : Slovak
21 : Finnish
If a number not indicated above is set, English is selected.

	#7	#6	#5	#4	#3	#2	#1	#0
3282	**SPN**	**HGL**	**ITA**	**CHS**	**CHT**	**FRE**	**GER**	**JPN**

	#7	#6	#5	#4	#3	#2	#1	#0
3283	**RUS**	**CZE**	**SWE**	**HUN**	**POL**	**POR**	**DAN**	**DTH**

	#7	#6	#5	#4	#3	#2	#1	#0
3284				**FIN**	**SKY**	**ROM**	**BGR**	**TRK**

NOTE
1 When at least one of these parameters is set, the power must be turned off before operation is continued.
2 If six or more languages are selected, five languages are used according to the priority shown in the table below.

[Input type] Parameter input
[Data type] Bit
Select the languages to be used with the function for selecting five optional languages.

Priority	Language	
<1>	JPN	Japanese
<2>	GER	German
<3>	FRE	French
<4>	CHT	Chinese(traditional characters)
<5>	CHS	Chinese(simplified characters)
<6>	ITA	Italian
<7>	HGL	Korean
<8>	SPN	Spanish
<9>	DTH	Dutch
<10>	DAN	Danish
<11>	POR	Portuguese
<12>	POL	Polish
<13>	HUN	Hungarian
<14>	SWE	Swedish
<15>	CZE	Czech
<16>	RUS	Russian
<17>	TRK	Turkish
<18>	BGR	Bulgarian
<19>	ROM	Rumanian
<20>	SKY	Slovak
<21>	FIN	Finnish

	#7	#6	#5	#4	#3	#2	#1	#0
3290	**KEY**	**MCM**	**GO2**	**IWZ**	**WZO**		**GOF**	**WOF**
	KEY	**MCM**		**IWZ**	**WZO**		**GOF**	**WOF**

[Input type] Parameter input
[Data type] Bit path

#0 WOF Setting the tool offset value (tool wear offset) by MDI key input is:
0: Not disabled.
1: Disabled. (With parameters Nos. 3294 and 3295, set the offset number range in which updating the setting is to be disabled.)

> **NOTE**
> When tool offset memory A is selected with the M series, the tool offset set in the parameter WOF is followed even if geometric compensation and wear compensation are not specified with the T series.

#1 GOF Setting the tool geometry offset value by MDI key input is:
0: Not disabled.
1: Disabled. (With parameters Nos. 3294 and 3295, set the offset number range in which updating the setting is to be disabled.)

#3 WZO Setting a workpiece zero point offset value and workpiece shift value (T series) by MDI key input is:
0: Not disabled.
1: Disabled.

#4 IWZ Setting a workpiece zero point offset value or workpiece shift value (T series) by MDI key input in the automatic operation activation or halt state is:
0: Not disabled.
1: Disabled.

#5 GO2 Setting the second geometric tool offset value by MDI key input is:
0: Disabled.
1: Not disabled.

#6 MCM Setting a custom macro variable by MDI key input is:
0: Enabled in any mode.
1: Enabled only in the MDI mode.

#7 KEY For memory protection keys:
0: The KEY1, KEY2, KEY3, and KEY4 signals are used.
1: Only the KEY1 signal is used.

> **NOTE**
> 1 The functions of the signals depend on whether KEY=0 or KEY=1.
> When KEY = 0:
> - KEY1: Enables a tool offset value, workpiece zero point offset value, and workpiece shift value to be input.
> - KEY2: Enables setting data, macro variables, and tool life management value to be input.
> - KEY3: Enables program registration and editing.
> - KEY4: Enables PMC data (counter and data table) to be input.
>
> When KEY = 1:
> - KEY1: Enables program registration and editing, and enables PMC parameter input.
> - KEY2 to KEY4: Not used

> **NOTE**
> 2 When a multi-path system is used, the setting for path 1 is followed.

	#7	#6	#5	#4	#3	#2	#1	#0
3291								**WPT**

[Input type] Parameter input
[Data type] Bit path

#0 WPT The input of the tool wear compensation amount is:
0: Enabled according to memory protection key signal KEY1.
1: Enabled, regardless of the memory protection key signal KEY1.

3294	**Start number of tool offset values whose input by MDI is disabled**

3295	**Number of tool offset values (from the start number) whose input by MDI is disabled**

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 999

When the modification of tool offset values by MDI key input is to be disabled using bits 0 (WOF) and 1 (GOF) of parameter No. 3290, parameters Nos. 3294 and 3295 are used to set the range where such modification is disabled. In parameter No. 3294, set the offset number of the start of tool offset values whose modification is disabled. In parameter No. 3295, set the number of such values. In the following cases, however, none of the tool offset values may be modified:

- When 0 or a negative value is set in parameter No. 3294
- When 0 or a negative value is set in parameter No. 3295
- When a value greater than the maximum tool offset number is set in parameter No. 3294

In the following case, a modification to the values ranging from the value set in parameter No. 3294 to the maximum tool offset number is disabled:

- When the value of parameter No. 3294 added to the value of parameter No. 3295 exceeds the maximum tool offset number

When the offset value of a prohibited number is input through the MDI panel, the warning "WRITE PROTECT" is issued.

[Example] When the following parameter settings are made, modifications to both of the tool geometry offset values and tool wear offset values corresponding to offset numbers 51 to 60 are disabled:

- Bit 1 (GOF) of parameter No. 3290 = 1 (to disable tool geometry offset value modification)
- Bit 0 (WOF) of parameter No. 3290 = 1 (to disable tool wear offset value modification)
- Parameter No. 3294 = 51
- Parameter No. 3295 = 10

If the setting of bit 0 (WOF) of parameter No. 3290 is set to 0 without modifying the other parameter settings above, tool geometry offset value modification only is disabled, and tool wear offset value modification is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3299								**PKY**

[Input type] Setting input

[Data type] Bit

#0 PKY "Parameter write enable" is:
0: Set on the setting screen (bit 0 (PWE) of setting parameter No. 8900).
1: Set by the memory protection signal KEYP<G046.0>.

	#7	#6	#5	#4	#3	#2	#1	#0
3301	HDC							H16

[Input type] Parameter input
[Data type] Bit path

#0 H16 Bit map data of screen hard copies uses:
0: 256 colors.
1: 16 colors.

#7 HDC A screen hard copy function is:
0: Disabled.
1: Enabled.

3321	Screen number assigned to the 1st vertical soft key
to	to
3336	Screen number assigned to the 16th vertical soft key

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 10000
Assign a screen number to be displayed as a shortcut to a vertical soft key.

The 1st to 8th vertical soft keys are displayed on page 1, and the 9th to 16th vertical soft keys are displayed on page 2.
When specifying page 2, be sure to specify "Display of next page" on each page.
When not specifying page 2, set 0 for the 9th to 16th soft keys.
In this case, page 2 is not used, so that "Display of next page" need not be specified on page 1.

If all of these parameters are 0 when turning on the power supply, one-touch menu of the default table is displayed.

NOTE
1 When screen numbers are specified in at least one of CNC parameters Nos. 3321 to 3336, the setting is valid. In the case, nothing is displayed in the vertical soft-key where 0 is specified in the parameter.
2 In order to display the default one-touch menu again, it is needed to turn off power after all of these parameters are set to 0.

(1) CNC operation screens

Screen No.	Screen name
99	Display of next page(*1)
100	Absolute position display(*2)
101	Relative position display(*2)
102	Overall position display(*2)
103	Overall position display(*3)
104	Handle screen

Screen No.	Screen name
143	Spindle setting
144	Spindle adjustment
145	Spindle monitor
146	FSSB amplifier setting
147	FSSB axis setting
148	FSSB amplifier maintenance

Screen No.	Screen name	Screen No.	Screen name
105	Monitor screen	149	Servo setting
106	3-dimensional manual feed	150	Servo adjustment
107	Program	151	Periodic maintenance: State
108	Program directory display	152	Periodic maintenance: Machine
109	Next block	153	Periodic maintenance: NC
110	Program check	154	8-level data protection: Operation level setting
111	Time display	155	8-level data protection: Password change
112	Manual value specification	156	8-level data protection: Protection level setting
113	Program restart	157	Protection against wrong operations
114	Offset display	158	Protection against wrong operations Offset range setting screen
115	Setting parameter	159	Protection against wrong operations External workpiece origin offset range setting screen
116	Coordinate system display	160	Protection against wrong operations Workpiece origin offset range setting screen
117	Software operator's panel	161	Protection against wrong operations Y-axis offset range setting screen
118	Y-axis offset	162	Protection against wrong operations Workpiece shift range setting screen
119	Workpiece coordinate system shift	163	Servo guide: Y-TIME
120	Second geometry offset	164	Servo guide: XY
121	Tool geometry data	165	Servo guide: CIRCLE
122	Precision level	166	Servo guide: FOURIER
123	Chopping	167	Servo guide: BODE
124	Chuck/tail	168	Servo guide: Channel setting
125	Language	169	Alarm: Details
126	Parameter	170	Alarm: All paths
127	Diagnosis	171	Waveform diagnosis: Graph
128	System configuration	172	Waveform diagnosis: Parameter
129	Memory contents display	173	Operation history
130	Pitch error compensation	174	Operation history signal selection
131	Machining adjustment	175	Cartridge management
132	Color setting	176	Tool management
133	Maintenance information	177	Power Mate CNC manager: Absolute coordinates
134	Touch panel calibration(*2)	178	Power Mate CNC manager: Machine coordinates
135	Parameter adjustment	179	Power Mate CNC manager: Parameter
136	M code group	180	Power Mate CNC manager: Message
137	3-dimensional error compensation	181	Power Mate CNC manager: Diagnosis
138	External operator message	182	Power Mate CNC manager: System configuration
139	Alarm history	183	Macro: Custom
140	External operator message history	184	Macro: Execution
141	Drawing parameter	185	Macro: Conversation
142	Tool path drawing	186	Macro: Auxiliary

*1 Definition for feeding vertical soft key pages
*2 Specifiable with a 10.4-inch display unit only
*3 Specifiable with a 15/19-inch display unit only

(2) PMC operation screens

Screen No.	Screen name
200	PMC signal status
201	PMC IO link
202	PMC alarm

(3) Communication operation screens

Screen No.	Screen name
Ethernet setting	
300	[Built-in port] Common
301	[Built-in port] FOCAS2/Ethernet

Screen No.	Screen name
203	PMC input/output
204	PMC timer
205	PMC counter
206	PMC keep relay
207	PMC data table
208	PMC trace
209	PMC trace setting
210	PMC program directory display
211	PMC ladder diagram display
212	PMC title setting
213	PMC configuration parameter setting
214	PMC general setting
215	PMC status
216	PMC system parameter
217	PMC IO assignment
218	PMC symbol
219	PMC message
220	PMC online setting

Screen No.	Screen name
302	[Built-in port] FTP transfer
303	[Built-in port] PING
304	[Built-in port] Communication state
305	[Built-in port] Task state
306	[PCMCIA] Common
307	[PCMCIA] FOCAS2/Ethernet
308	[PCMCIA] FTP transfer
309	[PCMCIA] PING
310	[PCMCIA] Communication state
311	[PCMCIA] Task state
312	[Board] Common
313	[Board] FOCAS2/Ethernet
314	[Board] Data server
315	[Board] PING
316	[Board] Communication state
317	[Board] Task state
318	[Board] DS mode
319	[Board] DS format
Ethernet log	
320	[Built-in/PCMCIA] Overall
321	[Built-in/PCMCIA] Common
322	[Built-in/PCMCIA] FOCAS2/Ethernet
323	[Built-in/PCMCIA] FTP transfer
Profibus setting	
324	[MASTER] Overall
325	[MASTER] Bus parameter
326	[MASTER] Slave table
327	[MASTER] Communication state
328	[MASTER] Slave parameter
329	[MASTER] Module data
330	[MASTER] DI/DO address
331	[MASTER] Mode

(4) ALL I/O Screen

Screen No.	Screen name
400	ALLIO Program(*1)
401	ALLIO Parameter(*1)
402	ALLIO Offset(*1)
403	ALLIO Macro(*1)
404	ALLIO Pitch Error Compensation(*1)
405	ALLIO Workpiece Coordinate(*1)
406	ALLIO Y-axis Offset(*1)
407	ALLIO Second Geometry Offset(*1)
408	ALLIO Tool Management(*1)
409	ALLIO Tool Management (Magazine) (*1)
410	ALLIO Tool Management (Custom) (*1)
411	ALLIO Tool Management (Status) (*1)
412	ALLIO Operation History(*1)
413	ALLIO Tool Geometry(*1)
416	ALLIO Maintenance Information(*1)

*1 The screen for RS-232C or memory card is displayed by setting I/O Devices.

(5) CNC screens

Screen No.	Screen name
500	Dual Check Safety MCC Off Test
501	Dual Check Safety Cross Check
502	Dual Check Safety Flow Monitoring
503	Dual Check Safety Feed Limit
504	Dual Check Safety Machine Positioning
505	Dual Check Safety Position Error
506	Dual Check Safety Brake Test
507	Dual Check Safety FL-net
508	Tool Life Management
509	Robot Status
510	Robot Connect
511	Power Consumption

4.21 PARAMETERS OF PROGRAMS (1 OF 4)

	#7	#6	#5	#4	#3	#2	#1	#0
3400		SMX	PGD				MGC	MGO

[Input type] Parameter input
[Data type] Bit path

#0 MGO If the program restart M/S/T/B code output function is used:
- 0: When bit 6 (MOA) of parameter No. 7300 is set to 0, the last M code only is output. When bit 6 (MOA) of parameter No. 7300 is set to 1, M codes are output in a specified order.
- 1: When bit 6 (MOA) of parameter No. 7300 is set to 0, the last M code of each M code group is output in the order of groups.
  When bit 6 (MOA) of parameter No. 7300 is set to 1, M codes are output in the order of groups.

NOTE
This parameter is valid only when the optional M code grouping function is used and bit 7 (MOU) of parameter No. 7300 is set to 1.
If this parameter is set to 1, M codes of group 0 are not output.
If this parameter is set to 1, M codes are output in the order of groups starting from the smallest group number.

#1 MGC When a single block specifies multiple M commands, an M code group check is:
- 0: Made.
- 1: Not made.

#5 PGD The G10.9 command (programmable diameter/radius specification switching) is:
- 0: Disabled.
- 1: Enabled.

NOTE
1 The option for the diameter and radius switching function is required.
2 When the G10.9 command is enabled by this parameter, signal-based diameter/radius switching is disabled.

#6 SMX An S code specified in a block that specifies G92 (G50 with G code system A of the T series) is:
- 0: Regarded as a maximum spindle speed command.
- 1: Not regarded as a maximum spindle speed command (but regarded as a spindle speed command).

	#7	#6	#5	#4	#3	#2	#1	#0
3401	GSC	GSB	ABS	MAB				DPI
			ABS	MAB				DPI

[Input type] Parameter input
[Data type] Bit path

#0 DPI When a decimal point is omitted in an address that can include a decimal point
0: The least input increment is assumed. (Normal decimal point input)
1: The unit of mm, inches, degree, or second is assumed. (Pocket calculator type decimal point input)

#4 MAB Switching between the absolute and incremental programming in MDI operation
0: Performed by G90 or G91
1: Depending on the setting of bit 5 (ABS) of parameter No. 3401

NOTE
When G code system A of the lathe system is used, this parameter is invalid.

#5 ABS Program command in MDI operation
0: Assumed as an incremental programming
1: Assumed as an absolute programming

NOTE
ABS is valid when bit 4 (MAB) of parameter No. 3401 is set to 1.
When G code system A of the lathe system is used, this parameter is invalid.

#6 GSB The G code system is set.
#7 GSC

GSC	GSB	G code
0	0	G code system A
0	1	G code system B
1	0	G code system C

NOTE
G code system B and G code system C are optional functions.
When no option is selected, G code system A is used, regardless of the setting of these parameters.

	#7	#6	#5	#4	#3	#2	#1	#0
3402	G23	CLR		FPM	G91			G01
	G23	CLR	G70		G91	G19	G18	G01

[Input type] Parameter input
[Data type] Bit path

#0 G01 G01 Mode entered when the power is turned on or when the control is cleared
0: G00 mode (positioning)
1: G01 mode (linear interpolation)

#1 G18 Plane selected when power is turned on or when the control is cleared
0: G17 mode (plane XY)
1: G18 mode (plane ZX)

#2 G19 Plane selected when power is turned on or when the control is cleared
0: The setting of bit 1 (G18) of parameter No. 3402 is followed.
1: G19 mode (plane YZ)

When this bit is set to 1, set bit 1 (G18) of parameter No. 3402 to 0.

#3 G91 When the power is turned on or when the control is cleared
0: G90 mode (absolute programming)
1: G91 mode (incremental programming)

#4 FPM At power-on time or in the cleared state:
0: G99 or G95 mode (feed per revolution) is set.
1: G98 or G94 mode (feed per minute) is set.

#5 G70 The commands for inch input and metric input are:
0: G20 (inch input) and G21 (metric input).
1: G70 (inch input) and G71 (metric input).

#6 CLR Reset button on the MDI unit, external reset signal, reset and rewind signal, and emergency stop signal
0: Cause reset state.
1: Cause clear state.
For the reset and clear states, refer to Appendix in the OPERATOR'S MANUAL.

#7 G23 When the power is turned on
0: G22 mode (stored stroke check on)
1: G23 mode (stored stroke check off)

	#7	#6	#5	#4	#3	#2	#1	#0
3403		ADB	CIR					

[Input type] Parameter input
[Data type] Bit path

#5 CIR When neither the distance (I, J, K) from a start point to the center nor an arc radius (R) is specified in circular interpolation (G02, G03) or helical interpolation (G02, G03):
0: The tool moves to an end point by linear interpolation.
1: An alarm PS0022, "R OR I,J,K COMMAND NOT FOUND" is issued.

#6 ADB When the same address two or more times are specified in one block:
0: The address specified last is valid.
1: It is treated as a program error and the alarm PS5074, "ADDRESS DUPLICATION ERROR" is issued.

NOTE

The following notes apply when this parameter is set to 1:

1 When two or more M codes are acceptable to one block, up to three M codes can be specified in the same block. Specifying more than three results in the alarm PS5074.
2 You can specify any number of G codes in the same block as long as they belong to different groups. Specifying G codes belonging to the same group causes the alarm PS5074. You can however specify any number of G90 and G91 codes in the same block as they cause no alarm.
3 The alarm is not caused by blocks which call a custom macro or execution macro.
4 When G code system A is used with the lathe system, specifying an absolute programming and incremental programming for the same axis causes the alarm PS5074.

	#7	#6	#5	#4	#3	#2	#1	#0
3404	M3B		M02	M30		SBP	POL	NOB

[Input type] Parameter input
[Data type] Bit path

#0 NOB When a program is executed, a block consisting of an O, N, or EOB is:
0: Not ignored.
1: Ignored.

#1 POL When a command is specified with a decimal point omitted in an address that can include a decimal point:
0: The command is assumed to be valid as it is.
1: A program error is assumed and the alarm PS5073, "NO DECIMAL POINT" is issued.

NOTE

The following notes apply when this parameter is set to 1:

1 G codes with a decimal point omitted do not cause the alarm PS5073.
2 Commands using a macro variable or numerical expression are treated as commands with a decimal point. Accordingly, they do not cause the alarm PS5073.
3 Argument specification I/II of a custom macro/execution macro does not cause the alarm PS5073.
4 Omitting a decimal point from a command of an extended axis name causes the alarm PS5073.
5 Omitting a decimal point from a command in an execution macro also causes the alarm PS5073.
6 Address R indicating setting data for programmable parameter input (G10L52) does not cause the alarm PS5073.

#2 SBP In an external device subprogram call, the address P format is based on:
0: File number specification
1: Program number specification

> **NOTE**
> In memory card operation, the program number specification format is used, regardless of the setting of this parameter.

#4 M30 When M30 is specified in a memory operation:
0: M30 is sent to the machine, and the head of the program is automatically searched for. So, when the ready signal FIN is returned and a reset or reset and rewind operation is not performed, the program is executed, starting from the beginning.
1: M30 is sent to the machine, but the head of the program is not searched for. (The head of the program is searched for by the reset and rewind signal.)

#5 M02 When M02 is specified in memory operation
0: M02 is sent to the machine, and the head of the program is automatically searched for. So, when the end signal FIN is returned and a reset or reset and rewind operation is not performed, the program is executed, starting from the beginning.
1: M02 is sent to the machine, but the head of the program is not searched for. (The head of the program is searched for by the reset and rewind signal.)

#7 M3B The number of M codes that can be specified in one block
0: One
1: Up to three

	#7	#6	#5	#4	#3	#2	#1	#0
3405			DDP	CCR	G36		DWL	AUX
							DWL	AUX

[Input type] Parameter input
[Data type] Bit path

#0 AUX When the second auxiliary function is specified in the calculator-type decimal point input format or with a decimal point, the multiplication factor for a value output (onto the code signal) relative to a specified value is such that:
0: The same multiplication factor is used for both of metric input and inch input.
1: A multiplication factor used for inch input is 10 times greater than that used for metric input.

When the second auxiliary function is specified in the calculator-type decimal point input format or with a decimal point, the value output onto the code signal is a specified value multiplied by a value indicated below.

Increment system		Parameter AUX=0	Parameter AUX=1
Metric input system	IS-A for reference axis	100 times	100 times
	IS-B for reference axis	1000 times	1000 times
	IS-C for reference axis	10000 times	10000 times
	IS-D for reference axis	100000 times	100000 times
	IS-E for reference axis	1000000 times	1000000 times
Inch input system	IS-A for reference axis	100 times	1000 times
	IS-B for reference axis	1000 times	10000 times
	IS-C for reference axis	10000 times	100000 times
	IS-D for reference axis	100000 times	1000000 times
	IS-E for reference axis	1000000 times	10000000 times

#1 DWL The dwell time (G04) is:
0: Always dwell per second.
1: Dwell per second in the feed per minute mode (G94), or dwell per rotation in the feed per rotation mode (G95).

#3 G36 As a G code to be used with the automatic tool length measurement function (M series)/automatic tool offset function (T series) is:
0: G36 (T series only)/G37 is used.
1: G37.1/G37.2/G37.3 is used.

> **NOTE**
> If it is necessary to perform circular threading (counterclockwise), set this parameter to 1.

#4 CCR Addresses used for chamfering
0: Address is “I”, “J”, or “K”.
In direct drawing dimension programming, addresses ",C", ",R", and ",A" (with comma) are used in stead of "C", "R", and "A".
1: Address is “C”.
Addresses used for direct drawing dimension programming are "C", "R", and "A" without comma.

> **NOTE**
> If this bit (CCR) is set to 0, the function for changing the compensation direction by specifying I, J, or K in a G01 block in the cutter compensation/ tool nose radius compensation mode cannot be used.
> If this bit (CCR) is set to 1 when address C is used as an axis name, the chamfer function cannot be used.

#5 DDP Angle commands by direct drawing dimension programming
0: Normal specification
1: A supplementary angle is given.

	#7	#6	#5	#4	#3	#2	#1	#0
3406	C07	C06	C05	C04	C03	C02	C01	
3407	C15	C14	C13	C12	C11	C10	C09	C08
3408	C23	C22		C20	C19	C18	C17	C16
3409	CFH	C30	C29	C28	C27	C26	C25	C24

[Input type] Parameter input
[Data type] Bit

C01 to C30 If bit 6 (CLR) of parameter No. 3402 is set to 1, set a group of G codes to be placed in the cleared state when the CNC is reset by the 

key of the MDI unit, the external reset signal, the reset and rewind signal, or the emergency stop signal.
The table below indicates the correspondence between bits and G code groups
The setting of a bit has the following meaning:
0: Places the G code group in the cleared state.
1: Does not place G code group in the cleared state.

Parameter	G code group
C01	01
C02	02
C03	03
:	:
C30	30

#7 CFH When bit 6 (CLR) of parameter No. 3402 is 1, the RESET key on the MDI unit, the external reset signal, the reset and rewind signal, or emergency stop will,

0: Clear F codes, H codes (for the M series), D codes (for the M series), and T codes (for the T series).

1: Not clear F codes, H codes (for the M series), D codes (for the M series), and T codes (for the T series).

3410	Tolerance of arc radius

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

When a circular interpolation command is executed, the tolerance for the radius between the start point and the end point is set.

3411	M code preventing buffering 1
3412	M code preventing buffering 2
to	to
3420	M code preventing buffering 10

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999

Set M codes that prevent buffering the following blocks. If processing directed by an M code must be performed by the machine without buffering the following block, specify the M code.

M00, M01, M02, and M30 always prevent buffering even when they are not specified in these parameters.

3421	Range specification 1 of M codes that do not perform buffering (lower limit)
3422	Range specification 1 of M codes that do not perform buffering (upper limit)
3423	Range specification 2 of M codes that do not perform buffering (lower limit)
3424	Range specification 2 of M codes that do not perform buffering (upper limit)
3425	Range specification 3 of M codes that do not perform buffering (lower limit)
3426	Range specification 3 of M codes that do not perform buffering (upper limit)
3427	Range specification 4 of M codes that do not perform buffering (lower limit)

3428	Range specification 4 of M codes that do not perform buffering (upper limit)
3429	Range specification 5 of M codes that do not perform buffering (lower limit)
3430	Range specification 5 of M codes that do not perform buffering (upper limit)
3431	Range specification 6 of M codes that do not perform buffering (lower limit)
3432	Range specification 6 of M codes that do not perform buffering (upper limit)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999

When a specified M code is within the range specified with parameters Nos. 3421 and 3422, 3423 and 3424, 3425 and 3426, 3427 and 3428, 3429 and 3430, or 3431 and 3432, buffering for the next block is not performed until the execution of the block is completed.

NOTE

M00, M01, M02, and M30 are M codes that do not perform buffering, regardless of parameter setting.
M98, M99, M codes for calling subprograms, and M codes for calling custom macros are M codes that performs buffering, regardless of parameter setting.

3436	Range specification 1 of second auxiliary function codes that do not perform buffering (lower limit)
3437	Range specification 1 of second auxiliary function codes that do not perform buffering (upper limit)
3438	Range specification 2 of second auxiliary function codes that do not perform buffering (lower limit)
3439	Range specification 2 of second auxiliary function codes that do not perform buffering (upper limit)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 99999999

Set the upper limit and lower limit of a series of second auxiliary function codes that do not perform buffering.
These parameters are invalid if the setting of an upper limit conflicts with the setting of a lower limit.

3441	Start number of M codes for which an M code group can be set (1)
3442	Start number of M codes for which an M code group can be set (2)
3443	Start number of M codes for which an M code group can be set (3)
3444	Start number of M codes for which an M code group can be set (4)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0, 100to99999999

Code numbers 0 to 99 on the M code group setting screen correspond to M00 to M99. When adding M codes after the first 100 M codes, specify a start M code number in these parameters. Thus, up to 400 M codes can be added to the M code group setting screen in groups of 100 M codes starting with the set value. When 0 is set, no M codes are added to the M code group setting screen.

When setting these parameters, follow the setting condition described below. If the condition is not satisfied, no M codes are added to the M code group setting screen as in the case where 0 is set.
(Setting condition)
The settings of parameters (1) to (4) (excluding the setting of 0) must satisfy:
99 < (1), (1)+99 < (2), (2)+99 < (3), (3) +99 < (4)

	#7	#6	#5	#4	#3	#2	#1	#0
3450	BDX					FGT		AUP

[Input type] Parameter input
[Data type] Bit path

#0 AUP The second auxiliary function specified in the calculator-type decimal point input format, with a decimal point, or with a negative value is:
0: Disabled.
1: Enabled.
If the second auxiliary function is specified after setting this bit to 0, the following operation results:
1. When a value is specified without a decimal point
A specified value is output onto the code signal without modification, regardless of the setting of the calculator-type decimal point input format (with bit 0 (DPI) of parameter No. 3401).
2. When a value is specified with a decimal point
The alarm PS0007, "ILLEGAL USE OF DECIMAL POINT" is issued.
3. When a negative value is specified
The alarm PS0006, "ILLEGAL USE OF MINUS SIGN" is issued.

#2 FGT The GOTO statement in the forward direction during DNC operation is:
0: Disabled.
(The alarm PS0123, "ILLEGAL MODE FOR GOTO/WHILE/DO" is issued.)
1: Enabled.

#7 BDX When ASCII code is called using the same address as the address for the second auxiliary function (specified by parameter No. 3460), this parameter prevents the argument unit used when the option for the second auxiliary function is selected from differing from the argument unit used when the same option is not selected.
0: When bit 0 (AUP) of parameter No. 3450 is set to 1, the argument unit differs, depending on whether the option for the second auxiliary function is selected or not.
1: The same argument unit is used. (The unit applied when the option for the second auxiliary function is selected is used.)

[Example] A setting is made so that address B is used to call O9004, and the program O1 below is executed with parameter No. 3460 = 66.

```
O1      O9004
B2      #500 = #146
M30     M99
```

When the increment system is IS-B, and metric input is used, #500 assumes a value indicated in the table below.

Bit 0 (DPI) of parameter No. 3401	Bit 0 (AUP) of parameter No. 3450	BDX=0		BDX=1
		Without the second auxiliary function option	With the second auxiliary function option	
0	0	2.000	2.000	2.000
	1	2.000	0.002	0.002
1	0	2.000	2.000	2.000
	1	2.000	2.000	2.000

	#7	#6	#5	#4	#3	#2	#1	#0
3451				NBN				
				NBN				GQS

[Input type] Parameter input
[Data type] Bit path

#0 GQS When threading is specified, the threading start angle shift function (Q) is:
0: Disabled.
1: Enabled.

#4 NBN If bit 0 (NOB) of parameter No. 3404 is set to 1, a block including just N is:
0: Ignored.
1: Not ignored but handled as a single block.
(For a block containing only N, bit 0 (NOB) of parameter No. 3404 is ignored.)

	#7	#6	#5	#4	#3	#2	#1	#0
3452	EAP							
	EAP			GCC				GC0

[Input type] Parameter input
[Data type] Bit path

#0 GC0 When G00 is specified in the mode of groove cutting by continuous circle motion:
0: A P/S alarm is issued.
1: G01 is assumed to have been specified and is executed.

#4 GCC When groove cutting along a path is stopped, continuous circle motion is:
0: Stopped.
1: Continued.

#7 EAP When bit 0 (ADX) of parameter No. 3455 is set to 1, calculator-type decimal point input at a macro calling argument address is:
0: Enabled.
1: Disabled.

> **NOTE**
> This parameter is valid when bit 0 (DPI) of parameter No. 3401 is set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
3453								CRD

[Input type] Setting input
[Data type] Bit path

#0 CRD If the functions of chamfering or corner R and direct drawing dimension programming are both enabled,
0: Chamfering or corner R is enabled.
1: Direct drawing dimension programming is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3454				G1B	PGR	DTO		

[Input type] Parameter input
[Data type] Bit path

#2 DTO The method of specifying a rotation axis in cylindrical interpolation mode is set.
0: In cylindrical interpolation mode, the rotation axis is specified by angle.
1: In cylindrical interpolation mode, the rotation axis is specified by distance on an expanded plane.

#3 PGR In the high speed program check mode, data modified during automatic operation is:
0: Neither stored nor restored.
1: Stored and restored.

If this parameter is set to 1, when the high speed program check mode ends, data modified during automatic operation in the high speed program check mode can be restored to the state present before the start of the high speed program check mode.
After the high speed program check mode ends, therefore, it is possible to perform automatic operation in the state present before the start of the high speed program check mode.

> ⚠ **WARNING**
> In a multi-path system, when one of the paths enters the high speed program check mode, data of all paths is stored. After there is no path left in the high speed program check mode, the data of all paths is restored at a time. This means that when the time to change the status of the high speed program check input signal PGCK<Gn290.5> differs among the paths, the end of the high speed program check mode in a path may affect the operation of other paths. For example, if the high speed program check mode of a path is turned off when machining is in progress on another path, data of the path on which machining is in progress is also restored, which poses serious danger. Therefore, when bit 3 (PGR) of parameter No. 3454 is set to 1 in a multi-path system, the status of the high speed program check mode must be made consistent throughout the paths. Make sure that paths placed in the high speed program check mode and paths placed in the normal mode are not present at the same time.

#4 G1B In programmable parameter input, specifying a change to a specific bit parameter is:
0: Disabled.
1: Enabled. (A bit number is specified with Q_.)

	#7	#6	#5	#4	#3	#2	#1	#0
3455								AXDx

[Input type] Parameter input
[Data type] Bit axis

#0 AXDx If a decimal point is omitted for an axis address with which a decimal point can be used, the value is determined:
0: In accordance with the least input increment. (Normal decimal point input)
1: In millimeters, inches, degrees, or seconds. (calculator-type decimal point input)

> **NOTE**
> This parameter specifies the calculator-type decimal point input function for each axis.
> For the same axis name, be sure to make the same setting.

	#7	#6	#5	#4	#3	#2	#1	#0
3456								PVT

[Input type] Parameter input
[Data type] Bit axis

#0 PVT As a pivot axis control axis:
0: Not used.
1: Used.

> **NOTE**
> 1 When this parameter is set, the power must be turned off before operation is continued.
> 2 The option for pivot axis control is required.
> 3 When an axis uses a synchronized axis, make this setting for both of them.

	#7	#6	#5	#4	#3	#2	#1	#0
3457	SCF	SCC			SYS	MC1	MC2	LIB

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> 1 The parameters LIB, MC2, MC1, and SYS are used to set a search folder for the following subprogram/macro calls:
> - Subprogram call based on an M code
> - Subprogram call based on a particular address
> - Subprogram call based on a second auxiliary function code
> - Macro call based on a G code
> - Macro call based on an M code
> - Macro call based on a T code
> - One-touch macro call

NOTE

2 The parameter SCF is used to set whether to add a search folder for the following subprogram/macro calls:
- Subprogram call based on M98
- Figure copy based on G72.1/G72.2
- Macro call based on G65/G66/G66.1
- Macro interrupt based on M96

#0 LIB The common program directory "//CNC_MEM/USER/LIBRARY/" of the initial directories is:
0: Set as a search directory.
1: Not set as a search directory.

#1 MC2 MTB dedicated directory 2 "//CNC_MEM/MTB2/" of the initial directories is:
0: Set as a search directory.
1: Not set as a search directory.

#2 MC1 MTB dedicated directory 1 "//CNC_MEM/MTB1/" of the initial directories is:
0: Set as a search directory.
1: Not set as a search directory.

#3 SYS The system directory "//CNC_MEM/SYSTEM/" of the initial directories is:
0: Set as a search directory.
1: Not set as a search directory.

#6 SCC The same folder as the main program is added to the top of the search order as a search folder for the following each subprogram call and macro call.
- Subprogram call by M code
- Subprogram call by ASCII code
- Subprogram call by the second auxiliary function code
- Macro call by S code
- Macro call by T code
- Macro call by G code
- Macro call by M code
- One-touch macro call

The same folder as the main program is:
0: Not added in the search order.
1: Added in the search order.
When a search folder is added, a search is made in the following order:
0) Folder only for embedded macro (With the embedded macro-function.)
1) Folder where the main program is stored
2) Common program folder, which is an initial folder (LIBRARY)
3) MTB-dedicated folder 2, which is an initial folder (MTB2)
4) MTB-dedicated folder 1, which is an initial folder (MTB1)
5) System folder, which is an initial folder (SYSTEM)
The folders of 2) through 5) can be excluded from search target folders by setting the bits 0 (LIB), 1 (MC2), 2 (MC1), and 3 (SYS) of parameter No. 3457.

#7 SCF A search folder is:
0: Not added.
1: Added.

When a search folder is added, a search is made in the following order:

0) Folder only for embedded macro (With the embedded macro-function.)
1) Folder where the main program is stored
2) Common program folder, which is an initial folder (LIBRARY)
3) MTB-dedicated folder 2, which is an initial folder (MTB2)
4) MTB-dedicated folder 1, which is an initial folder (MTB1)
5) System folder, which is an initial folder (SYSTEM)

The folders of 3) through 5) can be excluded from search target folders by setting the bits 1 (MC2), 2 (MC1), and 3 (SYS) of parameter No. 3457.

	#7	#6	#5	#4	#3	#2	#1	#0
3458								TPS

[Input type] Parameter input
[Data type] Bit path

#0 TPS When a plane is selected on the lathe system in the power-on state or cleared state:
0: G18 mode (Z-X plane) is selected.
1: Bits 1 (G18) and 2 (G19) of parameter No. 3402 are followed.

	#7	#6	#5	#4	#3	#2	#1	#0
3459								ESL

[Input type] Parameter input
[Data type] Bit path

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#0 ESL When an NC program contains lowercase alphabetic characters:
0: An alarm is issued.
1: The lowercase characters are converted into their uppercase equivalents.

This parameter specifies how to handle lowercase alphabetic characters included in an NC program, except in its comment part, program name, and folder name, when the program is registered from an external device into CNC built-in memory or compared. The parameter setting also applies to M198 operation or DNC operation as automatic operation.

[Example] G90G01X100y50;
When ESL is 1, the program is assumed to be G90G01X100Y50;.
When ESL is 0, the alarm SR1090, "PROGRAM FORMAT ERROR" is displayed upon registration or comparison. During operation, the alarm PS1090, "PROGRAM FORMAT ERROR" is issued.

NOTE
1 Program transfer by the program batch input/output function is excluded.
2 Program transfer by the FTP file transfer function is excluded.

3460	Second auxiliary function specification address

[Input type] Parameter input

[Data type] Byte path
[Valid data range] 65to67, 85to87

Specify which of A, B, C, U, V, and W is to be used as the address for specifying the second auxiliary function. If an address used as an axis name is specified, the second auxiliary function is disabled.

Name	A	B	C	U	V	W
Setting value	65	66	67	85	86	87

Address B is assumed when a value other than the above is set.
However, the name U, V, or W can be used with the T series only when G code system B or C is used. When a value from 85 to 87 is specified with G code system A, the specification address for the second auxiliary function is B.

3467	Selection of the target folder among initial folders

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 7, 11 to 20

This parameter selects a folder to be used for the external workpiece number search function, external program number search function, and macro executor program reference and write function among the following initial folders:

0: No specification
1: Root folder (//CNC_MEM)
2: System folder (//CNC_MEM/SYSTEM)
3: MTB-dedicated folder 1 (//CNC_MEM/MTB1)
4: MTB-dedicated folder 2 (//CNC_MEM/MTB2)
5: User folder (//CNC_MEM/USER)
6: Path folder (//CNC_MEM/USER/PATHn) (Note)
(NOTE) PATHn: n is the selected path number (1 to the maximum number of paths).
7: Common program folder (//CNC_MEM/USER/LIBRARY)
8 to 10: Not specified.
11: Path 1 folder (//CNC_MEM/USER/PATH1)
12: Path 2 folder (//CNC_MEM/USER/PATH2)
13: Path 3 folder (//CNC_MEM/USER/PATH3)
:
20: Path 10 folder (//CNC_MEM/USER/PATH10)

When “0: No specification” is selected, the following folder is used for each function:

- External program number search function
- External workpiece number search function
  (Default foreground folder)
- Macro executor program reference and write function
  (Default background folder)

NOTE

Any user-created folder cannot be specified.
For example, assume that a user folder named PATH3 is created in //CNC_MEM/USER in a 2-path system. User-created folder //CNC_MEM/USER/PATH3 cannot be specified by specifying 13 in this parameter.

3471	Allowable difference between the specified end position and the end position obtained from the increase/decrease and frequency in spiral interpolation or conic interpolation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the maximum allowable difference (absolute value) between the specified end position and the end position obtained from the increase/decrease and frequency in spiral or conic interpolation.

3472	Minimum radius needed to maintain the actual speed in spiral or conic interpolation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] (For IS-B and millimeter machines, 1.0 to 999999.999; for inch machines, 1.0 to 99999.9999)
If this parameter value is 0 or a value outside the valid data range, the minimum value of the range is assumed.
In spiral interpolation and conic interpolation, the speed is generally held constant. In an area near the center, the spiral radius decreases, resulting in an extremely high angular velocity. To prevent this, once the spiral radius has reached the parameter-set value, the angular velocity subsequently remains constant. As a result, the actual speed decreases.

3490	Clamp value of acceleration in continuous circle motion

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (D)
Feedrate command F for continuous circle movement can be clamped by specifying I and K of G12.4/G13.4 and this parameter.

Clamp feedrate F = SQR (parameter No. 3490 × (I-K)/2) × 60

Continuous circle motion feedrate override is applied to the clamped feedrate.

4.22 PARAMETERS OF PITCH ERROR COMPENSATION

	#7	#6	#5	#4	#3	#2	#1	#0
3601							EPC	

[Input type] Parameter input
[Data type] Bit path

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#1 EPC The pitch error compensation on an axis of Cs contour control on the slave spindle side during simple synchronous spindle control is:
0: The same as that on the master spindle.
1: Just for the slave spindle.

	#7	#6	#5	#4	#3	#2	#1	#0
3602								APE

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 APE The input type of Stored Pitch Error Compensation data is
0: An incremental value.
1: A total value.

This function is effective to the following functions.
- Stored Pitch Error Compensation
- Bi-directional Pitch Error Compensation
- Interpolation Type Pitch Error Compensation
- Periodical Secondary Pitch Error Compensation
- Interpolation Type Straightness Compensation
- Spindle Command Synchronous Control Independent Pitch Error Compensation

> **NOTE**
> If this parameter is changed, the data of stored pitch error compensation is cleared automatically at next power on.

	#7	#6	#5	#4	#3	#2	#1	#0
3605						IPCx	IPPx	BDPx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 BDPx Both-direction pitch error compensation is:
0: Not used.
1: Used.

#1 IPPx Interpolation type pitch error compensation is:
0: Not used.
1: Used.
In interpolation type pitch error compensation, a compensation value at each point in each error completion point interval is divided for output of one pulse at equally spaced intervals.

If cycle type second pitch error compensation and interpolation type pitch error compensation are used at the same time, a cycle type second pitch error compensation value is output in interpolation mode within a cycle type second pitch error compensation point interval.
If a high feedrate is used, multiple compensation pulse may be output at a time.
A minimum interval where multiple compensation pulses are not output at a time is determined by the following expression:
Minimum pitch error compensation point interval = (Fmax/7500) × (Pmax+1)
Fmax: Maximum feedrate
Pmax: Maximum pitch error compensation value
[Example]
When the maximum feedrate is 15000 mm/min, and the maximum pitch error compensation value is 7 pulses, the minimum compensation point interval is 16mm.

> **NOTE**
> Interpolation type pitch error compensation cannot be used with spindle positioning.

#2 IPCx Interpolated straightness compensation function is:
0: Not used.
1: Used.

3620	Number of the pitch error compensation position for the reference position for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1535
Set the number of the pitch error compensation position for the reference position for each axis.

3621	Number of the pitch error compensation position at extremely negative position for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1535
Set the number of the pitch error compensation position at the extremely negative position for each axis.

3622	Number of the pitch error compensation position at extremely positive position for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input

[Data type] Word axis
[Valid data range] 0 to 1535

Set the number of the pitch error compensation position at the extremely positive position for each axis.
This value must be larger than set value of parameter No. 3620.

3623	Magnification for pitch error compensation for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 100

Set the magnification for pitch error compensation for each axis.
If the magnification is set to 1, the same unit as the detection unit is used for the compensation data.
If 0 is set, compensation is not performed.

3624	Interval between pitch error compensation positions for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] See the description below.

The pitch error compensation positions are arranged with equal spacing. The space between two adjacent positions is set for each axis. The minimum interval between pitch error compensation positions is limited and obtained from the following equation:
Minimum interval between pitch error compensation positions = maximum feedrate/7500
Unit : mm, inch, deg or mm/min, inch/min, deg/min

[Example] When the maximum feedrate is 15000 mm/min, the minimum interval between pitch error compensation positions is 2 mm.

3625	Travel distance per revolution in pitch error compensation of rotation axis type

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] See the description below.

If the pitch error compensation of rotation axis type is performed (bit 1 (ROSx) of parameter No. 1006 is set to 0 and bit 0 (ROTx) of parameter No. 1006 is set to 1), set the travel distance per revolution. The travel distance per revolution does not have to be 360 degrees, and a cycle of pitch error compensation of rotation axis type can be set.
However, the travel distance per revolution, compensation interval, and number of compensation points must satisfy the following condition:
(Travel distance per revolution)
= (Compensation interval) × (Number of compensation points)
The compensation at each compensation point must be set so that the total compensation per revolution equals 0.

> **NOTE**
> If 0 is set, the travel distance per revolution becomes 360 degrees.

3626	Number of the both-direction pitch error compensation position at extremely negative position (for movement in the negative direction)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1023, 3000 to 4023

When using both-direction pitch error compensation, set the number of compensation point at the farthest end in the negative direction for a movement in the negative direction.

> **NOTE**
> 1 For a movement in the positive direction, set the compensation point number at the farthest end in the negative direction in parameter No. 3621.
> 2 A set of compensation data items for a single axis should not be set to lie astride 1023 to 3000.

3627	Pitch error compensation at reference position when a movement to the reference position is made from the direction opposite to the direction of reference position return

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -32768 to 32767

Set the absolute value of pitch error compensation at reference position when a movement to the reference position is made from the negative direction if the direction of reference position return (bit 5 (ZMI) of parameter No. 1006) is positive or from the positive direction if the direction of reference position return is negative.

3661	Number of a pitch error compensation position for the reference position for each slave axis when independent pitch error compensation is performed under spindle command synchronous control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 1535
Set the number of a pitch error compensation position for the reference position.

NOTE
1 This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).
2 The usable number of pitch error compensation positions and their range depend on the option configuration.

3666	Number of the pitch error compensation position at extremely negative position for each slave axis when independent pitch error compensation is performed under spindle command synchronous control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 1535
Set the compensation position number at the farthest end in the negative direction.

NOTE
1 This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).
2 When using the both-direction pitch error compensation function, set a compensation position number for a movement in the positive direction.
3 The usable number of pitch error compensation positions and their range depend on the option configuration.

3671	Number of the pitch error compensation position at extremely positive position for each slave axis when independent pitch error compensation is performed under spindle command synchronous control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 1535

Set the compensation position number at the farthest end in the positive direction.

> **NOTE**
> 1 This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).
> 2 When using the both-direction pitch error compensation function, set a compensation position number for a movement in the positive direction.
> 3 The usable number of pitch error compensation positions and their range depend on the option configuration.

3676	Number of the pitch error compensation position at extremely negative position for each slave axis when independent both-direction pitch error compensation is performed under spindle command synchronous control

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 1535

When using both-direction pitch error compensation, set the compensation position number at the farthest end in the negative direction for a movement in the negative direction.

> **NOTE**
> 1 This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).
> 2 The usable number of pitch error compensation positions and their range depend on the option configuration.

3681	Pitch error compensation value at the reference position when a movement is made to the reference position in the direction opposite to the reference position return direction for each slave axis in the case where independent both-direction pitch error compensation is performed under spindle command synchronous control

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] -32767 to 32767

By using an absolute value, set a pitch error compensation value at the reference position when a movement is made in the negative direction if the reference position return direction (bit 5 (ZMI) of parameter No. 1006) is positive or when a movement is made in the positive direction if the reference position return direction (bit 5 (ZMI) of parameter No. 1006) is negative.

NOTE
This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).

4.23 PARAMETERS OF SPINDLE CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
3700						CNM	NRF	CRF

[Input type] Parameter input
[Data type] Bit path

#0 CRF Reference position setting at an arbitrary position under Cs contour control is:
0: Not used.
1: Used.

> **NOTE**
> When this function is used, an attempt to specify G00 for a Cs contour control axis without performing a reference position return operation even once after switching the serial spindle to the Cs contour control mode results in the alarm PS0303, “REFERENCE POSITION RETURN IS NOT PERFORMED” even if bit 1 (NRF) of parameter No. 3700 is set to 0. Be sure to perform a reference position return operation by specifying G28.

#1 NRF With the first move command (G00) after switching the series spindle to Cs contour control mode:
0: A reference position return operation is once performed then positioning is performed.
1: A normal positioning operation is performed.

#2 CNM When an axis command of travel distance 0 is specified for the Cs axis in the origin unestablished state:
0: The alarm PS0224, "ZERO RETURN NOT FINISHED" is issued.
1: The alarm PS0224 is not issued.

	#7	#6	#5	#4	#3	#2	#1	#0
3702							EMS	

[Input type] Parameter input
[Data type] Bit path

#1 EMS The multi-spindle control function is:
0: Used.
1: Not used.

	#7	#6	#5	#4	#3	#2	#1	#0
3703				SPR	MPP	MPM		2P2

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 2P2 When a multi-path system is used, inter-path spindle control allows:

0: Configuration where the spindle that belongs to one path only is shared between path 1 and path 2.

1: Configuration where the spindles that belong to path 1 and 2 are shared between the two paths.

When the spindle that belongs to an arbitrary path is shared between arbitrary paths, set bit 2 (MPM) of parameter No. 3703. (The meanings of signals used vary, so that ladder program modifications need to be made.)

#2 MPM When a multi-path system is used, the configuration allowed by inter-path spindle control:

0: Follows the setting of bit 0 (2P2) of parameter No. 3703.

1: Allows the sharing of the spindle that belongs to a path between arbitrary paths.

#3 MPP In multi-spindle control, a spindle selection using a programmed command instead of using the signals (SWS1 to SWS4<G027.0 to 2, G026.3>) is:

0: Not made.

1: Made.

> **NOTE**
> When this parameter is set to 1, set parameter No. 3781 at the same time.

#4 SPR Rigid tapping with spindle of another path function is:

0: Not available.

1: Available.

	#7	#6	#5	#4	#3	#2	#1	#0
3704	CSS		SSY	SSS				

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#4 SSS Synchronous spindle control by each spindle is:

0: Not performed.

1: Performed.

The master axis and slave axis of synchronous spindle control can be selected from the arbitrary spindles.

The target spindle of synchronous spindle control is specified in parameter No. 4831.

In addition, the following signals affect the control.

- Synchronous spindle signals of each spindle SPSYCs
- Signals of synchronous control of the spindle phase for each spindle SPPHSs

#5 SSY Simple synchronous spindle control by each spindle is:

0: Not performed.

1: Performed.

The master axis and slave axis of simple synchronous spindle control can be selected from the arbitrary spindles.

The target spindle of simple synchronous spindle control is set in parameter No. 4821.

In addition, the following signals affect the control.

- Signals of simple synchronous control of each spindle ESSYCs
- Parking signals of simple synchronous control of each spindle PKESEs

#7 CSS On the each spindle, Cs contour control is:
0: Not performed.
1: Performed.

	#7	#6	#5	#4	#3	#2	#1	#0
3705				EVS				ESF
		SFA	NSF		SGT	SGB	GST	ESF

[Input type] Parameter input
[Data type] Bit path

#0 ESF When the spindle control function (Spindle analog output or Spindle serial output) is used, and the constant surface speed control function is used or bit 4 (GTT) of parameter No. 3706 is set to 1:
0: S codes and spindle function strobe signal SF are output for all S commands.
1: For the T series:
S codes and spindle function strobe signal SF are not output for an S command in the constant surface speed control (G96) mode and a command for maximum spindle speed clamping (G92 S_; (G50 for G code system A)).
For the M series:
S codes and SF are not output for an S command in the constant surface speed control (G96) mode.

NOTE
The operation of this parameter varies between the T series and M series.
For the T series:
This parameter is valid when bit 4 (EVS) of parameter No. 3705 is set to 1.
For the M series:
For an S command for maximum spindle speed clamping (G92 S_;), SF is not output, regardless of the setting of this parameter.

#1 GST The spindle orientation signal SOR is used for:
0: Spindle orientation
1: Gear shift

#2 SGB Gear switching method is:
0: Method A (Parameters Nos. 3741 to 3743 for the maximum spindle speed at each gear are used for gear selection.)
1: Method B (Parameters Nos. 3751 and 3752 for the spindle speed at the gear switching point are used for gear selection.)

#3 SGT Gear switching method during tapping cycle (G84 and G74) is:
0: Method A (Same as the normal gear switching method)
1: Method B (Gears are switched during tapping cycle according to the spindle speed set in parameters Nos. 3761 and 3762).

#4 EVS When the spindle control function (Spindle analog output or Spindle serial output) is used, S codes and spindle function strobe signal SF are:
0: Not output for an S command.
1: Output for an S command.
The output of S codes and spindle function strobe signal SF for an S command in constant surface speed control mode (G96), or for an S command used to specify maximum spindle speed clamping (G92 S_; (G50 for G code system A)) depends on the setting of bit 0 (ESF) of parameter No. 3705.

#5 NSF For the M series, when a T type gear is selected (with bit 4 (GTT) of parameter No. 3706 set to 1 or with the option for constant surface speed control), and an S code is specified:
0: Spindle function strobe signal SF is output.
1: Spindle function strobe signal SF is not output.

> **NOTE**
> This parameter does not affect S code output. For an S command for maximum spindle speed clamping (G92 S_;), spindle function strobe signal SF is not output, regardless of the setting of this parameter.

#6 SFA The spindle function strobe signal SF is output:
0: When gears are switched.
1: Irrespective of whether gears are switched.

	#7	#6	#5	#4	#3	#2	#1	#0
3706	TCW	CWM	ORM		PCS	MPA		
	TCW	CWM	ORM	GTT	PCS	MPA		

[Input type] Parameter input
[Data type] Bit path

#2 MPA If a spindle is to be selected using a P command (with bit 3 (MPP) of parameter No. 3703 set to 1) in multi-spindle control, and a P command is not specified together with an S command:
0: The alarm PS5305, “ILLEGAL SPINDLE NUMBER” is issued.
1: The last P specified by S_ P_; (by S_ P_; specified for the path in case of a multi-path system) is used. If P is not specified even once after power-up, the value of parameter No. 3775 is used.

> **NOTE**
> This parameter is valid only when bit 3 (MPP) of parameter No. 3703 is set to 1.

#3 PCS When a multi-path system is used, and multi-spindle control is enabled with each path, as the position coder signals (PC2SLC<Gn028.7>, PC3SLC<Gn026.0>, PC4SLC<Gn026.1>) for selecting the position coder of a spindle among the multiple spindles that belong to a path selected by the inter-path spindle feedback selection signals:
0: The signals of the path selected by the inter-path spindle feedback selection signal are used.
1: The signals of the local path are used.

Suppose that path x is selected by the inter-path spindle feedback selection signals (SLPCA<Gn064.2>, SLPCB<Gn064.3>, SLPCC<Gn403.4>, SLPCD<Gn403.5>). Then, the following position coder is selected in path x by the position coder selection signals:
n = m(path number)-1
y = x(path number selected by the spindle feedback selection signals)-1

When bit 3 (PCS) of parameter No. 3706 is set to 0

Position coder selected in path m	Selected path Position coder selection signals (path x)			Selecting path Position coder selection signals (path m)		
	PC2SLC <Gy028.7>	PC3SLC <Gy026.0>	PC4SLC <Gy026.1>	PC2SLC <Gn028.7>	PC3SLC <Gn026.0>	PC4SLC <Gn026.1>
PC1 of path x	0	0	0	-	-	-
PC2 of path x	1	0	0	-	-	-
PC3 of path x	0	1	0	-	-	-
PC4 of path x	0	0	1	-	-	-

When bit 3 (PCS) of parameter No. 3706 is set to 1

Position coder selected in path m	Selected path Position coder selection signals (path x)			Selecting path Position coder selection signals (path m)		
	PC2SLC <Gy028.7>	PC3SLC <Gy026.0>	PC4SLC <Gy026.1>	PC2SLC <Gn028.7>	PC3SLC <Gn026.0>	PC4SLC <Gn026.1>
PC1 of path x	-	-	-	0	0	0
PC2 of path x	-	-	-	1	0	0
PC3 of path x	-	-	-	0	1	0
PC4 of path x	-	-	-	0	0	1

#4 GTT Spindle gear selection method is:
0: Type M.
1: Type T.

NOTE
1 M type
The gear selection signal is not input. The CNC selects a gear based on the speed range of each gear set by a parameter beforehand according to S codes, and the selected gear is posted by outputting the gear selection signal. Moreover, the spindle speed matching the gear selected by the output gear selection signal is output.
T type
The gear selection signal is input. The spindle speed matching the gear selected by this signal is output.
2 When the constant surface speed control option is selected, type T is selected, regardless of whether this parameter is specified.
3 When type T spindle gear switching is selected, the following parameters have no effect:
No.3705#2(SGB), No.3751, No.3752,
No.3705#1(GST), No.3705#3(SGT), No.3761, No.3762,
No.3705#6(SFA), No.3735, No.3736
On the other hand, parameter No. 3744 becomes usable.

#5 ORM Voltage polarity during spindle orientation
0: Positive
1: Negative

#6 CWM
#7 TCW Voltage polarity when the spindle speed voltage is output

TCW	CWM	Voltage polarity
0	0	Both M03 and M04 positive
0	1	Both M03 and M04 negative
1	0	M03 positive, M04 negative
1	1	M03 negative, M04 positive

	#7	#6	#5	#4	#3	#2	#1	#0
3708		TSO	SOC				SAT	SAR
		TSO	SOC					SAR

[Input type] Parameter input
[Data type] Bit path

#0 SAR The spindle speed arrival signal SAR is:
0: Not checked
1: Checked

#1 SAT Check of the spindle speed arrival signal at the start of executing the thread cutting block
0: The signal is checked only when bit 0 (SAR) of parameter No. 3708 is set to 1.
1: The signal is always checked irrespective of the setting of SAR.

> **NOTE**
> When thread cutting blocks are consecutive, the spindle speed arrival signal is not checked for the second and subsequent thread cutting blocks.

#5 SOC During constant surface speed control (G96 mode), the speed clamp by the maximum spindle speed clamp command (G92 S_; (G50 for G code system A of lathe system)) is carried out:
0: Before spindle speed override.
1: After spindle speed override.
If this parameter is set to 0, the spindle speed may exceed the maximum spindle speed (numeric value following S in G92 S_; (G50 for G code system A of lathe system)).
If this parameter is set to 1, the spindle speed is limited to the maximum spindle speed.
The spindle speed is limited to the upper limit of spindle speed specified in parameter No. 3772, irrespective of the setting of this parameter.

#6 TSO During a threading or tapping cycle, the spindle override is:
0: Disabled (tied to 100%).
1: Enabled.

> **NOTE**
> During rigid tapping, the override is tied to 100%, irrespective of the setting of this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
3709					MRS	MSI	RSC	SAM

[Input type] Parameter input
[Data type] Bit path

#0 SAM The sampling frequency to obtain the average spindle speed
0: 4 (Normally, set to 0.)
1: 1

#1 RSC In the constant surface speed control mode, the surface speed of a rapid traverse block is calculated:
0: In accordance with the coordinates of the end point.
1: In accordance with the current value, as in cutting feed.

#2 MSI In multi-spindle control, the SIND signal is valid
0: Only when the first spindle is valid (SIND signal for the 2nd, 3rd spindle becomes ineffective) (TYPE-A)
1: For each spindle irrespective of whether the spindle is selected (Each spindle has its own SIND signal). (TYPE-B)

#3 MRS When the actual spindle speed signals and S 12-bit code signals are output in multi-spindle control:
0: The signals common to the first spindle and second spindle are used, and the signals for the spindle selected by the spindle selection signal are output.
1: The signals for the first spindle and the signals for the second spindle are output separately.

	#7	#6	#5	#4	#3	#2	#1	#0
3712		GMB		CSA		CSF		

[Input type] Parameter input
[Data type] Bit

#2 CSF In the Cs contour control mode, the function for setting machine coordinates and absolute coordinates based on the machine position of the spindle if the origin is already set up is:
0: Disabled.
1: Enabled.

#4 CSA When the constant surface speed control command (G96S_) is specified, if the max spindle speed clamp command (G92S_; in system M or G50S_; in system T) is not specified even once after power-up:
0 : Alarm does not occur (conventional specification).
1 : Alarm PS5557 “NO MAX SP SPEED CLAMP COMMAND”occurs.

#6 GMB With type-M gear switching method B, the speed of each gear is clamped to:
0 : The maximum rotation speed (No. 3741 to No. 3743) of each gear or the maximum clamping speed (No. 3736) of the spindle motor.
1 : The spindle motor speed (No. 3751) at the gear switching point between gear 1 and gear 2, and
The spindle motor speed (No. 3752) at the gear switching point between gear 2 and gear 3.

	#7	#6	#5	#4	#3	#2	#1	#0
3713		MPC		EOV	MSC			

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#3 MSC Multi-spindle control TYPE-C is:
0: Not used.
1: Used.

> **NOTE**
> If parameter MSC and bit 2 (MSI) of parameter No. 3709 for multi-spindle control TYPE-B) are set to 1 at the same time, multi-spindle control TYPE-C is enabled.

#4 EOV Each spindle speed override is:
0: Not used.
1: Used.

> **NOTE**
> Multi-spindle control TYPE-C (bit 3 (MSC) of parameter No. 3713=1) is necessary to use this function.

#6 MPC When a spindle is selected with address P in a program during multi-spindle control (bit 3 (MPP) of parameter No. 3703 is set to 1), position coder feedback used for thread cutting, feed per revolution, and so forth is:
0: Not changed automatically according to the selected spindle.
1: Changed automatically according to the selected spindle.

> **NOTE**
> Setting this parameter produces the same effects as when position coder select signals PC2SLC<Gn028.7>, PC3SLC<Gn026.0>, and PC4SLC<Gn026.1>, inter-path spindle feedback signals SLPCA<Gn064.2>, SLPCB<Gn064.3>, SLPCC<Gn403.4>, and SLPCD<Gn403.5> are set.
> At this time, even when an attempt to set these signals is made by a PMC ladder, these signal operations are ignored.

	#7	#6	#5	#4	#3	#2	#1	#0
3715								NSAx

[Input type] Parameter input
[Data type] Bit axis

#0 NSAx When a move command is executed for an axis, the spindle speed arrival signal SAR is:
0: Checked.
1: Not checked.
Set an axis for which the spindle speed arrival signal SAR need not be checked when a move command is executed for the axis. When a move command is specified only for an axis with this parameter set to 1, the spindle speed arrival signal SAR is not checked.

	#7	#6	#5	#4	#3	#2	#1	#0
3716	FBP							A/Ss

[Input type] Parameter input
[Data type] Bit spindle

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 A/Ss Spindle motor type is :
0: Analog spindle.
1: Serial spindle.

> **NOTE**
> 1 When an analog spindle is used, the option for spindle analog output is required.
> 2 When a serial spindle is used, the option for spindle serial output is required.
> 3 The option for the number of controlled spindles needs to be specified.

#7 FBP Changing the number of spindle position coder pulses is :
0: Executed.
1: Not executed.

3717	Spindle amplifier number of each spindle

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to Maximum number of controlled axes

Set a spindle amplifier number to be assigned to each spindle.
0: No spindle amplifier is connected.
1: Spindle motor connected to amplifier number 1 is used.
2: Spindle motor connected to amplifier number 2 is used.
to
n: Spindle motor connected to amplifier number n is used.

3718	Subscript for display of a serial spindle (main spindle) or analog spindle

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to 122

Set a subscript to be added to spindle speed display on a screen such as the position display screen.

3719	Subscript for display of a serial spindle (sub-spindle)

[Input type] Parameter input

[Data type] Byte spindle
[Valid data range] 0 to 122
Set a subscript to be added to spindle speed display on a screen such as the position display screen.

3720	Number of position coder pulses

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] Number of pulses
[Valid data range] Serial spindle
: 0, 4096 When bit 7 (FBP) of parameter No.3716 is set to 1: $4096\times2^{\wedge14}$
Spindle control with servo motor
: 0, 4096 When bit 7 (FBP) of parameter No.3716 is set to 1: $4096\times2^{\wedge14}$
Analog spindle
: 0, 4096 When bit 7 (FBP) of parameter No.3716 is set to 1: from 0 to 400000

Set the number of position coder pulses.
In analog spindle, 4096 is set to parameter automatically if parameter No.3720 is set to 0 or less.
In serial spindle or spindle control with servo motor, the setting method is changed by setting of the bit 7 (FBP) of parameter No.3716.
- When the bit 7 (FBP) of parameter No.3716 is set to 0:
  4096 is set to parameter automatically if parameter No.3720 is set to 0 or less.
- When the bit 7 (FBP) of parameter No.3716 is set to 1:
  $4096\times2^{\wedge14}$ is set to parameter automatically.

3721	Number of gear teeth on the position coder side

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 9999
Set the number of gear teeth on the position coder side in speed control (such as feed per revolution).

3722	Number of gear teeth on the spindle side

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 9999
Set the number of gear teeth on the spindle side in speed control (such as feed per revolution).

	#7	#6	#5	#4	#3	#2	#1	#0
3729	CSCs	CHMs			NCSs	CSNs	FPRs	ORTs

[Input type] Parameter input
[Data type] Bit spindle

#0 ORTs When a serial spindle is used, the spindle orientation function of stop position external setting type based on the position coder is:
0: Not performed.
1: Performed.

#1 FPRs Feed per revolution (without a position coder) is:
0: Not used for a spindle.
1: Used for a spindle.
In a machine that does not use a position coder, when FPRs is set to 1 for each axis, feed per revolution can be performed with a spindle command. A feed per revolution is specified with G95 (G99 for lathe systems) in the same way as for normal operation.
When multi-spindle control is performed, the target spindle for feed per revolution is selected with a position coder select signal (PC2SLC<Gn028.7>, PC3SLC<Gn026.0>, PC4SLC <Gn026.1>).

> **NOTE**
> The option for constant surface speed control is required.

#2 CSNs When the Cs contour control mode is turned off, an in-position check is:
0: Performed.
1: Not performed.

#3 NCSs When the Cs contour control mode is set:
0: Switching to Cs contour control is completed when the spindle activating current is on (the spindle amplifier is ready for operation in the Cs contour control mode).
1: Switching to Cs contour control is completed even when the spindle activating current is off (the spindle amplifier is not ready for operation in the Cs contour control mode).

If this parameter is set to 1, the Cs contour control switch end signal is output without waiting for the spindle to decelerate to a stop.

#6 CHMs Manual reference position return after the reference position for the Cs contour control axis is established is performed as:
0: Spindle orientation operation.
1: High-speed type of reference position return operation.

#7 CSCs The increment system of the Cs contour control axis is:
0: IS-B.
1: IS-C.

3730	Data used for adjusting the gain of the analog output of spindle speed

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 0.1%
[Valid data range] 700 to 1250
Set data used for adjusting the gain of the analog output of spindle speed.
[Adjustment method]
<1> Assign standard value 1000 to the parameter.
<2> Specify the spindle speed so that the analog output of the spindle speed is the maximum voltage (10 V).
<3> Measure the output voltage.
<4> Assign the value obtained by the following equation to parameter No. 3730.

Setting value = (10 (V) / Measured data (V)) × 1000

<5> After setting the parameter, specify the spindle speed so that the analog output of the spindle speed is the maximum voltage. Confirm that the output voltage is 10V.

> **NOTE**
> This parameter needs not to be set for serial spindles.

3731	Compensation value for the offset voltage of spindle speed analog output

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Velo
[Valid data range] -1024 to 1024

Set a compensation value for the offset voltage of spindle speed analog output.

Setting = -8191 × offset voltage (V)/12.5

[Adjustment method]

<1> Assign standard value 0 to the parameter.
<2> Specify the spindle speed so that the analog output of the spindle speed is 0.
<3> Measure the output voltage.
<4> Assign the value obtained by the following equation to parameter No. 3731.

$$\text{Setting value} = \frac{-8191 \times \text{Offset voltage (V)}}{12.5}$$

<5> After setting the parameter, specify the spindle speed so that the analog output of the spindle speed is 0. Confirm that the output voltage is 0V.

> **NOTE**
> This parameter needs not to be set for serial spindles.

3732	The spindle speed during spindle orientation or the spindle motor speed during spindle gear shift

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 20000

Set the spindle speed during spindle orientation or the spindle motor speed during gear shift.

When bit 1 (GST) of parameter No. 3705 is set to 0, set the spindle speed during spindle orientation in min^{-1}.

When bit 1 (GST) of parameter No. 3705 is set to 1, set the spindle motor speed during spindle gear shift calculated from the following formula.

For a serial spindle

$$\text{Setting value} = \frac{\text{Spindle motor speed during spindle gear shift}}{\text{Maximum spindle motor speed}} \times 16383$$

For an analog spindle

$$\text{Setting value} = \frac{\text{Spindle motor speed during spindle gear shift}}{\text{Maximum spindle motor speed}} \times 4095$$

3735	
	Minimum clamp speed of the spindle motor

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 4095

Set the minimum clamp speed of the spindle motor.

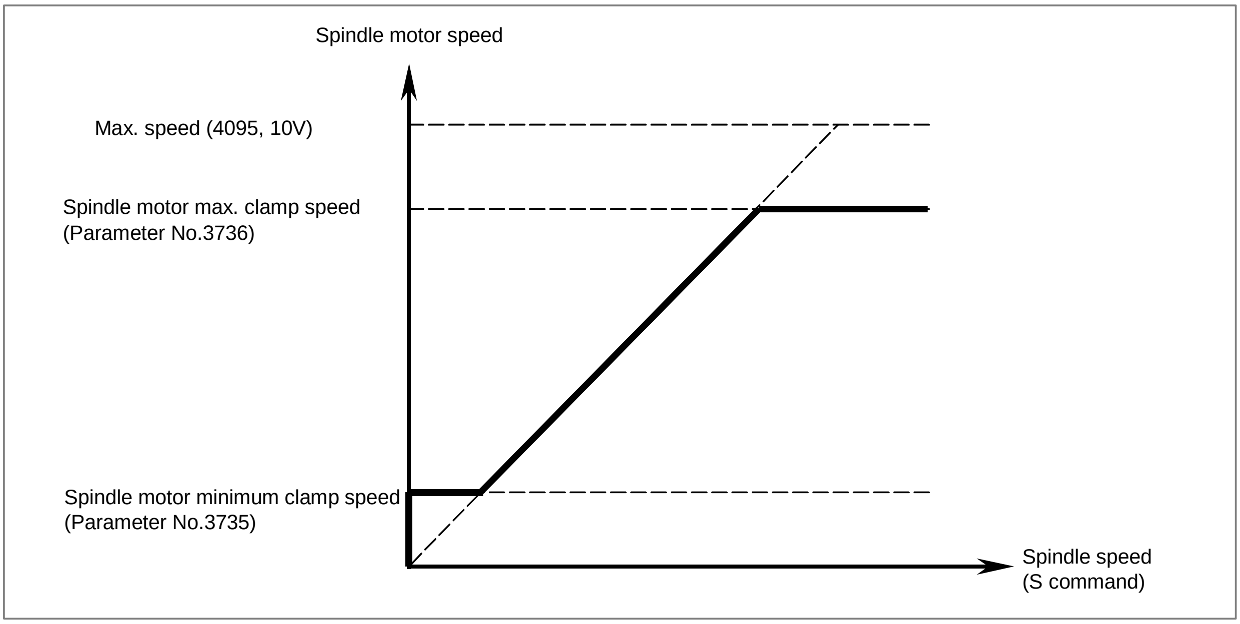
$$\text{Setting value} = \frac{\text{Minimum clamp speed of the spindle motor}}{\text{Maximum spindle motor speed}} \times 4095$$

3736	Maximum clamp speed of the spindle motor

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 4095

Set the maximum clamp speed of the spindle motor.

$$\text{Setting value} = \frac{\text{Maximum clamp speed of the spindle motor}}{\text{Maximum spindle motor speed}} \times 4095$$



3738	Spindle name 2 of each spindle
3739	Spindle name 3 of each spindle

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 48 to 57, 65 to 90

The command for a spindle is basically "S".
When all conditions below are satisfied, however, an extended spindle name can be used. An extended spindle name consists of up to three characters starting with "S" as the first spindle name. Thus, a command for a spindle can be specified.

- The serial (analog) spindle function is enabled.
- The multi-spindle function is enabled.
- Bit 0 (EEA) of parameter No. 1000 is set to 1.
- Bit 3 (MPP) of parameter No. 3703 is set to 1.
- Bit 1 (ESN) of parameter No. 3798 is set to 1.
- Bit 4 (GTT) of parameter No. 3706 is set to 1. (M series only)

As spindle name 2 (No. 3738) and spindle name 3 (No. 3739), ASCII codes from 0 to 9 and A to Z can be arbitrary set. However, before spindle name 3 for a spindle can be valid, spindle name 2 must be set for the spindle. Moreover, when a character from 0 to 9 is set as spindle name 2, do not set a character from A to Z as spindle name 3.

> **NOTE**
> 1 When an extended spindle name is used, a subscript (for a main spindle (parameter No. 3718)) and a subscript (for a sub-spindle (parameter No. 3719)) are unusable.
> 2 When the custom macro function is enabled, the same extended spindle name as a reserved word must not be used. Such an extended spindle name is regarded as a reserved word.

3740	Time elapsed prior to checking the spindle speed arrival signal

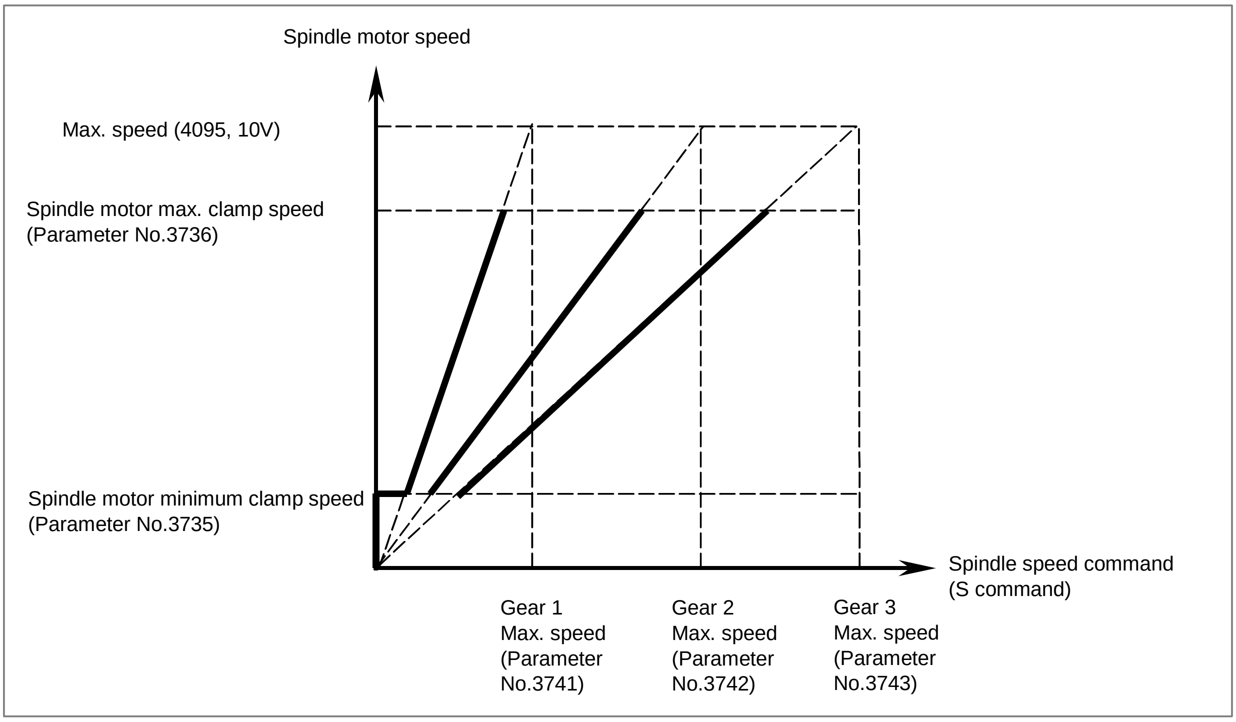
[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767

Set the time elapsed from the execution of the S function up to the checking of the spindle speed arrival signal.

3741	Maximum spindle speed for gear 1
3742	Maximum spindle speed for gear 2
3743	Maximum spindle speed for gear 3
3744	Maximum spindle speed for gear 4

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

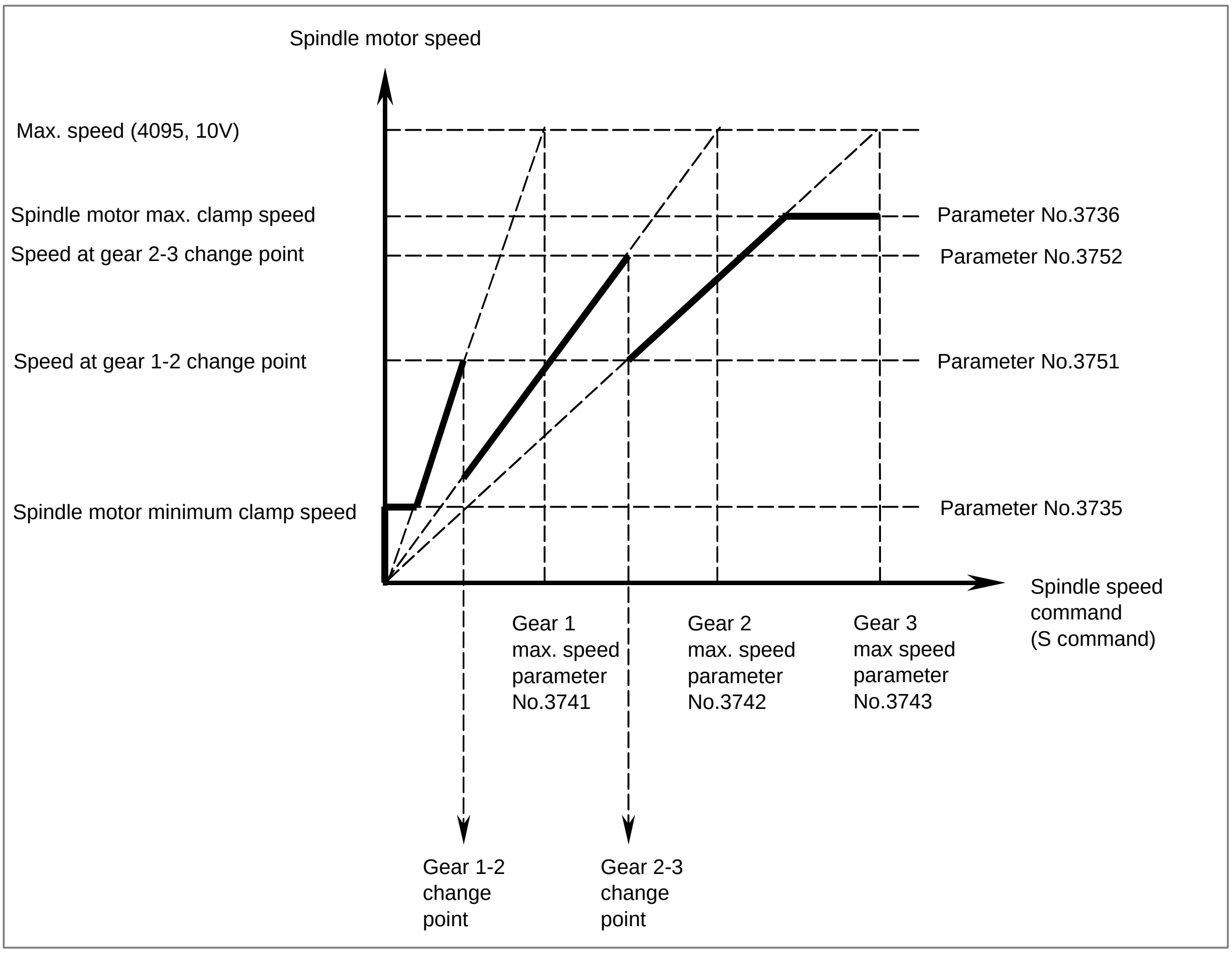
Set the maximum spindle speed corresponding to each gear.



3751	Spindle motor speed when switching from gear 1 to gear 2
3752	Spindle motor speed when switching from gear 2 to gear 3

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 4095

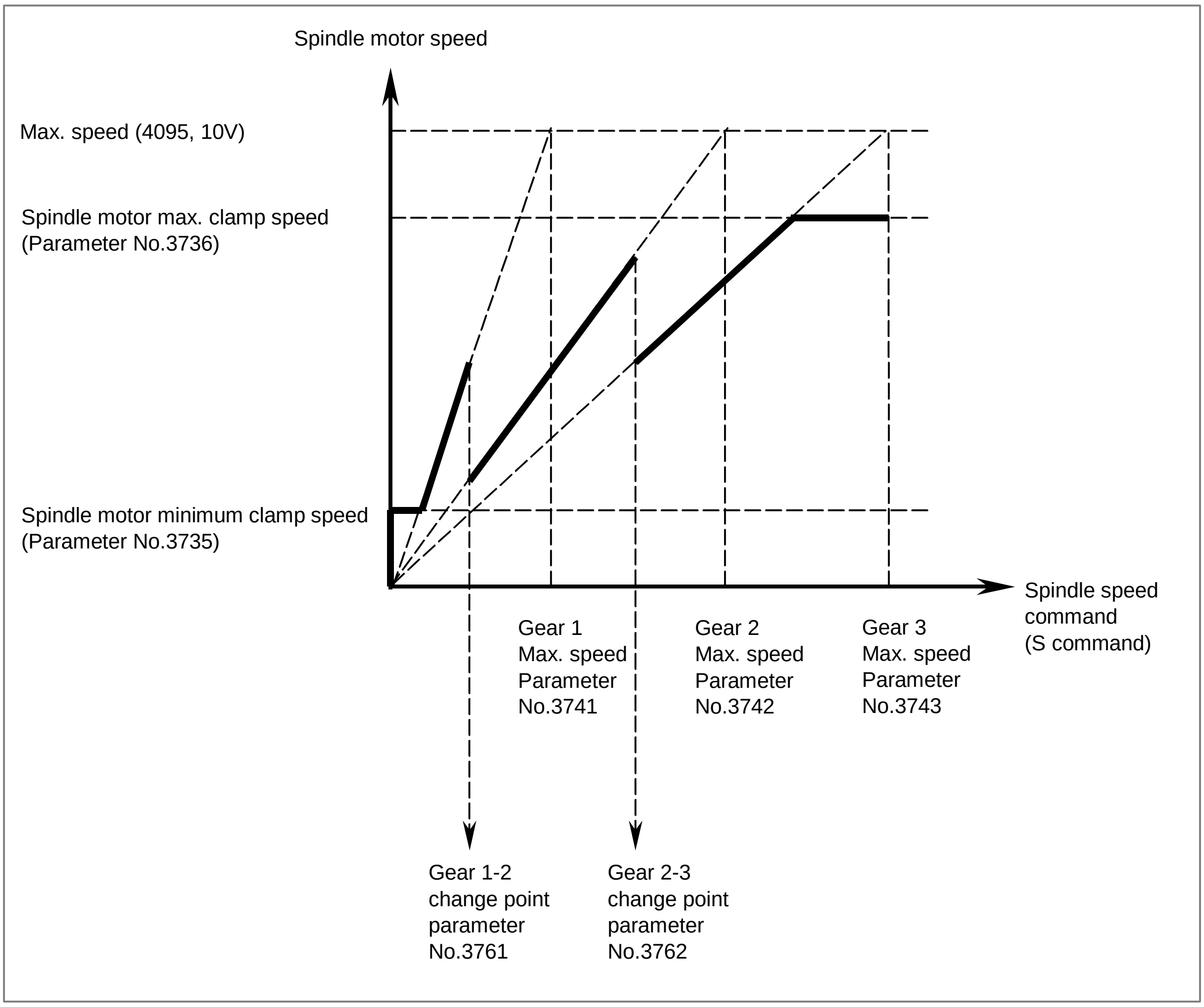
For gear switching method B, set the spindle motor speed when the gears are switched.
Setting value =
(Spindle motor speed when the gears are switched / Maximum spindle motor speed) × 4095



3761	Spindle speed when switching from gear 1 to gear 2 during tapping
3762	Spindle speed when switching from gear 2 to gear 3 during tapping

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

When method B is selected as the gear change method in the tapping cycle (when bit 3 (SGT) of parameter No. 3705 is set to 1), set the spindle speed at a change point of each gear.



3770	Axis as the calculation reference in constant surface speed control

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the axis as the calculation reference in constant surface speed control.

NOTE

When 0 is set, constant surface speed control is always applied to the X-axis. In this case, specifying P in a G96 block has no effect on the constant surface speed control.

3771	Minimum spindle speed in constant surface speed control mode (G96)

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

Set the minimum spindle speed in the constant surface speed control mode (G96).
The spindle speed in constant surface speed control is clamped to the speed given by parameter 3771.

3772	Maximum spindle speed

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

This parameter sets the maximum spindle speed.
When a command specifying a speed exceeding the maximum speed of the spindle is specified , or the speed of the spindle exceeds the maximum speed because of the spindle speed override function, the spindle speed is clamped at the maximum speed set in the parameter.

> ⚠ **CAUTION**
> 1 When 0 is set in this parameter, the speed of the spindle is not clamped.
> 2 When spindle speed command control is applied using the PMC, this parameter has no effect, and the spindle speed is not clamped.

> **NOTE**
> 1 For M series, this parameter is valid if the function of constant surface speed control is provided.
> 2 When the constant surface speed control option is selected, the spindle speed is clamped at the maximum speed, regardless of whether the G96 mode or G97 mode is specified.

3773	Start address of the R signal specifying maximum speed

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 0 to maximum address (multiple of 4. 0, 4, 8, ...)

This parameter sets the start address of the R signal specifying maximum speed.
Four bytes starting at the setting are used for each spindle.

> **NOTE**
> 1 As for the setting of parameter
> <1> Set a value that is a multiple of 4 (0, 4, 8, etc.).
> <2> The range of the R address differs depending on the PMC kind and the memory size. Check the specifications of the PMC, and set a value within the valid range. (Example: R addresses in the range from R0 to R7999 if memory B of the first PMC is used. Thus, values which can be set are 4, 8, 12, 16, …7992, 7996 in this case)
> If any setting other than the above items (<1>, <2>) is made, alarm PW5390"R-ADDRESS SETTING IS ILLEGAL" is issued.
> 2 When value of parameter No. 3773 is zero, this function has no effect.

3775	Default P command value for spindle selection in multi-spindle control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 32767

When bit 3 (MPP) of parameter No. 3703 is set to 1 and bit 2 (MPA) of parameter No. 3706 is set to 1 in multi-spindle control, set a default P command value applicable if S_P_ is not specified even once after power-up.

3781	P code for selecting the spindle in multi-spindle control

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 32767

If bit 3 (MPP) of parameter No. 3703 is set to 1, set the P code to select each spindle under multi-spindle control. Specify the P code in a block containing the S command.

[Example] If the P code value for selecting the second spindle is set to 3,
S1000 P3;
causes the second spindle to rotate at S1000.

NOTE
1 This parameter is valid if bit 3 (MPP) of parameter No. 3703 is set to 1.
2 If this parameter is set to 0, the corresponding spindle cannot be selected by a P code.
3 Under multi-path control, the P code specified here is valid for each path.
For instance, if the P code to select the first spindle of path 2 is set to 21, specifying S1000 P21; in path 1 causes the first spindle of path 2 to be rotated at S1000.
4 Identical P code values cannot be used for different spindles. (Identical P code values cannot be used even if the paths are different.)
5 When this parameter is used (when bit 3 (MPP) of parameter No. 3703 is set to 1), the spindle command selection signal is invalid.
6 To use this parameter, the multi-spindle control function is needed.

	#7	#6	#5	#4	#3	#2	#1	#0
3785							G96	CLM

[Input type] Parameter input
[Data type] Bit

#0 CLM When spindle selection by address P or extended spindle name of multi-spindle control is enabled, constant surface speed control command is:

0: The following specifications.
- If extended spindle name is commanded in clamp command of maximum spindle speed, alarm PS0539 “MAX SP SPEED CLAMP COMMAND ERROR” is issued.
- If address P is commanded at selection of axis as the calculation reference in constant surface speed control, alarm PS0190 “ILLEGAL AXIS SELECTED (G96)” is issued.

1: Conventional specifications.

#1 G96 When spindle selection by address P in multi-spindle control, or extended spindle name is enabled, if G96 is commanded without surface speed:

0: Alarm PS5355 is not issued.
1: Alarm PS5355 is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
3787							SLG	USG

[Input type] Parameter input
[Data type] Bit spindle

#0 USG When spindle speed calculated from spindle motor speed is displayed (bit 2 (ASD) of parameter No.3799):

0: Parameter Nos.4056 to 4059 is used for spindle speed calculation.
1: Parameter Nos.3741 to 3744 is used for spindle speed calculation.

#1 SLG In spindle speed calculation, gear selection status is judged from:

0: Clutch/gear signals.
1: Gear selection signals.

NOTE

1 Address of clutch/gear signals is as follows.
CTH1A, CTH2A<Gn070.3, Gn070.2> (First spindle)
CTH1B, CTH2B<Gn074.3, Gn074.2> (Second spindle)
CTH1C, CTH2C<Gn204.3, Gn204.2> (Third spindle)
CTH1D, CTH2D<Gn266.3, Gn266.2> (Fourth spindle)

2 Address of gear selection signals is as follows.
M type gear selection method
GR1O, GR2O, GR3O<Fn034.0, Fn034.2>
T type gear selection method
GR1, GR2 <Gn028.1, Gn028.2>(First spindle)
GR21, GR22<Gn029.0, Gn029.1>(Second spindle)
GR31, GR32<Gn029.2, Gn029.3>(Third spindle)
GR41, GR42<Gn031.4, Gn031.5>(Fourth spindle)

3792	**The sampling frequency to obtain the average spindle speed**

[Data type] Byte spindle
[Unit of data] No unit
[Valid data range] 0 to 4
The sampling frequency is 2^(parameter data).

> **NOTE**
> 1 If this parameter is 0 or out of range, the sampling frequency to obtain the average spindle speed obeys SAM (parameter No.3709#0). If you would like to set sampling frequency to 1, please set this parameter to 0, and SAM (parameter No.3709#0) to 1.
> 2 If you change this parameter, please operate on the condition that spindle rotation is stop state and the function to use spindle feedback such as feed per revolution is not executed.

	#7	#6	#5	#4	#3	#2	#1	#0
3794								CSH

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 CSH The spindle control switching function for high-speed cycle machining is:
0: Disabled.
1: Enabled.

3795	M code for high-speed switching of Cs contour control

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] None
[Valid data range] 0 to 99999999

This parameter sets an M code command value for high-speed switching of Cs contour control.

> **NOTE**
> 1 The parameter setting must not be the same as the M code used for any other function.
> 2 The parameter set to 0 becomes invalid.
> 3 If the same value is set for two or more Cs contour control axes within the system, the alarm PS0513, "CS HI-SPEED SWITCHING SETTINGERROR" is issued.
> 4 The M code set here is buffering-inhibited.

	#7	#6	#5	#4	#3	#2	#1	#0
3797								DCN

This parameter is related to Dual Check Safety.
See Dual Check Safety CONNECTION MANUAL (B-64483EN-2) for details.

	#7	#6	#5	#4	#3	#2	#1	#0
3798				SSI	SDP		ESN	ALM

[Input type] Parameter input

[Data type] Bit

#0 ALM The spindle alarm SP**** for all spindles is:
0: Enabled.
1: Ignored.
When this parameter is set to 1, the spindle-related alarms are ignored. So, be sure to set this parameter to 0 at all times except for special cases such as maintenance.

#1 ESN When the multi-spindle function is enabled and bit 3 (MPP) of parameter No. 3703 is set to 1, a spindle is specified in a program by using:
0: P command.
1: Extended spindle name.

A spindle to be specified is selected as follows:

Bit 1 (ESN) of parameter No. 3798	Bit 3 (MPP) of parameter No. 3703	Selection method
0	0	Signal selection
0	1	P command
1	0	Signal selection
1	1	Extended spindle name

> **NOTE**
> This parameter is valid when bit 0 (EEA) of parameter No. 1000 is set to 1.
> When setting this parameter to 1, set also parameter No. 3738 and No. 3739 properly.

#3 SDP High-precision spindle speed control is:
0: Not used.
1: Used.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#4 SSI The resolution enabled for the spindle speed command is:
0: Maximum spindle speed/4095 [min^{-1}].
1: Maximum spindle speed/16383 [min^{-1}].

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

	#7	#6	#5	#4	#3	#2	#1	#0
3799		SPC	SSH		SVPs	ASDs	NDPs	NALs

[Input type] Parameter input
[Data type] Bit spindle

#0 NALs An alarm detected on the spindle amplifier side is:
0: Displayed.
1: Not displayed.
(This parameter is valid when bit 0 (ALM) of parameter No. 3798 is set to 0.)

When this parameter is set to 1, an alarm detected on the spindle amplifier side is ignored. So, be sure to set this parameter to 0 at all times except for special cases such as maintenance.

#1 NDPs When an analog spindle is used, a position coder disconnection check is:
0: Made.
1: Not made.
(This parameter is valid when bit 0 (NAL) of parameter No. 3799 is set to 0.)
When no position coder is used with an analog spindle, set this parameter to 1.

#2 ASDs When a serial spindle is used, a spindle speed is calculated based on:
0: Feedback pulses from the position coder.
1: Speed monitor.

#3 SVPs As synchronization errors displayed on the spindle screen:
0: Monitor values are displayed.
1: Peak-hold values are displayed,
Spindle synchronization errors are displayed on the side of the spindle that functions as a slave axis in spindle synchronization control.

#5 SSH On the diagnosis screen, total spindle speed data is:
0: Not displayed.
1: Displayed.

#6 SPC The position coder pulse to obtain the average spindle speed is:
0 : Sampled without sign data.
1 : Sampled with sign data.

3841	Servo motor spindle control axis number

[Data type] Word
[Valid data range] 1 to 24
This parameter sets the axis number of an axis to be subject to servo motor spindle control or servo motor spindle synchronization.
Setting the parameter to 0 disables servo motor spindle control and servo motor spindle synchronization.
For servo motor spindle synchronization, you have to set bit 4 (SPSx) of parameter No. 2016.

3842	Maximum speed for servo motor spindle control

[Data type] 2-word
[Valid data range] 0 to 9999
This parameter sets the maximum speed of the spindle to be subject to servo motor spindle control.

3843	Time constant for acceleration/deceleration under servo motor spindle control

[Data type] Word
[Unit of data] msec
[Valid data range] 0 to 4000
This parameter sets the time constant for acceleration/deceleration under servo motor spindle control and servo motor spindle synchronization.
The type of acceleration/deceleration is linear acceleration/deceleration.
Set the parameter to the time to be taken for the spindle speed to reach 1000 (min^{-1}).

3844	Master spindle number

[Data type] Word
[Valid data range] 0 to 104

Set the number of the spindle (position coder) to be subject to servo motor spindle synchronization.
The hundreds and tens digits represent a path; the units digit represents the number of the position coder in the path.
To synchronize the servo axis in the second path and the second position coder in the first path under dual-path control, for example, set this parameter for the second path to 12.
When the hundreds and tens digits are both 0, the local path is assumed.
When a value of 0 is specified, the first position coder in the local path is assumed.

> ⚠ **WARNING**
> 1 The combination of the position coder and servo motor to be synchronized with each other is determined by wire connection. Even though you change the setting of this parameter, therefore, you cannot change the combination of the position coder and servo motor to be synchronized with each other.
> 2 This parameter is used for acceleration or deceleration to be performed when the synchronization mode is turned on/off.
> 3 It is dangerous to set a value not matching the actually wire-connected combination as it prevents correct acceleration/deceleration. Be sure to set a value matching the actual wire connection.

Parameters for Control of Serial Interface Spindle Cs Contouring Control Axis

Number	Data format	Description	
3900	Byte path	First group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3901 to 3904 when the Cs contouring axis is controlled
3901	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3902	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3903	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3904	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection
3910	Byte path	Second group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3911 to 3914 when the Cs contouring axis is controlled
3911	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3912	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3913	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3914	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection

Number	Data format	Description	
3920	Byte path	Third group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3921 to 3924 when the Cs contouring axis is controlled
3921	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3922	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3923	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3924	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection
3930	Byte path	Fourth group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3931 to 3934 when the Cs contouring axis is controlled
3931	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3932	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3933	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3934	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection
3940	Byte path	Fifth group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3941 to 3944 when the Cs contouring axis is controlled
3941	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3942	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3943	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3944	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection

<Setting method>

First, select servo axes which perform interpolation with the Cs contouring axis. (Up to five axes can be selected.)

When there is no servo axis for interpolation with the Cs contouring axis, set the parameters 3900, 3910, 3920, 3930, and 3940 to 0 to terminate parameter setting.

When there are servo axes for interpolation with the Cs contouring axis, the parameters must be set according to the procedure below for each axis.

(1) Set the number of a servo axis (1 to maximum number of controlled axes) for interpolation with the Cs contouring axis in parameters 39n0 (n = 0, 1, 2, 3, and 4).

(2) Set loop gain values of the servo axis specified in (1) above which is used when the Cs contouring axis is controlled in parameters 39n1, 39n2, 39n3, and 39n4. (There are four stages for main gears used.)

(3) When the number of specified servo axes is less than 5, set the remaining parameters (39n0) to 0 to terminate parameter setting.

When the number of a Cs contouring axis is set to parameter 39n0, the parameter is assumed to be set to 0.

NOTE

1 In general, it is difficult to set a high loop gain for a spindle motor axis when compared with a servo axis. These parameters are provided so that, by changing the loop gain of a servo axis that requires interpolation with the Cs contour axis, interpolation control can be exercised correctly between the Cs axis and servo axis while the spindle exercises Cs contour control.

2 The loop gain of the servo axis is changed using the parameter settings made for a spindle gear selected at the time of conversion from the spindle mode to the Cs contour control mode.
In normal use, it is unlikely that the gear of the spindle is switched during Cs contour control. However, note that if the gear of the spindle is changed during Cs contour control, the loop gain of the servo axis is not changed.

3 Even when multiple Cs axes are used with one path (bit 7 (CSS) of parameter No. 3704 = 1), these parameters are shared.

Parameters for Serial interface spindle or spindle

Parameters Nos. 4000 to 4799 below are basically used with the serial spindle amplifier. For details of these parameters, refer to either of the following manuals and other related documents, depending on the spindle that is actually connected.

- FANUC AC SPINDLE MOTOR α*i* series Parameter Manual (B-65280EN)

	#7	#6	#5	#4	#3	#2	#1	#0
4000								
to	to							
4015	(No user setting allowed = Note 1)							
to	to							
4019	(Note 2)							

[Input type] Parameter input
[Data type] Bit spindle

4020	
to	to
4133	

[Input type] Parameter input
[Data type] Word spindle

4134	
4135	

[Input type] Parameter input
[Data type] 2-word spindle

4136	
to	to
4175	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4176								
to	to							
4191	(No user setting allowed = Note 1)							
to	to							
4195	(Note 2)							

[Input type] Parameter input
[Data type] Bit spindle

4196	
to	to
4309	

[Input type] Parameter input
[Data type] Word spindle

4310	
4311	

[Input type] Parameter input
[Data type] 2-word spindle

4312	
to	to
4351	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4352								
4353								

[Input type] Parameter input
[Data type] Bit spindle

4354	
to	to
4371	(No user setting allowed = Note 1)
4372	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4373								
4374								

[Input type] Parameter input

[Data type] Bit spindle

4375	
to	to
4393	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4394								
to	to							
4403	(No user setting allowed = Note 1)							

[Input type] Parameter input
[Data type] Bit spindle

4404	
to	to
4437	(No user setting allowed = Note 1)
to	to
4439	(No user setting allowed = Note 1)
to	to
4441	(No user setting allowed = Note 1)
to	to
4447	(No user setting allowed = Note 1)
to	to
4459	(No user setting allowed = Note 1)
to	to
4461	(No user setting allowed = Note 1)
to	to
4466	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4467								
to	to							
4476	(No user setting allowed = Note 1)							

[Input type] Parameter input
[Data type] Bit spindle

4477	
to	to
4539	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
to	to	to						
to	to							
4544	(No user setting allowed = Note 1)							
to	to							
4549								

[Input type] Parameter input
[Data type] Bit spindle

4550	
to	to
4669	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4670								
to	to							
4679								

[Input type] Parameter input
[Data type] Bit spindle

4680	
to	to
4799	

[Input type] Parameter input
[Data type] Word spindle

NOTE

1. Among the parameters of the spindle amplifier with the serial interface, parameters Nos. 4015, 4191, 4403, and 4476 cannot be changed by the users.
   These parameters require to assign optional software to the CNC and are automatically set depending on the type of the software.
   The setting of parameters Nos. 4371, 4437, 4439, 4441, 4447, 4459, 4461, and 4544 are also unchangeable by the user.
2. To set the parameters of the spindle amplifier with the serial interface automatically, set bit 7 of parameter No. 4019 (if the sub spindle is set in the CNC with the spindle switching function, use parameter No. 4195) to 1, assign the model code of the motor to be used to parameter No. 4133 (if the sub spindle is set in the CNC with the spindle switching function, use parameter No. 4309), turn off the power of the CNC and spindle amplifier, and restart the CNC and spindle amplifier.

NOTE

3 Parameters Nos. 4000 to 4799 are used in the processing on the spindle amplifier. For details of these parameters, refer to either of the following manuals, depending on the serial spindle that is actually used.
   - FANUC AC SPINDLE MOTOR αi series Parameter Manual (B-65280EN)

4 The CNC can control up to eight spindle amplifiers with the serial interface. When the spindle amplifier provides the spindle switching function, one spindle amplifier can control two spindle motors using the switching function. The output switching function can be used in spindle motors to be connected. Up to sixteen spindles, or thirty two types, can be used by switching the spindle motors. (The number of spindles that can controlled simultaneously is the same as the number of spindle amplifiers, that is eight spindles.)
   Parameters of the spindle amplifier with the serial interface correspond to the above functions as follows:
   (1) Serial spindle parameters for the first to eighth spindles: Nos. 4000 to 4799 ”S1”to“S8”
   (2) Parameters Nos. 4000 to 4175 "S1" to "S8":
   When the spindle switching function is not provided, or for the main spindle in the spindle amplifier when the function is provided.
   Parameter Nos. 4176 to 4351 "S1" to "S8":
   For the sub spindle in the spindle amplifier when the spindle switching function is provided.
   (3) Parameters for low-speed winding when the output switching function is provided.
   Parameters Nos. 4136 to 4175 "S1" to "S8":
   When the spindle switching function is not provided, or for the main spindle when the function is provided.
   Parameters Nos. 4284 to 4351 "S1" to "S8":
   For the sub spindle when the spindle switching function is provided.

NOTE

5 The CNC stores the parameters of the spindle amplifier with the serial interface. The CNC sends them to the spindle amplifier at the system power on and they are used in the unit.
These parameters are sent from the CNC to the spindle amplifier in a batch when:
- The CNC is switched on.

If these parameters are rewritten, they are sent from the CNC to the spindle amplifier sequentially when:
- The parameters have been entered from the MDI.
- The parameters have been entered as programmable (G10).
- The parameters have been entered via the RS232C interface.

To set parameters automatically, upload parameters corresponding to the motor model from the spindle amplifier to the CNC prior to the procedure specified above.
The parameters of the spindle amplifier with serial interface can be changed after the system starts. Changing the parameters Nos. 4000 to 4799 "S1" to "S8") in the CNC sends them to the spindle amplifier at an appropriate time and the parameters in the unit are updated.
(Be careful not to change parameters incorrectly.)

	#7	#6	#5	#4	#3	#2	#1	#0
4800	SPK	EPZ	SCB					

[Input type] Parameter input
[Data type] Bit

NOTE

When at least one of these parameters is set, the power must be turned off before operation is continued.

#5 SCB The combination of a master spindle and slave spindle for spindle synchronization depends on:

0: Setting of bit 4 (SSS) of parameter No. 3704.
When bit 4 (SSS) of parameter No. 3704 is set to 0
The first spindle and second spindle of each path can be selected as the master spindle and slave spindle, respectively, for spindle synchronization.
When bit 4 (SSS) of parameter No. 3704 is set to 1
A combination of arbitrary spindles of each path can be selected for spindle synchronization.
Set a master spindle for each slave spindle in parameter No. 4831. Set a spindle number of each path.
By setting a spindle number common to the system in parameter No. 4832, an arbitrary spindle that belongs to a different path can be selected as a master spindle for spindle synchronization. Set a spindle number common to the system. Set parameter No. 4831 to 0. Spindle synchronization based on arbitrary spindles must be enabled for the path to which a slave spindle belongs and for the path to which a master spindle belongs.

1: Conventional 16TT system compatible specifications.
The first spindle of path 1 and the first spindle of path 2 can be selected as the master spindle and slave spindle, respectively, for spindle synchronization.
As control signals, the signal interface of the 16TT system compatible specifications can be used.

#6 EPZ When the parking signal is switched in the reference position established state during Cs contour control exercised using spindle command synchronous control:
0: Reference position established state is continued.
1: Reference position established state is canceled.
If this parameter is set, the same reference position return operation as manual reference position return is performed with the G28 command immediately after the parking signal is switched.
The G00 command performs a positioning operation including reference position return (when bit 1 (NRF) of parameter No. 3700 is set to 0).

#7 SPK As the parking signals for spindle command synchronous control:
0: PKESS1<Gn122.6> (first spindle) and PKESS2<Gn122.7> (second spindle) are used.
1: PKESS1<Gn031.6> (first spindle) and PKESS2<Gn031.7> (second spindle) are used.

NOTE
1 This parameter is valid only when bit 5 (SSY) of parameter No. 3704 is set to 0.
2 If the parking signals PK7 and PK8 for synchronization control are used when spindle command synchronous control and synchronization control are used at the same time, set bit 7 (SPK) of parameter No. 4800 to 1 to use the parking signals PKESS1 and PKESS2 for spindle command synchronous control as <Gn031.6,Gn031.7>.

	#7	#6	#5	#4	#3	#2	#1	#0
4801								SNDs

[Input type] Parameter input
[Data type] Bit spindle

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#0 SNDs During spindle synchronization control, the rotation direction of each spindle motor is:
0: Same as the specified sign.
1: Opposite to the specified sign.

	#7	#6	#5	#4	#3	#2	#1	#0
4803					SM4	SM3	SM2	SM1

[Input type] Parameter input
[Data type] Bit spindle

#0 SM1 Spindle position save to parameter No.4840 is:
0: Not completed.
1: Completed.

#1 SM2 Spindle position save to parameter No.4841 is:
0: Not completed.
1: Completed.

#2 SM3 Spindle position save to parameter No.4842 is:
0: Not completed.
1: Completed.

#3 SM4 Spindle position save to parameter No.4843 is:
0: Not completed.
1: Completed.

> **NOTE**
> Bit 0 to 3 (SM1 to SM4) of parameter No.4803 to are set to 0 if spindle position has to be saved again, for example, motor or detector is exchanged, parameter file of other machine is inputted, and so on.

	#7	#6	#5	#4	#3	#2	#1	#0
4809								NSY

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 NSY When the spindle speed changes during spindle synchronization control, resolution improvement is:
0: Disabled. (Speed change in units of about 3.7 [min^{-1}])
1: Enabled. (Speed change in units of about 0.03 [min^{-1}] at minimum but not higher than maximum spindle speed/4095 [min^{-1}])

This parameter is valid when spindle synchronization control or spindle-spindle polygon turning is used.
Using high-precision spindle speed control and spindle synchronization control simultaneously requires setting the parameter to 1.

> **NOTE**
> Using this function requires the serial spindle software that supports it.

4810	Error pulse between two spindles when synchronizing phases in the spindle synchronization control mode

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit

[Valid data range] 0 to 255

Set an allowable error pulse value between two spindles at phase synchronization time in the spindle synchronization control mode.

This parameter is used to check the completion of phase synchronization performed in the spindle synchronization control mode and to check the phase difference during spindle synchronization control.

When the error pulse value between two spindles become equal to or less than the value set in this parameter, the spindle phase synchronization control completion signals FSPPH<F044.3> and FSPPH1 to 4<F289.0 to 3> are set to “1”.

4811	Allowable error count for the error pulses between two spindles in the spindle synchronization control mode

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 32767

Set the allowable error count for the error pulses between two spindles in the spindle synchronization control mode.

This parameter is used to check a spindle synchronization error phase difference.

When a spindle synchronization error equal to or greater than the value set in this parameter is detected, the phase error monitor signals SYCAL<F044.4> and SYCAL1 to 4<F043.0 to F043.3> are set to “1”.

4821	Master axis of each slave spindle under simple synchronous spindle control

NOTE

When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to Maximum number of controlled spindle axes (within a path)

When a spindle is set as a slave spindle in spindle command synchronous control on each spindle, set which spindle (master spindle) the slave spindle is to be synchronized with.

[Examples of parameter setting]

- When spindle command synchronous control is exercised with the first spindle selected as a master spindle and the second spindle selected as a slave spindle:
  No. 4821(1)=0
  No. 4821(2)=1
  No. 4821(3)=0
  No. 4821(4)=0
- When spindle command synchronous control is exercised with four spindles under the following combinations:
  (Two combinations, namely, first spindle (master spindle)/ second spindle (slave spindle), and third spindle (master spindle)/fourth spindle (slave spindle))
  No. 4821(1)=0
  No. 4821(2)=1
  No. 4821(3)=0
  No. 4821(4)=3

NOTE

1 This parameter is valid if bit 5 (SSY) of parameter No. 3704 is set to 1.

> **NOTE**
> 2 The setting of a slave spindle as a master spindle is invalid. Be sure to set 0 for a spindle that is to function as a master spindle.
> 3 In this parameter, set a spindle number within the same path.

4826	Allowable error count for the error pulses between two spindles in the simple synchronization spindle control mode

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 32767

Set the allowable error count for the error pulses between two spindles in the simple synchronization spindle control mode.
This parameter is used to check a spindle synchronization error phase difference.
When a spindle synchronization error equal to or greater than the value set in this parameter is detected, the spindle phase error monitor signals SYCAL<Fn044.4> and SYCALs are set to “1”.

> **NOTE**
> 1 The detection unit per pulse depends on the spindle control mode (Cs contour control, rigid tapping, or spindle positioning).
> 2 Set this parameter for a spindle that is to function as a slave spindle. Set 0 for the master spindle.
> 3 In the spindle rotation control mode, synchronization error detection is not performed.

4831	Master axis of each slave spindle under spindle synchronous control

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to Maximum number of controlled spindle axes (within a path)

When a spindle is set as a slave spindle in spindle synchronization control on each spindle, set which spindle (master spindle) the slave spindle is to be synchronized with.
[Examples of parameter setting]

- When spindle synchronization control is exercised with the first spindle selected as a master spindle and the second spindle selected as a slave spindle:
  No. 4831(1)=0
  No. 4831(2)=1
  No. 4831(3)=0
  No. 4831(4)=0
- When spindle synchronization control is exercised with four spindles under the following combinations:
  (Two combinations, namely, first spindle (master spindle)/second spindle (slave spindle), and third spindle (master spindle)/fourth spindle (slave spindle))
  No. 4831(1)=0
  No. 4831(2)=1
  No. 4831(3)=0
  No. 4831(4)=3

- When spindle synchronization control is exercised with one master spindle and multiple slave spindles:
  (First spindle (master spindle)/second spindle (slave spindle)/third spindle (slave spindle)/fourth spindle (slave spindle))
  No. 4831(1)=0
  No. 4831(2)=1
  No. 4831(3)=1
  No. 4831(4)=1

NOTE
1 This parameter is valid if bit 4 (SSS) of parameter No. 3704 is set to 1.
2 The setting of a slave spindle as a master spindle is invalid.
3 In this parameter, set a spindle number within the same path. When a spindle not belonging to the local path is to be selected as a master spindle for spindle synchronization, set a spindle number common to the system in parameter No. 4832. In such a case, set 0 in this parameter.

4832	Master spindle of each slave spindle under spindle synchronization control (spindle number common to the system)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to Maximum number of controlled spindle axes (common to the system)

When a spindle is set as a slave spindle in spindle synchronization control on each spindle, set which spindle (master spindle) the slave spindle is to be synchronized with.

NOTE
1 This parameter is valid if bit 4 (SSS) of parameter No. 3704 is set to 1.
Bit 4 (SSS) of parameter No. 3704 must be set to 1 (to enable spindle synchronization based on arbitrary spindles) for the path to which a slave spindle belongs and for the path to which a master spindle belongs.
2 The setting of a slave spindle as a master spindle is invalid.
3 In this parameter, set a spindle number common to the system. When this parameter is used, parameter No. 4831 is set to 0.

4840	Spindle position 1 used as phase shift amount
4841	Spindle position 2 used as phase shift amount
4842	Spindle position 3 used as phase shift amount
4843	Spindle position 4 used as phase shift amount

[Input type] Parameter input

[Data type] Word spindle
[Unit of data] No unit
[Valid data range] 0 to 4095

Spindle position is saved by CNC. Spindle phase synchronous control whose shift amount is spindle position saved to this parameter can be executed.

	#7	#6	#5	#4	#3	#2	#1	#0
4900	FDTs			FDEs				FLRs

[Input type] Parameter input
[Data type] Bit spindle

#0 FLRs When the spindle speed fluctuation detection function is used, the unit of an allowable ratio (q) and fluctuation ratio (r) set by parameters No. 4911 and No. 4912 is:
0: 1%
1: 0.1%

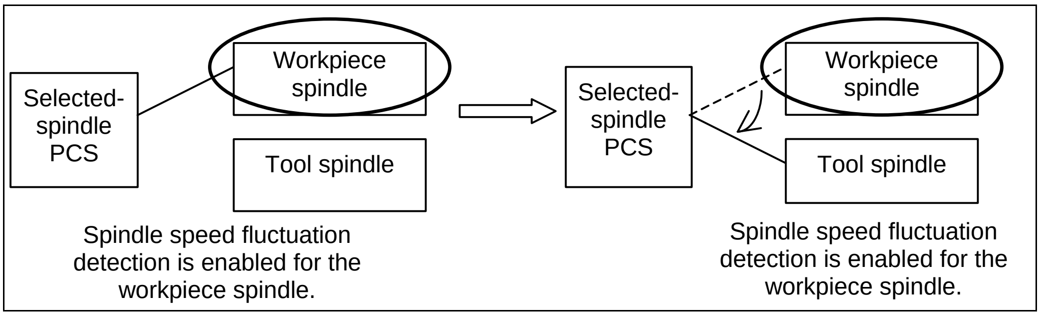
#4 FDEs Spindle speed fluctuation detection function is:
0: Enabled.
1: Disabled.

If the position coder selection signal is selected for a spindle for which this parameter is 1, the target spindle of spindle speed fluctuation detection remains unchanged. Spindle speed fluctuation detection stays enabled for the spindle for which spindle speed fluctuation detection was enabled before the selection of the position coder selection signal.

An example is given below.

[Example]

Bit 4 (FDE) of parameter No. 4900 (Workpiece spindle) = 0
Bit 4 (FDE) of parameter No. 4900 (Tool spindle) = 1
Even when the position coder selection signal is switched from the workpiece spindle to the tool spindle, the target spindle of spindle speed fluctuation detection remains unchanged, that is, the function stays enabled for the workpiece spindle.



Note) The selected spindle varies depending on the state of the position coder selection signal.

> **NOTE**
> 1 If bit 4 (FDE) of parameter No. 4900 is 0 for all spindles, spindle speed fluctuation detection is enabled for the spindle selected with the position coder selection signal as is conventionally. If the parameter FDE is 1 for all spindles, spindle speed fluctuation detection is enabled for the spindle selected with the position coder selection signal.
> 2 When the parameter FDE is 0 for all spindles, setting the parameter FDE for the spindle selected with the position coder selection signal to 1 does not cause an immediate change to the target spindle, which stays as the target until the next position coder selection signal is issued.
> 3 If the parameter FDE for the first spindle is 1 and the first spindle is the tool spindle when the power is turned on, spindle speed fluctuation detection remains enabled for the first spindle until a spindle for which the parameter FDE is 0 is selected.

#7 FDTs Spindle speed fluctuation detection is started:
0: When the actual spindle speed reaches a specified range or when the time specified with parameter No. 4914 elapses.
1: After the time specified with parameter No. 4914 has elapsed.

4911	Allowable speed ratio (q) used to assume that the spindle has reached a specified speed

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 1%, 0.1%
[Valid data range] 1 to 100, 1 to 1000

When the spindle speed fluctuation detection function is used, set an allowable speed ratio (q) used to assume that the spindle has reached a specified speed.

> **NOTE**
> The unit of data is determined by bit 0 (FLR) of parameter No. 4900.

4912	Spindle fluctuation ratio (r) for not issuing a spindle speed fluctuation detection alarm

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 1%, 0.1%
[Valid data range] 1 to 100, 1 to 1000

When the spindle speed fluctuation detection function is used, set a spindle fluctuation ratio (r) for not issuing an alarm.

> **NOTE**
> The unit of data is determined by bit 0 (FLR) of parameter No. 4900.

4913	Spindle speed fluctuation width (i) for not issuing a spindle speed fluctuation detection alarm

[Input type] Parameter input
[Data type] 2-word spindle

[Unit of data] min^{-1}
[Valid data range] 0 to 99999

When the spindle speed fluctuation detection function is used, set an allowable fluctuation width (i) for not issuing an alarm.

4914	Time (p) from the change of a specified speed until spindle speed fluctuation detection is started

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] msec
[Valid data range] 0 to 999999

When the spindle speed fluctuation detection function is used, set a time (p) from the change of a specified speed until spindle speed fluctuation detection is started. In other words, spindle speed fluctuation detection is not performed until a set time has elapsed after a specified speed is changed. However, when the actual spindle speed is assumed to have reached a specified value within a set time (p), spindle speed fluctuation detection is started.

	#7	#6	#5	#4	#3	#2	#1	#0
4950	IMBs	ESIs	TRVs			ISZs	IDMs	IORs

[Input type] Parameter input
[Data type] Bit spindle

#0 IORs Resetting the system in the spindle positioning mode
0: Does not release the mode.
1: Releases the mode

#1 IDMs The direction of spindle positioning (half-fixed angle positioning based on M codes) is:
0: Plus direction.
1: Minus direction.

#2 ISZs When an M code for switching to the spindle positioning mode is specified for spindle positioning:
0: The spindle is switched to the spindle positioning mode, and spindle orientation operation is performed.
1: Only the switching of the spindle to the spindle positioning mode is performed. (Spindle orientation operation is not performed.)

#5 TRVs The rotation direction for spindle positioning is:
0: Same as the specified sign.
1: Opposite to the specified sign.

NOTE
When a serial spindle is used, this parameter is invalid for the specification of a rotation direction for the orientation command.

#6 ESIs The unit of rapid traverse rate on the spindle positioning axis is:
0: Not increased by a factor of 10.
1: Increased by a factor of 10.

#7 IMBs When the spindle positioning function is used, half-fixed angle positioning based on M codes uses:

0: Specification A
1: Specification B

In the case of half-fixed angle positioning based on M codes, three types of spindle positioning operations can occur:

(1) The spindle rotation mode is cleared, and then the mode is switched to the spindle positioning mode. (After switching to the spindle positioning mode, spindle orientation operation is also performed.)
(2) Spindle positioning is performed in the spindle positioning mode.
(3) The spindle positioning mode is cleared, and then the mode is switched to the spindle rotation mode.

- In the case of specification A:
  Operations (1) to (3) are specified using separate M codes.
  (1) Specified using an M code for switching to the spindle positioning mode.
  (See parameter No. 4960)
  (2) Specified using M codes for specifying a spindle positioning angle.
  (See parameter No. 4962)
  (3) Specified using M codes for clearing spindle positioning operation.
  (See parameter No. 4961.)
- In the case of specification B:
  When M codes for specifying a spindle positioning angle are specified, operations (1) to (3) are performed successively. (See parameter No. 4962.) (However, spindle orientation operation of (1) is not performed.)

	#7	#6	#5	#4	#3	#2	#1	#0
4959								DMDx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 DMDx A machine coordinate on the spindle positioning axis is displayed in:

0: Degrees.
1: Pulses.

4960	M code specifying the spindle orientation

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 6 to 97

Set an M code for switching to the spindle positioning mode.

> **NOTE**
> 1 Do not set an M code that duplicates other M codes used for spindle positioning.
> 2 Do not set an M code used with other functions (such as M00-05, 30, 98, and 99, and M codes for calling subprograms).

4961	M code releasing the spindle positioning mode

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 6 to 97

Set an M code for canceling the spindle positioning mode on the spindle positioning axis.

NOTE
1 Do not set an M code that duplicates other M codes used for spindle positioning.
2 Do not set an M code used with other functions (such as M00-05, 30, 98, and 99, and M codes for calling subprograms).

4962	M code for specifying a spindle positioning angle

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 6 to 9999999

Two methods are available for specifying spindle positioning. One method uses axis address for arbitrary-angle positioning. The other uses an M code for half-fixed angle positioning. This parameter sets an M code for the latter method.

In this parameter, set an M code to be used for half-fixed angle positioning based on M codes.

Six M code from Mα to M(α+5) are used for half-fixed angle positioning, when α is the value of this parameter.

- When the number of M codes is set in parameter No. 4964, let α be the value set in parameter No. 4962, and let β be the value set in parameter No. 4964. Then, β M codes from Mα to M(α+β-1) are used as M codes for half-fixed angle positioning based on M codes.

The table below indicates the relationship between the M codes and positioning angles.

M code	Positioning angle	Example: Positioning angle when θ = 30°
Mα	θ	30°
M(α+1)	2θ	60°
M(α+2)	3θ	90°
M(α+3)	4θ	120°
M(α+4)	5θ	150°
M(α+5)	6θ	180°
:	:	:
M(α+β-1)	$\beta\times\theta$	$\beta\times$30°

β represents the number of M codes set in parameter No. 4964.
(When parameter No. 4964 is set to 0, β = 6.)
θ represents the basic angular displacement set in parameter No. 4963.

NOTE
1 Do not set an M code that duplicates other M codes used for spindle positioning.
2 Do not set an M code used with other functions (such as M00-05, 30, 98, and 99, and M codes for calling subprograms).

4963	Basic angle for half-fixed angle positioning

[Input type] Parameter input

[Data type] Real spindle
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 to 60

This parameter sets a basic angular displacement used for half-fixed angle positioning using M codes.

4964	Number of M codes for specifying a spindle positioning angle

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 0 to 255

This parameter sets the number of M codes used for Half-fixed angle positioning using M codes.
As many M codes as the number specified in this parameter, starting with the M code specified in parameter No. 4962, are used to specify half-fixed angle positioning.
Let α be the value of parameter No. 4962, and let β be the value of parameter No. 4964. That is, M codes from Mα to M($\alpha+\beta$-1) are used for half-fixed angle positioning.
Setting this parameter to 0 has the same effect as setting 6. That is, M codes from Mα to M(α+5) are used for half-fixed angle positioning.

NOTE
1. Make sure that M codes from Mα to M ($\alpha+\beta$-1) do not duplicate other M codes.
2. Do not set an M code that duplicates other M codes used for spindle positioning.
3. Do not set an M code used with other functions (such as M00-05, 30, 98, and 99, and M codes for calling subprograms).

4970	Position gain

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 0.01/sec
[Valid data range] 1 to 9999

Set the position gain of the analog spindle in the spindle positioning mode.

4971	Position gain multiplier (first stage)
4972	Position gain multiplier (second stage)
4973	Position gain multiplier (third stage)
4974	Position gain multiplier (fourth stage)

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 1 to 32767

Set a position gain multiplier for an analog spindle in spindle positioning.
Position gain multiplier GC is obtained from the following equation:

$$GC = \frac{2048000 \times 360 \times PC \times E}{PLS \times SP \times L}$$

PLS Number of pulses output from the position coder (pulses/rev)
SP Number of gear teeth on the spindle side

PC Number of gear teeth on the position coder side
E Specified voltage (V) for turning the spindle motor at 1000 min^{-1}
L Angular displacement of the spindle (degrees) per spindle motor rotation

[Example] For the spindle motor and gear ratio given below, GC is calculated as follows:

PLS = 4096 pulse/rev
SP = 1
PC = 1
E = 2.2 V
L = 360 deg

$$GC = \frac{2048000 \times 360 \times 1 \times 2.2}{4096 \times 1 \times 360} = 1100$$

> **NOTE**
> On the assumption that the spindle motor used turns at 4500 min^{-1} at 10 V, 2.2 V is required to turn the spindle motor at 1000 min^{-1}

4.24 PARAMETERS OF TOOL COMPENSATION (1 OF 3)

	#7	#6	#5	#4	#3	#2	#1	#0
5000				ASG			MOF	SBK

[Input type] Setting input
[Data type] Bit path

#0 SBK With a block created internally for Tool radius - tool nose radius compensation:
0: A single block stop is not performed.
1: A single block stop is performed.
This parameter is used to check a program including Tool radius - tool nose radius compensation.

#1 MOF When the tool length compensation shift type (bit 6 (TOS) of parameter No. 5006 or bit 2 (TOP) of parameter No. 11400 is set to 1) is used, if the tool length compensation amount is changed(NOTE 3) in the tool length compensation mode (NOTE 1) when look-ahead blocks are present(NOTE 2):
0: Compensation is performed for the change in compensation amount as the movement type.
1: Compensation is not performed for the change until a tool length compensation command (offset number) and an absolute programming for the compensation axis are specified.

NOTE
1 The tool length compensation mode refers to the following state:
- Tool length offset (G43/G44)
- Tool length compensation in tool axis direction (G43.1)
- Tool center point control (G43.4/G43.5)

2 "When look-ahead blocks are present" means as follows:
- The modal G code of the G codes (such as tool radius - tool nose radius compensation) of group 07 is other than G40.
- In the smooth interpolation (G05.1Q2) mode

One look-ahead block during automatic operation and multiple look-ahead blocks in the AI contour control mode are not included in the state "when look-ahead blocks are present".

3 Changes in tool length compensation amount are as follows:
- When the tool length compensation number is changed by H code (or D code for the extended tool selection function for lathe systems)
- When G43 or G44 is specified to change the direction of tool length compensation
- When the tool length compensation amount is changed using the offset screen, G10 command, system variable, PMC window, and so forth during automatic operation if bit 1 (EVO) of parameter No. 5001 is set to 1.
- When the tool length compensation vector is restored after being temporarily canceled by G53, G28, G30, or G30.1 during tool length compensation.

#4 ASG When tool compensation memory B/C (M series) or the tool geometry/wear compensation function (T series) is valid, the compensation amount to be modified by the active offset value change mode based on manual feed is:

0: Geometry compensation value
1: Wear compensation value

> **NOTE**
> This parameter is valid when the option for tool compensation memory B/C (M series) or tool geometry/wear compensation (T series) is specified.

	#7	#6	#5	#4	#3	#2	#1	#0
5001		EVO						
		EVO		EVR	TAL		TLB	TLC

[Input type] Parameter input
[Data type] Bit path

#0 TLC
#1 TLB These bits are used to select a tool length compensation type.

Type	TLB	TLC
Tool length compensation A	0	0
Tool length compensation B	1	0
Tool length compensation C	-	1

The axis to which cutter compensation is applied varies from type to type as described below.
Tool length compensation A: Z-axis at all times
Tool length compensation B: Axis perpendicular to a specified plane (G17/G18/G19)
Tool length compensation C: Axis specified in a block that specifies G43/G44

#3 TAL Tool length compensation C

0: Generates an alarm when two or more axes are offset
1: Not generate an alarm even if two or more axes are offset

#4 EVR When a tool compensation value is changed in tool radius - tool nose radius compensation mode:

0: Enables the change, starting from that block where the next D or H code is specified.
1: Enables the change, starting from that block where buffering is next performed.

#6 EVO If tool compensation value modification is made for tool length compensation A or tool length compensation B in the offset mode (G43 or G44):

0: The new value becomes valid in a block where G43, G44, or an H code is specified next.
1: The new value becomes valid in a block where buffering is performed next.

	#7	#6	#5	#4	#3	#2	#1	#0
5002	WNP	LWM	LGC	LGT	ETC	LWT	LGN	

[Input type] Parameter input
[Data type] Bit path

#1 LGN Geometry offset number of tool offset

0: Is the same as wear offset number
1: Specifies the geometry offset number by the tool selection number

NOTE
This parameter is valid when the option for tool geometry/wear compensation is specified.

#2 LWT Tool wear compensation is performed by:
0: Moving the tool.
1: Shifting the coordinate system.

NOTE
This parameter is valid when the option for tool geometry/wear compensation is specified.

#3 ETC When a T-code command is two digits or shorter, the T code is:
0: Not extended.
1: Extended.
When this parameter is 1, two-digit or shorter T-code commands are extended. (Three-digit or longer T-code commands are not extended.) The value after extension is determined by the setting of the number of digits in the offset number in T-code commands (parameter No. 5028).

Parameter No. 5028	Number of digits after extension	Sample extension
1	Extended to two digits	Before extension: T1 → After extension: T11
2	Extended to four digits	Before extension: T1 → After extension: T0101
3 or greater	Not extended	

[Example]
- Parameter No. 5028: 2
- Parameter No. 3032: 4 (Allowable number of digits in T code)

Before extension	→	After extension
T1	→	T0101 (1-digit command is extended to 4 digits.)
T12	→	T1212 (2-digit command is extended to 4 digits.)
T112	→	T112 (Not extended)
T1122	→	T1122 (Not extended)

NOTE
1 The setting of the allowable number of digits in T code (parameter No. 3032) indicates the number of digits in a specified command (before being extended). If the number of digits in the command exceeds the allowable number of digits in T code, the alarm PS0003, "TOO MANY DIGIT" is issued.
2 This parameter is dedicated to the lathe system. Tool change is available with the turret type setting (bit 3 (TCT) of parameter No. 5040 = 0).
3 If the number of digits in the offset number in a T-code command (parameter No. 5028) is set to 0, the value after extension is determined by the number of digits in the number of tool compensation values (parameter No. 5024).
4 Common variable #149 for calling a T-code macro is set to the pre-extension value.

#4 LGT Tool geometry compensation
0: Compensated by the shift of the coordinate system
1: Compensated by the tool movement

> **NOTE**
> This parameter is valid when the option for tool geometry/wear compensation is specified.

#5 LGC When tool geometry compensation is based on coordinate shifting, the tool geometry offset is:
0: Not canceled by a command with offset number 0.
1: Canceled by a command with offset number 0.

> **NOTE**
> This parameter is valid when the option for tool geometry/wear compensation is specified.

#6 LWM Tool offset operation based on tool movement is performed:
0: In a block where a T code is specified.
1: Together with a command for movement along an axis.

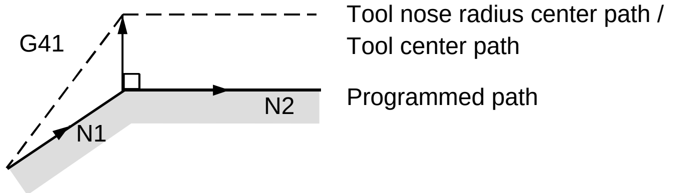
#7 WNP Imaginary tool tip number used for tool nose radius compensation, when the tool geometry/wear compensation function is equipped, is the number specified by:
0: Geometry offset number
1: Wear offset number

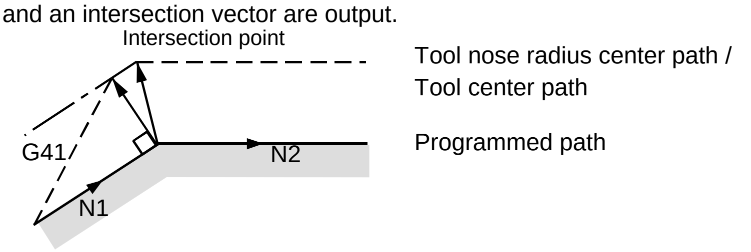
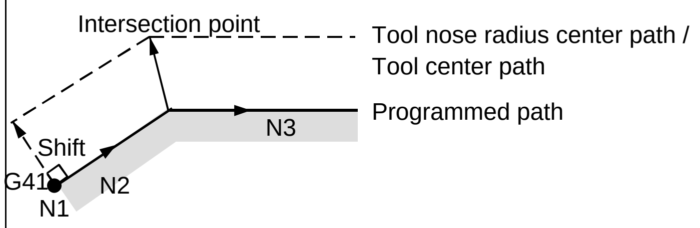
	#7	#6	#5	#4	#3	#2	#1	#0
5003	TGC						SUV	SUP
		LVK					SUV	SUP

[Input type] Parameter input
[Data type] Bit path

#0 SUP
#1 SUV These bits are used to specify the type of startup/cancellation of tool radius - tool nose radius compensation.

SUV	SUP	Type	Operation
0	0	Type A	A compensation vector perpendicular to the block next to the startup block or the block preceding the cancellation block is output.



<table>
<tr><th>SUV</th><th>SUP</th><th>Type</th><th>Operation</th></tr>
<tr><td>0</td><td>1</td><td>Type B</td><td>A compensation vector perpendicular to the startup block or cancellation block and an intersection vector are output.

</td></tr>
<tr><td>1</td><td>0
1</td><td>Type C</td><td>When the startup block or cancellation block specifies no movement operation, the tool is shifted by the cutter compensation amount in a direction perpendicular to the block next to the startup or the block before cancellation block.


When the block specifies movement operation, the type is set according to the SUP setting; if SUP is 0, type A is set, and if SUP is 1, type B is set.</td></tr>
</table>

NOTE

When SUV, SUP = 0, 1 (type B), an operation equivalent to that of FS16*i*-T is performed.

#6 LVK Tool length compensation vector

0: Cleared by reset

1: Not cleared, but held by reset

The tool length compensation vector in the tool axis direction is handled in the same way by this bit.

#7 TGC A tool geometry offset based on a coordinate shift is:

0: Not canceled by reset.

1: Canceled by reset.

NOTE

This parameter is valid when the option for tool geometry/wear compensation is specified.

	#7	#6	#5	#4	#3	#2	#1	#0
5004					TS1		ORC	
					TS1	ODI		

[Input type] Parameter input

[Data type] Bit path

#1 ORC The setting of a tool offset value is corrected as:

0: Diameter value

1: Radius value

> **NOTE**
> This parameter is valid only for an axis based on diameter specification. For an axis based on radius specification, specify a radius value, regardless of the setting of this parameter.

#2 ODI The setting of a tool radius - tool nose radius compensation value is corrected as:
0: Radius value
1: Diameter value

#3 TS1 For touch sensor contact detection with the function for direct input of offset value measured B:
0: Four-contact input is used.
1: One-contact input is used.

> **NOTE**
> For the machining center system, set TS1 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
5005		TLE	QNI			PRC		CNI
			QNI					

[Input type] Parameter input
[Data type] Bit path

#0 CNI On the offset screen, Y-axis offset screen, and macro screen, the [INP.C] soft key is:
0: Used.
1: Not used. (The [INP.C] soft key is not displayed.)

#2 PRC For direct input of a tool offset value or workpiece coordinate system shift amount:
0: The PRC signal is not used.
1: The PRC signal is used.

#5 QNI With the tool length measurement function or the function for direct input of offset value measured B, a tool compensation number is selected by:
0: Operation through the MDI panel by the operator (selection based on cursor operation).
1: Signal input from the PMC.

#6 TLE The "direct input of tool offset value measured B" function updates the offset value in offset write mode:
0: Constantly.
1: During axis movement.
Axis movement assumes a positional deviation other than 0.

	#7	#6	#5	#4	#3	#2	#1	#0
5006		TOS			LVC		TGC	
		TOS						

[Input type] Parameter input
[Data type] Bit

#1 TGC If a T code is specified in a block where G50, G04, or G10 is specified:
0: No alarm is issued.
1: The alarm PS0245, “T-CODE NOT ALLOWED IN THIS BLOCK” is issued.

#3 LVC A tool offset (geometry/wear) based on a tool movement and wear offset based on a coordinate shift are:
0: Not canceled by reset.
1: Canceled by reset.

#6 TOS Set a tool length compensation or tool offset operation.
0: Tool length compensation or tool offset operation is performed by an axis movement.
1: Tool length compensation or tool offset operation is performed by shifting the coordinate system.

	#7	#6	#5	#4	#3	#2	#1	#0
5007	3OF	3OC						
	3OF	3OC	WMC	WMH	WMA	TMA	TC3	TC2

[Input type] Parameter input
[Data type] Bit path
#0 TC2
#1 TC3 If a tool length compensation value is set by pressing the [MEASURE] or [+MEASURE] soft key in tool length measurement, the tool automatically moves to the tool change position. Specify at which reference position the tool change position is located.

TC3	TC2	Meaning
0	0	The tool change position is at the first reference position.
0	1	The tool change position is at the second reference position.
1	0	The tool change position is at the third reference position.
1	1	The tool change position is at the fourth reference position.

#2 TMA 0: Tool length measurement is enabled along the Z-axis only.
1: Tool length measurement is enabled along each axis.

#3 WMA 0: Surface-based measurement of a workpiece zero point offset value is enabled along the Z-axis only.
1: Surface-based measurement of a workpiece zero point offset value is enabled along each axis.

#4 WMH 0: Hole-based measurement of a workpiece zero point offset value is disabled.
1: Hole-based measurement of a workpiece zero point offset value is enabled.

#5 WMC 0: An axis for workpiece zero point offset value measurement is selected by entering an axis name.
1: An axis for workpiece zero point offset value measurement is selected by using the cursor.
This parameter is valid when bit 3 (WMA) of parameter No. 5007 is set to 1.

#6 3OC If tool length compensation is not cancelled before 3-dimensional coordinate conversion is specified, an alarm is:
0: Not raised.
1: Raised. (Alarm (PS0049) "ILLEGAL COMMAND(G68,G69)")

#7 3OF If 3-dimensional coordinate conversion is not nested with a command for tool length compensation, or if 3-dimensional coordinate conversion is specified during tool length compensation and another command for tool length compensation is specified:
0: No alarm is issued.
1: The alarm (PS0049) "ILLEGAL COMMAND(G68,G69)" is issued.

Example 1) An alarm is raised in the following cases:

```
1) G68 X_ Y_ Z_ I_ J_ K_ R_ ;
     :
   G43 H1 ;
     :
   G69 ;                          ← PS0049 raised
     :
   G49 ;
2) G43 H1 ;
     :
   G68 X_ Y_ Z_ I_ J_ K_ R_ ;
     :
   G49(G43H2,H2 etc.) ;           ← PS0049 raised
     :
   G69 ;
```

Example 2) No alarm is raised in the following cases:

```
3) G68 X_ Y_ Z_ I_ J_ K_ R_ ;
     :
   G43 H1 ;
     :
   G49 ;
     :
   G69 ;
4) G43 H1 ;
     :
   G68 X_ Y_ Z_ I_ J_ K_ R_ ;
     :
   G69 ;
     :
   G49 ;
```

NOTE

A command to cancel tool length compensation (G28, etc.) will not cause an alarm to be raised. If a command like this is specified in the G68 mode, program as indicated in 3) above.

```
G43 H1 ;
  :
G68 X_ Y_ Z_ I_ J_ K_ R_ ;
  :
G28 X_ Y_ Z_ ;              ← Offset is cancelled.
  :                            No alarm is raised.
G69 ;
```

	#7	#6	#5	#4	#3	#2	#1	#0
5008				MCR	CNV		CNC	

[Input type] Parameter input
[Data type] Bit path

#1 CNC
#3 CNV These bits are used to select an interference check method in the tool radius - tool nose radius compensation mode.

CNV	CNC	Operation
0	0	Interference check is enabled. The direction and the angle of an arc are checked.
0	1	Interference check is enabled. Only the angle of an arc is checked.
1	-	Interference check is disabled.

For the operation taken when the interference check shows the occurrence of an interference (overcutting), see the description of bit 5 (CAV) of parameter No. 19607.

> **NOTE**
> Checking of only the direction cannot be set.

#4 MCR If G41/G42 (tool radius - tool nose radius compensation) is specified in the MDI mode, an alarm is:
0: Not raised.
1: Raised. (Alarm (PS5257) “G41/G42 NOT ALLOWED IN MDI MODE”)

	#7	#6	#5	#4	#3	#2	#1	#0
5009				TSD				GSC
			TIP					

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 GSC When the function for direct input of offset value measured B is used, an offset write input signal is input from:
0: Machine side
1: PMC side
When the interlock function for each axis direction is enabled (when bit 3 (DIT) of parameter No. 3003 is set to 0), switching can also be made between input from the machine side and input from PMC side for the interlock function for each axis direction.

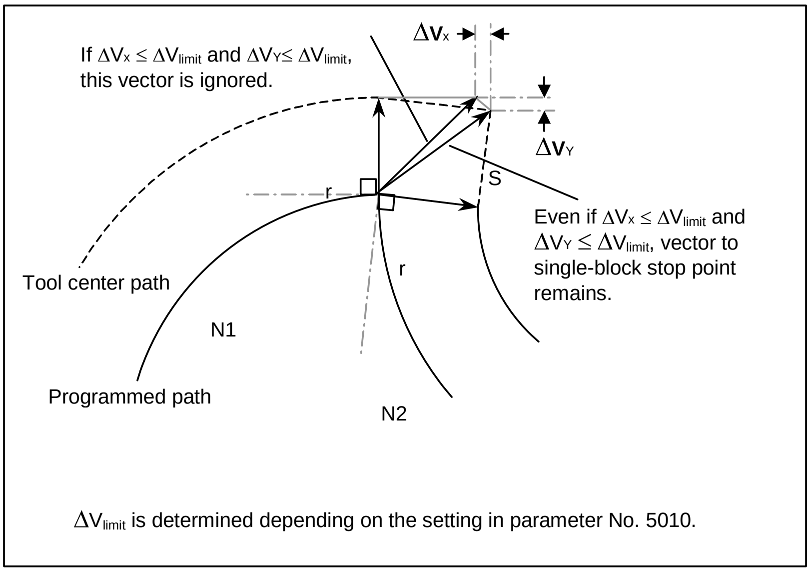
#4 TSD In the function for direct input of offset value measured B, the movement direction determination specifications:
0: Do not apply.
1: Apply.
This parameter is valid when four-contact input is used (bit 3 (TS1) of parameter No. 5004 is set to 0).

#5 TIP In tool radius - tool nose radius compensation, the virtual tool tip direction is:
0: Not used.
1: Used.

5010	Limit for ignoring the small movement resulting from tool radius - tool nose radius compensation

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis

[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
When the tool moves around a corner in cutter compensation or tool nose radius compensation mode, the limit for ignoring the small travel amount resulting from compensation is set. This limit eliminates the interruption of buffering caused by the small travel amount generated at the corner and any change in feedrate due to the interruption.



5011	Constant denominator for 3-dimensional tool compensation or tool length compensation in a specified direction

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the value of p in the expressions used for finding a 3-dimensional tool compensation vector:

$$Vx = i \times r / p$$
$$Vy = j \times r / p$$
$$Vz = k \times r / p$$

Where,
Vx, Vy, Vz : Components of a 3-dimensional tool compensation vector along the X-axis, Y-axis, and Z-axis, or their parallel axes
i, j, k : Values specified in addresses I, J, and K in the program
r : Compensation value
p : Value set in this parameter

When 0 is set in this parameter, the following is assumed:
$$p = \sqrt{I^2 + J^2 + K^2}$$

5013	Maximum value of tool wear compensation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (offset unit)
[Min. unit of data] The increment system of a tool offset value is followed.

[Valid data range] The settings of bits 3 to 0 (OFE, OFD, OFC, and OFA) of parameter No. 5042 are followed.

For metric input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0 to 9999.99mm
0	0	0	0	0 to 9999.999mm
0	0	1	0	0 to 9999.9999mm
0	1	0	0	0 to 9999.99999mm
1	0	0	0	0 to 999.999999mm

For inch input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0 to 999.999inch
0	0	0	0	0 to 999.9999inch
0	0	1	0	0 to 999.99999inch
0	1	0	0	0 to 999.999999inch
1	0	0	0	0 to 99.9999999inch

This parameter sets the maximum allowable tool wear compensation value. If an attempt is made to set a tool wear compensation value, the absolute value of which exceeds the value set in this parameter, the following alarm or warning is output:

Input from MDI	Warning: DATA IS OUT OF RANGE
Input by G10	Alarm (PS0032) “ILLEGAL OFFSET VALUE IN G10”

When 0 or a negative value is set, no maximum allowable value is applied.

[Example] When 30.000 are set
As a tool offset value, a value from -30.000 to +30.000 can be input.

5014	Maximum value of incremental input for tool wear compensation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (offset unit)
[Min. unit of data] The increment system of a tool offset value is followed.
[Valid data range] The settings of bits 3 to 0 (OFE, OFD, OFC, and OFA) of parameter No. 5042 are followed.

For metric input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0 to 9999.99mm
0	0	0	0	0 to 9999.999mm
0	0	1	0	0 to 9999.9999mm
0	1	0	0	0 to 9999.99999mm
1	0	0	0	0 to 999.999999mm

For inch input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0 to 999.999inch
0	0	0	0	0 to 999.9999inch
0	0	1	0	0 to 999.99999inch
0	1	0	0	0 to 999.999999inch
1	0	0	0	0 to 99.9999999inch

Set the maximum allowable value for the tool wear compensation value, input as an incremental value. If the incremental input value (absolute value) exceeds the set value, the following alarm or warning message is output:

Input from MDI	Warning: DATA IS OUT OF RANGE
Input by G10	Alarm (PS0032) “ILLEGAL OFFSET VALUE IN G10.”

When 0 or a negative value is set, no maximum allowable value is applied.

5015	Distance to X-axis + contact surface of touch sensor 1 (X1P)

5016	Distance to X-axis - contact surface of touch sensor 1 (X1M)

5017	Distance to Z-axis + contact surface of touch sensor 1 (Z1P)

5018	Distance to Z-axis - contact surface of touch sensor 1 (Z1M)

5056	Distance to X-axis + contact surface of touch sensor 2 (X2P)

5057	Distance to X-axis - contact surface of touch sensor 2 (X2M)

5058	Distance to Z-axis + contact surface of touch sensor 2 (Z2P)

5059	Distance to Z-axis - contact surface of touch sensor 2 (Z2M)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

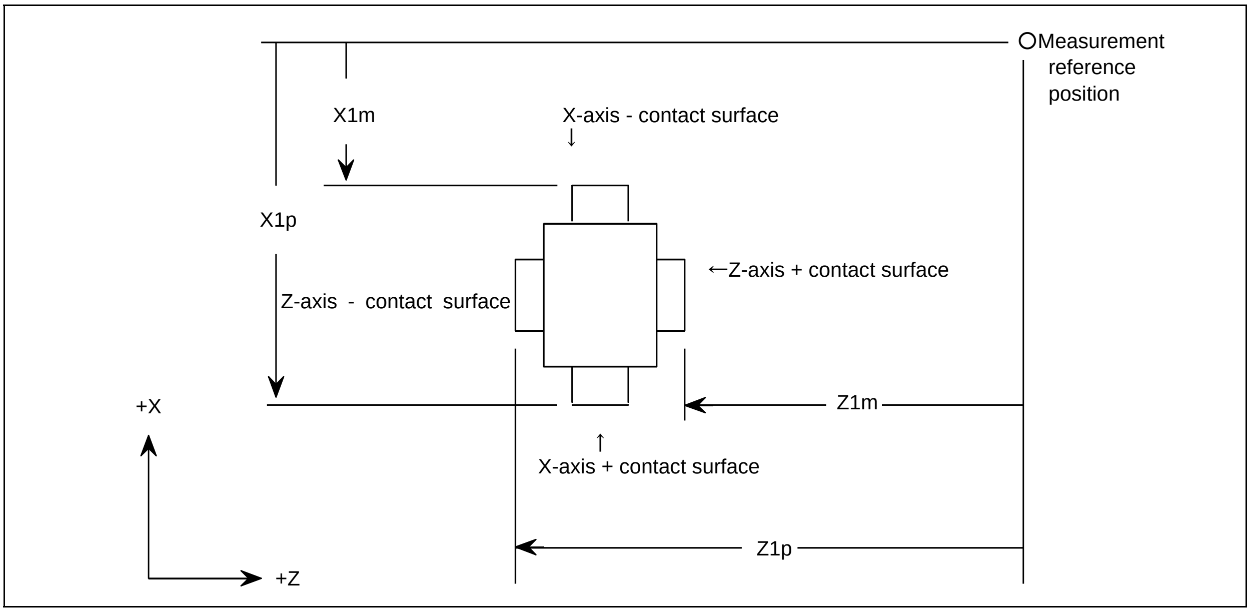
This parameter is related to the function for direct input of offset value measured B.

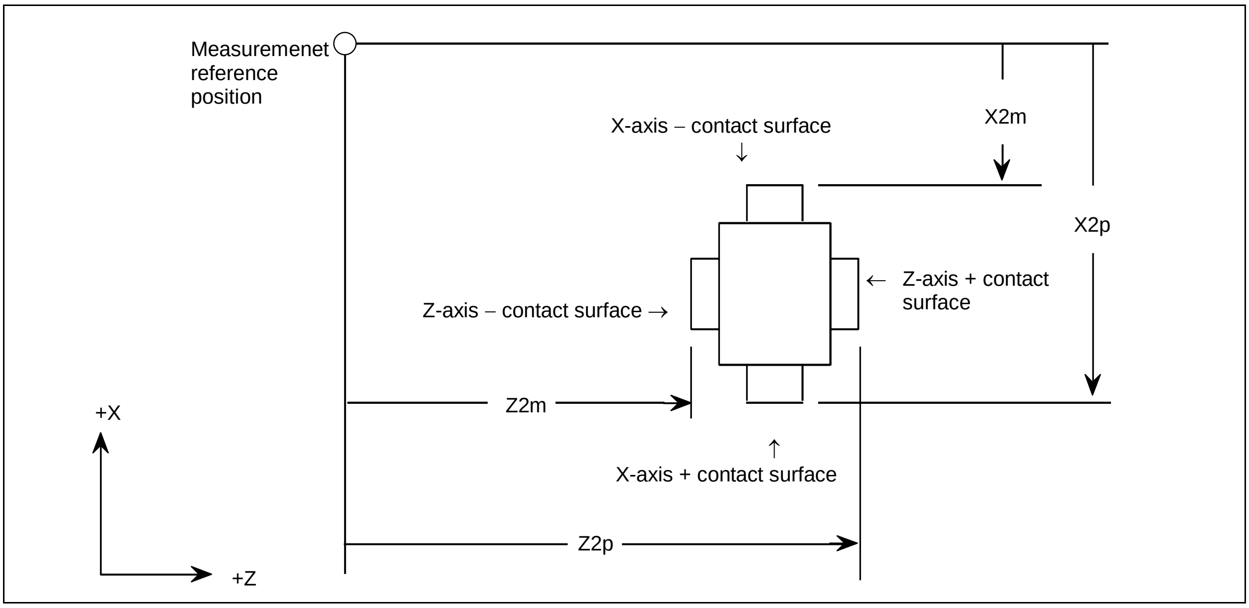
Set the distance (signed) from a measurement reference position to each contact surface of a sensor. For a diameter specification axis, set a diameter value.

When arbitrary angular axis control is performed, set the distance in the Cartesian coordinate system.

NOTE

Parameters Nos. 5056 to 5059 are valid when bit 0 (2NR) of parameter No. 5051 is set to 1.





5019	Chattering prevention distance for direct input of offset value measured B

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

Once a signal is input from the touch sensor, any subsequent signal input from the touch sensor is ignored until a command for movement through a distance longer than or equal to one specified with this parameter is issued. If the parameter setting is 0, this function is disabled. So, signals input from the touch sensor are always acceptable. Re-setting the parameter releases input signals from ignorance.

5020	Tool offset number used with the function for direct input of offset value measured B

[Input type] Parameter input
[Data type] Word path

[Valid data range] 0 to number of tool compensation values

Set a tool offset number used with the function for direct input of offset value measured B (when a workpiece coordinate system shift amount is set). (Set the tool offset number corresponding to a tool under measurement beforehand.) This parameter is valid when automatic tool offset number selection is not performed (when bit 5 (QNI) of parameter No. 5005 is set to 0).

5021	Number of interpolation cycles of pulses stored until the tool is about to touch the touch sensor

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 8

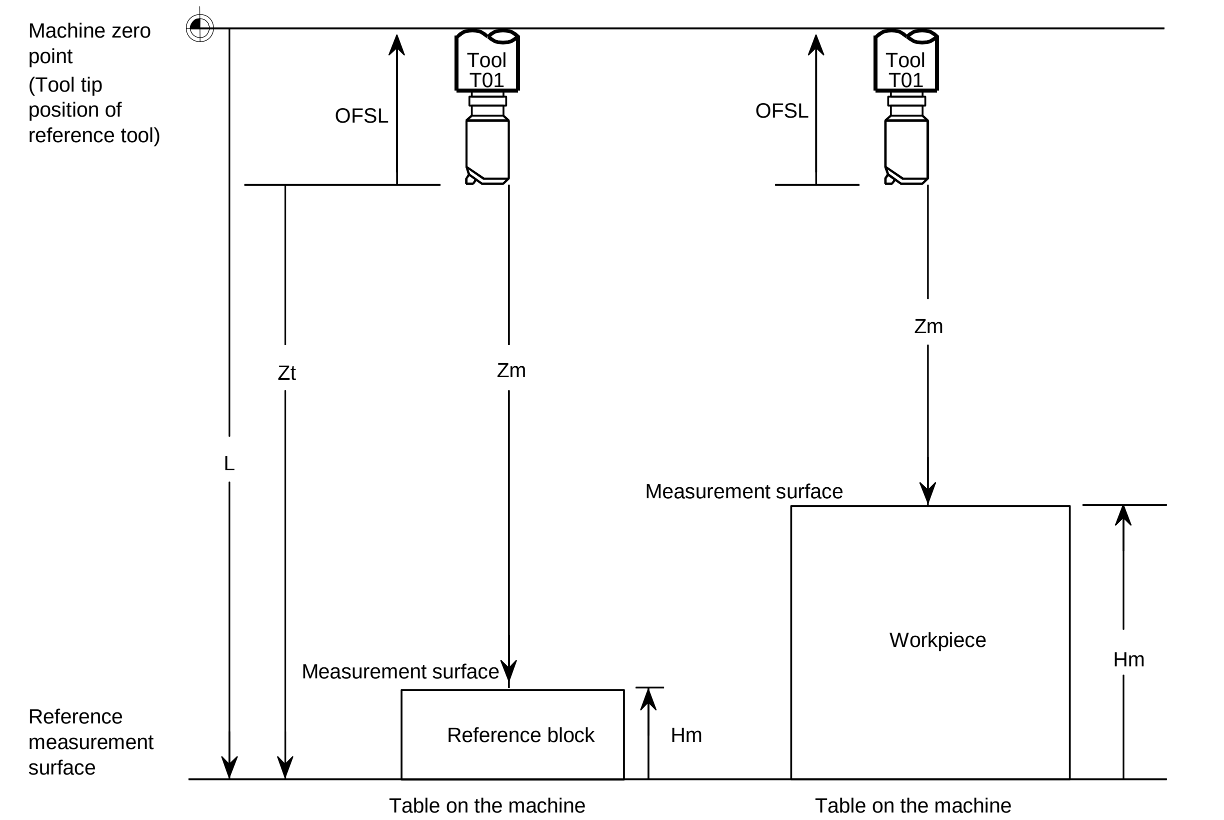
When a touch sensor with one contact signal input is used for the "direct input of tool offset value measured B" function or when the movement direction determination specification is enabled, set the number of interpolation cycles of pulses stored until the tool is about to touch the touch sensor by manual operation. When 0 is set, the specification of the maximum value 8 is assumed.

> **NOTE**
> This parameter is valid when bit 3 (TS1) of parameter No. 5004 or bit 4 (TSD) of parameter No. 5009 is set to 1.

5022	Distance (L) from reference tool tip position to the reference measurement surface

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

For each axis, this parameter sets the distance from the reference tool tip position to the reference measurement surface when the machine is at the machine zero point.



L: Distance from the reference tool tip to the reference measurement surface (machine coordinates of the reference measurement surface)
Hm: Distance from the reference measurement surface to actual measurement surface
Zm: Distance from the tool tip of the measured tool at the machine zero point to the measurement surface
Zt: Distance from the tool tip of the measured tool at the machine zero point to the reference measurement surface
OFSL: Tool length compensation (OFSL = Zm-Hm-L)

5024	Number of tool compensation values

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 999

Set the maximum allowable number of tool compensation values used for each path.
Ensure that the total number of values set in parameter No. 5024 for the individual paths is within the number of compensation values usable in the entire system. The number of compensation values usable in the entire system depends on the option configuration.
If the total number of values set in parameter No. 5024 for the individual paths exceeds the number of compensation values usable in the entire system, or 0 is set in parameter No. 5024 for all paths, the number of compensation values usable for each path is a value obtained by dividing the number of compensation values usable in the entire system by the number of paths.
Tool compensation values as many as the number of compensation values used for each path are displayed on the screen. If tool compensation numbers more than the numbers of compensation values usable for each path are specified, an alarm is issued.
For example, 64 tool compensation sets are used, 20 sets may be allocated to path 1, 30 sets to path 2, and 14 sets to path 3. All of 64 sets need not be used.

5028	Number of digits of an offset number used with a T code command

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 3

Specify the number of digits of a T code portion that is used for a tool offset number (wear offset number when the tool geometry/wear compensation function is used).
When 0 is set, the number of digits is determined by the number of tool compensation values.
When the number of tool compensation values is 1 to 9: Lower 1 digit
When the number of tool compensation values is 10 to 99: Lower 2 digits
When the number of tool compensation values is 100 to 999: Lower 3 digits

[Example] When an offset number is specified using the lower 2 digits of a T code, set 2 in parameter No. 5028.
Txxxxxx yy
xxxxxx : Tool selection
yy : Tool offset number

NOTE
A value longer than the setting of parameter No. 3032 (allowable number of digits of a T code) cannot be set.

5029	Number of tool compensation value memories common to paths

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 999

When using memories common to paths, set the number of common tool compensation values in this parameter.
Ensure that the setting of this parameter does not exceed the number of tool compensation values set for each path (parameter No. 5024).

[Example 1] When parameter No. 5029 = 10, parameter No. 5024 (path 1) = 15, and parameter No. 5024 (path 2) = 30 in a 2-path system, tool compensation numbers 1 to 10 of all paths are made common.

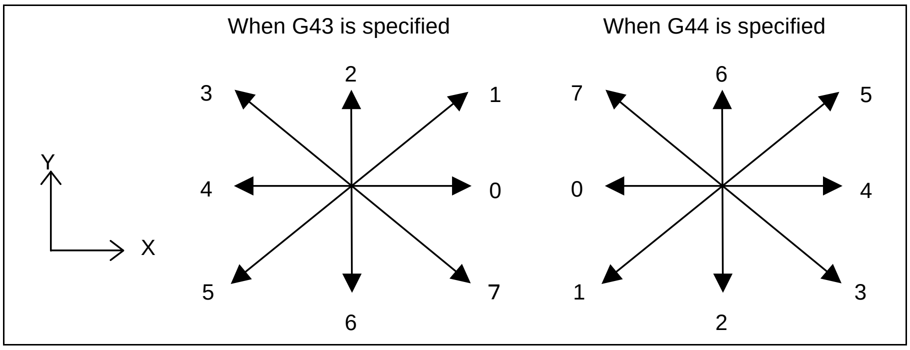
[Example 2] When parameter No. 5029 = 20 and the other conditions are the same as for Example 1, tool compensation numbers 1 to 15 are made common.

NOTE
1. When a multi-path system involving the machining center system and lathe system is used, memories are made common in each system.
2. In each of the machining center system and lathe system, the same unit of tool compensation values needs to be used.

> **NOTE**
> 3 Ensure that the setting of parameter No. 5029 does not exceed the number of tool compensation values for each path (parameter No. 5024). If the setting of parameter No. 5029 exceeds the number of compensation values of a path, the least of the numbers of compensation values in all paths is made common.
> 4 When 0 or a negative value is set, memories common to paths are not used.

5032	Direction of tool offset B

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 7
Specify the offset direction of tool offset B (G43, G44).



Setting value of parameter No. 5032	Offset direction	
	G43	G44
0	X+a	X-a
1	X+a Y+a	X-a Y-a
2	Y+a	Y-a
3	X-a Y+a	X+a Y-a
4	X-a	X+a
5	X-a Y-a	X+a Y+a
6	Y-a	Y+a
7	X+a Y-a	X-a Y+a

a : Offset value set to offset memory number specified by H code

	#7	#6	#5	#4	#3	#2	#1	#0
5033								GOB

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit path

#0 GOB The tool offset B function (for a gas cutting machine) is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
5040	NO4			TLG	TCT	MOF		OWD
						MOF		

[Input type] Parameter input
[Data type] Bit path

#0 OWD In radius programming (bit 1 (ORC) of parameter No. 5004 is set to 1),
0: Tool offset values of both geometry compensation and wear compensation is specified by radius.
1: Tool offset value of geometry compensation is specified by radius and tool offset value of wear compensation is specified by diameter, for an axis of diameter programming.

> **NOTE**
> This parameter is valid when the option for tool geometry/wear compensation is specified.

#2 MOF The DI/DO signals used with the active offset value modification mode based on manual feed are:
0: G297.4, G297.5, G297.6, and F297.5
1: G203.4, G203.5, G203.6, and F199.5

#3 TCT The tool change method is based on:
0: Turret rotation. (Tool change operation is performed with a T command only.)
With a T command, an auxiliary function and tool offset operation are performed.
1: Automatic tool changer (ATC).
(Tool change operation is performed with an M command (such as M06)).
With a T command, an auxiliary function only is performed.
This parameter is valid with a lathe system only.

> ⚠ **WARNING**
> Before changing the setting of this parameter, cancel the offset. If the setting is changed while the offset is applied, the subsequent offset operation may not be performed correctly or an alarm PS0368 occurs.

#4 TLG When tool change operation is performed with the automatic tool changer (when bit 3 (TCT) of parameter No. 5040 is set to 1), tool offset operation is specified by:
0: G43.7.
At this time, G43 and G44 function as G codes for tool length compensation.
1: G43.
At this time, G43.7 and G44.7 function as G codes for tool length compensation.

#7 NO4 4th axis offset function is:
0: Used.
1: Not used.

	#7	#6	#5	#4	#3	#2	#1	#0
5041	NM2	AON					ATP	ACR
	NM2	AON						ACR

[Input type] Parameter input
[Data type] Bit path

#0 ACR When the active offset value modification mode based on manual feed is selected in the reset state or cleared state, the tool compensation value is:
0: Changeable.
1: Not changeable.
- For the M series
In the cleared state (when bit 6 (CLR) of parameter No. 3402 is set to 1), the tool compensation value changeability depends on the setting of bit 7 (CFH) of parameter No. 3409 as indicated below.

	Parameter ACR=0	Parameter ACR=1
Parameter CFH=0	Not changeable	Not changeable
Parameter CFH=1	Changeable	Not changeable

- For the T series
The tool compensation value changeability depends on the settings of this parameter, bit 3 (LVC) of parameter No. 5006, and bit 7 (TGC) of parameter No. 5003 as indicated below.

	Parameter ACR=0	Parameter ACR=1
Parameter LVC=0	Changeable	Not changeable
Parameter LVC=1	Not changeable	
Parameter TGC=0	Changeable	
Parameter TGC=1	Not changeable	

#1 ATP When the tool compensation value in the active offset value modification mode based on manual feed is changed:
0: By moving the tool along the X-axis, Z-axis, and Y-axis, the compensation value for each axis can be changed.

Move axis	Selected offset value	State display
X-axis	X-axis compensation value	TOFS
Z-axis	Z-axis compensation value	TOFS
Y-axis	Y-axis compensation value	TOFS

1: By moving the tool along an arbitrary axis (other than rotation axes), the compensation value can be changed according to the selection of the output signals AOFS1 and AOFS2 <Gn297.5, Gn297.6>.

Output signal		Selected offset value	State display
AOFS2	AOFS1		
0	0	X-axis compensation value	OFSX
0	1	Z-axis compensation value	OFSZ
1	1	Y-axis compensation value	OFSY

> **NOTE**
> Do not change the setting of this parameter in the active offset value modification mode.

#6 AON When the tool compensation value (tool length compensation value used with tool length compensation A/B in the case of the M series) is changed in the active offset value modification mode:

0: In the case of the M series, the change becomes effective starting with the next block specifying G43, G44, or an H code.
In the case of the T series, the change becomes effective starting with the next block specifying a T code.

1: The change becomes effective starting with the next block to be buffered.

> **NOTE**
> 1 This parameter is valid when bit 6 (EVO) of parameter No. 5001 is set to 0.
> 2 The operation of this parameter set to 1 is valid even if a new compensation value is further changed by MDI input or a G10 command before the new compensation value becomes effective.
> 3 The operation of this parameter set to 1 is invalid if a reset operation is performed before a new compensation value becomes effective.

#7 NM2 When a “block not involving movement” is specified in the tool radius compensation offset mode, leading to a possible overcut because of no offset vector being normally created:

0: No alarm is issued.

1: Alarm PS0041, "INTERFERENCE IN CUTTER COMPENSATION", is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
5042					OFE	OFD	OFC	OFA

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 OFA
#1 OFC
#2 OFD
#3 OFE These bits are used to specify the increment system and valid data range of a tool offset value.

For metric input

OFE	OFD	OFC	OFA	Unit	Valid data range
0	0	0	1	0.01mm	±9999.99mm
0	0	0	0	0.001mm	±9999.999mm
0	0	1	0	0.0001mm	±9999.9999mm
0	1	0	0	0.00001mm	±9999.99999mm
1	0	0	0	0.000001mm	±999.999999mm

For inch input

OFE	OFD	OFC	OFA	Unit	Valid data range
0	0	0	1	0.001inch	±999.999inch
0	0	0	0	0.0001inch	±999.9999inch
0	0	1	0	0.00001inch	±999.99999inch

OFE	OFD	OFC	OFA	Unit	Valid data range
0	1	0	0	0.000001inch	±999.999999inch
1	0	0	0	0.0000001inch	±99.9999999inch

5043	Axis number for which Y-axis offset is used

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 24

Set the number of an axis for which the tool offset is corrected.
If 0 or a value beyond the valid data range is set, the Y-axis offset is applied to the Y-axis of the basic three axes. If setting is made for the X- or Z-axis of the basic three axes, the standard tool offset for the X- or Z-axis is not used, and only the Y-axis offset is used.

5044	Axis number for which 4th-axis offset is used

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0, 1 to number of controlled axes

Set the number of an axis for which the 4th-axis offset is used.
When a value ranging from 1 to the number of controlled axes is set in this parameter, the 4th-axis offset is applied to the set axis number. If 0 or a value beyond the valid data range is set, the 4th-axis offset is not used. For the basic two axes X and Z, the standard tool offsets are used, so the 4th-axis offset cannot be used. When the axis set for the Y-axis offset function is set in this parameter, the Y-axis offset is used for the axis, and the 4th-axis offset is not used.

NOTE
When this parameter is set, the power must be turned off before operation is continued.

5045	Axis number for which 5th-axis offset is used

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0, 1 to number of controlled axes

Set the number of an axis for which the 5th-axis offset is used.
When a value ranging from 1 to the number of controlled axes is set in this parameter, the 5th-axis offset is applied to the set axis number. If 0 or a value beyond the valid data range is set, the 5th-axis offset is not used. For the basic two axes X and Z, the standard tool offsets are used, so the 5th-axis offset cannot be used. When the axis set for the Y-axis offset function is set in this parameter, the Y-axis offset is used for the axis, and the 4th-axis offset is not used.
When settings are made so that both the 5th-axis offset and 4th-axis offset apply to the same axis, only the 4th-axis offset is used, and the 5th-axis offset is not used.

NOTE
When this parameter is set, the power must be turned off before operation is continued.

	#7	#6	#5	#4	#3	#2	#1	#0
5051							2AT	2NR

[Input type] Parameter input
[Data type] Bit path

#0 2NR When the direct input of offset value measured B for 2 spindle lathe is used:
0: One touch sensor is used.
1: Two touch sensors are used.

#1 2AT When a workpiece coordinate system shift amount is set in the workpiece coordinate system memory with the direct input of offset value measured B for 2 spindle lathe:
0: A setting is made at the current cursor position.
1: An automatic selection is made.

5053	Tool compensation number shift amount for the direct input of offset value measured B for 2 spindle lathe

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to number of tool compensation values

When the direct input of offset value measured B for 2 spindle lathe is used, tool compensation numbers used to set measured tool compensation values are divided into two groups, one for spindle 1 and the other for spindle 2.

[Example] When there are 32 tool offset pairs

	Setting	
	8	10
Spindle 1	1 to 8	1 to 10
Spindle 2	9 to 32	11 to 32

When this parameter is set to 0 or a value greater than the maximum number of tool offset pairs, the table below is applied.

Number of tool offset pairs	32 pairs	64 pairs	99 pairs	200 pairs	400 pairs	499 pairs	999 pairs
Spindle 1	1 to 16	1 to 32	1 to 49	1 to 100	1 to 200	1 to 249	1 to 499
Spindle 2	17 to 32	33 to 64	50 to 98	101 to 200	201 to 400	250 to 498	500 to 998

5054	Workpiece coordinate system memory for spindle 1

5055	Workpiece coordinate system memory for spindle 2

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 54 to 59

Specify a workpiece coordinate system from G54 to G59 for which a workpiece coordinate system shift amount is set. When parameter No. 5054 or No. 5055 is set to 0 or a value beyond the valid data range, the specification of 54 is assumed for the workpiece coordinate system memory for spindle 1, or the specification of 57 is assumed for the workpiece coordinate system memory for spindle 2.

NOTE
These parameters are valid when bit 1 (2AT) of parameter No. 5051 is set to 1.

5071	Number of first axis for grinding –wheel wear compensation

5072	Number of second axis for grinding–wheel wear compensation

[Input type] Parameter Input
[Data type] Byte path
[Valid data range] 1 to number of controlled axis
This parameter specifies the controlled axis numbers of the first and second axis for which grinding-wheel wear compensation is applied.

5081	1st-axis coordinate value of compensation center 1 in grinding-wheel wear compensation

5082	2nd-axis coordinate value of compensation center 1 in grinding-wheel wear compensation

5083	1st-axis coordinate value of compensation center 2 in grinding-wheel wear compensation

5084	2nd-axis coordinate value of compensation center 2 in grinding-wheel wear compensation

5085	1st-axis coordinate value of compensation center 3 in grinding-wheel wear compensation

5086	2nd-axis coordinate value of compensation center 3 in grinding-wheel wear compensation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate value (in the workpiece coordinate system) of the center of compensation in grinding-wheel wear compensation.

4.25 PARAMETERS OF CANNED CYCLES

4.25.1 Parameters of Canned Cycle for Drilling (1 of 2)

	#7	#6	#5	#4	#3	#2	#1	#0
5101						RTR	EXC	FXY
	M5B						EXC	FXY

[Input type] Parameter input
[Data type] Bit path

#0 FXY The drilling axis in the drilling canned cycle, or cutting axis in the grinding canned cycle is:

0: In case of the Drilling canned cycle:
   Z-axis at all times.
   In case of the Grinding canned cycle:
   - For the Lathe system
     X-axis at all times.
   - For the Machining Center system
     G75, G77 command: Y-axis
     G78, G79 command: Z-axis

1: Axis selected by the program

> **NOTE**
> In the case of the T series, this parameter is valid only for the drilling canned cycle in the Series 15 format.

#1 EXC G81

0: Specifies a drilling canned cycle
1: Specifies an external operation command

#2 RTR G83 and G87

0: Specify a high-speed peck drilling cycle
1: Specify a peck drilling cycle

#7 M5B In drilling canned cycles G76 and G87:

0: Outputs M05 before an oriented spindle stops
1: Not output M05 before an oriented spindle stops

	#7	#6	#5	#4	#3	#2	#1	#0
5102	RDI	RAB			F16	QSR		
						QSR		

[Input type] Parameter input
[Data type] Bit path

#2 QSR Before a multiple repetitive canned cycle (G70 (T series), G70.7 (M series) to G73 (T series), G73.7 (M series)) is started, a check to see if the program contains a block that has the sequence number specified in address Q is:

0: Not made.
1: Made.

When 1 is set in this parameter and the sequence number specified in address Q is not found, the alarm PS0063, “THE BLOCK OF A SPECIFIED SEQUENCE NUMBER IS NOT FOUND” is issued and the canned cycle is not executed.

#3 F16 When the Series 15 format is used (with bit 1 (FCV) of parameter No.0001 set to 1), a canned drilling cycle is specified using :

0: Series 15 format
1: Series 16 format. However, the number of repetitions is specified using address L.

#6 RAB When a canned drilling cycle using the Series 15 format is specified (with bit 1 (FCV) of parameter No. 0001 set to 1 and bit 3 (F16) of parameter No. 5102 set to 0), address R specifies:
0: Increment command.
1: Absolute command with G code system A. With G code system B or C, G90 and G91 are followed.

#7 RDI When a canned drilling cycle using the Series 15 format is specified (with bit 1 (FCV) of parameter No. 0001 set to 1 and bit 3 (F16) of parameter No. 5102 set to 0), address R is based on:
0: Radius specification.
1: Diameter/radius specification of the drilling axis.

	#7	#6	#5	#4	#3	#2	#1	#0
5103		TCZ			PNA	DCY		
		TCZ				DCY		SIJ

[Input type] Parameter input
[Data type] Bit path

#0 SIJ When the Series 15 program format is used (with bit 1 (FCV) of parameter No.0001 set to 1), a tool shift value for the drilling canned cycle G76 or G87 is specified by:
0: Address Q. Set a tool retraction direction in parameter No. 5148.
1: Address I, J, or K.

#2 DCY When an axis (to be used as a drilling axis) perpendicular to the positioning plane is specified in a drilling canned cycle:
0: The specified axis is used as a drilling axis.
1: The axis specified in the block where the G code for the drilling canned cycle is specified is used as a drilling axis. The specified axis is used as a positioning axis.

NOTE
This parameter is valid when bit 0 (FXY) of parameter No. 5101 is set to 1.

#3 PNA In a drilling canned cycle using the Series 15 format (with bit 1 (FCV) of parameter No. 0001 set to 1 and bit 3 (F16) of parameter No. 5102 set to 0), when a plane where no axis is present is specified in the drilling canned cycle mode:
0: An alarm is issued.
1: No alarm is issued.

#6 TCZ In a tapping cycle (excluding rigid tapping), an accumulated zero check in the tapping step (forward, backward) is:
0: Not performed.
1: Performed.

Execute a tapping cycle (excluding rigid tapping) with the servo feed forward (bit 1 (FEED) of parameter No. 2005). If an impact is detected, set this parameter to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
5104						FCK		
						FCK		

[Input type] Parameter input

[Data type] Bit path

#2 FCK In a multiple repetitive canned cycle (G71 (T series), G71.7 (M series), G72 (T series), G72.7 (M series)), the machining profile is:
0: Not checked.
1: Checked.
The target figure specified by G71, G71.7, G72, or G72.7 is checked for the following before machining operation:

- If the start point of the canned cycle is less than the maximum value of the machining profile even when the plus sign is specified for a finishing allowance, the alarm PS0322, "FINISHING SHAPE WHICH OVER OF STARTING POINT" is issued.
- If the start point of the canned cycle is greater than the minimum value of the machining profile even when the minus sign is specified for a finishing allowance, the alarm PS0322 is issued.
- If an unmonotonous command of type I is specified for the axis in the cutting direction, the alarm PS0064, "THE FINISHING SHAPE IS NOT A MONOTONOUS CHANGE(FIRST AXES)" or PS0329, "THE FINISHING SHAPE IS NOTA MONOTONOUS CHANGE(SECOND AXES)" is issued.
- If an unmonotonous command is specified for the axis in the roughing direction, the alarm PS0064 or PS0329 is issued.
- If the program does not include a block that has a sequence number specified by address Q, the alarm PS0063, "THE BLOCK OF A SPECIFIED SEQUENCE NUMBER IS NOT FOUND" is issued. This check is made, regardless of bit 2 (QSR) of parameter No. 5102.
- If a command (G41/G42) on the blank side in tool nose radius compensation is inadequate, the alarm PS0328, "ILLEGAL WORK POSITION IS IN THE TOOL NOSE RADIUS COMPENSATION" is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
5105		GIJ	TFA	K0D	M5T	RF2	RF1	SBC
		GIJ	TFA		M5T	RF2	RF1	SBC

[Input type] Parameter input
[Data type] Bit path

#0 SBC In a drilling canned cycle, chamfer cycle, or corner rounding cycle:
0: A single block stop is not performed.
1: A single block stop is performed.

#1 RF1 In a multiple repetitive canned cycle (G71 (T series), G71.7 (M series), G72 (T series), G72.7 (M series)) of type I, roughing is:
0: Performed.
1: Not performed.

> **NOTE**
> When a roughing allowance (Δi/Δk) is specified using the Series 15 program format, roughing is performed, regardless of the setting of this parameter.

#2 RF2 In a multiple repetitive canned cycle (G71 (T series), G71.7 (M series), G72 (T series), G72.7 (M series)) of type II, roughing is:
0: Performed.
1: Not performed.

> **NOTE**
> When a roughing allowance (∆i/∆k) is specified using the Series 15 program format, roughing is performed, regardless of the setting of this parameter.

#3 M5T When the rotation direction of the spindle is changed from forward rotation to reverse rotation or from reserve rotation to forward rotation in a tapping cycle (G84/G88 with the T series, or G84/G74 with the M series):
0: M05 is output before output of M04 or M03.
1: M05 is not output before output of M04 or M03.

#4 K0D When K0 is specified in a drilling canned cycle (G80 to G89):
0: Drilling operation is not performed, but drilling data only is stored.
1: One drilling operation is performed.

#5 TFA During tool center point control or tool length compensation in tool axis direction, canned cycles:
0: Cannot be used.
1: Can be used. However, an alarm PS5424, "ILLEGAL TOOL DIRECTION" is issued if the position of the rotation axis is not ±90° × n (n=0, 1, 2, ...) in the workpiece coordinate system.

#6 GIJ When a grinding canned cycle in the machining center system is executed, if the signs of I, J, and K are different:
0: An alarm is issued.
1: An operation compatible with the FS16i is performed.

	#7	#6	#5	#4	#3	#2	#1	#0
5106					NT2	NT1		GFX
					NT2	NT1		

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 GFX When the options of multiple respective canned cycle and grinding canned cycle are both specified, G71/G72/G73/G74 commands are:
0: Multiple respective canned cycle.
1: Grinding canned cycle.

#2 NT1 In the multiple repetitive cycle G71/G72/G73 (G-code system A), when the tool nose radius compensation G40/G41/G42 is commanded in the target figure program:
0: The alarm PS0325 is occurred.
1: No alarm is occurred. However, the tool nose radius compensation command in the target figure program is ignored.

#3 NT2 In the multiple repetitive cycle G70 (G-code system A), when the tool nose radius compensation G40/G41/G42 is commanded in the target figure program:
0: The alarm PS0325 is occurred.
1: No alarm is occurred. The tool nose radius compensation command is valid.

> **NOTE**
> Make the program by following ways to enable the tool nose radius compensation in the finishing cycle G70 by commanded the tool nose radius compensation in the target figure program.
> - The tool nose radius compensation cancel G40 is selected as the modal when the finishing cycle G70 is commanded.
> - Command G41/G42 at the first block of the target figure program (commanded by P address).
> - Command G40 at the last block of the target figure program (commanded by Q address).

	#7	#6	#5	#4	#3	#2	#1	#0
5107				ICS			ASC	ASU
				ICS			ASC	ASU

[Input type] Parameter input
[Data type] Bit path

#0 ASU For G71 (T series), G71.7 (M series), G72 (T series), or G72.7 (M series), movement to the last turning start position is performed by:
0: Cutting feed.
1: Rapid traverse.

For two-cycle operation to move toward the current turning start position, this parameter selects the feed in the first cycle (movement to the last turning start position). The feed in the second cycle (movement from the last turning start position to the current turning start position) follows the feed in the first block of the shape program.
This parameter is valid to both of type-I and type-II commands.

#1 ASC The G71/G72 and G71.7/G72.7 TYPE1 commands execute the movement toward the current turning start position in:
0: Two cycles.
1: One cycle.

You can change the two-cycle operation to move to the current turning start position from two cycles to one cycle. The feed mode follows the mode (G00, G01) in the first block of the shape program. This parameter is valid only to type-I commands.

#4 ICS In-position check switching function for drilling canned cycle is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
5108					NSP		DTP	R16
		SPH			NSP		DTP	R16

[Input type] Parameter input
[Data type] Bit path

#0 R16 In the cutting up movement of the multiple repetitive cycle G71/G72 (G-code system A) of type Ⅱ, if there is the block that commands just the movement of the first axis on the plane in the finishing shape:

0: The cutting up movement is executed before the cutting of the first axis on the plane.
1: The cutting up movement does not be executed and the cutting is continued along the finishing shape of the first axis on the plane.

#1 DTP In the multiple repetitive cycle G71/G72 (G-code system A) of type I, after rough cutting of the finishing shape program is finished, the tool return to the cycle start point:

0: After the tool moves to (cycle start point + distance of the finishing allowance) in order X-axis, Z-axis.
1: Directly from the end point of the finishing program.

#3 NSP In the multiple repetitive cycle G71/G72 (G-code system A) of type II, the cutting is executed:

0: By conventional path. (The same cutting path might be executed.)
1: Not to repeat the same cutting path.

#6 SPH When positioning the axes to hole position in Small-hole peck drilling cycle, the spindle is:

0: Stopped.
1: Not stopped.

5110	M code for C-axis clamping in canned cycles for drilling

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999998

This parameter sets the M code for C-axis clamping in canned cycles for drilling.

> **NOTE**
> When bit 4 (CME) of parameter No. 5161 is 1, the M code for C-axis clamping for the first pair is assumed.

5111	Dwell time when C-axis unclamping is specified in drilling canned cycle

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 32767
[Unit of data]

Increment system	IS-A	IS-B	IS-C	IS-D	IS-E	Unit
	10	1	0.1	0.01	0.001	msec

(The increment system does not depend on whether inch input or metric input is used.)

This parameter sets the dwell time when C-axis unclamping is specified in a drilling canned cycle.

5112	Spindle forward-rotation M code in drilling canned cycle

[Input type] Parameter input

[Data type] 2-word path
[Valid data range] 0 to 99999999
This parameter sets the spindle forward-rotation M code in a drilling canned cycle.

> **NOTE**
> M03 is output when 0 is set.

5113	Spindle reverse-rotation M code in drilling canned cycle

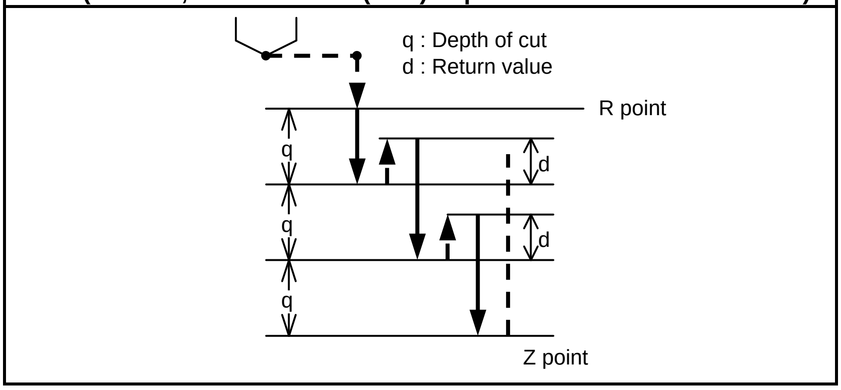
[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999
This parameter sets the spindle reverse-rotation M code in a drilling canned cycle.

> **NOTE**
> M04 is output when 0 is set.

5114	Return value of high-speed peck drilling cycle

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the return value in high-speed peck drilling cycle.

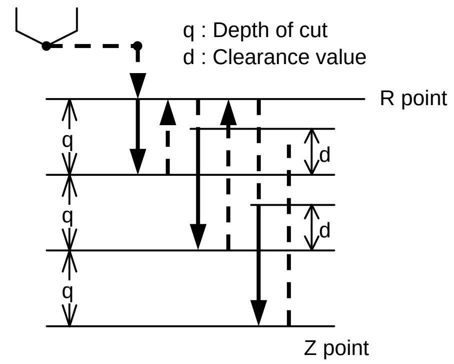
G73 (M series)
G83 (T series, when the bit 2 (RTR) of parameter No. 5101 is set to 0)



5115	Clearance value in a peck drilling cycle

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a clearance value in a peck drilling cycle.

G83 (M series)
G83 (T series, when the bit 2 (RTR) of parameter No. 5101 is set to 1)



4.25.2 Parameters of Thread Cutting Cycle

5130	**Cutting value (chamfering value) in thread cutting cycles G92 and G76**
	Cutting value (chamfering value) in thread cutting cycle G76.7

[Input type] Parameter input
[Data type] Byte path
[Unit of data] 0.1
[Valid data range] 0 to 127

This parameter sets a cutting value (chamfering value) in the thread cutting cycle (G76/G76.7) of a multiple repetitive canned cycle and in the thread cutting cycle (G92) of a canned cycle.
Let L b a lead. Then, a cutting value range from 0.1L to 12.7L is allowed.
To specify a cutting value of 10.0L, for example, specify 100 in this parameter.

5131	**Cutting angle in thread cutting cycles G92 and G76**
	Cutting angle in thread cutting cycle G76.7

[Input type] Parameter input
[Data type] Byte path
[Unit of data] Degree
[Valid data range] 1 to 89

This parameter sets a thread cutting angle in a thread cutting cycle (G92/G76/G76.7).
When 0 is set, an angle of 45 degrees is specified.

4.25.3 Parameters of Multiple Repetitive Canned Cycle

5132	**Depth of cut in multiple repetitive canned cycles G71 and G72**
	Depth of cut in multiple repetitive canned cycles G71.7 and G72.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the depth of cut in multiple repetitive canned cycles G71 and G72 or G71.7 and G72.7.
This parameter is not used with the Series 15 program format.

> **NOTE**
> Specify a radius value at all times.

5133	Escape in multiple repetitive canned cycles G71 and G72
	Escape in multiple repetitive canned cycles G71.7 and G72.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the escape in multiple repetitive canned cycles G71 and G72 or G71.7 and G72.7.

> **NOTE**
> Specify a radius value at all times.

5134	Clearance value in multiple repetitive canned cycles G71 and G72
	Clearance value in multiple repetitive canned cycles G71.7 and G72.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets a clearance value up to the cutting feed start point in multiple repetitive canned cycles (G71/G72 or G71.7/G72.7).

> **NOTE**
> Specify a radius value at all times.

5135	Retraction distance in the multiple repetitive canned cycle G73 (second axis on the plane)
	Retraction distance in the multiple repetitive canned cycle G73.7 (second axis on the plane)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a retraction distance along the second axis on the plane in the multiple repetitive canned cycle G73 or G73.7. This parameter is not used with the Series 15 program format.

> **NOTE**
> Specify a radius value at all times.

5136	Retraction distance in the multiple repetitive canned cycle G73 (first axis on the plane)
	Retraction distance in the multiple repetitive canned cycle G73.7 (first axis on the plane)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a retraction distance along the first axis on the plane in the multiple repetitive canned cycle G73 or G73.7. This parameter is not used with the Series 15 program format.

NOTE
Specify a radius value at all times.

5137	Number of divisions in the multiple repetitive canned cycle G73
	Number of divisions in the multiple repetitive canned cycle G73.7

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Cycle
[Valid data range] 1 to 99999999
This parameter sets the number of divisions in the multiple repetitive canned cycle G73 or G73.7.
This parameter is not used with the Series 15 program format.

5139	Return in multiple repetitive canned cycles G74 and G75
	Return in multiple repetitive canned cycles G74.7 and G75.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the return in multiple repetitive canned cycles G74 and G75 or G74.7 and G75.7.

NOTE
Specify a radius value at all times.

5140	Minimum depth of cut in the multiple repetitive canned cycle G76
	Minimum depth of cut in the multiple repetitive canned cycle G76.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets a minimum depth of cut in the multiple repetitive canned cycle G76 or G76.7 so that the depth of cut does not become too small when the depth of cut is constant.

> **NOTE**
> Specify a radius value at all times.

5141	Finishing allowance in the multiple repetitive canned cycle G76
	Finishing allowance in the multiple repetitive canned cycle G76.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the finishing allowance in multiple repetitive canned cycle G76 or G76.7.

> **NOTE**
> Specify a radius value at all times.

5142	Repetition count of final finishing in multiple repetitive canned cycle G76
	Repetition count of final finishing in multiple repetitive canned cycle G76.7

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Cycle
[Valid data range] 1 to 99999999
This parameter sets the number of final finishing cycle repeats in the multiple repetitive canned cycle G76 or G76.7.
When 0 is set, only one final finishing cycle is executed.

5143	Tool nose angle in multiple repetitive canned cycle G76
	Tool nose angle in multiple repetitive canned cycle G76.7

[Input type] Parameter input
[Data type] Byte path
[Unit of data] Degree
[Valid data range] 0, 29, 30, 55, 60, 80
This parameter sets the tool nose angle in multiple repetitive canned cycle G76 or G76.7.
This parameter is not used with the Series 15 program format.

5145	Allowable value 1 in multiple repetitive canned cycles G71 and G72
	Allowable value 1 in multiple repetitive canned cycles G71.7 and G72.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

If a monotonous command of type I or II is not specified for the axis in the roughing direction, the alarm PS0064, “THE FINISHING SHAPE IS NOT A MONOTONOUS CHANGE(FIRST AXES)” or PS0329, “THE FINISHING SHAPE IS NOTA MONOTONOUS CHANGE(SECOND AXES)” is issued. When a program is created automatically, a very small unmonotonous figure may be produced. Set an unsigned allowable value for such an unmonotonous figure. By doing so, G71 and G72 or G71.7 and G72.7 cycles can be executed even in a program including an unmonotonous figure.

[Example] Suppose that a G71 or G71.7 command where the direction of the cutting axis (X-axis) is minus and the direction of the roughing axis (Z-axis) is minus is specified. In such a case, when an unmonotonous command for moving 0.001 mm in the plus direction along the Z-axis is specified in a target figure program, roughing can be performed according to the programmed figure without an alarm by setting 0.001 mm in this parameter.

NOTE

A check for a monotonous figure is made at all times during G71 and G72 or G71.7 and G72.7 cycles. A figure (programmed path) is checked. When tool nose radius compensation is performed, a path after compensation is checked. When bit 2 (FCK) of parameter No. 5104 is set to 1, a check is made before G71, G72, G71.7, or G72.7 cycle operation. In this case, not a path after tool nose radius compensation but a programmed path is checked. Note that no alarm is issued when an allowable value is set. Use a radius value to set this parameter at all times.

5146	Allowable value 2 in multiple repetitive canned cycles G71 and G72
	Allowable value 2 in multiple repetitive canned cycles G71.7 and G72.7

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to cut of depth

If a monotonous command of type I is not specified for the axis in the cutting direction, the alarm PS0064, “THE FINISHING SHAPE IS NOT A MONOTONOUS CHANGE(FIRST AXES)” or PS0329, “THE FINISHING SHAPE IS NOTA MONOTONOUS CHANGE(SECOND AXES)” is issued. When a program is created automatically, a very small unmonotonous figure may be produced. Set an unsigned allowable value for such an unmonotonous figure. By doing so, G71 and G72 or G71.7 and G72.7 cycles can be executed even in a program including an unmonotonous figure.
The allowable value is clamped to the depth of cut specified by a multiple repetitive canned cycle.

[Example] Suppose that a G71 or G71.7 command where the direction of the cutting axis (X-axis) is minus and the direction of the roughing axis (Z-axis) is minus is specified. In such a case, when an unmonotonous command for moving 0.001 mm in the minus direction along the X-axis is specified in a target figure program for moving from the bottom of cutting to the end point, roughing can be performed according to the programmed figure without an alarm by setting 0.001 mm in this parameter.

> **NOTE**
> A check for a monotonous figure is made at all times during G71 and G72 or G71.7 and G72.7 cycles. A figure (programmed path) is checked. When tool nose radius compensation is performed, a path after compensation is checked. When bit 2 (FCK) of parameter No. 5104 is set to 1, a check is made before G71, G72, G71.7, or G72.7 cycle operation. In this case, not a path after tool nose radius compensation but a programmed path is checked.
> Note that no alarm is issued when an allowable value is set.
> Use a radius value to set this parameter at all times.

4.25.4 Parameters of Canned Cycle for Drilling (2 of 2)

5148	Tool retraction direction after orientation in a fine boring cycle or back boring cycle

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] -24 to 24

This parameter sets an axis and direction for tool retraction after spindle orientation in a fine boring cycle or back boring cycle. For each boring axis, an axis and direction for tool retraction after orientation can be set. Set a signed axis number. To use a fine boring cycle or back boring cycle in the tilted working plane indexing, set the retract direction when the absolute coordinate value of the rotation axis is 0.

[Example] Suppose that:
When the boring axis is the X-axis, the tool retraction direction after orientation is -Y.
When the boring axis is the Y-axis, the tool retraction direction after orientation is +Z.
When the boring axis is the Z-axis, the tool retraction direction after orientation is -X.
Then, set the following (assuming that the first, second, and third axes are the X-axis, Y-axis, and Z-axis, respectively):
Set -2 in the parameter for the first axis. (The tool retraction direction is -Y.)
Set 3 in the parameter for the second axis. (The tool retraction direction is +Z.)
Set -1 in the parameter for the third axis. (The tool retraction direction is -X.)
Set 0 for other axes.

5149	Override for retraction in a boring cycle (G85/G89)

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 0 to 2000

This parameter sets an override value for the feedrate of retraction in a boring cycle. The cutting feedrate override signal and the second feedrate override signal are valid, regardless of the setting of this parameter. The setting of this parameter is valid even when the override cancel signal is set to 1.
When 0 is set in this parameter, the following operation is performed:
For the T series
Operation performed when 200 is set in this parameter (The retraction feedrate is two times greater than the cutting feedrate.)
For the M series
Operation performed when 100 is set in this parameter (The retraction feedrate is the cutting feedrate.)

	#7	#6	#5	#4	#3	#2	#1	#0
5160					CYM			
				TSG	CYM	NOL	OLS	

[Input type] Parameter input
[Data type] Bit path

#1 OLS When an overload torque detection signal is received in a peck drilling cycle of a small diameter, the feedrate and spindle speed are:
0: Not changed.
1: Changed.

#2 NOL When the depth of cut per action is satisfied although no overload torque detection signal is received in a peck drilling cycle of a small diameter, the feedrate and spindle speed are:
0: Not changed.
1: Changed.

#3 CYM When a subprogram call is specified in a block specifying other commands in the canned cycle mode:
0: No alarm is issued. (When a command of address P is specified, the command is handled as both a command specifying a dwell time and a command specifying a subprogram number in a canned cycle.)
1: An alarm is issued.

#4 TSG The overload torque detection signal for a small-hole peck drilling cycle:
0: Depends on the parameter settings for the skip function.
1: Does not depend on the parameter settings for the skip function.

When this parameter is set to 1, the X address can be used for the overload torque signal even with the skip signal setting disabled. Even when the overload torque detection signal does not depend on the skip function parameter settings, parameter No. 3012 and bit 1 (SK0) of parameter No. 6200 remain valid.

	#7	#6	#5	#4	#3	#2	#1	#0
5161				CME				

[Input type] Parameter input
[Data type] Bit path

#4 CME For drilling canned cycles, the M code for C-axis clamping/unclamping is set to:
0: Value set by parameter No. 5110/value set by parameter No. 5110 + 1.
1: Value set by parameter No. 5110/value set by parameter No. 13543 (first pair), or the value set by parameter No. 13544/value set by parameter No. 13545 (second pair).

5163	M code that specifies the peck drilling cycle mode of a small diameter

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 99999999
This parameter sets an M code that specifies the peck drilling cycle mode of a small diameter.

5164	Percentage of the spindle speed to be changed at the start of the next advancing after an overload torque detection signal is received

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the spindle speed to be changed at the start of the next advancing after the tool is retracted because the overload torque detection signal is received.

$S2 = S1 \times d1 \div 100$

S1: Spindle speed to be changed
S2: Spindle speed changed

Set d1 as a percentage.

NOTE
When 0 is set, the spindle speed is not changed.

5165	Percentage of the spindle speed to be changed at the start of the next advancing when no overload torque detection signal is received

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the spindle speed to be changed at the start of the next advancing after the tool is retracted without the overload torque detection signal received.

$S2 = S1 \times d2 \div 100$

S1: Spindle speed to be changed
S2: Spindle speed changed

Set d2 as a percentage.

NOTE
When 0 is set, the spindle speed is not changed.

5166	Percentage of the cutting feedrate to be changed at the start of the next cutting after an overload torque detection signal is received

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the cutting feedrate to be changed at the start of cutting after the tool is retracted and advances because the overload torque detection signal is received.

$F2 = F1 \times b1 \div 100$

F1: Cutting feedrate to be changed
F2: Cutting feedrate changed

Set b1 as a percentage.

> **NOTE**
> When 0 is set, the cutting feedrate is not changed.

5167	Percentage of the cutting feedrate to be changed at the start of the next cutting when no overload torque detection signal is received

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the cutting feedrate to be changed at the start of cutting after the tool is retracted and advances without the overload torque detection signal received.

F2 = F1 × b2 ÷ 100

F1: Cutting feedrate to be changed
F2: Cutting feedrate changed

Set b2 as a percentage.

> **NOTE**
> When 0 is set, the cutting feedrate is not changed.

5168	Lower limit of the percentage of the cutting feedrate in a peck drilling cycle of a small diameter

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the lower limit of the percentage of the cutting feedrate changed repeatedly to the specified cutting feedrate.

FL = F × b3 ÷ 100

F: Specified cutting feedrate
FL: Changed cutting feedrate

Set b3 as a percentage.

5170	Number of the macro variable to which to output the total number of retractions during cutting

[Input type] Parameter input
[Data type] Word path
[Valid data range] 100 to 149

This parameter sets the number of the custom macro common variable to which to output the total number of times the tool is retracted during cutting. The total number cannot be output to common variables #500 to #599.

5171	Number of the macro variable to which to output the total number of retractions because of the reception of an overload torque detection signal

[Input type] Parameter input
[Data type] Word path
[Valid data range] 100 to 149

This parameter sets the number of the custom macro common variable to which to output the total number of times the tool is retracted after the overload torque detection signal is received during cutting. The total number cannot be output to common variables #500 to #599.

5172	Feedrate of retraction to point R when no address I is specified

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets the feedrate of retraction to point R when no address I is specified.

5173	Feedrate of advancing to the position just before the bottom of a hole when no address I is specified

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets the feedrate of advancing to the position just before the bottom of a previously machined hole when no address I is specified.

5174	Clearance in a peck drilling cycle of a small diameter

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the clearance in a peck drilling cycle of a small diameter.

4.25.5 Parameters of Canned Cycle for Grinding (for Grinding Machine)

5176	Grinding axis number in Traverse Grinding Cycle(G71)
	Grinding axis number in Plunge Grinding Cycle(G75)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes
For the Lathe system:
Set the Grinding axis number of Traverse Grinding Cycle(G71).
For the Machining Center system:
Set the Grinding axis number of Plunge Grinding Cycle(G75).

> **NOTE**
> The axis number except for the cutting axis can be specified. When the axis number which is same to cutting axis is specified, an alarm PS0456, "ILLEGAL PARAMETER IN GRINDING" is issued at the time of execution. The Grinding Cycle is executed when this parameter value is 0, the alarm PS0456 is also issued.

5177	Grinding axis number of Traverse direct constant-size Grinding cycle(G72)
	Grinding axis number of Direct Constant Dimension Plunge Grinding Cycle(G77)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

For the Lathe system:
Set the Grinding axis number of Traverse direct constant-size Grinding cycle(G72).
For the Machining Center system:
Set the Grinding axis number of Direct Constant Dimension Plunge Grinding Cycle (G77).

> **NOTE**
> The axis number except for the cutting axis can be specified. When the axis number which is same to cutting axis is specified, an alarm PS0456, "ILLEGAL PARAMETER IN GRINDING" is issued at the time of execution. The Grinding Cycle is executed when this parameter value is 0, the alarm PS0456 is also issued.

5178	Grinding axis number of Oscillation Grinding Cycle(G73)
	Grinding axis number of Continuous feed surface grinding cycle(G78)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

For the Lathe system:
Set the Grinding axis number of Oscillation Grinding Cycle(G73).
For the Machining Center system:
Set the Grinding axis number of Continuous feed surface grinding cycle(G78).

> **NOTE**
> The axis number except for the cutting axis can be specified. When the axis number which is same to cutting axis is specified, an alarm PS0456, "ILLEGAL PARAMETER IN GRINDING" is issued at the time of execution. The Grinding Cycle is executed when this parameter value is 0, the alarm PS0456 is also issued.

5179	Grinding axis number of Oscillation Direct Fixed Dimension Grinding Cycle(G74)
	Grinding axis number of Intermittent feed surface grinding cycle(G79)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

For the Lathe system:

Set the Grinding axis number of Oscillation Direct Fixed Dimension Grinding Cycle(G74).

For the Machining Center system:

Set the Grinding axis number of Intermittent feed surface grinding cycle(G79).

> **NOTE**
> The axis number except for the cutting axis can be specified. When the axis number which is same to cutting axis is specified, an alarm PS0456, “ILLEGAL PARAMETER IN GRINDING” is issued at the time of execution. The Grinding Cycle is executed when this parameter value is 0, the alarm PS0456 is also issued.

5180	Axis number of dressing axis in Plunge grinding cycle(G75)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the axis number of dressing axis in Plunge grinding cycle(G75).

> **NOTE**
> The axis number except for the cutting axis or grinding axis can be specified. When the axis number which is same to cutting axis or grinding axis is specified, an alarm PS0456, “ILLEGAL PARAMETER IN GRINDING” is issued at the time of execution. The Grinding Cycle is executed when this parameter value is 0 and address "L" is specified in NC program, the alarm PS0456 is also issued.

5181	Axis number of dressing axis in Direct constant dimension plunge grinding cycle(G77)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the axis number of dressing axis in Direct constant dimension plunge grinding cycle(G77).

> **NOTE**
> The axis number except for the cutting axis or grinding axis can be specified. When the axis number which is same to cutting axis or grinding axis is specified, an alarm PS0456, “ILLEGAL PARAMETER IN GRINDING” is issued at the time of execution. The Grinding Cycle is executed when this parameter value is 0 and address "L" is specified in NC program, the alarm PS0456 is also issued.

5182	Axis number of dressing axis in Continuous feed surface grinding cycle(G78)

[Input type] Parameter input

[Data type] Byte path
[Valid data range] 0 to Number of controlled axes
Set the axis number of dressing axis in Continuous feed surface grinding cycle(G78).

> **NOTE**
> The axis number except for the cutting axis or grinding axis can be specified. When the axis number which is same to cutting axis or grinding axis is specified, an alarm PS0456, "ILLEGAL PARAMETER IN GRINDING" is issued at the time of execution. The Grinding Cycle is executed when this parameter value is 0 and address "L" is specified in NC program, the alarm PS0456 is also issued.

5183	Axis number of dressing axis in Intermittent feed surface grinding cycle(G79)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes
Set the axis number of dressing axis in Intermittent feed surface grinding cycle(G79).

> **NOTE**
> The axis number except for the cutting axis or grinding axis can be specified. When the axis number which is same to cutting axis or grinding axis is specified, an alarm PS0456, "ILLEGAL PARAMETER IN GRINDING" is issued at the time of execution. The Grinding Cycle is executed when this parameter value is 0 and address "L" is specified in NC program, the alarm PS0456 is also issued.

5184	In-position width for other than hole bottoms (regular)
5185	In-position width for other than hole bottoms (for retraction in peck drilling cycle)
5186	In-position width for other than hole bottoms (for shift in boring cycles (G76 and G87)
5187	In-position width for hole bottoms

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999
When bit 4 (ICS) of parameter No.5107 is set to 1, the dedicated in-position width for drilling canned cycle can be used.

> **NOTE**
> When in-position check switching function for drilling canned cycle is enabled, the in-position width of these parameters are valid for all axis during drilling canned cycle execution. Please set an appropriate value to all axis besides drilling axis.

4.26 PARAMETERS OF RIGID TAPPING

	#7	#6	#5	#4	#3	#2	#1	#0
5200	SRS	FHD	PCP	DOV	SIG	CRG		G84
		FHD	PCP	DOV	SIG	CRG		G84

[Input type] Parameter input
[Data type] Bit path

#0 G84 Method for specifying rigid tapping:
- 0: An M code specifying the rigid tapping mode is specified prior to the issue of the G84 (or G74) command. (See parameter No. 5210).
- 1: An M code specifying the rigid tapping mode is not used. (G84 cannot be used as a G code for the tapping cycle; G74 cannot be used for the reverse tapping cycle.)

#2 CRG Rigid mode when a rigid mode cancel command is specified (G80, 01 group G code, reset, etc.) :
- 0: Canceled after rigid tapping signal RGTAP <Gn061.0> is set to “0”.
- 1: Canceled before rigid tapping signal RGTAP <Gn061.0> is set to “0”.

#3 SIG When gears are changed for rigid tapping, the use of SINDs <Gn033.7,Gn035.7,Gn037.7, and Gn273.7> is:
- 0: Not permitted.
- 1: Permitted.

#4 DOV Override during extraction in rigid tapping:
- 0: Invalidated
- 1: Validated (The override value is set in parameter No. 5211. However, set an override value for rigid tapping return in parameter No. 5381.)

#5 PCP Rigid tapping:
- 0: Used as a high-speed peck tapping cycle
- 1: Not used as a high-speed peck tapping cycle

#6 FHD Feed hold and single block in rigid tapping:
- 0: Invalidated
- 1: Validated

#7 SRS To select a spindle used for rigid tapping in multi-spindle control:
- 0: The spindle selection signals SWS1, SWS2, SWS3, and SWS4 <Gn027.0,Gn027.1,Gn027.2, and Gn026.3 > are used. (These signals are used also for multi-spindle control.)
- 1: The rigid tapping spindle selection signals RGTSP1, RGTSP2, RGTSP3, and RGTSP4 <Gn061.4 to Gn061.7> are used. (These signals are provided expressly for rigid tapping.)

	#7	#6	#5	#4	#3	#2	#1	#0
5201				OV3	OVU	TDR		

[Input type] Parameter input
[Data type] Bit path

#2 TDR Cutting time constant in rigid tapping:
0: Uses a same parameter during cutting and extraction (Parameters Nos. 5261 to 5264)
1: Not use a same parameter during cutting and extraction
Parameters Nos. 5261 to 5264: Time constant during cutting
Parameters Nos. 5271 to 5274: Time constant during extraction

#3 OVU The increment unit of the override parameter No. 5211 for tool rigid tapping extraction is:
0: 1%
1: 10%

#4 OV3 A spindle speed for extraction is programmed, so override for extraction operation is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
5202				IRR	CHR		RG3	ORI

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 ORI When rigid tapping is started:
0: Spindle orientation is not performed.
1: Spindle orientation is performed.
This parameter can be used only for a serial spindle.
This spindle orientation performs reference position return in the serial spindle/servo mode. The stop position can be changed using the serial spindle parameter No. 4073.

#1 RG3 Retraction for rigid tapping is performed by:
0: Input signal RTNT <Gn062.6>.
1: One-shot G code G30 command.

> **NOTE**
> When this parameter is 1, retraction for rigid tapping using the input signal RTNT <Gn062.6> cannot be performed.

#3 CHR Rigid tapping is:
0: Normal rigid tapping.
1: Interpolation type rigid tapping.

> **NOTE**
> 1 The rigid tapping function and interpolation type rigid tapping function cannot be used together within a path.
> 2 Before the interpolation type rigid tapping function can be used, the Cs contour control function is required. If interpolation type rigid tapping is specified when the Cs contour control function is disabled, an alarm PS1223, “ILLEGAL SPINDLE SELECT” is issued.

NOTE
3 The interpolation type rigid tapping function cannot be used in a path that has a spindle positioning axis. If interpolation type rigid tapping is specified for a path that has a spindle positioning axis, an alarm PS1223 is issued.

#4 IRR As the in-position width at point R after movement from point I to point R in rigid tapping:
0: The in-position widths dedicated to rigid tapping (parameters Nos. 5300, 5302, 5304, and 5306) are selected.
1: The normal in-position width (parameter No. 1826) is selected.

	#7	#6	#5	#4	#3	#2	#1	#0
5203			RBL	OVS		RFF	HRM	HRG

[Input type] Parameter input
[Data type] Bit path

#0 HRG Rigid tapping by the manual handle is:
0: Disabled.
1: Enabled.

#1 HRM When the tapping axis moves in the negative direction during rigid tapping controlled by the manual handle, the direction in which the spindle rotates is determined as follows:
0: In G84 mode, the spindle rotates in a normal direction. In G74 mode, the spindle rotates in reverse.
1: In G84 mode, the spindle rotates in reverse. In G74 mode, the spindle rotates in a normal direction.

#2 RFF In rigid tapping, feed forward is:
0: Disabled.
1: Enabled. (Recommended)

As the standard setting, set 1.
At the same time, set the parameter for the advanced preview feed forward coefficient for the tapping axis and the parameter for the advance preview feed forward coefficient for the spindle so that these values match.
- Advanced preview feed forward coefficient for the tapping axis: Parameter No. 2092 (or parameter No. 2144 if the cutting/rapid traverse feed forward function is enabled (bit 4 of parameter No. 2214 is set to 1))
- Advanced preview feed forward coefficient for the spindle: Parameter No. 4344

NOTE
This parameter is valid when a serial spindle is used.

#4 OVS In rigid tapping, override by the feedrate override select signal *FV0 to *FV7<Gn012> and cancellation of override by the override cancel signal OVC<Gn006.4> is:
0: Disabled.
1: Enabled.
When feedrate override is enabled, extraction override is disabled.
The spindle override is clamped to 100% during rigid tapping, regardless of the setting of this parameter.

#5 RBL As acceleration/deceleration for rigid tapping cutting feed:
0: Linear acceleration/deceleration is used.
1: Bell-shaped acceleration/deceleration is used.

	#7	#6	#5	#4	#3	#2	#1	#0
5209						DWP	RIP	RTX
							RIP	

[Input type] Parameter input
[Data type] Bit path

#0 RTX In rigid tapping in a lathe system, the tapping axis is:
0: Selected by selecting a plane.
1: Always assumed to be the Z-axis for G84 or the X-axis for G88.

> **NOTE**
> This parameter becomes invalid when bit 1 (FCV) of parameter No.0001 is set to 1, and rigid tapping is specified using the Series15 format.

#1 RIP When a movement from the initial point to point R is made, the in-position check is:
0: Dependent on the setting of bit 5 (NCI) of parameter No. 1601.
1: Performed.

> **NOTE**
> This parameter is valid when bit 5 (NCI) of parameter No. 1601 is set to 1 and bit 4 (IRR) of parameter No. 5202 is set to 0.
> If bit 5 (NCI) of parameter No. 1601 is set to 0, the in-position check is performed regardless of the setting of this parameter.

#2 DWP When a dwell (address P) command is not included in a block for lathe-system rigid tapping:
0: Dwelling at the bottom of a hole is not performed.
1: The dwell (address P) command specified in the block for drilling is valid.

> **NOTE**
> This parameter becomes invalid if rigid tapping is specified in the Series 15 format with bit 1 (FCV) of parameter No. 0001 set to 1.

5210	Rigid tapping mode specification M code

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 65535
This parameter sets an M code that specifies the rigid tapping mode.
The M code is judged to be 29 (M29) when 0 is set.

5211	Override value during rigid tapping extraction

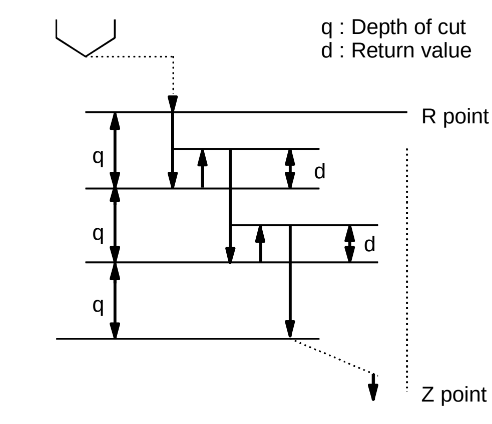
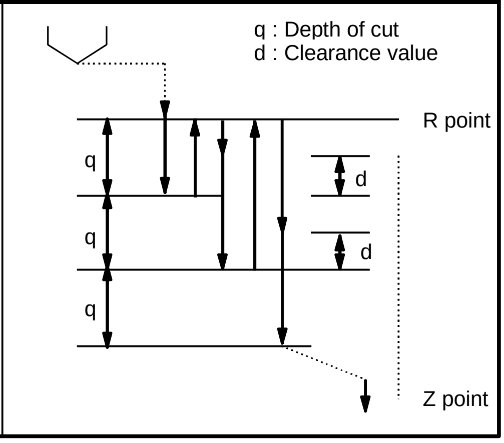
[Input type] Parameter input
[Data type] Word path
[Unit of data] 1% or 10%
[Valid data range] 0 to 200

The parameter sets the override value during rigid tapping extraction.

> **NOTE**
> The override value is valid when bit 4 (DOV) of parameter No. 5200 is set to 1. When bit 3 (OVU) of parameter No. 5201 is set to 1, the unit of set data is 10%. An override of up to 200% can be applied to extraction.

5213	Return in peck rigid tapping cycle

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the drilling axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the return or clearance in the peck tapping cycle.

When the parameter PCP (bit 5 of No.5200) is set to 0.	When the parameter PCP (bit 5 of No.5200) is set to 1.
	

5214	Setting of an allowable rigid tapping synchronization error range

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 99999999
This parameter sets an allowable synchronization error range in rigid tapping.
If a synchronous error range exceeding the setting of this parameter is detected, the alarm SP0741, “RIGID TAP ALARM : EXCESS ERROR” is issued. When 0 is set in this parameter, no synchronization error check is made.

5221	Number of gear teeth on the spindle side in rigid tapping (first gear)

5222	Number of gear teeth on the spindle side in rigid tapping (second gear)

5223	Number of gear teeth on the spindle side in rigid tapping (third gear)

5224	Number of gear teeth on the spindle side in rigid tapping (fourth gear)

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 1 to 32767

Each of these parameters is used to set the number of gear teeth on the spindle side for each gear in rigid tapping.

NOTE
When a position coder is attached to the spindle, set the same value for all of parameters Nos. 5221 to 5224.

5231	**Number of gear teeth on the position coder side in rigid tapping (first gear)**
5232	**Number of gear teeth on the position coder side in rigid tapping (second gear)**
5233	**Number of gear teeth on the position coder side in rigid tapping (third gear)**
5234	**Number of gear teeth on the position coder side in rigid tapping (fourth gear)**

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 1 to 32767

Each of these parameters is used to set the number of gear teeth on the position coder side for each gear in rigid tapping.

NOTE
When a position coder is attached to the spindle, set the same value for all of parameters Nos. 5231 to 5234.

5241	**Maximum spindle speed in rigid tapping (first gear)**
5242	**Maximum spindle speed in rigid tapping (second gear)**
5243	**Maximum spindle speed in rigid tapping (third gear)**
5244	**Maximum spindle speed in rigid tapping (fourth gear)**

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 9999

Spindle position coder gear ratio
1 : 1 0 to 7400
1 : 2 0 to 9999
1 : 4 0 to 9999
1 : 8 0 to 9999

Each of these parameters is used to set a maximum spindle speed for each gear in rigid tapping.
Set the same value for both parameter No. 5241 and parameter No. 5243 for a one-stage gear system. For a two-stage gear system, set the same value as set in parameter No. 5242 in parameter No. 5243. Otherwise, alarm PS0200, “ILLEGAL S CODE COMMAND” will be issued. This applies to the M series.

5261	**Time constant for acceleration/deceleration in rigid tapping for each gear (first gear)**
5262	**Time constant for acceleration/deceleration in rigid tapping for each gear (second gear)**
5263	**Time constant for acceleration/deceleration in rigid tapping for each gear (third gear)**
5264	**Time constant for acceleration/deceleration in rigid tapping for each gear (fourth gear)**

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] msec
[Valid data range] 0 to 4000

Each of these parameters is used to set a linear acceleration/ deceleration time constant for the spindle of each gear and the tapping axis in rigid tapping.
Set the period required to reach each maximum spindle speed (parameters Nos. 5241 to 5244).
The set time constant, multiplied by the ratio of a specified S value to a maximum spindle speed, is actually used as a time constant.
For bell-shaped acceleration/deceleration, set a time constant for a linear portion.

5271	**Time constant for acceleration/deceleration in rigid tapping extraction (first gear)**
5272	**Time constant for acceleration/deceleration in rigid tapping extraction (second gear)**
5273	**Time constant for acceleration/deceleration in rigid tapping extraction (third gear)**
5274	**Time constant for acceleration/deceleration in rigid tapping extraction (fourth gear)**

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] msec
[Valid data range] 0 to 4000

Each of these parameters is used to set a linear acceleration/ deceleration time constant for the spindle of each gear and tapping axis in extraction operation during rigid tapping.
For bell-shaped acceleration/deceleration, set a time constant for a linear portion.
In interpolation type rigid tapping, linear/bell-shaped acceleration/ deceleration of constant acceleration time type is used. So, set a time constant directly for the spindle and tapping axis for each gear.

NOTE
These parameters are enabled when the parameter TDR (bit 2 of parameter No. 5201) is set to 1.

5280	**Position control loop gain for the spindle and tapping axis in rigid tapping (common to gears)**
5281	**Position control loop gain for the spindle and tapping axis in rigid tapping (first gear)**
5282	**Position control loop gain for the spindle and tapping axis in rigid tapping (second gear)**
5283	**Position control loop gain for the spindle and tapping axis in rigid tapping (third gear)**
5284	**Position control loop gain for the spindle and tapping axis in rigid tapping (fourth gear)**

[Input type] Parameter input
[Data type] Word spindle

[Unit of data] 0.01/sec

[Valid data range] 1 to 9999

Each of these parameters is used to set a position control loop gain for the spindle and tapping axis in rigid tapping. These parameters significantly affect the precision of threading. Optimize these parameters as well as the loop gain multipliers by conducting a cutting test.

> **NOTE**
> To use a varied loop gain on a gear-by-gear basis, set parameter No. 5280 to 0, and set a loop gain for each gear in parameters Nos. 5281 to 5284. The specification of a loop gain on a gear-by-gear basis is disabled if parameter No. 5280 is set to a value other than 0. In such a case, the value set in parameter No. 5280 is used as a loop gain that is common to all the gears.

5291	**Loop gain multiplier for the spindle in rigid tapping (first gear)**
5292	**Loop gain multiplier for the spindle in rigid tapping (second gear)**
5293	**Loop gain multiplier for the spindle in rigid tapping (third gear)**
5294	**Loop gain multiplier for the spindle in rigid tapping (fourth gear)**

[Input type] Parameter input

[Data type] Word spindle

[Valid data range] 1 to 32767

Each of these parameters is used to set a loop gain multiplier for the spindle in rigid tapping each gear.

These parameters significantly affect the precision of threading. Optimize these parameters as well as the loop gains by conducting a cutting test.

Loop gain multiplier GC is obtained from the following equation:

$$GC = \frac{2048000 \times 360 \times PC \times E}{PLS \times SP \times L}$$

PLS Number of pulses output from the position coder (pulses/rev)

SP Number of gear teeth on the spindle side

PC Number of gear teeth on the position coder side

E Specified voltage (V) for turning the spindle motor at 1000 min^{-1}

L Angular displacement of the spindle (degrees) per spindle motor rotation

[Example] For the spindle motor and gear ratio given below, GC is calculated as follows:

$$GC = \frac{2048000 \times 360 \times 1 \times 2.2}{4096 \times 1 \times 360} = 1100$$

PLS = 4096 pulse/rev

SP = 1

PC = 1

E = 2.2 V

L = 360 deg

(Note) On the assumption that the spindle motor used turns at 4500 min^{-1} at 10 V, 2.2 V is required to turn the spindle motor at 1000 min^{-1}.

> **NOTE**
> These parameters are used for analog spindles.

5300	Tapping axis in-position width in rigid tapping (first spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a tapping axis in-position width when rigid tapping is performed using the first spindle.

NOTE

Set the following parameter for each spindle:

First spindle	No. 5300
Second spindle	No. 5302
Third spindle	No. 5304
Fourth spindle	No. 5306

5301	Spindle in-position width in rigid tapping

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 32767

These parameters are used to set spindle in-position widths in rigid tapping.

NOTE

If an excessively large value is specified, the threading precision will deteriorate.

5302	Tapping axis in-position width in rigid tapping (second spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a tapping axis in-position width when rigid tapping is performed using the second spindle.

5304	Tapping axis in-position width in rigid tapping (third spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a tapping axis in-position width when rigid tapping is performed using the third spindle.

5306	Tapping axis in-position width in rigid tapping (fourth spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a tapping axis in-position width when rigid tapping is performed using the fourth spindle.

5310	Positional deviation limit imposed during tapping axis movement in rigid tapping (first spindle)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the first spindle.

NOTE

Set the following parameter for each spindle:

First spindle	No. 5310
Second spindle	No. 5350
Third spindle	No. 5354
Fourth spindle	No. 5358

5311	Limit value of spindle positioning deviation during movement in rigid tapping

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

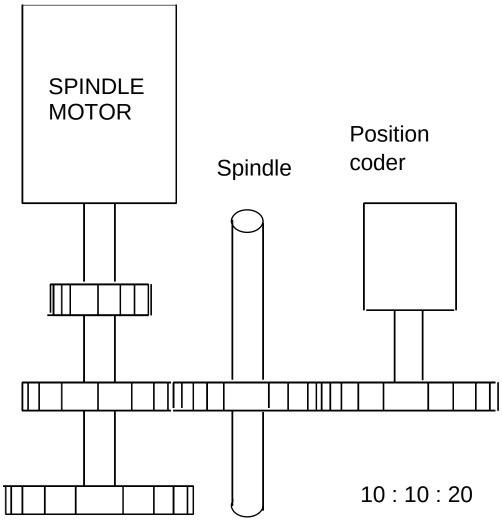
This parameter sets the limit value of a spindle positioning deviation during movement in rigid tapping.

Find a value to be set from the following expression:

$$Setting\ value = \frac{S \times PLS \times 100 \times SP \times C}{60 \times GP \times C}$$

S Maximum spindle speed in rigid tapping (min^{-1})
(Setting value of parameter Nos. 5241 and greater)
PLS Number of pulses output from the position coder (pulses/rev)
SP Number of gear teeth on the spindle side
PC Number of gear teeth on the position coder side
G Loop gain in the rigid tapping ($0.01sec^{-1}$)
(Setting value of parameter Nos. 5281 and greater)
C Coefficient 1.5

[Calculation example]



S = 3600
PLS = 4096
SP = 10
PC = 20
G = 3000
C = 1.5

$$Setting\ value = \frac{3600 \times 4096 \times 100 \times 10 \times 1.5}{60 \times 3000 \times 20} = 6144$$

5312	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (first spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the first spindle.

NOTE
Set the following parameter for each spindle:
First spindle No. 5312
Second spindle No. 5352
Third spindle No. 5356
Fourth spindle No. 5360

5313	Positional deviation limit imposed while the spindle is stopped in rigid tapping

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter is used to set a positional deviation limit imposed while the spindle is stopped in rigid tapping.

5321	Spindle backlash in rigid tapping (first-stage gear)
5322	Spindle backlash in rigid tapping (second-stage gear)
5323	Spindle backlash in rigid tapping (third-stage gear)
5324	Spindle backlash in rigid tapping (fourth-stage gear)

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit

[Valid data range] -9999 to 9999
Each of these parameters is used to set a spindle backlash.

5350	Positional deviation limit imposed during tapping axis movement in rigid tapping (second spindle)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999
This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the second spindle.

5352	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (second spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767
This parameter is used to set a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the second spindle.

5354	Positional deviation limit imposed during tapping axis movement in rigid tapping (third spindle)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999
This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the third spindle.

5356	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (third spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767
This parameter is used to set a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the third spindle.

5358	Positional deviation limit imposed during tapping axis movement in rigid tapping (fourth spindle)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999
This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the fourth spindle.

5360	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (fourth spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter is used to set a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the fourth spindle.

5365	Bell-shaped acceleration/deceleration time constant in rigid tapping (first-stage gear)
5366	Bell-shaped acceleration/deceleration time constant in rigid tapping (second-stage gear)
5367	Bell-shaped acceleration/deceleration time constant in rigid tapping (third-stage gear)
5368	Bell-shaped acceleration/deceleration time constant in rigid tapping (fourth-stage gear)

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] msec
[Valid data range] 0 to 512

Each of these parameters is used to set a time constant for a curved portion when bell-shaped acceleration/deceleration is selected in rigid tapping. When 0 is set in this parameter, linear acceleration/ deceleration is performed.

> **NOTE**
> This parameter is enabled when the parameter RBL (bit 5 of parameter No. 5203) is set to 1.

5381	Override value during rigid tapping return

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 0 to 200

This parameter is used to set the override value during rigid tapping return.
If the setting is 0, no override is applied.

> **NOTE**
> This parameter is valid when bit 4 (DOV) of parameter No. 5200 for enabling override at normal extraction time is set to 1.

5382	Amount of return for rigid tapping return

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the drilling axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter is used to set an extra amount of rigid tapping return. The tool is retracted additionally near point R by the distance set in this parameter. If the tool has already been retracted from rigid tapping, it will be retracted further only by the distance specified in this parameter.

4.27 PARAMETERS OF SCALING/COORDINATE ROTATION

	#7	#6	#5	#4	#3	#2	#1	#0
5400	SCR	XSC	LV3			D3R		RIN

[Input type] Parameter input
[Data type] Bit path

#0 RIN Coordinate rotation angle command (R) :
0: Specified by an absolute method
1: Specified by an absolute method (G90) or incremental method (G91)

#2 D3R When Reset is done by reset operation or reset signal from PMC, 3-dimensional coordinate system conversion mode and tilted working plane indexing mode is:
0: Canceled.
1: Not canceled.

> **NOTE**
> In case that workpiece setting error compensation is active, the 3-dimensional coordinate system conversion mode and tilted working plane indexing mode are canceled by a reset no matter what the setting of the parameter D3R.
> And in case that tilted working plane indexing and tool center point control are used together, tilted working plane indexing mode is canceled by a reset no matter what the setting of the parameter D3R.

#5 LV3 When system variables #100101 to #100132 (current position coordinates) and #100151 to #100182 (skip coordinates) are read in the 3-dimensional coordinate conversion mode or tilted working plane indexing mode:
0: Coordinates of the workpiece coordinate system can be read.
1: Coordinates of the program coordinate system after 3-dimensional coordinate conversion or tilted working plane indexing can be read.
This parameter applies also to system variables #5041 to #5060 (current position coordinates) and #5061 to #5080 (skip coordinates).

#6 XSC The setting of a scaling magnification (axis-by-axis scaling) is:
0: Disabled.
1: Enabled.

#7 SCR Scaling (G51) magnification unit:
0: 0.00001 times (1/100,000)
1: 0.001 times

	#7	#6	#5	#4	#3	#2	#1	#0
5401								SCLx

[Input type] Parameter input
[Data type] Bit axis

#0 SCLx Scaling on this axis:
0: Invalidated
1: Validated

	#7	#6	#5	#4	#3	#2	#1	#0
5402					DMK			

[Input type] Parameter input
[Data type] Bit path

#3 DMK The manual handle interruption screen is displayed:
0: Using the program coordinate system (post-conversion coordinate system).
1: Using the workpiece coordinate system (pre-conversion coordinate system).
This parameter is valid only in 3-dimensional coordinate conversion mode.

5410	Angular displacement used when no angular displacement is specified for coordinate system rotation

[Input type] Setting input
[Data type] 2-word path
[Unit of data] 0.001 degree
[Valid data range] -360000 to 360000
This parameter sets the angular displacement for coordinate system rotation. When the angular displacement for coordinate system rotation is not specified with address R in the block where G68 is specified, the setting of this parameter is used as the angular displacement for coordinate system rotation.

5411	Scaling (G51) magnification

[Input type] Setting input
[Data type] 2-word path
[Unit of data] 0.001 or 0.00001 times (Selected using bit 7 (SCR) of parameter No. 5400)
[Valid data range] 1to999999999
This parameter sets a scaling magnification when axis-by-axis scaling is disabled (with bit 6 (XSC) of parameter No. 5400 set to 0). If no scaling magnification (P) is specified in the program, the setting of this parameter is used as a scaling magnification.

NOTE
When bit 7 (SCR) of parameter No. 5400 is set to 1, the valid data range is 1 to 9999999.

5412	Rapid traverse rate for canned cycle for drilling in 3-dimensional coordinate conversion mode

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets a rapid traverse rate for canned cycle for drilling in the 3-dimensional coordinate conversion mode, the tilted working plane indexing mode, or the workpiece setting error compensation mode.

5421	Scaling magnification for each axis

[Input type] Setting input
[Data type] 2-word axis
[Unit of data] 0.001 or 0.00001 times (Selected using bit 7 (SCR) of parameter No. 5400)

[Valid data range] -999999999 to -1, 1 to 999999999

This parameter sets a scaling magnification for each axis when axis-by-axis scaling is enabled (with bit 6 (XSC) of parameter No. 5400 set to 1). For the first spindle to the third spindle (X-axis to Z-axis), the setting of this parameter is used as a scaling magnification if scaling magnifications (I, J, K) are not specified in the program.

> **NOTE**
> When bit 7 (SCR) of parameter No. 5400 is set to 1, the valid data ranges are -9999999 to -1 and 1 to 9999999.

4.28 PARAMETERS OF SINGLE DIRECTION POSITIONING

	#7	#6	#5	#4	#3	#2	#1	#0
5431							PDI	MDL

[Input type] Parameter input
[Data type] Bit path

#0 MDL The G60 code (single direction positioning) is:
0: One-shot G code (group 00).
1: Modal G code (group 01).

#1 PDI In the G60 mode, an in-position check at a stop position is:
0: Not made. (Waiting for only the end of acceleration/deceleration)
1: Made.

5440	Positioning direction and overrun distance in single direction positioning

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (A)
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the positioning direction and overrun distance in single direction positioning (G60) for each axis. The positioning direction is specified using a setting data sign, and the overrun distance using a value set here.
Overrun distance>0: The positioning direction is positive (+).
Overrun distance<0: The positioning direction is negative (-).
Overrun distance=0: Single direction positioning is not performed.

4.29 PARAMETERS OF POLAR COORDINATE INTERPOLATION

	#7	#6	#5	#4	#3	#2	#1	#0
5450						PLS		PDI

[Input type] Parameter input
[Data type] Bit path

#0 PDI When the second axis on the plane in the polar coordinate interpolation mode is based on radius specification:
0: Radius specification is used.
1: Diameter specification is used.

#2 PLS The polar coordinate interpolation shift function is:
0: Not used.
1: Used.
This enables machining using the workpiece coordinate system with a desired point which is not the center of the rotation axis set as the origin of the coordinate system in polar coordinate interpolation.

5460	Axis (linear axis) specification for polar coordinate interpolation

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes
This parameter sets control axis numbers of linear axis to execute polar interpolation.

5461	Axis (rotation axis) specification for polar coordinate interpolation

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes
This parameter sets control axis numbers of rotation axis to execute polar interpolation.

5463	Automatic override tolerance ratio for polar coordinate interpolation

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100
Typical setting: 90% (treated as 90% when set to 0)
Set the tolerance ratio of the fastest cutting feedrate to the speed of the rotation axis during automatic override of polar coordinate interpolation.

5464	Compensation for error on hypothetical axis of polar coordinate interpolation

[Input type] Parameter input
[Data type] Byte path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(For IS-B, -999999.999 to +999999.999)
This parameter is used to set the error if the center of the rotation axis on which polar coordinate interpolation is performed is not on the X-axis.
If the setting of the parameter is 0, regular polar coordinate interpolation is performed.

4.30 PARAMETERS OF NORMAL DIRECTION CONTROL

5480	Number of the axis for controlling the normal direction

[Input type] Parameter input
[Data type] Byte path

[Valid data range] 1 to the maximum controlled axis number

This parameter sets the controlled axis number of the axis for controlling the normal direction.

5481	Feedrate of rotation of the normal direction controlled axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg/min
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)

This parameter sets the feedrate of the movement along the normal direction controlled axis that is inserted at the start point of a block during normal direction control.

5482	Limit value used to determine whether to ignore the rotation insertion of the normal direction controlled axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))

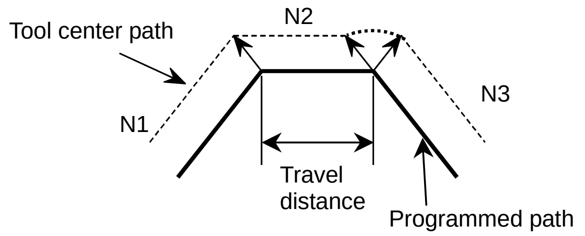
The rotation block of the normal direction controlled axis is not inserted when the rotation insertion angle calculated during normal direction control does not exceed this setting.

The ignored rotation angle is added to the next rotation insertion angle, and the block insertion is then judged.

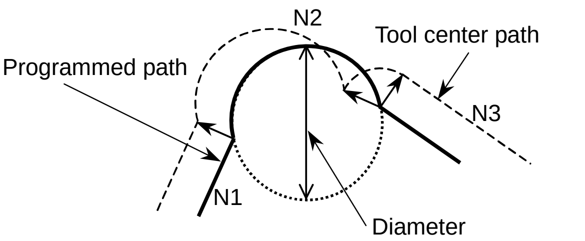
NOTE
1. No rotation block is inserted when 360 or more degrees are set.
2. If 180 or more degrees are set, a rotation block is inserted only when the circular interpolation setting is 180 or more degrees.

5483	Limit value of movement that is executed at the normal direction angle of a preceding block

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to standard parameter setting table (B)



For straight line
When the travel distance of N2 in the figure on the left does not exceed the setting, block N2 is machined with the tool being normal to block N1.



For arc
When the arc diameter of N2 in the figure on the left does not exceed the setting, arc N2 is machined with the tool being normal to block N1. A normal direction axis is not controlled to move in the normal direction according to the arc movement.

	#7	#6	#5	#4	#3	#2	#1	#0
5484								**SDC**

[Input type] Parameter input
[Data type] Bit path

#0 SDC Gentle normal direction control function is:
0: Disabled.
1: Enabled.

5485	**Limit for single-block rotation by the gentle normal direction control function**

[Input type] Parameter input
[Data type] Real path
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to 360

This parameter is valid when bit 0 (SDC) of parameter No. 5484 is set to 1.
Gentle normal direction control rotates a normal direction control axis simultaneously with an X/Y-axis move block when the calculated rotation insertion angle is smaller than this parameter setting. If it is greater than the setting, the normal direction control axis is rotated with a single block.

NOTE
1. This parameter is valid only when the normal direction control axis is rotated according to the settings of parameters No. 5482 and No. 5483.
2. If this parameter is set to 360 or greater, the setting is assumed to be 360, and the normal direction control axis is rotated simultaneously with the X/Y-axis move block.
3. If this parameter is set to 180 or greater, the normal direction control axis is rotated simultaneously with the X/Y-axis move block unless circular interpolation is used.
4. If this parameter is set to a negative value, the setting is assumed to be 0, and the normal direction control axis is rotated with the single block.

5486	Block distance to move until the end of rotation of the normal direction control axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the command block distance to move until the rotation of the normal direction control axis is completed. When 0 is specified, this function is disabled.

5490	
	Axis number in which torch swing axis exists

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to number of controlled axes
Set the axis in which to the torch swing axis exists for gas cutting machine.
Set either the Y or V axis on the torch swing axis for gas cutting machine.

4.31 PARAMETERS OF INDEX TABLE INDEXING

	#7	#6	#5	#4	#3	#2	#1	#0
5500	IDX	SIM		G90	INC	ABS	REL	DDP

[Input type] Parameter input
[Data type] Bit path

#0 DDP As the method for inputting a decimal point in a command for the index table indexing axis:
0: The conventional method is used.
1: The pocket calculator method is used.

#1 REL The position display of the index table indexing axis in the relative coordinate system is:
0: Not rounded by one rotation.
1: Rounded by one rotation.

#2 ABS The position display of the index table indexing axis in the absolute coordinate system is:
0: Not rounded by one rotation.
1: Rounded by one rotation.

#3 INC When the M code that specifies rotation in the negative direction (parameter No. 5511) is not set, rotation in the G90 mode is:
0: Not set to the shorter way around the circumference.
1: Set to the shorter way around the circumference.

#4 G90 A command for the index table indexing axis is:
0: Assumed to be an absolute or incremental programming according to the mode.
1: Always assumed to be an absolute programming.

#6 SIM When the same block includes a command for the index table indexing axis and a command for another controlled axis:
0: The setting of bit 0 (IXS) of parameter No. 5502 is followed.
1: The commands are executed.

> **NOTE**
> Even when this parameter is set to 1, an alarm PS1564, “INDEX TABLE AXIS - OTHER AXIS SAME TIME” is issued if the block is neither G00, G28, nor G30 (or the G00 mode).

#7 IDX Operation sequence of the index table indexing axis:
0: Type A
1: Type B

	#7	#6	#5	#4	#3	#2	#1	#0
5501							ISP	ITI

[Input type] Parameter input
[Data type] Bit path

#0 ITI The index table indexing function is:
0: Enabled.
1: Disabled.

#1 ISP Servo-off for an index axis at the completion of clamping is:
0: Processed by the CNC.
1: Not processed by the CNC. (The CNC follows the status of the servo-off signal <Gn0126> input from the PMC.)

	#7	#6	#5	#4	#3	#2	#1	#0
5502								IXS

[Input type] Parameter input
[Data type] Bit axis

#0 IXSx When a command is specified in a block that contains a command for the index table indexing axis:
0 : An alarm PS1564, “INDEX TABLE AXIS - OTHER AXIS SAME TIME” is issued.
1 : The command is executed.

If bit 6 (SIM) of parameter No. 5500 is set to 1, a simultaneous operation with all axes except the index table indexing axis can be performed regardless of the setting of this parameter.
To set an axis that allows simultaneous operation for each axis, set SIM to 0, and set this parameter.

> **NOTE**
> Even when this parameter is set to 1, an alarm PS1564, “INDEX TABLE AXIS - OTHER AXIS SAME TIME” is issued if the block is neither G00, G28, nor G30 (or the G00 mode).

5510	Controlled axis number of the index table indexing axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes
This parameter sets the number of a controlled axis to be used as the index table indexing axis.
When 0 is set, the fourth axis is assumed.

5511	M code that specifies rotation in the negative direction for index table indexing

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999
0: The rotation direction for the index table indexing axis is determined according to the setting of bit 3 (INC) of parameter No. 5500 and a command.
1 to 99999999:
The rotation for the index table indexing axis is always performed in the positive direction. It is performed in the negative direction only when a move command is specified together with the M code set in this parameter.

> **NOTE**
> Be sure to set bit 2 (ABS) of parameter No. 5500 to 1.

5512	Minimum positioning angle for the index table indexing axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the minimum positioning angle (travel distance) for the index table indexing axis. The travel distance specified in the positioning command must always be an integer multiple of this setting. When 0 is set, the travel distance is not checked.
The minimum positioning angle is checked not only for the command, but also for the coordinate system setting and workpiece origin offset.

4.32 PARAMETERS OF INVOLUTE INTERPOLATION

5610	Limit of initial permissible error during involute interpolation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the allowable limit of deviation between an involute curve passing through a start point and an involute curve passing through an end point for an involute interpolation command.

5620	Lower override limit in automatic feedrate control during involute interpolation

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100

In "override in the cutter compensation mode" under involute interpolation automatic feedrate control, the feedrate of the tool center near a basic circle may become very low in the case of an inner offset. To prevent this, set a lower override limit in this parameter.
Thus, the feedrate is clamped so that the feedrate is not lower than a specified feedrate multiplied by the lower override limit set in this parameter.

NOTE
When 0 or a value not within the valid data range is set, involute interpolation automatic feedrate control ("override in the cutter compensation mode" and "acceleration clamping near a basic circle") is disabled.

4.33 PARAMETERS OF EXPONENTIAL INTERPOLATION

	#7	#6	#5	#4	#3	#2	#1	#0
5630								SPN

[Input type] Parameter input
[Data type] Bit path

#0 SPN The amount of linear axis division (span value) in exponential interpolation is:
0: Specified with parameter No. 5643.
1: Specified using address K in a block containing G02.3/G03.3. When address K is not specified, the value set with parameter No. 5643 is used.

5641	Linear axis number subject to exponential interpolation

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

This parameter sets the ordinal number, among the controlled axes, for the linear axis to which exponential interpolation is applied.

5642	Rotation axis number subject exponential interpolation

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

This parameter sets the ordinal number, among the controlled axes, for the rotation axis to which exponential interpolation is applied.

5643	Amount of linear axis division (span value) in exponential interpolation

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets an amount of linear axis division in exponential interpolation when bit 0 (SPN) of parameter No. 5630 is set to 0 or when address K is not specified.

4.34 PARAMETERS OF FLEXIBLE SYNCHRONOUS CONTROL (1 OF 2)

5660	Master axis number (group A)
5661	Slave axis number (group A)
5662	Master axis number (group B)
5663	Slave axis number (group B)
5664	Master axis number (group C)
5665	Slave axis number (group C)
5666	Master axis number (group D)
5667	Slave axis number (group D)

[Input type] Parameter input
[Data Input type] Word path
[Valid data range] 0 to Number of controlled axes or m × 100+n
(m: 1 to Number of paths, n: 1 to Number of controlled axes)
Specify both master and slave axis numbers.
[Example of setting]

1 to 24: Controlled axes on own path (for single-path systems only)
101 to 124: Controlled axes on path 1
201 to 224: Controlled axes on path 2
:
901 to 924: Controlled axes on path 9
1001 to 1024: Controlled axes on path 10

In inter-path flexible synchronous control, an axis of a path can be specified as the master axis of another path.

> **NOTE**
> In inter-path flexible synchronous control, an axis of any path cannot be specified as the slave axis of another path.

	#7	#6	#5	#4	#3	#2	#1	#0
5668					ACD	ACC	ACB	ACA

[Input type] Parameter input
[Data Input type] Bit axis

#0 ACA Update of the machine coordinates of flexible synchronous control group A is:
0 : Executed.
1 : Not executed.

#1 ACB Update of the machine coordinates of flexible synchronous control group B is:
0 : Executed.
1 : Not executed.

#2 ACC Update of the machine coordinates of flexible synchronous control group C is:
0 : Executed.
1 : Not executed.

#3 ACD Update of the machine coordinates of flexible synchronous control group D is:
0 : Executed.
1 : Not executed.

> **NOTE**
> The machine coordinates update is not done though the slave axis operates on the motor.
> In this case, if an automatic reference position return to origin is done after the synchronous mode is canceled, the alarm of DS0405, "ZERO RETURN END NOT ON REF" is issued.
> Please use a manual reference position return to origin to do the return to origin.

	#7	#6	#5	#4	#3	#2	#1	#0
5669					PHD	PHC	PHB	PHA

[Input type] Parameter input
[Data Input type] Bit path

#0 PHA The automatic phase synchronization for flexible synchronous control of group A is:
0: Disabled.
1: Enabled.

#1 PHB The automatic phase synchronization for flexible synchronous control of group B is:
0: Disabled.
1: Enabled.

#2 PHC The automatic phase synchronization for flexible synchronous control of group C is:
0: Disabled.
1: Enabled.

#3 PHD The automatic phase synchronization for flexible synchronous control of group D is:
0: Disabled.
1: Enabled.

> **NOTE**
> When this parameter is set, acceleration/deceleration upon a synchronization start or synchronization cancellation is enabled.
> For automatic positioning, set the automatic phase synchronization signal for each group to 1.

5670	M code number for turning on the flexible synchronous control mode(group A)
5671	M code number for turning off the flexible synchronous control mode(group A)
5672	M code number for turning on the flexible synchronous control mode(group B)
5673	M code number for turning off the flexible synchronous control mode(group B)
5674	M code number for turning on the flexible synchronous control mode(group C)
5675	M code number for turning off the flexible synchronous control mode(group C)
5676	M code number for turning on the flexible synchronous control mode(group D)
5677	M code number for turning off the flexible synchronous control mode(group D)

[Input type] Parameter input
[Data Input type] Word path
[Valid data range] 1 to 999

Specify an M code for turning on or off the flexible synchronous control mode for an automatic operation.

5680	Numerator determining gear ratio for flexible synchronization(group A)
5681	Denominator determining gear ratio for flexible synchronization(group A)
5682	Numerator determining gear ratio for flexible synchronization(group B)
5683	Denominator determining gear ratio for flexible synchronization(group B)
5684	Numerator determining gear ratio for flexible synchronization(group C)
5685	Denominator determining gear ratio for flexible synchronization(group C)
5686	Numerator determining gear ratio for flexible synchronization(group D)
5687	Denominator determining gear ratio for flexible synchronization(group D)

[Input type] Parameter input
[Data Input type] 2 word path
[Valid data range] -99999999 to 99999999

Specify a gear ratio between the master and slave axes.

5690	Index to gear ratio denominator for flexible synchronization(group A)
5691	Index to gear ratio denominator for flexible synchronization(group B)
5692	Index to gear ratio denominator for flexible synchronization(group C)
5693	Index to gear ratio denominator for flexible synchronization(group D)

[Input type] Parameter input
[Data Input type] Byte path
[Valid data range] 0 to 8

Specify an index to the denominator of a gear ratio between the master and slave axes.

Let p, q, and k be, respectively, a denominator determining gear ratio for flexible synchronization, numerator determining gear ratio for flexible synchronization, and index to the gear ratio denominator for flexible synchronization:

The gear ratio is $\dfrac{q}{p \times 10^k}$

4.35 PARAMETERS OF STRAIGHTNESS COMPENSATION (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
5700						SM2		

[Input type] Parameter input
[Data type] Bit path

#2 SM2 In the straightness compensation function, magnification parameters (parameters Nos. 13391 to 13396) are treated as follows:

0: When more than one moving axis is set with the same number, the setting of the magnification parameter for the moving axis set first is used.

1: When more than one moving axis is set with the same number, the setting of the magnification parameter for each axis is used.

5711	Straightness compensation : Axis number of moving axis 1
5712	Straightness compensation : Axis number of moving axis 2
5713	Straightness compensation : Axis number of moving axis 3
5714	Straightness compensation : Axis number of moving axis 4
5715	Straightness compensation : Axis number of moving axis 5
5716	Straightness compensation : Axis number of moving axis 6

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

Set the axis number of a moving axis in straight compensation.
When 0 is set, compensation is not performed.

5721	Straightness compensation : Axis number of compensation axis 1 for moving axis 1
5722	Straightness compensation : Axis number of compensation axis 2 for moving axis 2
5723	Straightness compensation : Axis number of compensation axis 3 for moving axis 3
5724	Straightness compensation : Axis number of compensation axis 4 for moving axis 4
5725	Straightness compensation : Axis number of compensation axis 5 for moving axis 5
5726	Straightness compensation : Axis number of compensation axis 6 for moving axis 6

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

5731	Straightness compensation : Compensation point number a of moving axis 1
5732	Straightness compensation : Compensation point number b of moving axis 1
5733	Straightness compensation : Compensation point number c of moving axis 1
5734	Straightness compensation : Compensation point number d of moving axis 1

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 1023

These parameters set compensation point numbers in stored pitch error compensation. Set four compensation points for each moving axis.

5741	Straightness compensation : Compensation point number a of moving axis 2
5742	Straightness compensation : Compensation point number b of moving axis 2
5743	Straightness compensation : Compensation point number c of moving axis 2
5744	Straightness compensation : Compensation point number d of moving axis 2

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 1023

These parameters set compensation point numbers in stored pitch error compensation. Set four compensation points for each moving axis.

5751	Straightness compensation : Compensation point number a of moving axis 3
5752	Straightness compensation : Compensation point number b of moving axis 3
5753	Straightness compensation : Compensation point number c of moving axis 3
5754	Straightness compensation : Compensation point number d of moving axis 3

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 1023

These parameters set compensation point numbers in stored pitch error compensation. Set four compensation points for each moving axis.

5761	Compensation corresponding compensation point number a of moving axis 1
5762	Compensation corresponding compensation point number b of moving axis 1
5763	Compensation corresponding compensation point number c of moving axis 1
5764	Compensation corresponding compensation point number d of moving axis 1

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

Each of these parameters sets a compensation value for each moving axis compensation point.

5771	Compensation corresponding compensation point number a of moving axis 2
5772	Compensation corresponding compensation point number b of moving axis 2
5773	Compensation corresponding compensation point number c of moving axis 2
5774	Compensation corresponding compensation point number d of moving axis 2

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

Each of these parameters sets a compensation value for each moving axis compensation point.

5781	Compensation corresponding compensation point number a of moving axis 3
5782	Compensation corresponding compensation point number b of moving axis 3
5783	Compensation corresponding compensation point number c of moving axis 3
5784	Compensation corresponding compensation point number d of moving axis 3

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

Each of these parameters sets a compensation value for each moving axis compensation point.

4.36 PARAMETERS OF INCLINATION COMPENSATION

5861	Inclination compensation : Compensation point number a for each axis
5862	Inclination compensation : Compensation point number b for each axis
5863	Inclination compensation : Compensation point number c for each axis
5864	Inclination compensation : Compensation point number d for each axis

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1023

These parameters set the compensation points for inclination compensation. The points are set for the compensation point numbers for stored pitch error compensation.

5871	Inclination compensation : Compensation α at compensation point number a for each axis
5872	Inclination compensation : Compensation β at compensation point number b for each axis
5873	Inclination compensation : Compensation γ at compensation point number c for each axis
5874	Inclination compensation : Compensation δ at compensation point number d for each axis

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

Each of these parameters sets a compensation value for each axis compensation point.

4.37 PARAMETERS OF CUSTOM MACROS

	#7	#6	#5	#4	#3	#2	#1	#0
6000	SBV		SBM	HGO		HMC	MGO	G67
	SBV		SBM	HGO	V15	HMC	MGO	G67

[Input type] Parameter input
[Data type] Bit path

#0 G67 If the macro modal call cancel command (G67) is specified when the macro modal call mode (G66/G66.1) is not set:
0: Alarm PS1100, “CANCEL WITHOUT MODAL CALL” is issued.
1: The specification of G67 is ignored.

#1 MGO When a GOTO statement for specifying custom macro control is executed, a high-speed branch to 20 sequence numbers executed from the start of the program is:
0: A high-speed branch is not caused to n sequence numbers from the start of the executed program.
1: A high-speed branch is caused to n sequence numbers from the start of the program.

#2 HMC A custom macro is executed:
0: At a normal speed.
1: At a high-speed.

NOTE
When the parameter HMC is set to 1, the CNC gives priority to a custom macro. For this reason, when this parameter is set, performance of the following functions may be degraded:
- Screen display of CNC
- Macro executor (Auxiliary macro, Conversational macro screen)
- C language executor (excluding high-level tasks)
- External data input
etc.

#3 V15 As system variable numbers for tool offset:
0 : The standard system variable numbers for the Series 16 are used.
1 : The same system variable numbers as those used for the Series 15 are used.
The tables indicate the system variables for tool offset numbers 1 to 999. The values for tool offset numbers 1 to 200 can be read from or assigned to the system variables in parentheses.

(1) Tool offset memory A

	System variable number	
	V15 = 0	V15 = 1
Wear offset value	#10001 to #10999 (#2001 to #2200)	#10001 to #10999 (#2001 to #2200)

(2) Tool offset memory B

	System variable number	
	V15 = 0	V15 = 1
Geometry offset value	#11001 to #11999 (#2201 to #2400)	#10001 to #10999 (#2001 to #2200)
Wear offset value	#10001 to #10999 (#2001 to #2200)	#11001 to #11999 (#2201 to #2400)

(3) Tool offset memory C

		System variable number	
		V15 = 0	V15 = 1
Tool length offset	Geometry offset value	#11001 to #11999 (#2201 to #2400)	#10001 to #10999 (#2001 to #2200)
	Wear offset value	#10001 to #10999 (#2001 to #2200)	#11001 to #11999 (#2201 to #2400)
Tool radius offset	Geometry offset value	#13001 to #13999	#12001 to #12999
	Wear offset value	#12001 to #12999	#13001 to #13999

#4 HGO When a GOTO statement for specifying custom macro control is executed, a branch to 30 sequence numbers just before the GOTO statement or to up to 10 sequence numbers saved by a sequence number search previously made with a GOTO statement is:
0: Not made at high speed.
1: Made at high speed.

#5 SBM Custom macro statement
0: Not stop the single block
1: Stops the single block
If you want to disable the single blocks in custom macro statements using system variable #3003, set this parameter to 0. If this parameter is set to 1, the single blocks in custom macro statements cannot be disabled using system variable #3003. To control single blocks in custom macro statements using system variable #3003, use bit 7 (SBV) of parameter No. 6000.

#7 SBV Custom macro statement
0: Not stop the single block
1: Enable/disable single block stop with system variable #3003

		Bit 5 (SBM) of parameter No. 6000	
		0	1
Bit 7 (SBV) of parameter No. 6000	0	Disables single block stop.	Enables single block stop. (With variable #3003, single block stop cannot be enabled/disabled. Single block stop is enabled at all times.)
	1	Enables single block stop. (With variable #3003, single block stop can be enabled/disabled.)	

	#7	#6	#5	#4	#3	#2	#1	#0
6001		CCV	TCS	CRO	PV5		PRT	MIF

[Input type] Parameter input
[Data type] Bit path

#0 MIF The custom macro interface signals are based on:
0: Standard specification.
(Custom macro input signals UI000 to UI015<Gn054,Gn055>, custom macro output signals UO000 to UO015<Fn054,Fn055>, and UO100 to UO131<Fn056 to Fn059> are used.)
1: Extended specification.
(Custom macro input signals UI000 to UI031<Gn054 to Gn057>, UI100 to UI131<Gn276 to Gn279>, UI200 to UI231<Gn280 to Gn283>, UI300 to UI331<Gn284 to Gn287>, custom macro output signals UO000 to UO031<Fn054,Fn055,Fn276,Fn277>, UO100 to UO131<Fn056 to Fn059>, UO200 to UO231<Fn280 to Fn283>, and UO300 to UO331<Fn284 to Fn287> are used.)

#1 PRT Reading zero when data is output using a DPRINT command
0: Outputs a space
1: Outputs no data

#3 PV5 Custom macro common variables:
0: #500 to #549 are output. (Note)
1: #100 to #149 and #500 to 549 are output. (Note)

> **NOTE**
> Output variables are as the table according to the combination of added options.

When the parameter PV5=0

		Option "Addition of custom macro common variables"	
		Non	**Yes**
Option "Embedded macro"	**Non**	#500 to #549	#500 to #999
	Yes	#500 to #549	#500 to #999

When the parameter PV5=1

		Option "Addition of custom macro common variables"	
		Non	**Yes**
Option "Embedded macro"	**Non**	#100 to #149 and #500 to #549	#100 to #199 and #500 to #999
	Yes	#100 to #149, #200 to #499 and #500 to #549	#100 to #199, #200 to #499 and #500 to #999

#4 CRO ISO code in BPRWT or DPRNT command
0: Outputs only "LF" after data is output
1: Outputs "LF" and "CR" after data is output

#5 TCS Custom macro (subprogram)
0: Not called using a T code
1: Called using a T code

#6 CCV Common variables #100 to #149(NOTE) cleared by power-off are:
0: Cleared to <null> by reset
1: Not cleared by reset

> **NOTE**
> Cleared variables are as the table according to the combination of added options.

		Option "Addition of custom macro common variables"	
		Non	**Yes**
Option "Embedded macro"	**Non**	#100 to #149	#100 to #199
	Yes	#100 to #149 and #200 to #499	#100 to #199 and #200 to #499

	#7	#6	#5	#4	#3	#2	#1	#0
6003	MUS		MSB	MPR	TSE	MIN	MSK	

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#1 MSK Absolute coordinates at that time during custom macro interrupt
0: Not set to the skip coordinates (system variables #5061 and later)
1: Set to the skip coordinates (system variables #5061 and later)

#2 MIN Custom macro interrupt
0: Performed by interrupting an in-execution block (Custom macro interrupt type I)
1: Performed after an in-execution block is completed (Custom macro interrupt type II)

#3 TSE Custom macro interrupt signal UINT
0: Edge trigger method (Rising edge)
1: Status trigger method

#4 MPR Custom macro interrupt valid/invalid M code
0: M96/M97
1: M code set using parameters Nos. 6033 and 6034

#5 MSB Interrupt program
0: Uses a dedicated local variable (Macro-type interrupt)
1: Uses the same local variable as in the main program (Subprogram- type interrupt)

#7 MUS Interrupt-type custom macro
0: Not used
1: Used

	#7	#6	#5	#4	#3	#2	#1	#0
6004						VHD		NAT
			D15					NAT

[Input type] Parameter input
[Data type] Bit path

#0 NAT The results of the custom macro functions ATAN (with 2 arguments) and ASIN are specified as follows:
0: The result of ATAN is 0 to 360.0.
The result of ASIN is 270.0 to 0 to 90.0.
1: The result of ATAN is -180.0 to 0 to 180.0.
The result of ASIN is -90.0 to 0 to 90.0.

#2 VHD With system variables #5121 to #5140:
0: The tool offset value (geometry offset value) in the block currently being executed is read. (This parameter is valid only when tool geometry/tool wear compensation memories are available.)
1: An interrupt travel distance based on manual handle interrupt is read.

#5 D15 When tool compensation memory C is used, for reading or writing tool offset values (for up to offset number 200) for D code (tool radius), the same system variables, #2401 through #2800, as Series 15 are:
0: Not used.
1: Used.
When bit 3 (V15) of parameter No. 6000 is set to 1

D code				
Compensation number	Geometry		Wear	
	Variable number	Variable name	Variable number	Variable name
1	#2401	[#_OFSDG[1]]	#2601	[#_OFSDW[1]]
2	#2402	[#_OFSDG[2]]	#2602	[#_OFSDW[2]]
3	#2403	[#_OFSDG[3]]	#2603	[#_OFSDW[3]]
:	:	:	:	:
199	#2599	[#_OFSDG[199]]	#2799	[#_OFSDW[199]]
200	#2600	[#_OFSDG[200]]	#2800	[#_OFSDW[200]]

	#7	#6	#5	#4	#3	#2	#1	#0
6005								SQC

[Input type] Parameter input
[Data type] Bit path

#0 SQC In the subprogram call function, a subprogram sequence number call is:
0: Not used.
1: Used.

	#7	#6	#5	#4	#3	#2	#1	#0
6007	SKM			CVA	MGE	BCS	SCS	DPG

[Input type] Parameter input
[Data type] Bit path

#0 DPG Specifies whether to allow G codes with a decimal point to be called.
0: Do not allow.
1: Allow.

#1 SCS Specifies whether to call subprograms with S codes.
0: Do not call with S codes.
1: Call with S codes.

#2 BCS Specifies whether to call subprograms with the second auxiliary function codes.
0: Do not call with the second auxiliary function codes.
1: Call with the second auxiliary function codes.

#3 MGE Specifies whether a G code modal call is made after movement or for each block.
0: Make a call for each block (equivalent to G66.1).
1: Make a call after movement (equivalent to G66).

#4 CVA The format for macro call arguments is specified as follows:
0: Arguments are passed in NC format without modifications.
1: Arguments are converted to macro format then passed.
[Example]
When G65 P_ X10 ; is specified, the value in local variable #24 in the calling program is set as follows:

Command	CVA=0	CVA=1
#24	0.01	0.01
ADP[#24]	10.0	0.01

> **NOTE**
> External operations are the same unless the ADP function is used.

#7 SKM After skip operation, with the workpiece coordinate system setting command (G92 for the M series or G50 for the T series) or select command (G54 to G59), the values of macro variables #100151 to #100200 (#5061 to #5080) holding the skip position:
0: Change. (The workpiece coordinate system at the time of reading is reflected.)
1: Do not change.

	#7	#6	#5	#4	#3	#2	#1	#0
6008	IJK	GMP	ADD	ISO	KOP		MCA	F16

[Input type] Parameter input
[Data type] Bit path

#0 F16 The precision of operation is based on:
0: New specification.
1: FS16*i* compatible specification.

#1 MCA A macro alarm specification based on system variable #3000 is selected as follows:
0: An alarm number obtained by adding 3000 to a value assigned to variable #3000 and the corresponding message are displayed. (A value from 0 to 200 can be assigned to variable #3000.)
1: A value assigned to variable #3000 and the corresponding message are displayed. (A value from 0 to 4095 can be assigned to variable #3000.)

[Example]
Execution of #3000=1 (ALARM MESSAGE);
When bit 1 (MCA) of parameter No. 6008 is set to 0:
The alarm screen displays "MC 3001 ALARM MESSAGE".
When bit 1 (MCA) of parameter No. 6008 is set to 1:
The alarm screen displays "MC0001 ALARM MESSAGE".

#3 KOP When the NC is reset in the state where the line is made open by POPEN:
0: Communication continues, and the line is left open.
1: Communication stops, and the line is closed.

#4 ISO 0: When the EIA code is used, the bit patterns of codes specified instead of [,], #, *, =, ?, @, &, and _ are set in parameter No. 6010 to No. 6018.
1: When the ISO/ASCII code is used, the bit patters of codes specified instead of [,], #, *, =, ?, @, &, and _ are set in parameter No. 6010 to No. 6018.

#5 ADD When the number of digits in the integer part, a, in the format specification [a,b] of the DPRNT statement is less than the number of digits in the integer part of an output variable value:
0: The specified number of digits only are output, with the unspecified digits discarded.
1: An alarm for excessive digits is issued.

#6 GMP The calling of M, S, T, a second auxiliary function code, or a particular code during the calling of a G code, and the calling of a G code during the calling of M, S, T, a second auxiliary function code, or particular code are:
0: Not allowed. (They are executed as an ordinary G, M, S, T, second auxiliary function code, and NC address.)
1: Allowed.

#7 IJK For addresses I, J, and K specified as arguments:
0: Argument specification I or II is automatically determined.
1: Argument specification I is always used.

Example

When K_J_I_ is specified:
- When this parameter is set to 0:
  Argument specification II is used and K=#6, J=#8, and I=#10 are specified.
- When this parameter is set to1:
  Argument specification I is used and I=#4, J=#5, and K=#6 are specified regardless of the specification order.
  (Argument specification II cannot be used.)

	#7	#6	#5	#4	#3	#2	#1	#0
6009						MAA		MSM

[Input type] Parameter input
[Data type] Bit path

#0 MSM When a Macro Call using M code or a Macro Call using M code (Specification of 3 Sets) are not at the beginning of the block:
0: Alarm PS0127, "DUPLICATE NC,MACRO STATEMENT" is issued.
1: The Macro Call using M code is executed. All addresses specified in the same block are used as arguments.

NOTE
1. When MSM is set to 1 and an M code specified for a macro call is not at the beginning of the block, argument specification II cannot be used.
2. When MSM is set to 1 and an M code specified for a macro call is not at the beginning of the block, the number of repetitions (L) cannot be used.

#2 MAA When a Macro Call using M code or Special Macro Call using M code are executed:
0: Address G does not become an argument.
The addresses that can be used as arguments are as shown in the tables below.
- Usual Macro Call

Address	Variable number
A	#1
B	#2
C	#3
D	#7
E	#8
F	#9
G	*1
H	#11
I	#4

Address	Variable number
J	#5
K	#6
L	*2
M	#13 *3
M(Call code)	*4
N	#14 *5
P	#16
Q	#17
R	#18

Address	Variable number
S	#19
T	#20
U	#21
V	#22
W	#23
X	#24
Y	#25
Z	#26

*1: Address G can not command. If address G is commanded, alarm PS0129 occurs.
*2: Address L is a number of times in which the macro call is repeated.
*3: Address M other than call code is passed to variable #13.
*4: Address M for call code does not become an argument.
*5: Address N is passed to variable #14.

- Special Macro Call

Address	Variable number
A	#1
B	#2
C	#3
D	#7
E	#8
F	#9
G	*1
H	#11
I	#4

Address	Variable number
J	#5
K	#6
L	*2
M	#13 *3
M(Call code)	*4
N	#14 *5
P	#16
Q	#17
R	#18

Address	Variable number
S	#19
T	#20
U	#21
V	#22
W	#23
X	#24
Y	#25
Z	#26

*1: Even if address G is commanded, PS alarm does not occur. And address G does not become an argument.
*2: Address L does not become a number of times in which the macro call is repeated, and does not become an argument.
*3: Address M other than call code is passed to variable #13.
*4: Address M for call code does not become an argument.
*5: Address N is passed to variable #14, and becomes a sequence number.

1: Address G becomes an argument.
The addresses that can be used as arguments are as shown in the tables below.

- Usual Macro Call

Address	Variable number
A	#1
B	#2
C	#3
D	#7
E	#8
F	#9
G	#28 to #32 *1
H	#11
I	#4

Address	Variable number
J	#5
K	#6
L	*2
M	#13 *3
M(Call code)	*4
N	#14 *5
P	#16
Q	#17
R	#18

Address	Variable number
S	#19
T	#20
U	#21
V	#22
W	#23
X	#24
Y	#25
Z	#26

*1: The first five addresses G in ascending order of G code groups are used as arguments and passed to variables #28 to #32.
*2: Address L is a number of times in which the macro call is repeated.
*3: Address M other than call code is passed to variable #13.
*4: Address M for call code does not become an argument.
*5: Address N is passed to variable #14.

- Special Macro Call

Address	Variable number
A	#1
B	#2
C	#3
D	#7
E	#8
F	#9
G	#28 to #32 *1
H	#11
I	#4

Address	Variable number
J	#5
K	#6
L	#12 *2
M	#13 *3
M(Call code)	#27 *4
N	#14 *5
P	#16
Q	#17
R	#18

Address	Variable number
S	#19
T	#20
U	#21
V	#22
W	#23
X	#24
Y	#25
Z	#26

*1: The first five addresses G in ascending order of G code groups are used as arguments and passed to variables #28 to #32.

*2: Address L is passed to variable #12, and does not become a number of times in which the macro call is repeated.
*3: Address M other than call code is passed to variable #13.
*4: Address M for call code is passed to variable #27.
*5: Address N is passed to variable #14, and becomes a sequence number.

	#7	#6	#5	#4	#3	#2	#1	#0
6010	*7	*6	*5	*4	*3	*2	*1	*0
6011	=7	=6	=5	=4	=3	=2	=1	=0
6012	#7	#6	#5	#4	#3	#2	#1	#0
6013	[7	[6	[5	[4	[3	[2	[1	[0
6014	]7	]6	]5	]4	]3	]2	]1	]0
6015	?7	?6	?5	?4	?3	?2	?1	?0
6016	@7	@6	@5	@4	@3	@2	@1	@0
6017	&7	&6	&5	&4	&3	&2	&1	&0
6018	_7	_6	_5	_4	_3	_2	_1	_0

[Input type] Parameter input
[Data type] Bit path

*0 to *7 : The bit pattern of the EIA or ISO/ASCII code indicating * is set.
=0 to =7 : The bit pattern of the EIA or ISO/ASCII code indicating = is set.
#0 to #7 : The bit pattern of the EIA or ISO/ASCII code indicating # is set.
[0 to [7 : The bit pattern of the EIA or ISO/ASCII code indicating [is set.
]0 to]7 : The bit pattern of the EIA or ISO/ASCII code indicating] is set.
?0 to ?7 : The bit pattern of the EIA or ISO/ASCII code indicating ? is set.
@0 to @7 : The bit pattern of the EIA or ISO/ASCII code indicating @ is set.
&0 to &7 : The bit pattern of the EIA or ISO/ASCII code indicating & is set.
_0 to _7 : The bit pattern of the EIA or ISO/ASCII code indicating _ is set.
0: A corresponding bit is 0.
1: A corresponding bit is 1.

	#7	#6	#5	#4	#3	#2	#1	#0
6019	SFN		EDP		OFN	DPD		MCO
	SFN		EDP	MSV	OFN			MCO

[Input type] Parameter input
[Data type] Bit

#0 MCO When data is output, the decimal number value of the macro variable data is
0: Not output as a comment.
1: Output at the same time as a comment.

After the number, data, and the variable name of the macro variable are output when data output operation is performed the variable number and the value of the macro variable data in decimal number are output as a comment.

NOTE

1 Output data by this parameter is "Comment", and this is ignored at the time of reading.
2 Accuracy of the output data of the comment is up to 15 digits. The range of output data are nine digits above decimal point and eight digits below decimal point. "± OVER FLOW" is output instead of a value when the total digits number is more than 16 and the digit number above the decimal point is ten or more. When the number of digits below the decimal point becomes nine digits or more, the ninth place of the decimal point is rounded off and output. Moreover, the seventh place or the eighth place of the decimal point is rounded off and output when the total digits number is more than 16 and the digit number above decimal point is nine or eight.
3 The output becomes "EMPTY" when displayed, the macro variable data is "DATA EMPTY".

#2 DPD When argument D is specified for a macro call without a decimal point, the number of decimal places:

0: Is assumed to be 0.
[Example]
When G65PppppD1 is specified, #7=1.0000 is passed as the argument.

1: Depends on the increment system of the reference axis.
[Example]
When the increment system of the reference axis is IS-B and G65PppppD1 is specified, #7=0.0010 is passed as the argument.

#3 OFN The format of the name of a file output by the external output command (DPRNT or BPRNT) is:

0: PRNTxxxx.DAT (xxxx: 0000 to 9999).
1: MCR_PRNT.TXT (fixed).

#4 MSV When Tool length compensation shift type is used, the value in which Tool offset value, Tool length offset and Tool holder offset are :
#5041 - #5060, #100101 - #100132 (Current position)
#5061 - #5080, #100151 - #100182 (Skip position):

0: It is included in above-mentioned system value.
1: It is not included in above-mentioned system value.

Only in the machining center system, this parameter becomes effective.

#5 EDP Precision setting for macro relational operators is:

0: Disabled.
1: Enabled.

NOTE

Parameter No. 6100 is used to set the number of significant digits after the decimal point.

#7 SFN The format of the name of a file output by the external output command (DPRNT or BPRNT) is:

0: PRNTxxxx.DAT (xxxx: 0000 to 9999).
If the power is off and on, xxxx is reset to 0000.
1: PRNTxxxx.DAT (xxxx: 0000 to 9999).
If the power is off and on, xxxx is continued and the next number is applied.

> **NOTE**
> The setting value of bit 7 (SFN) is effective in case of that bit 3 (OFN) equals 0.

	#7	#6	#5	#4	#3	#2	#1	#0
6020					NCM	IFR	NC2	NC1

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 NC1 The setting of the number of custom macro variables common to paths for #100 to #199 (#499) (parameter No. 6036) is:

0: Valid.
As many custom macro variables #100 to #199 (or #100 to #499) set for this path as the number set in parameter No. 6036 are used as custom macro variables common to tool paths.

1: Invalid.
Custom macro variables #100 to #199 (or #100 to #499) set for this path are all used as variables for the path.

> **NOTE**
> For path 1, be sure to set this parameter to 0.

> **Example**
> In a 4-path system, when parameters are set as listed below, custom macro variables for paths 1 to 3 are used as variables common to these paths, but for path 4, custom macro variables for the path are used.

Path number	No. 6036	NC1	Used custom macro variables
1	20	0	Custom macro variables #100 to #119 are used as variables common to these paths, and other custom macro variables are used independently for the relevant path.
2		0	
3		0	
4		1	Custom macro variables for path 4 are all used independently.

#1 NC2 The setting of the number of custom macro variables common to paths for #500 to #999 (parameter No. 6037) is:

0: Valid.
As many custom macro variables #500 to #999 set for this path as the number set in parameter No. 6037 are used as custom macro variables common to tool paths.

1: Invalid.
Custom macro variables #500 to #999 set for this path are all used as variables for the path.

> **NOTE**
> For path 1, be sure to set this parameter to 0.

Example

In a 4-path system, when parameters are set as listed below, custom macro variables for paths 1 to 3 are used as variables common to these paths, but for path 4, custom macro variables for the path are used.

Path number	No. 6037	NC2	Used custom macro variables
1	50	0	Custom macro variables #500 to #999 are used as variables common to these paths, and other custom macro variables are used independently for the relevant path.
2		0	
3		0	
4		1	Custom macro variables for path 4 are all used independently.

#2 IFR The custom macro interface signal R address is:
0: Disabled.
1: Enabled.

#3 NCM The position in which comment section can be inserted in macro statements changes places by setting value of this parameter.
When #3000(Alarm) or #3006(Stop with a message) are commanded with the comment section, the order of message and the comment section changes places by setting value of this parameter.

0: The position in which comment section can be inserted in macro statements is as follows.

(ABC) #100 =1; Head of the block
#100 =1 (ABC); End of the block
N01 (ABC) #100 =1; Just behind of the sequence number

It is assumed that it message first, and assumes since the second to be comment section.

#3000 =1 (ALARM MESSAGE) (COMMENT 1) (COMMENT 2);

1: The position in which comment section can be inserted in macro statements is as follows.

(ABC) #100 =1; Head of the block
#100 =1 (ABC); End of the block
N01 (ABC) #100 =1; Just behind of the sequence number
#100(ABC) =1; Just behind of variable number
#100 =#101 +1.(ABC) *#102; Just behind of numeric values
#100 =[#_UIL[1]](ABC) *100.; Just behind of the name of variable

The end is assumed to be message, and it assumes to be comment section from it ahead.

#3000 =1 (COMMENT 1) (COMMENT 2) (ALARM MESSAGE);

6030	M code to execute external device subprogram calls

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 99999999

Set the M code to execute external device subprogram calls. When 0 is set, M198 is used. M01, M02, M30, M98, and M99 cannot be used to execute external device subprogram calls. When a negative number, 1, 2, 30, 98, or 99 is set for this parameter, M198 is used to execute external device subprogram calls.

6031	Start number of common variables to be protected among the common variables (#500 to #999)
6032	End number of common variables to be protected among the common variables (#500 to #999)

[Input type] Parameter input
[Data type] Word path
[Valid data range] 500 to 999

Among the common variables #500 to #999, the range of common variables specified by this parameter can be protected (by setting their attributes to read-only). If a write attempt (on the left side) is made, an alarm is issued.

> **NOTE**
> Set 0 in both parameter No. 6031 and No. 6032 not to protect common variables.

6033	M code that validates a custom macro interrupt
6034	M code that invalidates a custom macro interrupt

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 03 to 99999999 (excluding 30, 98 and 99)

These parameters can be used when bit 4 (MPR) of parameter No. 6003 is 1. M96 is used as a valid M code and M97 is used as an invalid M code when MPR is 0, irrespective of the state of this parameter.

6036	Number of custom macro variables common to tool path (for #100 to #199 (#499))

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 400

When the memory common to paths is used, this parameter sets the number of custom macro common variables to be shared (custom macro variables common to paths). Common variables #100 to #199 (up to #499 in a system with the embedded macro option) may be shared. Ensure that the maximum number of usable macro common variables is not exceeded.

> **Example**
> When 20 is set in parameter No. 6036
> #100 to #119: Shared by all paths
> #120 to #149: Used by each path independently

> **NOTE**
> 1 To use up to #199, the option for adding custom macro common variables is required.
> 2 To use up to #499, the embedded macro option is required.
> 3 When 0 or a negative value is set, the memory common to paths is not used.
> 4 When the option for embedded macro is effective and the option for addition of custom macro common variables is not effective, #150 to #199 can not be used but this parameter should be set the number which includes #150 to #199.

6037	Number of custom macro variables common to tool path (for #500 to #999)

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 500

When the memory common to paths is used, this parameter sets the number of custom macro common variables to be shared (custom macro variables common to paths). Common variables #500 to #999 may be shared. Ensure that the maximum number of usable macro common variables is not exceeded.

Example

When 50 is set in parameter No. 6037
#500 to #549: Shared by all paths
#550 to #599: Used by each path independently

NOTE

1 To use up to #999, the option for adding custom macro common variables is required.
2 When 0 or a negative value is set, the memory common to paths is not used.

6038	Start G code used to call a custom macro

[Input type] Parameter input
[Data type] Word path
[Valid data range] -9999 to 9999

6039	Start program number of a custom macro called by G code

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

6040	Number of G codes used to call custom macros

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 255

Set this parameter to define multiple custom macro calls using G codes at a time. With G codes as many as the value set in parameter No. 6040 starting with the G code set in parameter No. 6038, the custom macros of program numbers as many as the value set in parameter No. 6040 starting with the program number set in parameter No. 6039 can be called. Set 0 in parameter No. 6040 to disable this mode of calling.

If a negative value is set in parameter No. 6038, the modal call mode is entered. Whether the modal call is equivalent to G66 or G66.1 depends on bit 3 (MGE) of parameter No. 6007.

[Example] When parameter No. 6038 = 900, parameter No. 6039 = 1000, and parameter No. 6040 = 100 are set, a set of 100 custom macro calls (simple calls) is defined as follows:

G900 → O1000
G901 → O1001
G902 → O1002
:
G999 → O1099

When the setting of parameter No. 6038 is changed to -900, the same set of custom macro calls (modal calls) is defined.

> **NOTE**
> 1 When the following conditions are satisfied, all calls using these parameters are disabled:
>   1) When a value not within the specifiable range is set in each parameter
>   2) (Value of parameter No. 6039 + value of parameter No. 6040 - 1) > 9999
> 2 The specification of a mixture of simple calls and modal calls is not allowed.
> 3 If a range of G codes set by these parameters duplicate G codes specified in parameters Nos. 6050 to 6059, the calls specified by parameters Nos. 6050 to 6059 are made preferentially.

6041	Start G code with a decimal point used to call a custom macro

[Input type] Parameter input
[Data type] Word path
[Valid data range] -999 to 999

6042	Start program number of a custom macro called by G code with a decimal point

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

6043	Number of G codes with a decimal point used to call custom macros

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 255

Set this parameter to define multiple custom macro calls using G codes with a decimal point at a time. With G codes with a decimal point as many as the value set in parameter No. 6043 starting with the G code with a decimal point set in parameter No. 6041, the custom macros of program numbers as many as the value set in parameter No. 6043 starting with the program number set in parameter No. 6042 can be called. Set 0 in parameter No. 6043 to disable this mode of calling.
If a negative value is set in parameter No. 6041, the modal call mode is entered. Whether the modal call is equivalent to G66 or G66.1 depends on bit 3 (MGE) of parameter No. 6007.

[Example] When parameter No. 6041 = 900, parameter No. 6042 = 2000, and parameter No. 6043 = 100 are set, a set of 100 custom macro calls (simple calls) is defined as follows:
G90.0 → O2000
G90.1 → O2001
G90.2 → O2002
:
G99.9 → O2099
When the setting of parameter No. 6041 is changed to -900, the same set of custom macro calls (modal calls) is defined.

NOTE

1 When the following conditions are satisfied, all calls using these parameters are disabled:
   1) When a value not within the specifiable range is set in each parameter
   2) (Value of parameter No. 6042 + value of parameter No. 6043 - 1) > 9999
   3) When bit 0 (DPG) of parameter No. 6007 = 0 (to disable calls using G codes with a decimal point)

2 The specification of a mixture of simple calls and modal calls is not allowed.

3 If a range of G codes set by these parameters duplicate G codes specified in parameters Nos. 6060 to 6069, the calls specified by parameters Nos. 6060 to 6069 are made preferentially.

6044	Start M code used to call a subprogram

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999

6045	Start program number of a subprogram called by M code

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

6046	Number of M codes used to call subprograms (number of subprograms called by M codes)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 32767

Set this parameter to define multiple subprogram calls using M codes at a time. With M codes as many as the value set in parameter No. 6046 starting with the M code set in parameter No. 6044, the subprograms of program numbers as many as the value set in parameter No. 6046 starting with the program number set in No. 6045 can be called. Set 0 in parameter No. 6046 to disable this mode of calling.

[Example] When parameter No. 6044 = 80000000, parameter No. 6045 = 3000, and parameter No. 6046 = 100 are set, a set of 100 subprogram calls is defined as follows:

M80000000 → O3000
M80000001 → O3001
M80000002 → O3002
:
M80000099 → O3099

NOTE

1 When the following conditions are satisfied, all calls using these parameters are disabled:
   1) When a value not within the specifiable range is set in each parameter
   2) (Value of parameter No. 6045 + value of parameter No. 6046 - 1) > 9999

> **NOTE**
> 2 If a range of M codes set by these parameters duplicate M codes specified in parameter Nos. 6071 to 6079, the calls specified by parameter Nos. 6071 to 6079 are made preferentially.

6047	Start M code used to call a custom macro

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999

6048	Start program number of a custom macro called by M code

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

6049	Number of M codes used to call custom macros (number of custom macros called by M codes)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 32767

Set this parameter to define multiple custom macro calls using M codes at a time. With M codes as many as the value set in parameter No. 6049 starting with the M code set in parameter No. 6047, the custom macros of program numbers as many as the value set in parameter No. 6049 starting with the program number set in parameter No. 6048 can be called. Set 0 in parameter No. 6049 to disable this mode of calling.

[Example] When parameter No. 6047 = 90000000, parameter No. 6048 = 4000, and parameter No. 6049 = 100 are set, a set of 100 custom macro calls (simple calls) is defined as follows:

M90000000 → O4000
M90000001 → O4001
M90000002 → O4002
:
M90000099 → O4099

> **NOTE**
> 1 When the following conditions are satisfied, all calls using these parameters are disabled:
> 1) When a value not within the specifiable range is set in each parameter
> 2) (Value of parameter No. 6048 + value of parameter No. 6049 - 1) > 9999
>
> 2 If a range of M codes set by these parameters duplicate M codes specified in parameter Nos. 6080 to 6089, the calls specified by parameter Nos. 6080 to 6089 are made preferentially.

6050	G code that calls the custom macro of program number 9010
6051	G code that calls the custom macro of program number 9011
6052	G code that calls the custom macro of program number 9012
6053	G code that calls the custom macro of program number 9013

6054	**G code that calls the custom macro of program number 9014**
6055	**G code that calls the custom macro of program number 9015**
6056	**G code that calls the custom macro of program number 9016**
6057	**G code that calls the custom macro of program number 9017**
6058	**G code that calls the custom macro of program number 9018**
6059	**G code that calls the custom macro of program number 9019**

[Input type] Parameter input
[Data type] Word path
[Valid data range] (-9999 to 9999 : excluding 0, 5, 65, 66 and 67)

Set the G codes used to call the custom macros of program numbers 9010 to 9019. However, note that when a negative value is set in this parameter, it becomes a modal call. For example, if this parameter is set to -11, the modal call mode is entered by G11.
Whether the modal call is equivalent to G66 or G66.1 depends on bit 3 (MGE) of parameter No. 6007.

6060	**G code with a decimal point used to call the custom macro of program number 9040**
6061	**G code with a decimal point used to call the custom macro of program number 9041**
6062	**G code with a decimal point used to call the custom macro of program number 9042**
6063	**G code with a decimal point used to call the custom macro of program number 9043**
6064	**G code with a decimal point used to call the custom macro of program number 9044**
6065	**G code with a decimal point used to call the custom macro of program number 9045**
6066	**G code with a decimal point used to call the custom macro of program number 9046**
6067	**G code with a decimal point used to call the custom macro of program number 9047**
6068	**G code with a decimal point used to call the custom macro of program number 9048**
6069	**G code with a decimal point used to call the custom macro of program number 9049**

[Input type] Parameter input
[Data type] Word path
[Valid data range] -999 to 999

Set the G codes used to call the custom macros of program numbers 9040 to 9049. However, note that when a negative value is set in this parameter, it becomes a modal call. For example, if this parameter is set to -11, the modal call mode is entered by G11.
Whether the modal call is equivalent to G66 or G66.1 depends on bit 3 (MGE) of parameter No. 6007. Set G codes in the format Gm.n. The value expressed by ($m \times 10+n$) is set in the parameter. The values m and n must satisfy the following relationships: $0 \leq m \leq 99$, $0 \leq n \leq 9$.

NOTE

Parameter Nos. 6060 to 6069 are valid when bit 0 (DPG) of parameter No. 6007 is set to 1.

6071	**M code used to call the subprogram of program number 9001**
6072	**M code used to call the subprogram of program number 9002**

6073	M code used to call the subprogram of program number 9003
6074	M code used to call the subprogram of program number 9004
6075	M code used to call the subprogram of program number 9005
6076	M code used to call the subprogram of program number 9006
6077	M code used to call the subprogram of program number 9007
6078	M code used to call the subprogram of program number 9008
6079	M code used to call the subprogram of program number 9009

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999 (excluding 30, 98 and 99)

These parameters set the M codes that call the subprograms of program numbers 9001 to 9009.

NOTE
If the same M code is set in these parameters, the younger number is called preferentially. For example, if 100 is set in parameter Nos. 6071 and 6072, and programs O9001 and O9002 both exist, O9001 is called when M100 is specified.

6080	M code used to call the custom macro of program number 9020
6081	M code used to call the custom macro of program number 9021
6082	M code used to call the custom macro of program number 9022
6083	M code used to call the custom macro of program number 9023
6084	M code used to call the custom macro of program number 9024
6085	M code used to call the custom macro of program number 9025
6086	M code used to call the custom macro of program number 9026
6087	M code used to call the custom macro of program number 9027
6088	M code used to call the custom macro of program number 9028
6089	M code used to call the custom macro of program number 9029

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999 (excluding 30, 98 and 99)

Set the M codes used to call the custom macros of program numbers 9020 to 9029. The simple call mode is set.

> **NOTE**
> 1 If the same M code is set in these parameters, the younger number is called preferentially. For example, if 200 is set in parameter No. 6081 and No. 6082, and programs O9021 and O9022 both exist, O9021 is called when M200 is specified.
> 2 If the same M code is set in a parameters Nos. 6071 to 6079 used to call subprograms and in a parameters Nos. 6080 to 6089 used to call custom macros, a custom macro is called preferentially. For example, if 300 is set in parameters Nos. 6071 and 6081, and programs O9001 and O9021 both exist, O9021 is called when M300 is specified.

6090	ASCII code that calls the subprogram of program number 9004
6091	ASCII code that calls the subprogram of program number 9005

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 65(A:41H) to 90(Z:5AH)

These parameters set the ASCII codes that call subprograms in decimal.
The settable addresses are indicated below.

Address	Parameter setting value	T series	M series
A	65	O	O
B	66	O	O
D	68	X	O
F	70	O	O
H	72	O	O
I	73	O	O
J	74	O	O
K	75	O	O
L	76	O	O
M	77	O	O
P	80	O	O
Q	81	O	O
R	82	O	O
S	83	O	O
T	84	O	O
V	86	X	O
X	88	X	O
Y	89	X	O
Z	90	X	O

> **NOTE**
> 1 When address L is set, the number of repeats cannot be specified.
> 2 Set 0 when no subprogram is called.

6093	Top address of custom macro interface signal R address (input signal)

6094	Top address of custom macro interface signal R address (output signal)

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to maximum address (multiple of 4. 0, 4, 8, ...)
Set the top address of custom macro interface signal R address. 128 signals starting at the top address are allocated.

[Example]

Parameter	System variable number	Signal to use	Attribute
No.6093=1000	#1068 #1069 #1070 #1071	R1000 to R1003 R1004 to R1007 R1008 to R1011 R1012 to R1015	R
No.6094=1100	#1168 #1169 #1170 #1171	R1100 to R1103 R1104 to R1107 R1108 to R1111 R1112 to R1115	R/W

*) The R and R/W attributes of variables represent, respectively, read-only and read/write enabled.

NOTE
1 Each value specified with this parameter must be a multiple of 4 (0, 4, 8, · · ·). Otherwise, this function is disabled.
2 If a non-existent R address or system relay address is set, the corresponding system variable becomes invalid. The effective R address area varies depending on the PMC used and its memory. Be sure to specify a usable range by checking the specification of the PMC in use.
3 When setting the parameter, make sure that the input signal addresses do not overlap with the output signal addresses.

6095	The number of programs used by the one touch macro call function

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 16
Specify the number of programs used by the one touch macro call function.
For instance, when three is set, macro call start signal MCST1, MCST2, and MCST3 is valid.
When 0 is specified, this function is invalid.

6096	The first O number of the program used by the one touch macro call function

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

Specify the first O number of the program used by the one touch macro call function.
When 9000 is set, for example, the relationship between macro call start signal MSCTx and the program number of a program started by the signal is as follows:
MCST1 signal : Starts O9000 (when 1 or a greater value is set in parameter No. 6095).
MCST2 signal : Starts O9001 (when 2 or a greater value is set in parameter No. 6095).
MCST3 signal : Starts O9002 (when 3 or a greater value is set in parameter No. 6095).
: : :
MCST15 signal: Starts O9014 (when 15 or a greater value is set in parameter No. 6095).
MCST16 signal: Starts O9015 (when 16 or a greater value is set in parameter No. 6095).

6100	Precision setting for relational operators

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 15
This parameter sets the number of digits after the decimal point in two values to be compared using the custom macro relational operator. The two values are rounded off to the specified number of digits before comparison.

NOTE
1 This function is enabled by setting bit 5 (EDP) of parameter No. 6019 to 1.
2 This function is disabled if parameter No. 6100 is set to a value out of the valid data range.

4.38 PARAMETERS OF PATTERN DATA INPUT

6101	Macro variable number selected first when pattern menu 1 is selected
6102	Macro variable number selected first when pattern menu 2 is selected
6103	Macro variable number selected first when pattern menu 3 is selected
6104	Macro variable number selected first when pattern menu 4 is selected
6105	Macro variable number selected first when pattern menu 5 is selected
6106	Macro variable number selected first when pattern menu 6 is selected
6107	Macro variable number selected first when pattern menu 7 is selected
6108	Macro variable number selected first when pattern menu 8 is selected
6109	Macro variable number selected first when pattern menu 9 is selected
6110	Macro variable number selected first when pattern menu 10 is selected

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0,100 to 199,500 to 999
Set the macro variable number to be selected first when a pattern menu is selected on the custom macro screen.
If 0 is specified, 500 is assumed.
If a value beyond the above range is entered, 100 is assumed.

4.39 PARAMETERS OF POSITIONING BY OPTIMUM ACCELERATION

	#7	#6	#5	#4	#3	#2	#1	#0
6131								OADx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 OADx The function for positioning by optimum acceleration (seven step switch of the rapid traverse rate, time constant, and loop gain by the positioning distance to rapid traverse by automatic operation) is
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
6132								ILG

[Input type] Parameter input
[Data type] Bit path

#0 ILG In the function for positioning by optimum acceleration, the switch of the loop gain is
0: Enabled. (Parameters Nos. 6181 to 6187 is used.)
1: Disabled. (Parameter No. 1825 is used.)

6136	Distance D1 for level 1 of positioning by optimum acceleration for each axis
6137	Distance D2 for level 2 of positioning by optimum acceleration for each axis
6138	Distance D3 for level 3 of positioning by optimum acceleration for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree(machine unit)
[Valid data range] Refer to the standard parameter setting table(B)
When a function for changing the rapid traverse rate, time constant, and loop gain according to the positioning distance is used, set the positioning distance for each axis.

> **NOTE**
> 1 When this parameter is enabled, bit 0 (OADx) of parameter No. 6131 must be set to 1.
> 2 When 0 is set to all parameters Nos. 6136 to 6138 and Nos. 11230 to 11232, this function is invalid.
> 3 The setting must satisfy the relationship D1 < D2 < D3 < D4 < D5 < D6.
> 4 Up to seven levels can be used for adjustment. When using four levels, for example, set to become D1<D2<D3 and set D4, D5, D6 to maximum setting value (When the increment system is IS-B, 999999.999).

NOTE

5 For diameter programming axes, set a diameter. For example, assume that 10.000mm is set in a parameter for diameter programming axes. Then, when the travel distance has reached 10.000 mm, adjustment is performed.

6 The distance of each axis is set to each parameter Nos. 6136 to 6138 and Nos. 11230 to 11232. The length of the block cannot be specified.

6161	**Level 1 rapid traverse rate**
6162	**Level 2 rapid traverse rate**
6163	**Level 3 rapid traverse rate**
6164	**Level 4 rapid traverse rate**
6165	**Level 5 rapid traverse rate**
6166	**Level 6 rapid traverse rate**
6167	**Level 7 rapid traverse rate**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Valid data range] Refer to the standard parameter setting table(C)

The rapid traverse rate for each axis is set.

6171	**Level 1 rapid traverse time constant**
6172	**Level 2 rapid traverse time constant**
6173	**Level 3 rapid traverse time constant**
6174	**Level 4 rapid traverse time constant**
6175	**Level 5 rapid traverse time constant**
6176	**Level 6 rapid traverse time constant**
6177	**Level 7 rapid traverse time constant**

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

The rapid traverse time constant for each axis is set.

6181	**Level 1 servo loop gain**
6182	**Level 2 servo loop gain**
6183	**Level 3 servo loop gain**
6184	**Level 4 servo loop gain**
6185	**Level 5 servo loop gain**

6186	Level 6 servo loop gain
6187	Level 7 servo loop gain

[Input type] Parameter input
[Data type] Word axis
[Unit of data] 0.01/sec
[Valid data range] 1 to 9999
The servo loop gain for each axis is set.
If 0 is set, parameter No. 1825 is used.

6191	Time constant T2 of level 1 bell-shaped acceleration/deceleration in rapid traverse T2
6192	Time constant T2 of level 2 bell-shaped acceleration/deceleration in rapid traverse T2
6193	Time constant T2 of level 3 bell-shaped acceleration/deceleration in rapid traverse T2
6194	Time constant T2 of level 4 bell-shaped acceleration/deceleration in rapid traverse T2
6195	Time constant T2 of level 5bell-shaped acceleration/deceleration in rapid traverse T2
6196	Time constant T2 of level 6 bell-shaped acceleration/deceleration in rapid traverse T2
6197	Time constant T2 of level 7 bell-shaped acceleration/deceleration in rapid traverse T2

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 512
Time constant T2 of bell-shaped acceleration/deceleration in rapid traverse for each axis is set.

4.40 PARAMETERS OF SKIP FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
6200	SKF	SRE	SLS	HSS			SK0	GSK

[Input type] Parameter input
[Data type] Bit path

#0 GSK As a skip signal, the skip signal SKIPP<Gn006.6> is:
0: Invalid.
1: Valid.

#1 SK0 This parameter specifies whether the skip signal is made valid under the state of the skip signal SKIP<X0004.7> and the multistage skip signals SKIP2 to SKIP8<X0004.2> to <X0004.1>.
0: Skip signal is valid when these signals are “1”.
1: Skip signal is valid when these signals are “0”.

#4 HSS 0: The skip function does not use high-speed skip signals while skip signals are input. (The conventional skip signal is used.)
1: The step skip function uses high-speed skip signals while skip signals are input.

#5 SLS 0: The multi-step skip function does not use high-speed skip signals while skip signals are input. (The conventional skip signal is used.)
1: The multi-step skip function uses high-speed skip signals while skip signals are input.

> **NOTE**
> The skip signals SKIP<X0004.7> and SKIP2 to SKIP8<X0004.2> to <X0004.1> are valid regardless of the setting of this parameter. They can also be disabled using bit 4 (IGX) of parameter No. 6201. If you want to use high-speed skip signals when the multi-step skip function option is used, set this parameter to 1.

#6 SRE When a high-speed skip signal or high-speed measurement position arrival signal is used:
0: The signal is assumed to be input on the rising edge (contact open → close).
1: The signal is assumed to be input on the falling edge (contact close → open).

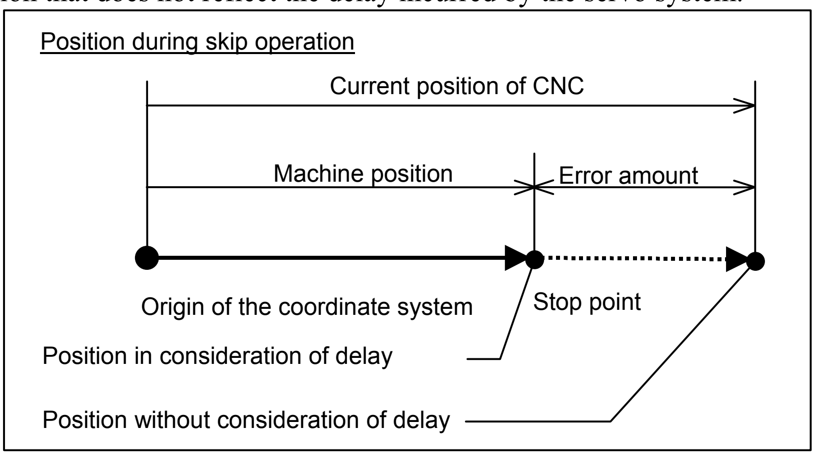
#7 SKF Dry run, override, and automatic acceleration/deceleration for G31 skip command
0: Disabled
1: Enabled

	#7	#6	#5	#4	#3	#2	#1	#0
6201	SKPXE		CSE	IGX		TSE	SEB	

[Input type] Parameter input
[Data type] Bit path

#1 SEB When a skip signal, high-speed skip signal or measurement position arrival signal goes on while the skip function, the continuous high-speed skip function or the automatic tool length measurement (M series) or automatic tool compensation (T series) is used, the accumulated pulses and positional deviation due to acceleration/deceleration are:
0: Ignored.
1: Considered and compensated.
The accumulated pulses and positional deviation due to actual acceleration/deceleration when the skip signal, high-speed skip signal or measurement position arrival signal goes on are considered to obtain the position at which the signal is input.

#2 TSE When the torque limit skip function (G31 P98/99) is used, the skip position held in a system variable (#5061 to #5080) is:
0: Position that is offset considering the delay (positional deviation) incurred by the servo system.
1: Position that does not reflect the delay incurred by the servo system.



#4 IGX When the high-speed skip function is used, SKIP<X0004.7>, SKIPP<Gn006.6>, and SKIP2 to SKIP8<X0004.2> to <X0004.1> are:
0: Enabled as skip signals.
1: Disabled as skip signals.

#5 CSE For the continuous high-speed skip command, high-speed skip signals are:
0: Effective at either a rising or falling edge (depending on the setting of bit 6 (SRE) of parameter No. 6200).
1: Effective at both the rising and falling edges.

#7 SKPXE For the skip function (G31), the skip signal SKIP is:
0: Enabled.
1: Disabled.

Whether the skip signals are enabled or disabled

Parameter	Bit 4 (IGX) of parameter No. 6201	Bit 0 (GSK) of parameter No. 6200	Bit 7 (SKPXE) of parameter No .6201	Skip signal SKIPP	Skip signal SKIP	Multistage skip signals SKIP2-SKIP8
Setting	0	0	0	Disabled	Enabled	Enabled
	0	1	0	Enabled	Enabled	Enabled
	0	0	1	Disabled	Disabled	Enabled
	0	1	1	Enabled	Disabled	Enabled
	1	0	0	Disabled	Disabled	Disabled
	1	1	0	Disabled	Disabled	Disabled
	1	0	1	Disabled	Disabled	Disabled
	1	1	1	Disabled	Disabled	Disabled

Bit 4 (IGX) of parameter No. 6201 is valid for the skip function using high-speed skip signals (when bit 4 (HSS) of parameter No. 6200 is set to 1) or for the multistage skip function using high-speed skip signals (when bit 5 (SLS) of parameter No. 6200 is set to 1).
To use multistage skip signals, the multistage skip function option is required.

	#7	#6	#5	#4	#3	#2	#1	#0
6202	1S8	1S7	1S6	1S5	1S4	1S3	1S2	1S1

[Input type] Parameter input
[Data type] Bit path

1S1 to 1S8 These parameters specify whether to enable or disable each high-speed skip signal when the G31 skip command is issued.
The following table shows the correspondence between the bits, input signals, and commands.
The settings of the bits have the following meaning :
0: The high-speed skip signal corresponding to a bit is disabled.
1: The high-speed skip signal corresponding to a bit is enabled.

Parameter	High-speed skip signals	Parameter	High-speed skip signals
1S1	HDI0	1S5	HDI4
1S2	HDI1	1S6	HDI5
1S3	HDI2	1S7	HDI6
1S4	HDI3	1S8	HDI7

> **NOTE**
> Do not specify the same signal simultaneously for different paths.

	#7	#6	#5	#4	#3	#2	#1	#0
6203	2S8	2S7	2S6	2S5	2S4	2S3	2S2	2S1

	#7	#6	#5	#4	#3	#2	#1	#0
6204	3S8	3S7	3S6	3S5	3S4	3S3	3S2	3S1

	#7	#6	#5	#4	#3	#2	#1	#0
6205	4S8	4S7	4S6	4S5	4S4	4S3	4S2	4S1

	#7	#6	#5	#4	#3	#2	#1	#0
6206	DS8	DS7	DS6	DS5	DS4	DS3	DS2	DS1

[Input type] Parameter input
[Data type] Bit path

1S1to1S8, 2S1to2S8, 3S1to3S8, 4S1to4S8, DS1toDS8

Specify which skip signal is enabled when the skip command (G31, or G31P1 to G31P4) and the dwell command (G04, G04Q1 to G04Q4) are issued with the multi-step skip function.
The following table shows the correspondence between the bits, input signals, and commands.
The setting of the bits have the following meaning :
0: The skip signal corresponding to a bit is invalid.
1: The skip signal corresponding to a bit is enabled.

Multi-step skip function

Input signal \ Command	G31 G31P1 G04Q1	G31P2 G04Q2	G31P3 G04Q3	G31P4 G04Q4	G04
SKIP/HDI0	1S1	2S1	3S1	4S1	DS1
SKIP2/HDI1	1S2	2S2	3S2	4S2	DS2
SKIP3/HDI2	1S3	2S3	3S3	4S3	DS3
SKIP4/HDI3	1S4	2S4	3S4	4S4	DS4
SKIP5/HDI4	1S5	2S5	3S5	4S5	DS5
SKIP6/HDI5	1S6	2S6	3S6	4S6	DS6
SKIP7/HDI6	1S7	2S7	3S7	4S7	DS7
SKIP8/HDI7	1S8	2S8	3S8	4S8	DS8

> **NOTE**
> HDI0 to HDI7 are high-speed skip signals. Do not specify the same signal simultaneously for different paths.

When bit 0 (GSK) of parameter No. 6200 is set to 1, commands to be skipped can be selected by setting the following parameter:

Commands skipped by skip signal SKIPP <Gn006.6>

Parameter	Command skipped
When bit 0 (1S1) of parameter No. 6202 is set to 1	G31P1,G04Q1
When bit 0 (2S1) of parameter No. 6203 is set to 1	G31P2,G04Q2
When bit 0 (3S1) of parameter No. 6204 is set to 1	G31P3,G04Q3
When bit 0 (4S1) of parameter No. 6205 is set to 1	G31P4,G04Q4
When bit 0 (DS1) of parameter No. 6206 is set to 1	G04,G04Q1,G04Q2,G04Q3,G04Q4

	#7	#6	#5	#4	#3	#2	#1	#0
6207						SFN	SFP	

[Input type] Parameter input
[Data type] Bit path

#1 SFP The feedrate used when the skip function (G31) is being executed is:
0: Feedrate of a programmed F code.
1: Feedrate set in parameter No. 6281.

> **NOTE**
> For the multi-stage skip function and high-speed skip, see the description of bit 2 (SFN) of parameter No. 6207.

#2 SFN The feedrate used when the skip function based on high-speed skip signals (with bit 4 (HSS) of parameter No. 6200 set to 1) or the multi-skip function is being executed is:
0: Feedrate of a programmed F code.
1: Feedrate set in a parameter from parameter Nos. 6282 to 6285.

> **NOTE**
> For not the multistage skip function, but the skip function using no high-speed skip signals (when bit 4 (HSS) of parameter No. 6200 is set to 0), see the description of bit 1 (SFP) of parameter No. 6207.

	#7	#6	#5	#4	#3	#2	#1	#0
6208	9S8	9S7	9S6	9S5	9S4	9S3	9S2	9S1

[Input type] Parameter input
[Data type] Bit path

9S1 to 9S8 Specify which high-speed skip signal is enabled for the continuous high-speed skip command G31P90 or the EGB skip and the skip function for flexible synchronous control command G31.8.
The settings of each bit have the following meaning:
0: The high-speed skip signal corresponding to the bit is disabled.
1: The high-speed skip signal corresponding to the bit is enabled.
The bits correspond to signals as follows:

Parameter	High-speed skip signal	Parameter	High-speed skip signal
9S1	HDI0	9S5	HDI4
9S2	HDI1	9S6	HDI5
9S3	HDI2	9S7	HDI6
9S4	HDI3	9S8	HDI7

	#7	#6	#5	#4	#3	#2	#1	#0
6210		MDC		ASB	ASL	DSK		
	CCM	MDC		ASB	ASL	DSK		

[Input type] Parameter input
[Data type] Bit path

#2 DSK Skip position reading (system variables #5421 to #5440, #100701 to #100750) by the detection unit is:
0: Disabled.
1: Enabled.

#3 ASL
#4 ASB The ASB and ASL bits set the type and time constant of acceleration/deceleration after interpolation in the skip function as follows:

ASB	ASL	Type of acceleration/ deceleration	Parameter No. for time constant
0	1	Linear type	Parameter No. 6280
1	–	Bell-shaped	
0	0	This function is disabled(NOTE).	

When bell-shaped acceleration/deceleration is specified, T1=T/2 and T2=T/2 are obtained as with normal acceleration/deceleration after cutting feed interpolation, where T is the time constant. Therefore, the acceleration/deceleration type includes no linear part.

> **NOTE**
> In this case, the acceleration/deceleration type is set in bits 0 and 1 of parameter No. 1610, and the time constant is set in parameter No. 1622.

#6 MDC The measurement result of automatic tool length measurement (M series) or automatic tool compensation (T series) is:
0: Added to the current offset.
1: Subtracted from the current offset.

#7 CCM The current offset amount of automatic tool length measurement (M series) is:
0: The offset amount set to the offset screen.
In case of tool offset memory B or C, the value for tool wear offset is selected.
1: The offset amount actually effected.

	#7	#6	#5	#4	#3	#2	#1	#0
6215								CSTx

[Input type] Parameter input
[Data type] Bit axis

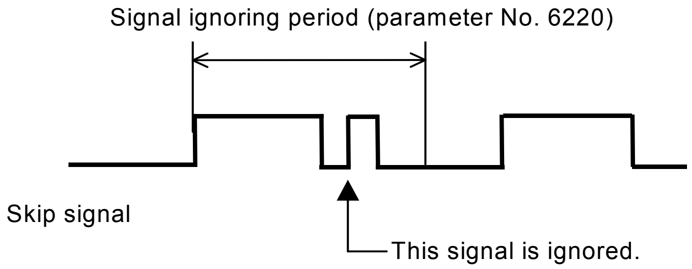
#0 CSTx On a Cs contour control axis, torque limit skip operation is:
0: Not performed.
1: Performed.
Torque limit skip operation is performed using the torque limit command signal TLMH and the load detection signal LDT1 of the serial spindle.

6220	Period during which skip signal input is ignored for the continuous high-speed skip function and EGB axis skip function and the skip function for flexible synchronous control

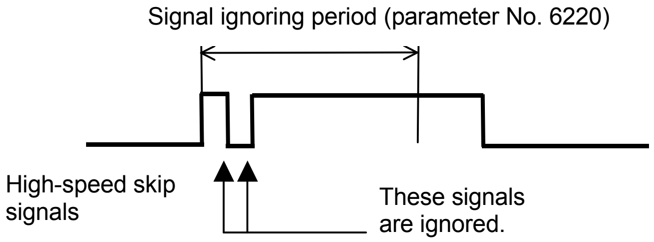
[Input type] Parameter input
[Data type] Byte path
[Unit of data] 8msec
[Valid data range] 3 to 127(× 8msec)

This parameter specifies the period from when a skip signal is input to when the next skip signal can be input for the continuous high-speed skip function and EGB axis skip function and the skip function for flexible synchronous control. This parameter is used to ignore chattering in skip signals.

If a value that falls outside the valid range is specified, the setting is assumed to be 24 msec.



When high-speed skip signals are used and bit 5 (CSE) of parameter No. 6201 is set to 1, signals are handled as follows:



6221	Torque limit dead zone time for a torque limit skip command

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] 2msec
[Valid data range] 0 to 65535

The torque limit skip arrival signal is ignored for a set period of time.
If G31P98 is specified, skip operation is not performed for a set period of time after the torque limit skip arrival signal is set to “1”.
If G31P99 is specified, skip operation is not performed for a set period of time after the torque limit skip arrival signal is set to “1”.
However, if a skip signal is input, skip operation is performed, regardless of the period of time set in this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
6224	1A8	1A7	1A6	1A5	1A4	1A3	1A2	1A1

[Input type] Parameter input
[Data type] Bit path

1A1 to 1A8 Specify which high-speed measurement position arrival signal is to be enabled for each AE1 signal of G37 (automatic tool length measurement (M series) or automatic tool compensation (T series)).

Parameter	Corresponding high-speed measurement position arrival signal	Parameter	Corresponding high-speed measurement position arrival signal
1A1	HAE1	1A5	HAE5
1A2	HAE2	1A6	HAE6
1A3	HAE3	1A7	HAE7
1A4	HAE4	1A8	HAE8

0: The corresponding high-speed measurement position arrival signal is disabled.
1: The corresponding high-speed measurement position arrival signal is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
6225	2A8	2A7	2A6	2A5	2A4	2A3	2A2	2A1

[Input type] Parameter input
[Data type] Bit path

2A1 to 2A8 Specify which high-speed measurement position arrival signal is enabled for each AE2 signal of G37 (automatic tool length measurement (M series) or automatic tool compensation (T series)).

Parameter	Corresponding high-speed measurement position arrival signal	Parameter	Corresponding high-speed measurement position arrival signal
2A1	HAE1	2A5	HAE5
2A2	HAE2	2A6	HAE6
2A3	HAE3	2A7	HAE7
2A4	HAE4	2A8	HAE8

0: The corresponding high-speed measurement position arrival signal is disabled.
1: The corresponding high-speed measurement position arrival signal is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
6226	3A8	3A7	3A6	3A5	3A4	3A3	3A2	3A1

[Input type] Parameter input
[Data type] Bit path

3A1 to 3A8 Specify which high-speed measurement position arrival signal is to be enabled for each AE3 signal of G37 (automatic tool length measurement (M series) or automatic tool compensation (T series)).

Parameter	Corresponding high-speed measurement position arrival signal	Parameter	Corresponding high-speed measurement position arrival signal
3A1	HAE1	3A5	HAE5
3A2	HAE2	3A6	HAE6
3A3	HAE3	3A7	HAE7
3A4	HAE4	3A8	HAE8

0: The corresponding high-speed measurement position arrival signal is disabled.
1: The corresponding high-speed measurement position arrival signal is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
6240							AMH	AE0

[Input type] Parameter input
[Data type] Bit path

#0 AE0 Measurement position arrival is assumed when the automatic tool compensation signals XAE1 and XAE2<X004.0 and X004.1> (T series) or the automatic tool length measurement signals XAE1, XAE2, and XAE3<X004.0, X004.1, and X004.2> (M series) are:
0: “1”.
1: “0”.

#1 AMH For automatic tool compensation signals (T series) or automatic tool length measurement signals (M series), a high-speed measurement position arrival signal is:
0: Not used.
1: Used.

> **NOTE**
> Setting this parameter to 1 disables the input of standard measuring position reached signals (X/G). Just the high-speed measuring position reached signals are valid.

6241	Feedrate during measurement of automatic tool compensation (T series) (for the XAE1 and GAE1 signals)
	Feedrate during measurement of automatic tool length measurement (M series) (for the XAE1 and GAE1 signals)

6242	Feedrate during measurement of automatic tool compensation (T series) (for the XAE2 and GAE2 signals)
	Feedrate during measurement of automatic tool length measurement (M series) (for the XAE2 and GAE2 signals)

6243	
	Feedrate during measurement of automatic tool length measurement (M series) (for the XAE3 and GAE3 signals)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, deg/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
These parameters set the relevant feedrate during measurement of automatic tool compensation (T series) or automatic tool length measurement (M series).

> **NOTE**
> When the setting of parameter No. 6242 or No. 6243 is 0, the setting of parameter No. 6241 is used.

6251	γ value on the X axis during automatic tool compensation (T series)
	γ value during automatic tool length measurement (M series) (for the XAE1 and GAE1 signals)

6252	γ value on the Z axis during automatic tool compensation (T series)
	γ value during automatic tool length measurement (M series) (for the XAE2 and GAE2 signals)

6253	
	γ value during automatic tool length measurement (M series) (for the XAE3 and GAE3 signals)

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] mm, inch, deg (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the relevant γ value during automatic tool compensation (T series) or automatic tool length measurement (M series).

> **NOTE**
> When the Reference axis (parameter No.1031) is Diameter specification, specify the diameter value. When the Reference axis (parameter No.1031) is Radius specification, specify the radius value.

6254	ε value on the X axis during automatic tool compensation (T series)
	ε value during automatic tool length measurement (M series) (for the XAE1 and GAE1 signals)

6255	ε value on the Z axis during automatic tool compensation (T series)
	ε value during automatic tool length measurement (M series) (for the XAE2 and GAE2 signals)

6256	
	ε value during automatic tool length measurement (M series) (for the XAE3 and GAE3 signals)

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] mm, inch, deg (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the relevant ε value during automatic tool compensation (T series) or automatic tool length measurement (M series).

> **NOTE**
> When the Reference axis (parameter No.1031) is Diameter specification, specify the diameter value. When the Reference axis (parameter No.1031) is Radius specification, specify the radius value.

6280	Time constant for acceleration/deceleration after interpolation for the skip function for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 512

This parameter sets a time constant for acceleration/deceleration after interpolation for the skip function for each axis.
This parameter is valid when bit 3 (ASB) of parameter No. 6210 or bit 4 (ASL) of parameter No. 6210 is set to 1.

6281	Feedrate for the skip function (G31)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

This parameter sets a feedrate for the skip function (G31). This parameter is valid when bit 1 (SFP) of parameter No. 6207 is set to 1.

> **NOTE**
> For the multi-stage skip function and high-speed skip, see the description of parameter Nos. 6282 to 6285.

6282	Feedrate for the skip function (G31, G31 P1)
6283	Feedrate for the skip function (G31 P2)
6284	Feedrate for the skip function (G31 P3)
6285	Feedrate for the skip function (G31 P4)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Each of these parameters sets a feedrate for each skip function G code. These parameters are valid when bit 2 (SFN) of parameter No. 6207 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
6286								TQOx

[Input type] Parameter input
[Data type] Bit axis

#0 TQOx The torque limit override function is:
0: Disabled. (Override of 100%)
1: Enabled.

> **NOTE**
> Before the torque limit skip function can be used, this parameter must be set to 1.

6287	Positional deviation limit in torque limit skip

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 327670
This parameter sets a positional deviation limit for each axis imposed when torque limit skip is specified. When the actual positional deviation exceeds the positional deviation limit, the alarm SV0004, "EXCESS ERROR (G31)" is issued and an immediate stop takes place.

4.41 PARAMETERS OF EXTERNAL DATA INPUT/OUTPUT

	#7	#6	#5	#4	#3	#2	#1	#0
6300	EEX			ESR	ESC			

[Input type] Parameter input
[Data type] Bit path

#3 ESC When a reset is input between the input of the external data input read signal ESTB and the execution of a search, the external program number search function:
0: Performs a search.
1: Does not perform a search.

#4 ESR The external program number search function is:
0: Disabled.
1: Enabled.

#7 EEX PMC EXIN function
0: Conventional specifications
1: Extended specifications

If you want to use external machine coordinate system shift which handles ±10.000 or more shift unavailable with the PMC/EXIN command in the conventional specifications, set 1.
When this function is used for a multi-path system, the setting for path 1 is used.
For details of EXIN and how to change ladder software, refer to the PMC manuals.

	#7	#6	#5	#4	#3	#2	#1	#0
6301					EED	NNO	EXM	EXA

[Input type] Parameter input
[Data type] Bit machine group

#0 EXA This bit selects an external alarm message specification.
0: A message number from 0 to 999 can be sent. When displaying an alarm number, the CNC prefixes the character string "EX" to the alarm number obtained by adding 1000 to the message number.
1: A message number from 0 to 4095 can be sent. The CNC prefixes the character string "EX" to a alarm number for display.

#1 EXM This bit selects an external operator message specification.
0: A message number from 0 to 999 can be sent. The message of a message number from 0 to 99 is displayed together with its number. The CNC adds 2000 to a number for distinction. A message number from 100 to 999 is not displayed on the screen, but only the corresponding message is displayed on the screen.
1: A message number from 0 to 4095 can be sent. The message of a message number from 0 to 99 is displayed together with its number. The CNC prefixes the character string "EX" to a message number for display. A message number from 100 to 4095 is not displayed on the screen, but only the corresponding message is displayed on the screen.

#2 NNO When operator messages are set by external data input, a new line operation between one message set with a number and another message set with a different number is:
0: Performed.
1: Not performed.

#3 EED To specify data for external tool compensation and external workpiece coordinate system shift, use:
0: Signals ED15 to ED0.
(The value which can be specified for tool compensation and workpiece coordinate system shift is from 0 to ±7999.)
1: Signals ED31 to ED0.
(The value which can be specified for tool compensation and workpiece coordinate system shift is from 0 to ±79999999.)

6310	Setting for number addition to external operator messages

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word machine group
[Valid data range] 0 to 4096
This parameter sets the number of messages to which message numbers are to be prefixed in external operator message display.
When 0 is set, the same operation as when 100 is set is performed.
[Example] When 500 is set in this parameter, the messages of message numbers 0 to 499 are displayed together with their numbers on the screen. A message number of 500 and up is not displayed on the screen, but only the corresponding message is displayed on the screen.

4.42 PARAMETERS OF FINE TORQUE SENSING

	#7	#6	#5	#4	#3	#2	#1	#0
6350				ATL		SPL	TQ2	TQ1

[Input type] Parameter input
[Data type] Bit path

#0 TQ1
#1 TQ2 These parameters set the interval at which the fine torque sensing function stores data.

TQ2	TQ1	Store interval
0	0	8msec
0	1	16msec
1	0	32msec
1	1	-

#2 SPL The function which saves the stored disturbance load torque data as sample data is:
0: Disabled.
1: Enabled.

#4 ATL On the torque graph screen for fine torque sensing, the alarm threshold for detecting abnormal load:
0: Cannot be changed.
1: Can be changed.
When this bit is set to 1, the detection level is reflected in parameter No. 2104 (servo) or 4341 (spindle) when the soft key [END] is pressed after the detection level is changed on the torque monitor screen. (The abnormal load detection function is optional.)

> **NOTE**
> The detection level on the torque monitor screen is not changed by changing parameter No. 2104 or 4341 by MDI input or using the relevant command.

6360	Target axis 1 for fine torque sensing
6361	Target axis 2 for fine torque sensing
6362	Target axis 3 for fine torque sensing
6363	Target axis 4 for fine torque sensing

[Input type] Parameter input
[Data type] Byte path
[Valid data range] -16 to 48

This parameter sets the target axis for the fine torque sensing function. For a servo axis, specify a value between 1 and the number of controlled axes as the corresponding controlled-axis number. For a spindle axis, specify a value between -1 and -(number of controlled axes), inverting the sign of the controlled-axis number, as the corresponding controlled-axis number.

> **NOTE**
> 1 When target axis for fine torque sensing N is set to 0, the setting of target axis N + 1 and subsequent target axis settings are ignored and assumed to be 0.
> 2 To set a servo axis as a target axis, the parameter for the target controlled axis (bit 0 of No. 2016) must be set to 1. When this parameter is set to 0, the input torque sensing command signal is not stored.

4.43 PARAMETERS OF MANUAL HANDLE RETRACE (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
6400	MG4	MGO	RVN	HMP	MC8	MC5	FWD	RPO

[Input type] Parameter input
[Data type] Bit path

#0 RPO With the manual handle retrace function, the rapid traverse rate is clamped, assuming that:
0: An override of 10% is used.
1: An override of 100% is used.

#1 FWD With the manual handle retrace function, program execution can be performed:
0: In both forward and backward directions.
1: In the forward direction only. Execution in the backward direction is not permitted.

#2 MC5
#3 MC8 These parameters set the number of M code groups and the number of M codes per group. (See explanations of parameters Nos. 6411 to 6490.)

MC5	MC8	M code group setting
0	0	Standard (20 groups of four)
1	0	16 groups of five
0	1	10 groups of eight

When 16 groups of five are used, the meanings of parameters are changed as follows:
Group A No. 6411(1) to No. 6415(5)
Group B No. 6416(1) to No. 6420(5)
:
Group P No. 6486(1) to No. 6490(5)
When 10 groups of eight are used, they are changed as follows:
Group A No. 6411(1) to No. 6418(8)
Group B No. 6419(1) to No. 6426(8)
:
Group J No. 6483(1) to No. 6490(8)

#4 HMP When inversion or backward movement is inhibited in other paths:
0: Inversion or backward movement is not inhibited for the currently executed path.
1: Inversion or backward movement is inhibited also for the currently executed path.

#5 RVN When the manual handle retrace function is used, M codes other than grouped M codes:
0: Do not disable backward movement.
1: Disable backward movement.

When this parameter is set to 1, M codes other than grouped M codes disable backward movement in general. Exceptionally, however, the following M codes allow backward movement:
1. Subprogram call based on M98/M99
2. Subprogram call based on an M code
3. Macro call based on an M code
4. Waiting M code
5. M0

#6 MGO When the manual handle retrace function is used, handle pulses during execution of a G code related to measurement are:
0: Valid.
1: Invalid. A speed with an override of 100% is used for execution at all times.

#7 MG4 In the manual handle retrace function, for blocks for which multi-step skip G04 is enabled (when the multi-step skip software option is used, and the settings of parameters Nos. 6202 to 6206 are valid):
0: Backward movement is not prohibited.
1: Backward movement is prohibited.

	#7	#6	#5	#4	#3	#2	#1	#0
6401	STO	HST				CHS		ADC

[Input type] Parameter input
[Data type] Bit path

#0 ADC If a move command and an auxiliary function (M/S/T/B code) are specified in the same block when the manual handle retrace function is used, the block:
0: Disables reverse movement.
1: Does not disable reverse movement.

> **NOTE**
> To use this parameter, the optional function for the direction change movement in auxiliary function output block is required.

#2 CHS In manual handle retrace:
0: The status is displayed if the following conditions are all satisfied:
(1) The manual handle retrace software option is used.
(2) Bit 6 (HST) of parameter No. 6401, which specifies whether to enable or disable status display, is set to “1”.
(3) Check mode output signal MMMOD<Fn091.3> is set to “1”.
1: The status is displayed if the following conditions are all satisfied:
(1) The manual handle retrace software option is used.
(2) Bit 6 (HST) of parameter No. 6401, which specifies whether to enable or disable status display, is set to “1”.
(3) Cycle start lamp signal STL<Fn000.5> is set to “1”.
(4) Check mode input signal MMOD<Gn067.2> is set to “1”.
(5) Handle input signal MCHK<Gn067.3> is set to “1” in the check mode.

#6 HST When the manual handle retrace function is used, the time display field on the status display line of the CNC screen:
0: Does not display status.
1: Displays status.

#7 STO In the manual handle retrace function, the timing for outputting an S code and T code during backward movement is:
0: Different from the timing during forward movement:
1: The same as during forward movement.

	#7	#6	#5	#4	#3	#2	#1	#0
6402			MWR					

[Input type] Parameter input
[Data type] Bit path

#5 MWR When the manual handle retrace function is used, for a handle operation placed in the wait state by a wait M code during backward movement:
0: Inversion is prohibited.
1: Inversion is permitted.

	#7	#6	#5	#4	#3	#2	#1	#0
6403				HRE	HRD	HRC	HRB	HRA

[Input type] Parameter input
[Data type] Bit path

#0 HRA In rigid tapping and thread cutting, with the manual handle retrace function, program execution in the forward direction:
0: Cannot be performed.
1: Can be performed.

#1 HRB In PMC axis control, with the manual handle retrace, program execution in the forward direction:
0: Cannot be performed.
1: Can be performed.

#2 HRC During orientation operation according to G00 for a Cs contour control axis, with the manual handle retrace function, program execution in the backward direction:
0: Cannot be performed.
1: Can be performed.

#3 HRD In polygon machining with two spindles, with the manual handle retrace function, program execution in the backward direction:
0: Cannot be performed.
1: Can be performed.

#4 HRE In balanced cutting, with the manual handle retrace function, program execution in the backward direction:
0: Cannot be performed.
1: Can be performed.

6405	Override value (equivalence) for clamping the rapid traverse rate used with the manual handle retrace function

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 0 to 100

This parameter sets an override value (equivalence) for clamping the rapid traverse rate used with the manual handle retrace function. If a value greater than 100 is set in parameter No. 6405, the rapid traverse rate is clamped to an override of 100%. This function is invalid if 0 is set in parameter No. 6405. In this case, the setting of bit 0 (RPO) of parameter No. 6400 is used.

6410	Travel distance per pulse generated from the manual pulse generator

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 0 to 100

Set the travel distance per pulse generated from the manual pulse generator in terms of the override value.
The distance traveled by the machine when the manual handle is actually turned can be found by the following expression:
[Specified speed] × [Handle magnification] × ([Setting of this parameter]/100) × (8/60000) (mm or inch)

[Example] When a specified feedrate is 30mm/min, the manual handle magnification is 100, and parameter No. 6410 is set to 1, the travel distance per pulse generated from the manual pulse generator is calculated as follows:
[Travel distance per pulse]=30[mm/min] × 100 × (1/100) × (8/60000)[min]= 0.004mm

6411	M code of group A in manual handle retrace (1)
to	to
6414	M code of group A in manual handle retrace (4)

6415	M code of group B in manual handle retrace (1)
to	to
6418	M code of group B in manual handle retrace (4)

6419	M code of group C in manual handle retrace (1)
to	to
6422	M code of group C in manual handle retrace (4)

6423	M code of group D in manual handle retrace (1)
to	to
6426	M code of group D in manual handle retrace (4)

6427	M code of group E in manual handle retrace (1)
to	to
6430	M code of group E in manual handle retrace (4)

6431	M code of group F in manual handle retrace (1)
to	to
6434	M code of group F in manual handle retrace (4)

6435	M code of group G in manual handle retrace (1)
to	to
6438	M code of group G in manual handle retrace (4)

6439	M code of group H in manual handle retrace (1)
to	to
6442	M code of group H in manual handle retrace (4)

6443	M code of group I in manual handle retrace (1)
to	to
6446	M code of group I in manual handle retrace (4)

6447	M code of group J in manual handle retrace (1)
to	to
6450	M code of group J in manual handle retrace (4)

6451	M code of group K in manual handle retrace (1)
to	to
6454	M code of group K in manual handle retrace (4)

6455	M code of group L in manual handle retrace (1)
to	to
6458	M code of group L in manual handle retrace (4)

6459	M code of group M in manual handle retrace (1)
to	to
6462	M code of group M in manual handle retrace (4)

6463	M code of group N in manual handle retrace (1)
to	to
6466	M code of group N in manual handle retrace (4)

6467	M code of group O in manual handle retrace (1)
to	to
6470	M code of group O in manual handle retrace (4)

6471	M code of group P in manual handle retrace (1)
to	to
6474	M code of group P in manual handle retrace (4)

6475	**M code of group Q in manual handle retrace (1)**
to	**to**
6478	**M code of group Q in manual handle retrace (4)**

6479	**M code of group R in manual handle retrace (1)**
to	**to**
6482	**M code of group R in manual handle retrace (4)**

6483	**M code of group S in manual handle retrace (1)**
to	**to**
6486	**M code of group S in manual handle retrace (4)**

6487	**M code of group T in manual handle retrace (1)**
to	**to**
6490	**M code of group T in manual handle retrace (4)**

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 9999

Set a group of M codes output during backward movement.
For backward movement for an M code, the modal M code in the same group set by the parameter is output.
The first M code in each group is set as the default.
When the number of M codes in a group is 3 or less, set the parameter corresponding to an unused M code to 0.
For backward movement for "M0", "M0" is output regardless of which M code is set for the parameter. 0 set in the parameter is ignored.
For an M code which is not set in any group by any of the above parameters, the M code for forward movement is output.
With these parameters, an M code in the same group can be output in backward movement only when the M code is the first M code in each block. When a block contains two or more M codes, the same M codes as output in forward movement are output as a second M code and up.

> **NOTE**
> The above explanation of M code groups applies to the standard settings. The number of M codes in each group and the number of M code groups vary depending on the settings of bits 2 (MC5) and 3 (MC8) of parameter No. 6400.

6495	**Time constant T or T1 used for linear acceleration/deceleration or bell-shaped acceleration/deceleration in rapid traverse for each axis for manual handle retrace**

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

Specify a time constant used for acceleration/deceleration in rapid traverse for manual handle retrace. For an axis with 0 set in this parameter, a time constant for acceleration/deceleration of parameter (No.1620) is enabled.

6496	**Time constant T_2 used for bell-shaped acceleration/deceleration in rapid traverse for each axis for manual handle retrace**

[Input type] Parameter input
[Data type] Word axis

[Unit of data] msec
[Valid data range] 0 to 1000

Specify time constant T_2 used for bell-shaped acceleration/ deceleration in rapid traverse for each axis for manual handle retrace. For an axis with 0 set in this parameter, a time constant for acceleration/deceleration of parameter (No.1621) is enabled.

6497	Time constant of acceleration/deceleration in cutting feed for each axis for manual handle retrace

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

Set the time constant used for exponential acceleration/deceleration in cutting feed, bell-shaped acceleration/deceleration after interpolation or linear acceleration/deceleration after interpolation in cutting feed for each axis for manual handle retrace. Which type to use is selected with bits 1 (CTBx) and 0 (CTLx) of parameter No. 1610. Except for special applications, the same time constant must be set for all axes in this parameter. If the time constants set for the axes differ from each other, proper straight lines and arcs cannot be obtained. For an axis with 0 set in this parameter, a time constant for acceleration/deceleration of parameter (No.1622) is enabled.

4.44 PARAMETERS OF GRAPHIC DISPLAY (1 OF 5)

	#7	#6	#5	#4	#3	#2	#1	#0
6501			CSR					

[Input type] Parameter input
[Data type] Bit path

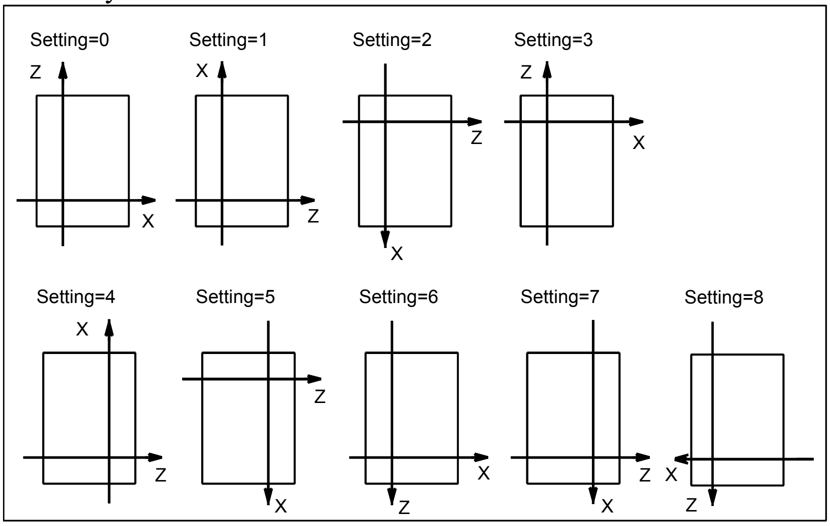
#5 CSR On the PATH GRAPHIC (TOOL POSITION) screen, the shape of the cursor indicating the tool position is:
0: A square (■).
1: An x (×).

6510	Specifying the graphic coordinate system

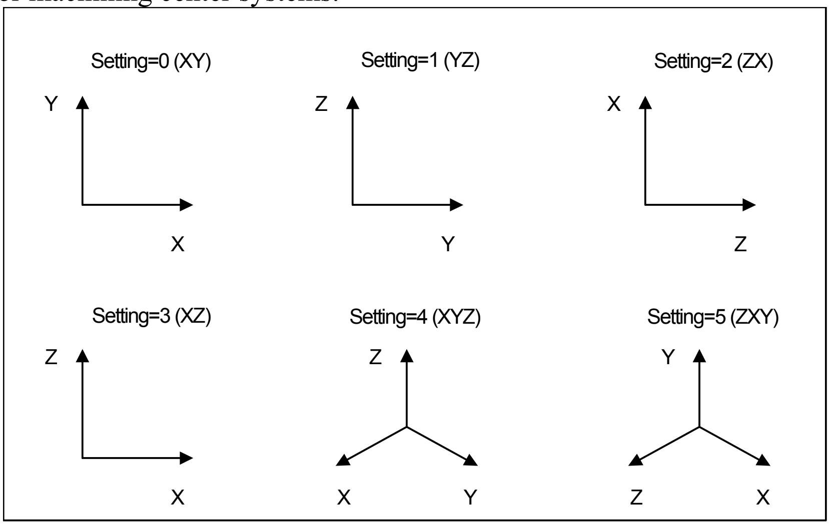
[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 8 (When the dynamic graphic display function is used, set a value from 0 to 7.)

Specify the graphic coordinate system in tool path drawing.

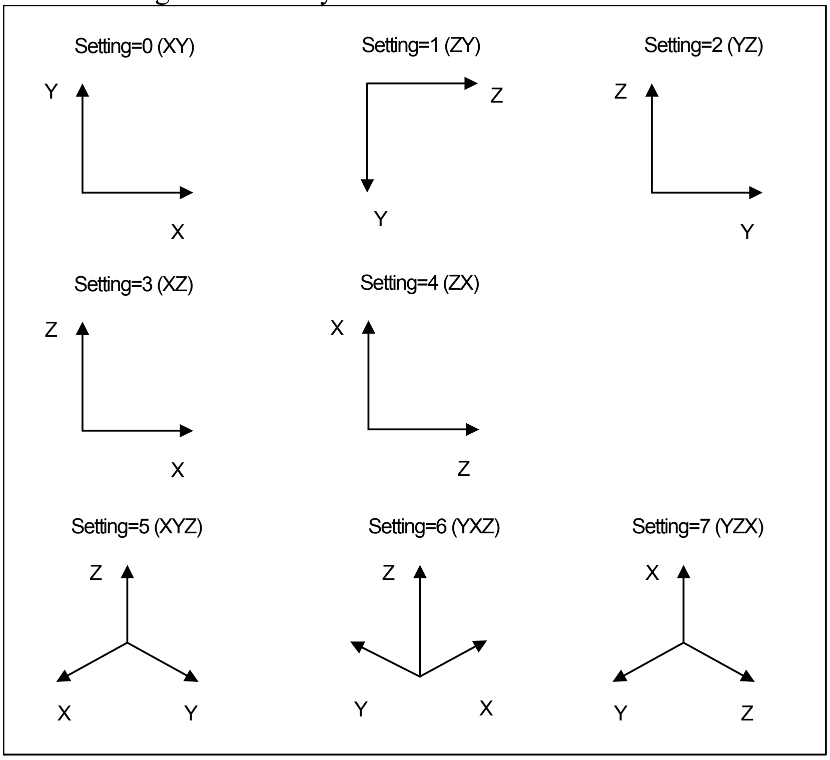
For lathe systems:



For machining center systems:



When the dynamic graphic display function is used, the relationship between the setting and the drawing coordinate system is as follows:



4.45 PARAMETERS OF SCREEN DISPLAY COLORS (1 OF 2)

6581	**RGB value of color palette 1**
6582	**RGB value of color palette 2**
6583	**RGB value of color palette 3**
6584	**RGB value of color palette 4**
6585	**RGB value of color palette 5**
6586	**RGB value of color palette 6**
6587	**RGB value of color palette 7**
6588	**RGB value of color palette 8**
6589	**RGB value of color palette 9**
6590	**RGB value of color palette 10**
6591	**RGB value of color palette 11**
6592	**RGB value of color palette 12**
6593	**RGB value of color palette 13**
6594	**RGB value of color palette 14**
6595	**RGB value of color palette 15**

[Input type] Parameter input
[Data type] 2-word

[Valid data range] 0 to 151515

Each of these parameters sets the RGB value of each color palette by specifying a 6-digit number as described below.

rrggbb: 6-digit number (rr: red data, gg: green data, bb: blue data)

The valid data range of each color is 0 to 15 (same as the tone levels on the color setting screen). When a number equal to or greater than 16 is specified, the specification of 15 is assumed.

[Example] When the tone level of a color is: red:1 green:2, blue:3, set 10203 in the parameter.

4.46 PARAMETERS OF RUN HOUR AND PARTS COUNT DISPLAY

	#7	#6	#5	#4	#3	#2	#1	#0
6700							PRT	PCM

[Input type] Parameter input
[Data type] Bit path

#0 PCM M code that counts the total number of machined parts and the number of machined parts
0: M02, or M30, or an M code specified by parameter No. 6710
1: Only M code specified by parameter No. 6710

#1 PRT Upon reset, the required parts count arrival signal PRTSF <Fn062.7> is:
0: Set to “0”.
1: Not set to ”0”.

6710	M code that counts the number of machined parts

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 999999999

The total number of machined parts and the number of machined parts are counted (+1) when the M code set is executed.

> **NOTE**
> The setting of 0 is invalid (no count operation is performed with M00.) Moreover, M98, M99, M198 (external device subprogram calling), and M codes used for subprogram calling and macro calling cannot be set as M codes for count-up operation. (Even when such an M code is set, count-up operation is not performed, ignoring the M code.)

6711	Number of machined parts

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 999999999

The number of machined parts is counted (+1) together with the total number of machined parts when the M02, M30, or a M code specified by parameter No. 6710 is executed.

> **NOTE**
> The number of parts is not counted for M02, M30 when bit 0 (PCM) of parameter No. 6700 is set to 1.

6712	Total number of machined parts

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 999999999

This parameter sets the total number of machined parts.
The total number of machined parts is counted (+1) when M02, M30, or an M code specified by parameter No. 6710 is executed.

> **NOTE**
> The number of parts is not counted for M02, M30, when bit 0 (PCM) of parameter No. 6700 is set to 1.

6713	Number of required parts

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 999999999

This parameter sets the number of required machined parts.
Required parts finish signal PRTSF <F0062.7> is output to PMC when the number of machined parts reaches the number of required parts. The number of parts is regarded as infinity when the number of required parts is zero. The PRTSF signal is then not output.

6750	Integrated value of power-on period

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the integrated value of power-on period.

6751	Operation time (integrated value of time during automatic operation) 1

[Input type] Setting input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 59999

For details, see the description of parameter No. 6752.

6752	Operation time (integrated value of time during automatic operation) 2

[Input type] Setting input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the integrated value of time during automatic operation (neither stop nor hold time included).
The actual time accumulated during operation is the sum of this parameters Nos. 6751 and 6752.

6753	Integrated value of cutting time 1

[Input type] Setting input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 59999

For details, see the description of parameter No. 6754.

6754	Integrated value of cutting time 2

[Input type] Setting input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the integrated value of a cutting time that is performed in cutting feed such as linear interpolation (G01) and circular interpolation (G02 or G03).
The actual time accumulated during cutting is the sum of this parameters Nos. 6753 and 6754.

6755	Integrated value of general-purpose integrating meter drive signal (TMRON) ON time 1

[Input type] Setting input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 59999

For details, see the description of parameter No. 6756.

6756	Integrated value of general-purpose integrating meter drive signal (TMRON) ON time 2

[Input type] Setting input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the integrated value of a general-purpose integrating meter start signal TMRON <Gn053.0> from PMC is on.
The actual integrated time is the sum of this parameters Nos. 6755 and 6756.

6757	Operation time (integrated value of one automatic operation time) 1

[Input type] Setting input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 59999

For details, see the description of parameter No. 6758.

6758	Operation time (integrated value of one automatic operation time) 2

[Input type] Setting input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the one automatic operation drive time (neither stop nor hold state included). The actual time accumulated during operating is the sum of this parameters Nos. 6757 and 6758. The operation time is automatically preset to 0 during the power-on sequence and the cycle start from the reset state.

4.47 PARAMETERS OF TOOL MANAGEMENT FUNCTIONS (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
6801						LVF		

> **NOTE**
> The use of this parameter varies depending on whether the tool management function or tool life management function is used.

[Input type] Parameter input
[Data type] Bit path

#2 LVF When the life of a tool is counted in terms of time with the tool management function, the tool life count override signals *TLV0 to *TLV9 <Gn049.0 to Gn050.1> are:
0: Invalid.
1: Valid.

6811	Tool life count restart M code

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 127 (not including 01, 02, 30, 98, and 99)

When 0 is set, this parameter is ignored.
When an M code for tool life count restart is specified, the counting of the life of the tool attached at the spindle position is started.
When the type for counting the number of use times is selected, the target of life counting is switched to the tool attached at the spindle position, and the life count is incremented by 1.
When the type for counting time is selected, the target of life counting is switched to the tool attached at the spindle position, with no other operations performed.
If the tool attached at the spindle position is not a tool under tool life management, no operation is performed.

> **NOTE**
> The use of this parameter varies depending on whether the tool management function or tool life management function is used.

4.48 PARAMETERS OF TOOL LIFE MANAGEMENT (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
6800	M6T	IGI	SNG	GRS	SIG	LTM	GS2	GS1

[Input type] Parameter input
[Data type] Bit path

#0 GS1
#1 GS2 For the maximum number of groups set in parameter No. 6813, up to four tools can be registered per group. The combination of the number of registrable groups and the number of tools per group can be changed by setting GS1 and GS2.

GS2	GS1	Number of groups	Number of tools
0	0	1/8 of maximum number of groups (No. 6813)	32
0	1	1/4 of maximum number of groups (No. 6813)	16
1	0	1/2 of maximum number of groups (No. 6813)	8
1	1	Maximum number of groups (No. 6813)	4

NOTE
After changing these parameters, set data again by using G10 L3 ;(registration after deletion of data of all groups).

#2 LTM The tool life count is specified by:
0: Count.
1: Duration.

NOTE
After changing this parameter, set data again by using G10 L3 ;(registration after deletion of data of all groups).

#3 SIG When a tool is skipped by a signals TL01 to TL512 <Gn047.0 to Gn048.1>, the group number is:
0: Not input by the tool group number selection signals.
1: Input by the tool group number selection signals.

NOTE
When this parameter is set to 0, a tool of the currently used group is skipped.

#4 GRS When the tool change reset signal TLRST <Gn048.7> is input:
0: If the life of the group specified by the tool group number selection signals TL01 to TL512 <Gn047.0 to Gn048.1> has expired, the execution data of the group is cleared.
1: The execution data of all registered groups is cleared.
If this parameter is set to 1, the execution data of all registered groups is cleared also when the clear operation to clear execution data is performed on the tool life management list screen.

#5 SNG When the tool skip signal TLSKP <Gn048.5> is input while a tool not controlled by the tool life management function is being used:
0: A tool of the most recently used group or a specified group (bit 3 (SIG) of parameter No. 6800) is skipped.
1: The tool skip signal is ignored.

#6 IGI Tool back numbers are:
0: Not ignored.
1: Ignored.

#7 M6T A T code specified in the same block as M06 is:
0: Assumed to be a back number.
1: Assumed to be a command specifying the next tool group.

	#7	#6	#5	#4	#3	#2	#1	#0
6801	M6E				EMD	LVF	TSM	
	M6E				EMD	LVF		

> **NOTE**
> The use of this parameter varies depending on whether the tool management function or tool life management function is used.

[Input type] Parameter input
[Data type] Bit path

#1 TSM In the tool life management function, life counting is performed as follows when more than one offset is specified:
0: Counting is performed for each tool number.
1: Counting is performed for each tool.

#2 LVF When the life value is counted by duration in the tool management function or tool life management function, tool life count override signals *TLV0 to *TLV9 <Gn049.0 to Gn050.1> are:
0: Not used.
1: Used.

#3 EMD In the tool life management function, the mark "*" indicating that the life has expired is displayed when:
0: The next tool is used.
1: The life has just expired.

> **NOTE**
> If this parameter is set to 0, the "@" mark (indicating that the tool is in use) is kept displayed unless the next tool whose life has not expired is used. If this parameter is set to 1, marks are displayed in different ways depending on the life count type.
> If the life count type is the duration specification type, the "*" mark (indicating that the life has expired) appears when the life has expired. If the life count type is the count specification type, one count is not assumed until the end of the program (M02, M30, and so on). Therefore, even when the life value and the tool life counter value match, the "*" mark (life has expired) does not appear. The "*" mark (life has expired) appears when the tool is used again by a tool group command (T code) or tool change command (M06) issued after the CNC is reset.

#7 M6E When a T code is specified in the same block as M06:
0: The T code is treated as a back number or the group number to be selected next. Which number is assumed depends on the setting of bit 7 (M6T) of parameter No. 6800.
1: Life counting for the tool group starts immediately.

	#7	#6	#5	#4	#3	#2	#1	#0
6802	RMT	TSK	TGN	ARL	GRP	E17	TCO	T99

[Input type] Parameter input
[Data type] Bit path

#0 T99 When M99 of the main program is executed, and there is a the life was expired tool group:
0: The tool change signal TLCH <Fn064.0> is not output.
1: TLCH is output, and the automatic operation becomes a stopped state..

If the life count is specified by use count and this parameter 1, TLCH is output and the automatic operation becomes a stopped state if the life of at least one tool group has expired when the M99 command is specified.
If the life count type is the duration specification type, the automatic operation becomes a stopped state if the life of at least one tool group has expired when the M99 command is specified.

M

If the life count is specified by use count, after the M99 command is specified, a tool group command (T code) selects, from a specified group, a tool whose life has not expired, and the next tool change command (M06) increments the tool life counter by one.

T

If the life count is specified by use count, when a tool group command (T code) is specified after the M99 command is specified, a tool whose life has not expired is selected from a specified group, and the tool life counter is incremented by one.
When the tool change type is the ATC type (bit 3 (TCT) of parameter No. 5040 = 1), the same specifications as for the M series apply.

#1 TCO
#2 E17 Specifies whether to allow the FOCAS2 or PMC window function to write tool information of a group being used or a group to be used next during automatic operation (the automatic operation signal OP <Fn000.7> is set to 1).

<table>
<tr><th colspan="3" rowspan="4">Condition</th><th colspan="3">Bit 1 (TCO) of parameter No. 6802</th></tr>
<tr><th rowspan="3">0</th><th colspan="2">1</th></tr>
<tr><th colspan="2">Bit 2 (E17) of parameter No. 6802</th></tr>
<tr><th>1</th><th>0</th></tr>
<tr><td rowspan="3">During automatic operation</td><td rowspan="2">Group being used or to be used next</td><td>Tool being used</td><td>×</td><td>□</td><td>○</td></tr>
<tr><td>Tool not being used</td><td>×</td><td>○</td><td>○</td></tr>
<tr><td colspan="2">Group neither being used nor to be used next</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td colspan="3">Not during automatic operation</td><td>○</td><td>○</td><td>○</td></tr>
</table>

○: Tool information can be written from FOCAS2 and PMC window.
×: Tool information cannot be written from FOCAS2 and PMC window.
When an attempt is made to write tool information from PMC window, completion code 13 (REJECT ALARM) is returned.
□: Tool information cannot be cleared.

> **NOTE**
> When tool information of a tool being used (marked with "@") in the group being used or to be used next or tool information of the most recently used tool (marked with "@") in a group that is neither the group being used nor the group to be used next is cleared, the life counter is reset to 0.
> It is possible to modify tool information of a tool in the group to be used next. However, because tool selection is already completed, the selected tool does not change even when the tool information is modified.
> This parameter has no influence on modifications to tool information by edit operations from the tool life management screen.

#3 GRP Management data of tool life arrival notice signal TLCHB <Fn064.3> is:
0: Managed using the remaining life value set in parameter No. 6844 and 6845.
1: Managed using the remaining life value set in tool life management data.

> **NOTE**
> When the tool life arrival notice signal function is used, bit 4 (LFB) of parameter No. 6805 must be set to 1 to enable the tool life management B function.

#4 ARL Tool life arrival notice signal TLCHB <Fn064.3> of tool life management is:
0: Output for each tool.
1: Output for the last tool of a group.
This parameter is valid only when bit 3 (GRP) of parameter No. 6802 is set to 1.

#5 TGN In the tool life management function, the optional group number function is:
0: Not used.
1: Used.

> **NOTE**
> When the optional group number function is used, bit 4 (LFB) of parameter No. 6805 must be set to 1 to enable the tool life management B function.
> In lathe systems, the optional group number function can be used if the tool change type is the ATC type (bit 3 (TCT) of parameter No. 5040 = 1).

#6 TSK If the count type in tool life management is the duration type, then when the last tool of a group is skipped by a signal:
0: The count value for the last tool equals the life value.
1: The count value for the last tool remains unchanged.

#7 RMT Tool life arrival notice signal TLCHB <Fn064.3> is turned ”1” and ”0” as follows:

0: The signal is turned ”1” if the remaining life value (the life value minus the life counter value) is smaller than or equal to the remaining life setting. The signal is turned ”0” if the remaining life value (the life value minus the life counter value) is greater than the remaining life setting.

1: The signal is turned ”1” if the remaining life value (the life value minus the life counter value) is equal to the remaining life setting. The signal is turned ”0” if the remaining life value (the life value minus the life counter value) is not equal to the remaining life setting.

> **NOTE**
> When using the life count override feature, set bit 7 (RMT) of parameter No. 6802 to 0. When the life count is specified by duration, the unit used for determining the result of comparison between the remaining life and the remaining life setting varies depending on the life count interval (bit 0 (FCO) of parameter No. 6805). If the life is counted every second, the comparison is made in units of 1 minute; if the life is counted every 0.1 second, the comparison is made in units of 0.1 minute.

	#7	#6	#5	#4	#3	#2	#1	#0
6803	CTB							

[Input type] Parameter input
[Data type] Bit path

 # 7 CTB Whether to turn the tool life arrival notice signal TLCHB <Fn064.3> of tool life management off is determined when life counting starts. An additional turn-off condition is:

0: Not added.
1: Added.

The tool life arrival notice signal is turned off when one of the following operations is performed for the currently used group:

- Clears the execution data on the tool life management list screen.
- Deletes all tool group data at a time, adds a tool number, or deletes tool data on the tool life management edit screen.
- Clears the execution data by the tool change reset signal TLRST <Gn048.7>.
- Registers, changes, or deletes all tool life management group data by the G10 command.
- Executes the FOCAS2 cnc_clrcntinfo function (which clears the tool life counter or tool information).
- Replaces a tool with a tool of which life is not managed by the M06 command.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

	#7	#6	#5	#4	#3	#2	#1	#0
6804		LFI				ETE	TCI	

[Input type] Parameter input
[Data type] Bit path

#1 TCI During automatic operation (the automatic operation signal OP<Fn000.7> is ”1”), editing of tool life data is:
0: Disabled.
1: Enabled.

> **NOTE**
> When this parameter is set to 1, tool life data can be edited even during automatic operation (the OP is 1). If the target group for editing is the group being used or the group to be used next, however, only presetting of the life counter is permitted, and other data cannot be modified.

#2 ETE In the tool life management screen, the mark of the tool at the life was expired of the final tool in the group :
0: depends on setting bit 3 (EMD) of parameter No. 6801.
1: is "*" mark.
If bit 2 (ETE) of parameter No. 6804 is set to 1, when the life counter of the final tool in the group becomes equal to the life value, display mark "*" in the final tool of the tool life management screen.
When tool change signal TLCH <Fn064.0> is ”1”, the state of the life was expired of the tool can be read by reading tool information on the final tool in FOCAS2 or the PMC window.

#6 LFI In tool life management, counting of the life of a selected tool is:
0: Enabled.
1: Enabled or disabled according to the status of tool life counting disable signal LFCIV <Gn048.2>.

	#7	#6	#5	#4	#3	#2	#1	#0
6805	TAD	TRU	TRS	LFB			FGL	FCO

[Input type] Parameter input
[Data type] Bit path

#0 FCO If the life count type is the duration specification type, the life is counted as follows:
0: Every second.
1: Every 0.1 second.
According to the setting of this parameter, the increment system of life values and tool life counter values displayed on the tool life management screen is set as follows:

Parameter FCO	0	1
Increment system for display and setting of life values and life counter values	1-minute increments	0.1-minute increments

> **NOTE**
> After changing the setting of this parameter, set data again by using G10L3;(registration after deletion of data of all groups).

#1 FGL If the life count type is the duration specification type, life data registered by G10 is:
0: In minute increments.
1: In 0.1-second increments.

#4 LFB The tool life management B function is:
0: Disabled.
1: Enabled.
When the tool life management B function is enabled, the following functions can be used:
<1> Tool life value extension (count specification: 99999999 times, duration specification: 100000 minutes)
<2> Optional group number function
<3> Tool life arrival notice function
In lathe systems, if the tool change type is the ATC type (bit 3 (TCT) of parameter No. 5040 = 1), the optional group number function can be used.

#5 TRS Tool change reset signal TLRST <Gn048.7> is valid when reset signal RST <Fn001.1> is not ”1” and:
0: The reset state (automatic operation signal OP is ”0”) is observed.
1: The reset state (automatic operation signal OP <Fn000.7> is ”0”), automatic operation stop state (cycle start lamp signal STL <Fn000.5> and feed hold lamp signal SPL <Fn000.4> are ”0” and OP is ”1”), or the automatic operation pause state (STL is ”0” and SPL is ”1”) is observed. The TLRST signal, however, is invalid when the automatic operation stop state, automatic operation pause state, and automatic operation start state (STL is ”1”) is observed during execution of a data setting command (G10L3).

#6 TRU When the life count type is the duration specification type, and the life is counted every second (bit 0 (FCO) of parameter No. 6805 is set to 0):
0: Cutting time less than one second is discarded and is not counted.
1: Cutting time less than one second is rounded up and is counted as one second.

> **NOTE**
> If the life is counted every 0.1 second (bit 0 (FCO) of parameter No. 6805 is set to 1), cutting time less than 0.1 second is always rounded up and is counted as 0.1 second.

#7 TAD With tool change type D (bit 7 (M6E) of parameter No. 6801 is set to 1), when a block specifying M06 contains no T command:
0: An alarm PS0153, “T-CODE NOT FOUND” is issued.
1: No alarm is issued.

6810	Tool life management ignore number

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the tool life management ignore number.
When the value specified in a T code exceeds the value set in this parameter, the value obtained by subtracting the parameter-set value from the T code value is assumed to be the tool group number for tool life management.

6811	Tool life count restart M code

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 127 (except 01, 02, 30, 98, and 99)

When 0 is specified, it is ignored.

When the life is specified by count, the tool change signal TLCH <Fn064.0> is output if the life of at least one tool group has expired when the tool life count restart M code is issued.
The T code (tool life management group command) specified after the tool life count restart M code selects a tool whose life has not expired from a specified group, and the next M06 command increments the tool life counter by one.
When the life is specified by duration, specifying the tool life count restart M code causes nothing. When 0 is set in this parameter, the tool life count restart M code is invalid. When the data of M code exceeds 127 values, set 0 in parameter No. 6811, and set the value of M code in parameter No. 13221. The data range of parameter No. 13221 is from 0 to 255.

NOTE
The use of this parameter varies depending on whether the tool management function or tool life management function is used.

6813	Maximum number of groups in tool life management

NOTE
After this parameter has been set, the power must be turned off then back on for the setting to become effective.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Group
[Valid data range] 0, 8, 16 to 256,1024 (when the additional tool life management group option is added)

This parameter sets the maximum number of groups to be used for each path. As the maximum number of groups, set a multiple of eight. When the tool life management function is not used, 0 must be set. Set this parameter so that the total number of groups in all paths does not exceed the total number of groups in the entire system (256 groups). When the additional tool life management group option is added, set this parameter so that the total number of groups in all paths does not exceed 1024.

NOTE
When the power is turned on, all tool life management file data is initialized. So, tool life management data must be set for all paths that use tool life management.

6844	Remaining tool life (use count)

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 9999

This parameter sets a remaining tool life (use count) used to output the tool life notice signal TLCHB <Fn064.3> when the tool life is specified by use count. If a value greater than the tool life value or 0 is set in this parameter, the tool life notice signal is not output.

6845	Remaining tool life (use duration)

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min
[Valid data range] Not greater than the tool life value

This parameter sets the remaining tool life (use duration) used to output the tool life notice signal TLCHB <Fn064.3> when the tool life is specified by use duration. If a value greater than the tool life value or 0 is specified in this parameter, the tool life notice signal is not output.

NOTE
When the life is counted every 0.1 second (bit 0 (FCO) of parameter No. 6805 = 1), the parameter value is in 0.1-minute increments.

6846	Remaining tool number in a group

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 127

This parameter sets the remaining tool number in a group.
When the remaining tool number in the group selected by the T code is smaller than or equal to the value set in this parameter, the remaining tool number notice signal TLAL <Fn154.0> is output. When this parameter is set to 0, the remaining tool number notice signal is not output.

4.49 PARAMETERS OF POSITION SWITCH FUNCTIONS

	#7	#6	#5	#4	#3	#2	#1	#0
6901						PSA	EPW	

[Input type] Parameter input
[Data type] Bit path

#1 EPW The number of position switches is:
0: Not extended.
1: Extended.

#2 PSA In determination of a position switch function operation range, a servo delay amount (positional deviation) and a delay amount in acceleration/deceleration control are:
0: Not considered.
1: Considered.

6910	Controlled axis for which the 1st position switch function is performed (PSWA01)
6911	Controlled axis for which the 2nd position switch function is performed (PSWA02)
:	:
6925	Controlled axis for which the 16th position switch function is performed (PSWA16)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the controlled axis number corresponding to one of the first to sixteenth position switch functions. When the machine coordinate of the corresponding axis is within a parameter-set range, the corresponding position switch signals PSW01 to PSW16 <Fn070 and Fn071> are output to the PMC.

> **NOTE**
> The setting of 0 means that the position switch function is not used.

6930	**Maximum value of the operating range of the 1st position switch (PSW101)**
6931	**Maximum value of the operating range of the 2nd position switch (PSW102)**
:	:
6945	**Maximum value of the operating range of the 16th position switch (PSW116)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the maximum value of the operating range of the first to sixteenth position switches.

> **NOTE**
> 1 For a diameter-specified axis, use diameter values to specify the parameters used to set the maximum and minimum values of an operating range.
> 2 The position switch function is enabled upon completion of reference position return.

6950	**Minimum value of the operating range of the 1st position switch (PSW201)**
6951	**Minimum value of the operating range of the 2nd position switch (PSW202)**
:	:
6965	**Minimum value of the operating range of the 16th position switch (PSW216)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the minimum value of the operating range of the first to sixteenth position switches.

> **NOTE**
> 1 For a diameter-specified axis, use diameter values to specify the parameters used to set the maximum and minimum values of an operating range.
> 2 The position switch function is enabled upon completion of reference position return.

4.50 PARAMETERS OF MANUAL OPERATION AND AUTOMATIC OPERATION

	#7	#6	#5	#4	#3	#2	#1	#0
7001	MFM	JEX		JSN		JST	ABS	MIT

[Input type] Parameter input
[Data type] Bit path

#0 MIT Manual intervention and return function is:
0: Disabled.
1: Enabled.

#1 ABS For the move command after manual intervention in the manual absolute on state:
0: Different paths are used in the absolute (G90) and incremental (G91) modes.
1: The same path (path in the absolute mode) is used in the absolute (G90) and incremental (G91) modes.

#2 JST In manual numerical specification, the cycle start lamp signal STL <Fn000.5> is:
0: Not output.
1: Output.

#4 JSN When an S code is specified with the manual numerical specification function, the modal display of the S code is:
0: Not updated.
1: Updated.

#6 JEX The number of axes controlled simultaneously in jog feed, manual rapid traverse, and manual reference position return is:
0: Set by bit 0 (JAX) of parameter No. 1002.
1: The maximum number of simultaneously controlled axes.

#7 MFM For the manual interpolation function, modifying a value specified with a command during jog feed in the guidance direction (approach direction):
0: Immediately starts moving according to the new value.
1: Stops moving.

	#7	#6	#5	#4	#3	#2	#1	#0
7002	TRO	TNR			JBF	JTF	JSF	JMF

[Input type] Parameter input
[Data type] Bit path

#0 JMF In manual numerical specification, M function specification is:
0: Allowed.
1: Not allowed.

#1 JSF In manual numerical specification, S function specification is:
0: Allowed.
1: Not allowed.

#2 JTF In manual numerical specification, T function specification is:
0: Allowed.
1: Not allowed.

#3 JBF In manual numerical specification, B function specification is:
0: Allowed.
1: Not allowed.

#6 TNR When the updated compensation value in the tool retract and recover function is effective (the bit 7 (TRO) of parameter No.7002 is set to 1),
0: The updated compensation value is effective in the recovery operation.
1: The updated compensation value is effective in the re-positioning operation.

#7 TRO When the compensation value is updated while the tool retract and recover function is executing,
0: The updated compensation value is invalid.
1: The updated compensation value is effective

	#7	#6	#5	#4	#3	#2	#1	#0
7010								JMVx

[Input type] Parameter input
[Data type] Bit axis

#0 JMVx In manual numerical specification, axis movement specification is:
0: Allowed.
1: Not allowed.

	#7	#6	#5	#4	#3	#2	#1	#0
7040					TRC	RPS	TRS	TRI

[Input type] Parameter input
[Data type] Bit path

#0 TRI The G10.6 command for tool retract and return is:
0: Assumed to be an absolute or incremental programming according to the absolute or incremental programming mode.
1: Always assumed to be an incremental programming.

#1 TRS After the completion of repositioning in tool retract and return:
0: Automatic operation is restarted.
1: Operation stops when the single block switch is on. When a cycle start is executed again, automatic operation is started.

#2 RPS When the tool retract signal TRESC <Gn059.0> is set to "1" after G10.6 is specified alone:
0: The tool is not retracted.
1: The tool is retracted with the value set for parameter No. 7041 or 11261 used as the incremental retraction distance.

#3 TRC When automatic operation is restarted after the tool retract and return is executed during the execution of a drilling canned cycle:
0: Machining of the same cycle is performed again (the same drilling is performed).
1: Machining of the next drilling cycle is performed (the next drilling is performed).

7041	Retraction distance in tool retract and return

[Input type] Setting input

[Data type] Real axis
[Unit of data] mm, inch, deg (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the retraction distance used when G10.6 is specified alone for the tool retract and return. The tool is retracted by the distance set for this parameter in the incremental mode. This data is valid only when bit 2 (RPS) of parameter No. 7040 is set to 1.
During tool center point control and workpiece setting error compensation, however, this parameter is valid if parameter No. 11261 is set to 0.

7042	Feedrate for each axis in tool retract and recover

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
Set the feedrate for each axis in tool retract and recover. The recovery is performed at the feedrate specified by this parameter. The retract and repositioning are performed at the minimum feedrate among the parameter values of moving axes. Furthermore, if maximum number of record point in manual retract is exceeded, the tool move to last record point by linear interpolation at the minimum feedrate among the parameter values of moving axes.

	#7	#6	#5	#4	#3	#2	#1	#0
7055					BCG			

[Input type] Parameter input
[Data type] Bit path

#3 BCG The pre-interpolation bell-shaped acceleration/deceleration time constant change function is:
0: Disabled.
1: Enabled.

7066	Acceleration/deceleration reference speed for the time constant change function of bell-shaped acceleration/deceleration before interpolation

[Input type] Setting input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter is used when the time constant change function of bell-shaped acceleration/deceleration before interpolation is used.

4.51 PARAMETERS OF MANUAL HANDLE (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
7100			MPX		HCL		THD	JHD

[Input type] Parameter input
[Data type] Bit path

#0 JHD Manual handle feed in JOG feed mode or incremental feed in the manual handle feed is:
0: Invalid.
1: Valid.

#1 THD In the TEACH IN JOG mode, the manual pulse generator is:
0: Disabled.
1: Enabled.

#3 HCL The clearing of handle interruption amount display by soft key [CAN] operation is:
0: Disabled.
1: Enabled.

#5 MPX In Manual handle feed mode:
0 : Manual handle feed amount selection signals MP1 and MP2 <Gn019.4 and Gn019.5> for the 1st manual pulse generator are used as signals common to all manual pulse generators.
1 : Manual handle feed amount selection signals differ depending on the manual pulse generator as follow:
1st. Manual Pulse Generator : MP1, MP2 <Gn019.4, Gn019.5>
2nd. Manual Pulse Generator : MP21, MP22 <Gn087.0, Gn087.1>
3rd. Manual Pulse Generator : MP31, MP32 <Gn087.3, Gn087.4>
4th. Manual Pulse Generator : MP41, MP42 <Gn087.6, Gn087.7>
5th. Manual Pulse Generator : MP51, MP52 <Gn380.0, Gn380.1>

	#7	#6	#5	#4	#3	#2	#1	#0
7102							HNAx	HNGx

[Input type] Parameter input
[Data type] Bit axis

#0 HNGx Axis movement direction for rotation direction of manual pulse generator
0: Same in direction
1: Reverse in direction

#1 HNAx When manual handle feed direction inversion signal HDN <Gn0347.1> is set to "1", the direction of movement is set for each axis with respect to the rotation direction of the manual pulse generator.
0: The axis movement direction is the same as the direction in which the manual pulse generator rotates.
1: The axis movement direction is opposite to the direction in which the manual pulse generator rotates.
When the rotation direction is reversed by manual handle feed direction inversion signal HDN <Gn0347.1>, the rotation axis direction obtained by the setting of bit 0 (HNGx) of parameter No. 7102 is reversed.

	#7	#6	#5	#4	#3	#2	#1	#0
7103					HIT	HNT	RTH	

[Input type] Parameter input
[Data type] Bit path

#1 RTH By a reset or emergency stop, the amount of manual handle interruption is:
0: Not canceled.
1: Canceled.

#2 HNT When compared with the travel distance magnification selected by the manual handle feed travel distance selection signals (incremental feed signals) (MP1, MP2 <Gn019.4, Gn019.5>), the travel distance magnification for incremental feed/manual handle feed is:
0: Same.
1: 10 times greater.

#3 HIT When compared with the travel distance magnification selected by the manual handle feed travel distance selection signals (incremental feed signals (MP1, MP2 <Gn019.4, Gn019.5>), the travel distance magnification for manual handle interrupt is:
0: Same.
1: 10 times greater.

	#7	#6	#5	#4	#3	#2	#1	#0
7105		BHS	LBH				HDX	

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#1 HDX Manual handle for I/O Link connection is:
0: Automatically set.
1: Manually set.

> **NOTE**
> In manual setting, parameters Nos. 12300 to 12304 and 12340 to 12344 must be set by manual to connect Manual Pulse Generator with I/O Link.

#5 LBH Manual handle feed for the I/O Link β using the I/O link manual pulse generator is:
0: Disabled.
1: Enabled.

 # 6 BHS When the I/O Link β is operated using the manual pulse generator on the host, whether to perform manual handle feed is:
0: Not automatically determined. (Whether to perform manual handle feed is set using parameters Nos. 12330 to 12337.)
1: Automatically performed.

	#7	#6	#5	#4	#3	#2	#1	#0
7106			HSR	MRO	MRI			

[Input type] Parameter input
[Data type] Bit path

#3 MRI Internal relay (the R signal) of PMC that uses it with input data in manual linear/circular interpolation:
0: R960 to R979 are used.
1: The address that bound it with the parameter No. 13541 is used.

#4 MRO Internal relay (the R signal) of PMC that uses it with output data in manual linear/circular interpolation:
0: R980 to R989 are used.
1: The address that bound it with the parameter No. 13542 is used

#5 HSR The direction of manual pulse generator rotation in the handle-synchronous feed function is:
0: effective in both.
1: effective in one direction. The effective direction is selected by selecting direction of manual handle rotation signal HDSR <Gn193.3>.

7113	Manual handle feed magnification m

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 2000
This parameter sets the magnification m when manual handle feed movement selection signals MP1 <Gn019.4> and MP2 <Gn019.5> are set to 0 and 1.

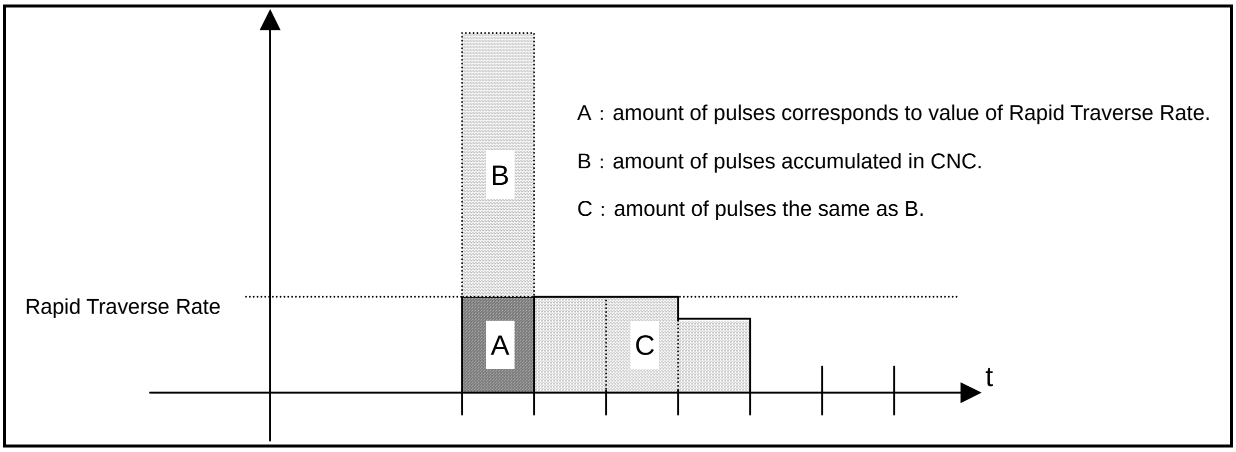
7114	Manual handle feed magnification n

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 2000
This parameter sets the magnification when manual handle feed movement selection signals MP1 <Gn019.4> and MP2 <Gn019.5> are set to 1.

7117	Allowable number of pulses that can be accumulated during manual handle feed

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Pulse
[Valid data range] 0 to 999999999
This parameter sets the number of pulses from the manual pulse generator that exceed the rapid traverse rate and can be accumulated without being discarded if manual handle feed faster than the rapid traverse rate is specified.

The amount of pulses exceeding the rapid traverse rate can be saved by CNC as B. And amount of pulses B will be exported as pulses C.



Amount of pulses exported by CNC in Manual Handle Feed

Amount of pulses B is calculated in 2 cases as following:

In case of

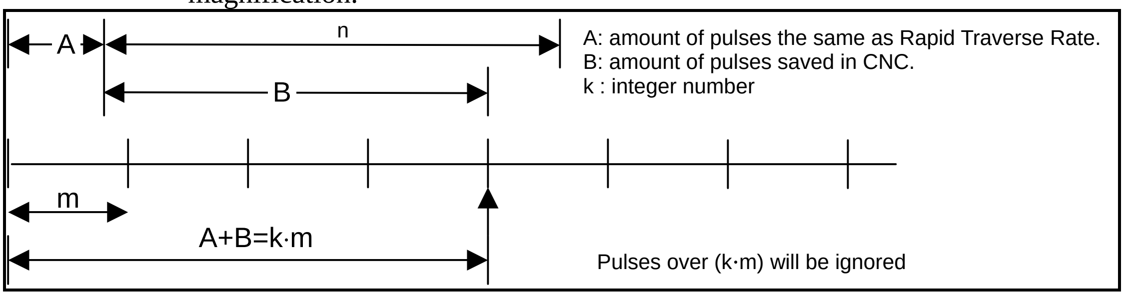
1) Parameter No.7117 = 0
   The feedrate is clamped at the Rapid Traverse Rate and generated pulses exceeding the Rapid Traverse Rate are ignored (B=0)

In case of

2) Parameter No.7117 > 0
   The feedrate is clamped as the Rapid Traverse Rate, but the pulses exceeding the Rapid Traverse Rate is not ignored. Amount of pulses accumulated in CNC is calculated as following. (Although stopping the rotation of manual pulse generator, if there is pulses accumulated in CNC, it will be exported and the tool will move as long as amount of it.)

   Magnification set by manual handle feed amount selection signals MP1, MP2 <Gn019.4, Gn019.5> is m, value of parameter No.7117 is n.

   n < m: Clamping is set performed at value of parameter No.7117.
   n ≥ m: Amount A+B, showed in figure, which's value is multiple of m and small than n. As a result, clamping is performed as an integral multiple of the selected magnification.



Amount of pulses exceeding the Rapid Traverse Rate (n ≥ m)

NOTE

Due to change of mode, clamping can be performed not as an integral multiple of the selected magnification.
The distance the tool moves may not match the graduations on the manual pulse generator.

7131	Manual handle feed magnification m2 / 2nd. manual pulse generator
7132	Manual handle feed magnification n2 / 2nd. manual pulse generator
7133	Manual handle feed magnification m3 / 3rd. manual pulse generator
7134	Manual handle feed magnification n3 / 3rd. manual pulse generator
7135	Manual handle feed magnification m4 / 4th. manual pulse generator
7136	Manual handle feed magnification n4 / 4th. manual pulse generator
7137	Manual handle feed magnification m5 / 5th. manual pulse generator
7138	Manual handle feed magnification n5 / 5th. manual pulse generator

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 2000

The ‘mx’ is selected when manual handle feed amount selection signals MPx1 = "0", MPx2 = "1". The ‘nx’ is selected when manual handle feed amount selection signalsMPx1 ="1", MPx2 = "1".

7160	Approach handle clamp feedrate

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis。
[Valid data range] Refer to standard parameter setting table (C)

Approach handle clamp feedrate is set.

7161	Guidance handle clamp feedrate

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis。
[Valid data range] Refer to standard parameter setting table (C)

Guidance handle clamp feedrate is set.

4.52 PARAMETERS OF REFERENCE POSITION WITH MECHANICAL STOPPER

	#7	#6	#5	#4	#3	#2	#1	#0
7180						SZE	SFS	

[Input type] Parameter input
[Data type] Bit path

#1 SFS Reference position setting with mechanical stopper in axis synchronous control is:
0: Disabled (conventional specifications).
1: Enabled.

#2 SZE When reference position setting with mechanical stopper is used in axis synchronous control, the limit of the difference between the positional deviation of the master axis and that of the slave axis (parameter No. 8323) is:
0: Checked.
1: Not checked.

7181	First withdrawal distance in reference position setting with mechanical stopper
7182	Second withdrawal distance in reference position setting with mechanical stopper

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the distance, by which an axis is withdrawn after the axis butts against the mechanical stopper in each cycle operation, (the distance from the mechanical stopper to the withdrawal point).

NOTE
Set the same direction as that set in bit 5 (ZMIx) of parameter No. 1006. Cycle operation cannot be started if the opposite direction is set.

7183	First butting feedrate in reference position setting with mechanical stopper
7184	Second butting feedrate in reference position setting with mechanical stopper or butting feedrate in reference position setting with mechanical stopper by grid method
7185	Withdrawal feedrate (common to the first and second butting operations) in reference position setting with mechanical stopper

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets a feedrate used to butt against the stopper along an axis in each cycle.

7186	Torque limit value in reference position setting with mechanical stopper

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 100
This parameter sets a torque limit value. A value from 0 to 100 corresponds to 0% to 39%. The torque limit value is obtained by multiplying the setting by 1/255. If more than 39% is to be set, use parameter No. 7187.

NOTE
When 0 is set in this parameter, 100% is assumed.

7187	Torque limit value in reference position setting with mechanical stopper or grid-type reference position return with mechanical stopper

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 255

This parameter sets a torque limit value. A value from 0 to 255 corresponds to 0% to 100%.
If this parameter is set up in reference position setting with mechanical stopper, parameter No. 7186 is ignored. If this parameter is set to 0, the setting of parameter No. 7186 is valid.
However, in case of reference position setting with mechanical stopper by grid method, only this parameter is valid. If this parameter is set to 0, 100% of the rated torque is assumed even if parameter No.7186 is set up.

	#7	#6	#5	#4	#3	#2	#1	#0
7188	RNWx							GRSx

[Input type] Parameter input
[Data type] Bit axis

#0 GRSx Reference point setting with mechanical stopper by grid method is:
0: Not performed.
1: Performed.

#7 RNWx During grid-type reference position return with mechanical stopper, until the sign of servo position deviation is inverted, the grid is
0: Not ignored.
1: Ignored.

4.53 PARAMETERS OF SOFTWARE OPERATOR'S PANEL

	#7	#6	#5	#4	#3	#2	#1	#0
7200		OP7	OP6	OP5	OP4	OP3	OP2	OP1

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 OP1 Mode selection on software operator's panel
0: Not performed
1: Performed

#1 OP2 JOG feed axis select and manual rapid traverse select on software operator's panel
0: Not performed
1: Performed

#2 OP3 Manual pulse generator's axis select and manual pulse generator's magnification select on software operator's panel
0: Not performed
1: Performed

#3 OP4 JOG feedrate override select, feedrate override select, and rapid traverse override select on software operator's panel
- 0: Not performed
- 1: Performed

#4 OP5 Optional block skip select, single block select, machine lock select, and dry run select on software operator's panel
- 0: Not performed
- 1: Performed

#5 OP6 Protect key on software operator's panel
- 0: Not performed
- 1: Performed

#6 OP7 Feed hold on software operator's panel
- 0: Not performed
- 1: Performed

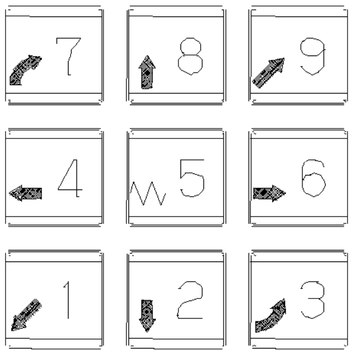
7210	**Jog-movement axis and its direction on software operator's panel "↑"**
7211	**Jog-movement axis and its direction on software operator's panel "↓"**
7212	**Jog-movement axis and its direction on software operator's panel "→"**
7213	**Jog-movement axis and its direction on software operator's panel "←"**
7214	**Jog-movement axis and its direction on software operator's panel "↙"**
7215	**Jog-movement axis and its direction on software operator's panel "↗"**
7216	**Jog-movement axis and its direction on software operator's panel "⤴"**
7217	**Jog-movement axis and its direction on software operator's panel "↱"**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 8

On software operator's panel, set a feed axis corresponding to an arrow key on the MDI panel when jog feed is performed.

Setting value	Feed axis and direction
0	Not moved
1	First axis, positive direction
2	First axis, negative direction
3	Second axis, positive direction
4	Second axis, negative direction
5	Third axis, positive direction
6	Third axis, negative direction
7	Fourth axis, positive direction
8	Fourth axis, negative direction

Arrow keys on MDI panel



[Example] Under X, Y, and Z axis configuration, to set arrow keys to feed the axes in the direction specified as follows, set the parameters to the values given below. <8↑> to the positive direction of the Z axis, <2↓> to the negative direction of the Z axis, <6→> to the positive direction of the X axis <4←> to the negative direction of the X axis, <1↙> to the positive direction of the Y axis, <9↗> to the negative direction of the Y axis
Parameter No.7210 = 5 (Z axis, positive direction)
Parameter No.7211 = 6 (Z axis, negative direction)
Parameter No.7212 = 1 (X axis, positive direction)
Parameter No.7213 = 2 (X axis, negative direction)
Parameter No.7214 = 3 (Y axis, positive direction)
Parameter No.7215 = 4 (Y axis, negative direction)
Parameter No.7216 = 0 (Not used)
Parameter No.7217 = 0 (Not used)

7220	**Name of general-purpose switch 1 on software operator's panel (first character)**
to	**to**
7283	**Name of general-purpose switch 8 on software operator's panel (eighth character)**

7284	**Name of general-purpose switch 9 on software operator's panel (first character)**
to	**to**
7299	**Name of general-purpose switch 10 on software operator's panel (eighth character)**

7352	**Name of general-purpose switch 11 on software operator's panel (first character)**
to	**to**
7399	**Name of general-purpose switch 16 on software operator's panel (eighth character)**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] -128 to 127

Each of these parameters sets the name of a general-purpose switch on the software operator's panel with character codes indicated in the character-code correspondence table. A switch name consists of up to eight characters.

Parameters Nos. 7220 to 7227 : Name of general-purpose switch 1
Parameters Nos. 7228 to 7235 : Name of general-purpose switch 2
Parameters Nos. 7236 to 7243 : Name of general-purpose switch 3
Parameters Nos. 7244 to 7251 : Name of general-purpose switch 4
Parameters Nos. 7252 to 7259 : Name of general-purpose switch 5
Parameters Nos. 7260 to 7267 : Name of general-purpose switch 6
Parameters Nos. 7268 to 7275 : Name of general-purpose switch 7
Parameters Nos. 7276 to 7283 : Name of general-purpose switch 8
Parameters Nos. 7284 to 7291 : Name of general-purpose switch 9
Parameters Nos. 7292 to 7299 : Name of general-purpose switch 10
Parameters Nos. 7352 to 7359 : Name of general-purpose switch 11
Parameters Nos. 7360 to 7367 : Name of general-purpose switch 12
Parameters Nos. 7368 to 7375 : Name of general-purpose switch 13
Parameters Nos. 7376 to 7383 : Name of general-purpose switch 14
Parameters Nos. 7384 to 7391 : Name of general-purpose switch 15
Parameters Nos. 7392 to 7399 : Name of general-purpose switch 16

Character code list

Character	Code	Character	Code	Character	Code
A	65	Q	81	6	54
B	66	R	82	7	55

Character	Code	Character	Code	Character	Code
C	67	S	83	8	56
D	68	T	84	9	57
E	69	U	85		32
F	70	V	86	!	33
G	71	W	87	“	34
H	72	X	88	#	35
I	73	Y	89	$	36
J	74	Z	90	%	37
K	75	0	48	&	38
L	76	1	49	‘	39
M	77	2	50	(	40
N	78	3	51	)	41
O	79	4	52	*	42
P	80	5	53	+	43

4.54 PARAMETERS OF PROGRAM RESTART (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
7300	MOU	MOA	CCS					

[Input type] Parameter input
[Data type] Bit path

#5 CCS When the Cs contour control axis is used in the spindle mode or when the origin of the Cs contour control axis is not established, program restart is:
0: Disabled.
1: Enabled.

#6 MOA In program restart operation, before movement to a machining restart point:
0: The last M, S, T, and B codes are output.
1: All M codes and the last S, T, and B codes are output.
This parameter is enabled when the bit 7 (MOU) of parameter No.7300 is set to 1.

#7 MOU In program restart operation, before movement to a machining restart point after restart block search:
0: The M, S, T, and B codes are not output.
1: The last M, S, T, and B codes are output.

	#7	#6	#5	#4	#3	#2	#1	#0
7301							3DD	ROF

[Input type] Parameter input
[Data type] Bit path

#0 ROF When the coordinates for restarting are displayed on the program restart screen:
0: Tool length compensation (M series), tool position compensation (T series), cutter compensation (M series), and tool-nose radius compensation (T series) are considered.
1: Whether these compensation values are considered depends on the settings of bit 6 (DAL) of parameter No. 3104, bit 7 (DAC) of parameter No. 3104, and bit 1 (DAP) of parameter No. 3129 (parameters for specifying whether to consider each compensation value).

#1 3DD In program restart operation, when the restart block is in 3-dimensional coordinate conversion mode G68 (machining center system) or G68.1 (lathe system), the tool moves to the restart point along each axis:
0: According to the program coordinate system in dry run.
1: According to the workpiece coordinate system in dry run.
The restart coordinates and restart travel distance are also displayed in the coordinate system set in this parameter.

> **NOTE**
> The change made to this parameter in program restart operation is ignored.

7310	Ordinal number of an axis along which a movement is made in dry run after program restart

[Input type] Setting input
[Data type] Byte axis
[Valid data range] 1 to (Number of controlled axes)
This parameter sets the ordinal number of an axis along which a movement is made in dry run after the program is restarted.

4.55 PARAMETERS OF HIGH-SPEED CYCLE CUTTING

	#7	#6	#5	#4	#3	#2	#1	#0
7501	IPC	IT2	IT1	IT0	BDS			

[Input type] Parameter input
[Data type] Bit path

#3 BDS In the high-speed binary program operation mode, the data format of axis movement is:
0 : Special format.
1 : Ordinary format.

- When BDS is set to 0 (special format)
  The bits marked with an asterisk (*) are used to specify the travel distance per unit time.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
*	*	*	*	*	*	*	<u>0</u>	*	*	*	*	*	*	*	<u>0</u>

- When BDS is set to 1 (ordinary format)
  The bits marked with an asterisk (*) are used to specify the travel distance per unit time.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

#4 IT0
#5 IT1
#6 IT2

IT2	IT1	IT0	Interpolation of high-speed cutting G05 data (ms)
0	0	0	8
0	0	1	2
0	1	0	4
0	1	1	1
1	0	0	16
1	1	1	0.5

NOTE
To perform high-speed cycle cutting for multiple paths, set the same interpolation for all paths.

#7 IPC While high-speed cutting (G05) is being executed using cycle machining data, monitoring to see whether distribution processing is stopped or not is:
0: Not performed.
1: Performed. (If distribution processing is stopped, an alarm PS0179, “PARAM. (NO.7510) SETTING ERROR” is issued after distribution is completed.)

	#7	#6	#5	#4	#3	#2	#1	#0
7502			LC2	LC1				

[Input type] Parameter input
[Data type] Bit path

#4 LC1
#5 LC2 In the servo learning control mode, high-speed cycle cutting and high-speed binary program operation are performed with the retract function as follows.

- High-speed cycle cutting

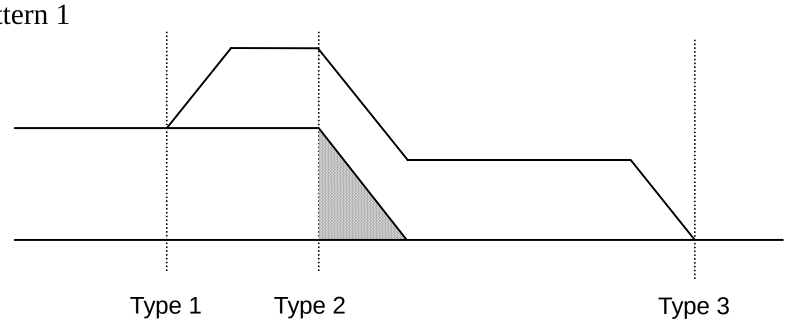
LC2	LC1	End timing of servo learning function during high-speed cycle cutting retract function
0	0	Disables the servo learning function, after which retract operation starts.
0	1	Disables the servo learning function upon the completion of retract operation.
1	0	Disables the servo learning function upon the completion of a retract cycle.

- High-speed binary program operation

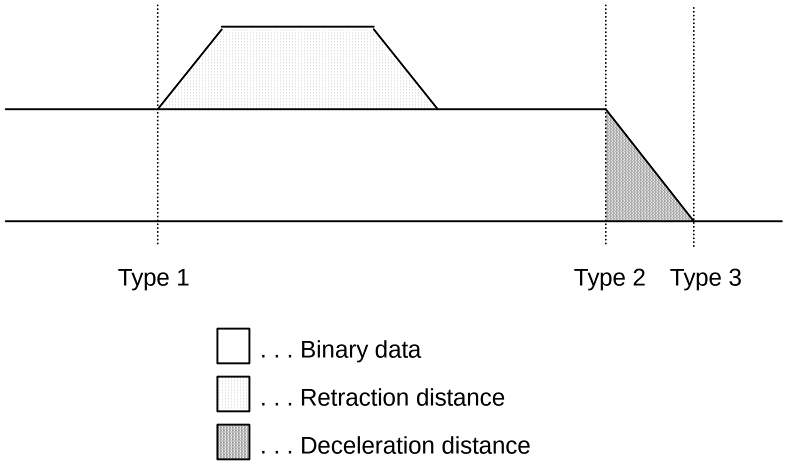
	LC2	LC1	End timing of servo learning function during high-speed binary program operation retract function
Type1	0	0	Disables the servo learning function, after which retract operation starts.
Type2	0	1	Disables the servo learning function at the end of operation according to binary data.
Type3	1	0	Disables the servo learning function when the tool is stopped along all axes.

In pattern 1, retract operation ends after high-speed binary program operation ends, and in pattern 2, retract operation ends before high-speed binary program operation ends.

Pattern 1



Pattern 2



	#7	#6	#5	#4	#3	#2	#1	#0
7503				HCT		RNR		

[Input type] Parameter input
[Data type] Bit path

#2 RNR After retract operation according to the retract function during high-speed binary program operation, when the system enters the reset state, the reset signal RST <Fn001.1>:
0: Is set to 1.
1: Remains 0.

#4 HCT The variable number for starting storage of high-speed cycle machining distribution data is:
0: Specified by 1/10.
1: Specified by 1/100.

	#7	#6	#5	#4	#3	#2	#1	#0
7504							HIF	BM0

[Input type] Parameter input
[Data type] Bit path

#0 BM0 During high-speed cycle cutting or high-speed binary program operation, axis moving signals MV1 to MV8 <Fn102> are:
0: Always set to "1".
1: Set to 1 when the tool moves along the axis.

NOTE
When bit 0 (BM0) of parameter No. 7504 is set to 1 and the same position is specified after a very small movement for each execution cycle, axis moving signals MV1 to MV8 <Fn102> may not be output.

#1 HIF High-speed cycle machining operation information output function is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
7505							HUN	

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter bit is set, the power must be turned off before operation is continued.

#1 HUN During high-speed cutting, the setting unit of distribution data is:
0: 1 pulse.
1: 10 pulses.

> **NOTE**
> If data distributed at one time is longer than one word because of the least input increment and the maximum feedrate, this parameter is used. If bit parameter HUN is set to 1 for an axis, high-speed cycle machining/high-speed binary program operation data distributed to that axis is internally multiplied by 10 by the CNC and then input. Therefore, when using HUN for an axis, set a 1/10 of high-speed cycle machining/high-speed binary program operation data to be distributed to that axis.

7510	Number of controlled axes for high-speed cycle machining or high-speed binary program operation

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to number of controlled axes
Set the number of axes to be controlled when G05 is specified to perform high-speed cycle machining or high-speed binary program operation.

7514	Retract direction and retract feedrate in high-speed cycle machining retract operation

[Input type] Parameter input
[Data type] Real axis
[Valid data range] Refer to standard parameter setting table (C)
This parameter sets a retract direction and retract feedrate along each axis in a high-speed cycle machining retract operation. The superimposed feedrate for each axis is specified, and the retract direction is specified with a sign.

7515	Number of retract operation distributions in a high-speed cycle machining retract operation

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999
This parameter sets the number of retract operation distributions in a high-speed cycle machining retract operation.
When the cycle currently being executed ends before the number of distributions specified in this parameter are performed, retract operation is terminated. When 0 is specified in this parameter, the number of retract operation distributions is assumed to be infinite. In this case, retract operation is performed until the cycle currently being executed ends.

7516	High-speed cycle cutting data area ID

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes
When data assigned to a path is to be used as common data, this parameter sets the number of the path.

7517	Number of high-speed cycle cutting data items

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 65536, 0 to 131072, 0 to 262144, 0 to 786432, 0 to 2000000
This parameter sets the number of data items to be used for high-speed cycle cutting.
Since variables are sequentially assigned to each path from path 1 to path 2 and so on, to some paths, the specified number of variables may not be assigned depending on the setting. When this parameter is set to 0 for all paths, however, all variables are assigned to path 1.
In parameter No. 7516, set the number of the path of which data is to be used as common data. For the path of which data is to be used as common data, set the parameter to 0.

[Example 1] When the high-speed cycle cutting data variable mode is set to standard (65536 variables), 40000 variables are to be used for paths 1 and 3 as common data and remaining 25536 variables are to be used for path 2

	No.7516	No.7517	Available variables
Path 1	0	40000	#20000 to #59999
Path 2	0	25536	#20000 to #45535
Path 3	1	0	#20000 to #59999

[Example 2] When the high-speed cycle cutting data variable mode is set to addition B (262144 variables) and high-speed cycle cutting is to be performed only for path 2

	No.7516	No.7517	Available variables
Path 1	0	0	#200000 to #462143 (Not used)
Path 2	1	0	#200000 to #462143
Path 3	0	0	-

or

	No.7516	No.7517	Available variables
Path 1	0	0	-
Path 2	0	262144	#200000 to #462143
Path 3	0	0	-

[Example 3] When the high-speed cycle cutting data variable mode is addition D (2000000 variables) and all variables are to be used as common variables

	No.7516	No.7517	Available variables
Path 1	0	0	#2000000 to #3999999
Path 2	1	0	#2000000 to #3999999

7521	Retract time constant in high-speed binary program operation

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000
This parameter sets the time constant for linear acceleration/deceleration of time fixed type for each axis for retract operation during high-speed binary program operation. (Time constant for deceleration during stop operation)

NOTE

The set time constant is shifted according to the interpolation of high-speed binary program operation data.
When the interpolation is 8 ms, the time constant is assumed to be a multiple of 8 in ms.
When the interpolation is 4 ms, the time constant is assumed to be a multiple of 4 in ms.
When the interpolation is 2 ms, the time constant is assumed to be a multiple of 2 in ms.
When the interpolation is 1 ms or less, the time constant is assumed to be the value in ms.
When the set time constant is not a multiple of 8, 4, or 2, it is raised to the next multiple of 8, 4, or 2.
[Example]
When a value of 9 is set
1) When the interpolation is 8 ms, the time constant is assumed to be 16 msec.
2) When the interpolation is 4 ms, the time constant is assumed to be 12 msec.
3) When the interpolation is 2 ms, the time constant is assumed to be 10 msec.
4) When the interpolation is 1 ms or less, the time constant is assumed to be 9 msec.

7522	Retraction distance in high-speed binary program operation

[Input type] Parameter input
[Data type] 2-word axis
[Valid data range] -999999999 to 999999999

This parameter sets the travel distance in retract operation during high-speed binary program operation.

Unit of data	Increment system	Value corresponding to 1
mm degree	IS-A	0.01
	IS-B	0.001
	IS-C	0.0001
	IS-D	0.00001
	IS-E	0.000001
inch	IS-A	0.001
	IS-B	0.0001
	IS-C	0.00001
	IS-D	0.000001
	IS-E	0.0000001

7523	Feedrate of retract during high-speed binary program operation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min(machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)

This parameter sets the feedrate of retract operation during high-speed binary program operation for each axis.

7525	Retract reference axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

In retract operation during high-speed binary program operation, deceleration can be started at the specified timing when the tool passes a certain point along a reference axis during cycle operation. Setting the reference controlled-axis number and absolute position for parameters makes deceleration start when the tool passes the set absolute position along the reference axis after high-speed binary program operation retract select signal HRST <Gn065.3> is input. This parameter sets the reference axis.

0 : Deceleration starts immediately after HRST is input.

Other than 0:
Deceleration starts when the tool passes the set absolute position along the reference axes. Set the reference axis with its controlled-axis number.

7525	Retract absolute position

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

In retract operation during high-speed binary program operation, deceleration can be started at the specified timing when the tool passes a certain point along a reference axis during cycle operation. Setting the reference controlled-axis number and absolute position for parameters makes deceleration start when the tool passes the set absolute position along the reference axis after high-speed binary program operation retract select signal HRST <Gn065.3> is input. This parameter sets the absolute position.

7526	Start address of the R signal for high-speed cycle cutting operation information output function

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 59964 (multiple of 4)

This parameter sets the start address of the destination PMC internal relay (R signal) when high-speed cycle cutting operation information output is enabled (bit 1 (HIF) of parameter No. 7504 is set to 1).

The destination PMC internal relay (R signal) must have a 36-byte area starting from the set address.

NOTE

1 When a multi-path PMC is used, the available R address is only for the first PMC.

2 If one of the following invalid settings is made, alarm PS0507, "ILLEGAL PARAMETER(NO.7526)" is issued at the start of high-speed cycle cutting:
- The specified R signal address is invalid.
- The specified value is not a multiple of 4 (0, 4, 8, ...).
- A 36-byte area cannot be allocated.

NOTE

3 In multi-path control, set a data address which is not used for another path.
4 The range of R addresses for the first PMC differs between PMC memory A - D. Before setting, check the available range. For details, refer to “PMC PROGRAMMING MANUAL” (B-64513EN). (Example: First PMC memory B -> R0 to R7999)

7527	Maximum number of the machining cycle for high-speed cycle machining

[Input type] Parameter input
[Data type] Word path
[Unit of data] None
[Valid data range] 0, 1000 to 1999

Set the maximum number of the machining cycle in high-speed cycle machining. When the value other than 1000 to 1999 is set in this parameter, the maximum number of the machining cycle is 999.
This parameter is valid when high-speed cycle cutting additional variables D is effective.

	#7	#6	#5	#4	#3	#2	#1	#0
9033			SHS					

[Input type] Parameter input
[Data type] Bit path

#5 SHS When the high-speed cycle cutting function is enabled, variables #20000 and after are treated as:
0: High-speed cycle cutting variables.
1: P-CODE variables.

4.56 PARAMETERS OF ROTARY TABLE DYNAMIC FIXTURE OFFSET

	#7	#6	#5	#4	#3	#2	#1	#0
7570								
					CFA			FTP

[Input type] Parameter input
[Data type] Bit path

#0 FTP Fixture offset type setting
0: Movement type (The tool moves when the fixture offset changes.)
1: Shift type (The tool does not move when the fixture offset changes.)

#3 CFA When the fixture offset function is used, and a rotation axis is specified in the increment mode (G91 mode) after manual intervention in the state where the manual absolute switch is on:
0: A vector calculation is made using coordinates not reflecting a manual intervention amount.
1: A vector calculation is made using coordinates reflecting a manual intervention amount.

	#7	#6	#5	#4	#3	#2	#1	#0
7575								
								FAX

[Input type] Parameter input
[Data type] Bit axis

#0 FAX Fixture offset on each axis is:
0: Disabled.
1: Enabled.

7580	Rotation axis for fixture offset (first group)
7581	Linear axis 1 for fixture offset (first group)
7582	Linear axis 2 for fixture offset (first group)
7583	Rotation axis for fixture offset (second group)
7584	Linear axis 1 for fixture offset (second group)
7585	Linear axis 2 for fixture offset (second group)
7586	Rotation axis for fixture offset (third group)
7587	Linear axis 1 for fixture offset (third group)
7588	Linear axis 2 for fixture offset (third group)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

These parameters specify rotation axes for fixture offset and pairs of linear axes for selecting a rotation plane. Specify a pair of linear axes so that rotation from the positive direction of linear axis 1 to the positive direction is in the normal direction of the rotation axis.

Up to three groups of a rotation axis setting and two linear axis settings can be specified. The fixture offset value is calculated first for the rotation axis in the first group. Then, for the second and third groups, the fixture value is sequentially calculated using the previous calculation result. When you do not need the third group, set 0 for the rotation axis.

4.57 PARAMETERS OF POLYGON TURNING

	#7	#6	#5	#4	#3	#2	#1	#0
7600	PLZ							PFF

[Input type] Parameter input
[Data type] Bit path

#0 PFF In spindle-servo polygon turning, feed forward for the tool rotation axis (servo axis) during polygon turning is always:
0: Disabled.
1: Enabled.

#7 PLZ Reference position return based on a G28 command on the tool rotation axis for polygon turning is:
0: Performed in the same sequence as manual reference position return.
1: Performed by positioning using the rapid traverse rate.
The synchronous axis returns to the reference position in the same sequence as the manual reference position return when no return-to-reference position is performed after the power is turned on.

	#7	#6	#5	#4	#3	#2	#1	#0
7602			COF	HST	HSL	HDR	SNG	MNG

[Input type] Parameter input
[Data type] Bit path

#0 MNG The rotational direction of the master axis in the spindle-spindle polygon turning mode is:
0: Not reversed.
1: Reversed.

#1 SNG The rotational direction of the polygon synchronization axis in the spindle-spindle polygon turning mode is:
0: Not reversed.
1: Reversed.

#2 HDR When phase control is exercised in spindle-spindle polygon turning mode (bit 5 (COF) of parameter No. 7602 is set to 0), the phase shift direction is:
0: Not reversed for phase synchronization.
1: Reversed for phase synchronization.

NOTE
The rotation directions and phase shift directions of the master axis and polygon synchronization axis in the spindle-spindle polygon turning mode can be reversed with a programmed command. MNG, SNG, and HDR are used to reverse an actual direction relative to the programmed command.

#3 HSL When phase control is exercised in spindle-spindle polygon turning mode (bit 5 (COF) of parameter No. 7602 is set to 0), this parameter selects the spindle that is subject to a phase shift operation for phase synchronization:
0: The polygon synchronization axis is selected.
1: The master axis is selected.

NOTE
1 Select an axis to which a phase shift command is applied.
2 Spindle operation for phase synchronization is performed with both spindles.

#4 HST When phase control is applied in spindle-spindle polygon turning mode (bit 5 (COF) of parameter No. 7602 is set to 0), and spindle-spindle polygon turning mode is specified:
0: Spindle-spindle polygon turning mode is entered with the current spindle speed maintained.
1: Spindle-spindle polygon turning mode is entered after the spindle is stopped.

> **NOTE**
> This parameter can be used, for example, when single-rotation signal detection cannot be guaranteed at an arbitrary feedrate because a separate detector is installed to detect the spindle single-rotation signal, as when a built-in spindle is used. (When bit 7 (RFCHK3) of parameter No. 4016 for the serial spindle is set to 1, together with this parameter, a single-rotation signal detection position in spindle-spindle polygon turning mode is guaranteed.)

#5 COF In spindle-spindle polygon turning mode, phase control is:
0: Enabled.
1: Disabled.

> **NOTE**
> When the use of phase control is not selected, the steady state is reached in a shorter time because phase synchronization control is not applied. Once steady rotation is achieved, however, polygon turning must be completed without changing the steady state. (If a spindle speed change including a spindle stop is made, a phase shift occurs, so that polygon turning is not performed normally.)
> Even when this parameter is set to 1, an R command (phase position command) in a block containing G51.2 is ignored ; no alarm is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
7603	PST		RDG		PLROT	SBR	QDR	RPL

[Input type] Parameter input
[Data type] Bit path

#0 RPL Upon reset, polygon turning mode or spindle-spindle polygon turning mode is:
0: Released.
1: Not released.

NOTE

Notes on the polygon turning function

1. When an emergency stop occurs, the polygon turning mode is released regardless of whether this parameter is set to 0 or 1.
2. When any of the following PS alarms is issued, the polygon turning mode is released regardless of whether this parameter is set to 0 or 1:
   - PS0217, "DUPLICATE G51.2(COMMANDS)"
   - PS0219, "COMMAND G51.2/G50.2 INDEPENDENTLY"
   - PS0220, "ILLEGAL COMMAND IN SYNCHR-MODE"
   - PS0221, "ILLEGAL COMMAND IN SYNCHR-MODE"
   - PS5018, "POLYGON SPINDLE SPEED ERROR"
3. If an SV alarm is issued, the polygon turning mode is released regardless of whether this parameter is set to 0 or 1.
4. When this parameter is set to 1, polygon turning modal information is kept regardless of whether bit 6 (CLR) of parameter No. 3402 is set to 0 or 1.
5. Set bit 4 (C20) of parameter No. 3408 to 0.

#1 QDR The rotational direction of the polygon synchronization axis:

0: Depends on the sign (+/-) of a specified value for Q.

1: Depends on the rotational direction of the first spindle.

If a negative value is specified for Q when QDR = 1, the alarm PS0218, “NOT FOUND P/Q COMMAND” is issued.

#2 SBR For spindle synchronization, speed ratio control is:

0: Not used.

1: Used.

#3 PLROT The machine coordinates of a tool rotation axis for polygon turning are:

0: Rounded by the setting in parameter No.7620.

1: Rounded by 360° (or the setting in parameter No. 1260 when bit 0 (ROA) of parameter No. 1008 is set to 1).

#5 RDG On the diagnosis screen No. 476, for spindle-spindle polygon phase command value (R), displays:

0: The specified value (in the increment system for the rotation axis).

1: The actual number of shift pulses.

NOTE

A phase command is specified in address R, in units of degrees. For control, the actual shift amount is converted to a number of pulses according to the conversion formula: 360 degrees = 4096 pulses. This parameter switches the display of a specified value to that of a converted value.

#7 PST The polygon spindle stop signal *PLSST <Gn038.0> is:

0: Not used.

1: Used.

	#7	#6	#5	#4	#3	#2	#1	#0
7604	PCG							

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit path

#7 PCG If both the spindle-spindle polygon turning option and the polygon turning option are specified:
0: Spindle-spindle polygon turning is performed.
1: Either of the options is enabled depending on the setting of parameter No. 7605.

7605	Polygon turning type selection

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0, 1

If both the spindle-spindle polygon turning option and the polygon turning option are specified, this parameter can be used to select one of the options for use. A type of polygon turning is selected according to the setting as follows:
0: Polygon machining with two spindles
1: Polygon turning
If a value other than 0 or 1 is specified, 0 is assumed.

> **NOTE**
> Before re-setting this parameter, using the PMC window function or the G10 command, cancel polygon turning (G50.2). In addition, when re-setting this parameter, using the PMC window function, use the M code not involving buffering.

7610	Control axis number of tool rotation axis for polygon turning

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

This parameter sets the control axis number of a rotation tool axis used for polygon turning.
However, when a G51.2 command is executed by setting 0 in this parameter, operation stops with the alarm PS0314, "ILLEGAL SETTING OF POLYGONAL AXIS".

7620	Movement of tool rotation axis per revolution for polygon turning

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the movement of a tool rotation axis per revolution.

7621	Maximum allowable speed for the tool rotation axis for polygon turning

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min^{-1}
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the maximum allowable speed of the tool rotation axis.

> **NOTE**
> If the speed of the tool rotation axis exceeds the set maximum allowable speed during polygon turning, the synchronization between the spindle and tool rotation axis is lost, and operation stops with alarm PS5018, “POLYGON SPINDLE SPEED ERROR”.

7631	Allowable spindle speed deviation level in spindle-spindle polygon turning

[Input type] Parameter input
[Data type] Word path
[Unit of data] min^{-1}
[Valid data range] 0 to 32767
This parameter sets the allowable level of deviation between the actual speed and specified speed of each spindle in spindle-spindle polygon turning. The value set with this parameter is used for both the master axis and polygon synchronization axis.
When 0 is set in this parameter, the specification of 8 [min^{-1}] is assumed.

7632	Steady state confirmation time duration in spindle polygon turning

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767
This parameter sets the duration required to confirm that both spindles have reached their specified speeds in spindle-spindle polygon turning.
If the state where the speed of each spindle is within the range set with parameter No.7631, and has lasted at least for the duration specified with parameter No.7632, the spindle polygon speed arrival signal PSAR <Fn063.2> is set to “1”.

When 0 is set in this parameter, the specification of 64 [msec] is assumed.

7635	Ratio of slave spindle speed in spindle synchronization control

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to 9

This parameter sets the ratio of master spindle speed: slave spindle speed (1:n) in spindle synchronization control.

> **NOTE**
> This parameter is valid only when bit 2 (SBR) of parameter No. 7603 is set to 1.

7636	Maximum allowable slave spindle speed in spindle synchronization control

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 19999

The speed of the slave spindle under speed ratio control in spindle synchronization control is clamped so that the speed does not exceed the value set in this parameter.

> **NOTE**
> 1 This parameter is valid only when bit 2 (SBR) of parameter No. 7603 is set to 1.
> 2 When speed ratio control in spindle synchronization control is used, be sure to set this parameter.
> When 0 is set, the speed is clamped to 0, disabling rotation under spindle synchronization.

7640	Master axis in spindle-spindle polygon turning

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Maximum number of controlled axes (Within a path)

This parameter sets the master axis in spindle-spindle polygon turning.

> **NOTE**
> 1 Spindle-spindle polygon turning is enabled only for serial spindles.
> 2 When any one of parameters No. 7640 and 7641 is set to 0, polygon turning is performed using the first spindle (master axis) and the second spindle (polygon synchronous axis) in the path to which the parameter belongs.
> 3 When a spindle other than the first serial spindle is used as a master axis, the multi-spindle control option is required to specify an S command for the master axis.

> **NOTE**
> 4 When the PMC window function or G10 command is used to rewrite this parameter, rewrite this parameter before the block specifying the spindle-spindle polygon command G51.2. When the PMC window function is used to rewrite this parameter in the block immediately before G51.2, specify the rewriting of this parameter by using an M code (parameter No. 3411 and up) without buffering.

7641	Polygon synchronous axis in spindle-spindle polygon turning

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Maximum number of controlled axes (Within a path)

This parameter sets the polygon synchronous (slave) axis in spindle-spindle polygon turning.

> **NOTE**
> 1 Spindle-spindle polygon turning is enabled only for serial spindles.
> 2 When any one of parameter No. 7640 and No. 7641 is set to 0, polygon turning is performed using the first spindle (master axis) and the second spindle (polygon synchronous axis) in the path to which the parameter belongs.
> 3 When a spindle other than the first serial spindle is used as a master axis, the multi-spindle control option is required to specify an S command for the master axis.
> 4 When the PMC window function or G10 command is used to rewrite this parameter, rewrite this parameter before the block specifying the spindle-spindle polygon command G51.2. When the PMC window function is used to rewrite this parameter in the block immediately before G51.2, specify the rewriting of this parameter by using an M code (parameter No. 3411 and up) without buffering.

7642	Master axis in spindle-spindle polygon turning (spindle number common to the system)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Maximum number of controlled axes (Common to the system)

This parameter sets the master axis in spindle-spindle polygon turning.

> **NOTE**
> 1 Spindle-spindle polygon turning is enabled only for serial spindles.
> 2 This parameter is invalid if either parameter No. 7642 or No.7643 is set to 0. In this case, the settings of parameter No. 7640 and No.7641 are valid.
> 3 When a spindle other than the first serial spindle is used as a master axis, the multi-spindle control option is required to specify an S command for the master axis.

> **NOTE**
> 4 When the PMC window function or G10 command is used to rewrite this parameter, rewrite this parameter before the block specifying the spindle-spindle polygon command G51.2. When the PMC window function is used to rewrite this parameter in the block immediately before G51.2, specify the rewriting of this parameter by using an M code (parameter No. 3411 and up) without buffering.
> 5 A spindle number common to the system is to be set in this parameter. When using this parameter, set 0 in parameter No. 7640 and No. 7641.

7643	Polygon synchronous axis in spindle-spindle polygon turning (spindle number common to the system)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Maximum number of controlled axes (Common to the system)

This parameter sets the polygon synchronous (slave) axis in spindle-spindle polygon turning.

> **NOTE**
> 1 Spindle-spindle polygon turning is enabled only for serial spindles.
> 2 This parameter is invalid if either parameter No. 7642 or No.7643 is set to 0. In this case, the settings of parameter No. 7640 and No.7641 are valid.
> 3 When a spindle other than the first serial spindle is used as a master axis, the multi-spindle control option is required to specify an S command for the master axis.
> 4 When the PMC window function or G10 command is used to rewrite this parameter, rewrite this parameter before the block specifying the spindle-spindle polygon command G51.2. When the PMC window function is used to rewrite this parameter in the block immediately before G51.2, specify the rewriting of this parameter by using an M code (parameter No. 3411 and up) without buffering.
> 5 A spindle number common to the system is to be set in this parameter. When using this parameter, set 0 in parameter No. 7640 and No. 7641.

4.58 PARAMETERS OF THE ELECTRONIC GEAR BOX (EGB)

	#7	#6	#5	#4	#3	#2	#1	#0
7700						HDR		HBR

[Input type] Parameter input
[Data type] Bit path

#0 HBR When the electronic gear box (EGB) function is used, performing a reset:
0: Cancels the synchronization mode (G81 or G81.5).
1: Does not cancel the synchronization mode. The mode is canceled only by the G80 or G80.5 command.

NOTE

To perform U-axis control, set this parameter to 1 so that performing a reset does not cancel the synchronization mode.

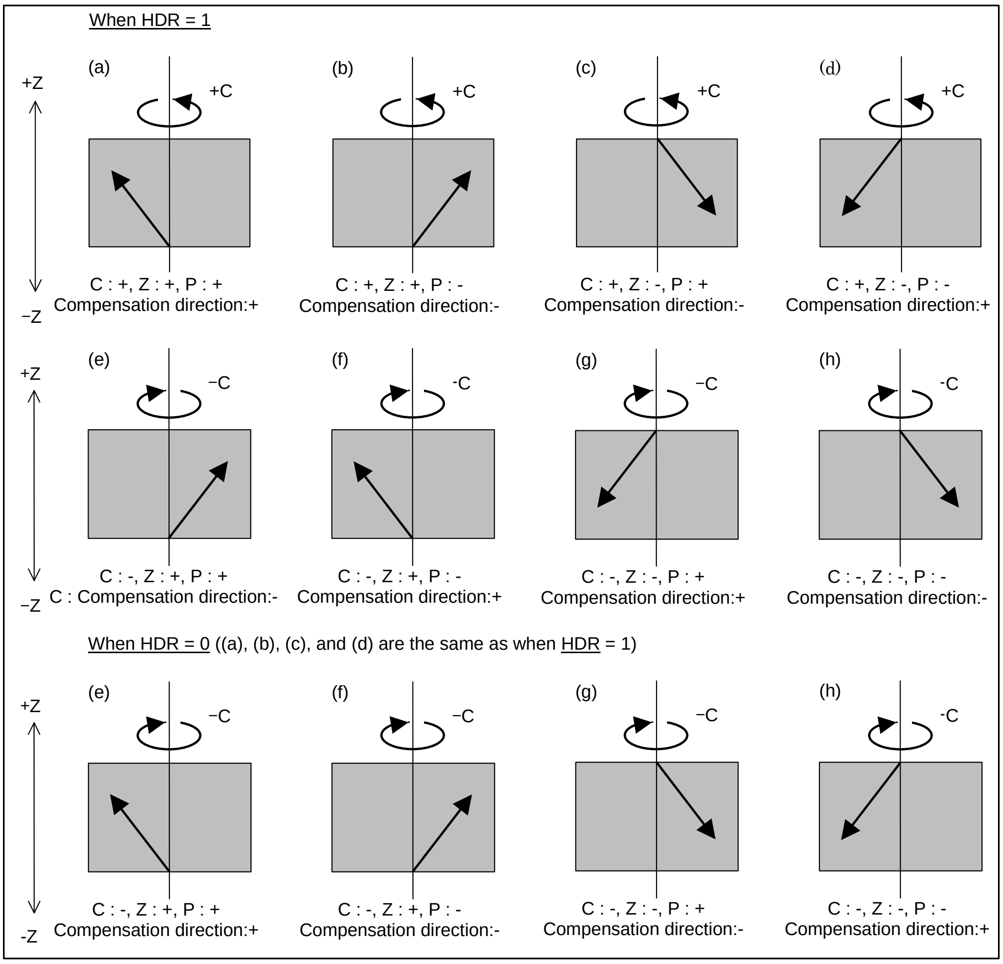
#2 HDR Direction of helical gear compensation (usually, set 1.)

[Example]

To cut a left-twisted helical gear when the direction of rotation about the C-axis is the negative (-) direction:

0: Set a negative (-) value in P.

1: Set a positive (+) value in P.



	#7	#6	#5	#4	#3	#2	#1	#0
7701					LZR			

[Input type] Parameter input
[Data type] Bit path

#3 LZR When L (number of hob threads) = 0 is specified at the start of EGB synchronization (G81):

0: Synchronization is started, assuming that L = 1 is specified.

1: Synchronization is not started, assuming that L = 0 is specified. However, helical gear compensation is performed.

	#7	#6	#5	#4	#3	#2	#1	#0
7702	PHD	PHS			ART		UAX	TDP

[Input type] Parameter input
[Data type] Bit path

#0 TDP The specifiable number of teeth, T, of the electronic gear box (G81) is:
0: 1 to 1000
1: 0.1 to 100 (1/10 of a specified value)

> **NOTE**
> In either case, a value from 1 to 1000 can be specified.

#1 UAX U-axis control is:
0: Not performed.
1: Performed.

#3 ART The retract function executed when an alarm is issued is:
0: Disabled.
1: Enabled.
When an alarm is issued, a retract operation is performed with a set feedrate and travel distance (parameters Nos. 7740 and 7741).

> **NOTE**
> If a servo alarm is issued for other than the axis along which a retract operation is performed, the servo activating current is maintained until the retract operation is completed.

#6 PHS When the G81/G80 block contains no R command:
0: Acceleration/deceleration is not performed at the start or cancellation of EGB synchronization.
1: Acceleration/deceleration is performed at the start or cancellation of EGB synchronization. After acceleration at the start of synchronization, phase synchronization is automatically performed.

#7 PHD The direction of movement for automatic phase synchronization is:
0: Positive (+).
1: Negative (-).

	#7	#6	#5	#4	#3	#2	#1	#0
7703						ARO	ARE	ERV

[Input type] Parameter input
[Data type] Bit path

#0 ERV During EGB synchronization (G81), feed per revolution is performed for:
0: Feedback pulses.
1: Pulses converted to the speed for the workpiece axis.

#1 ARE In the retract function by an alarm, the tool retracts:
0: During the function mode (refer to Note.2) or automatic operation (automatic operation signal OP <Fn000.7> = “1”).
1: During the function mode (refer to Note.2).

#2 ARO In the retract function by an alarm, the tool retracts :

0: During the function mode (refer to Note.2).

1: During the function mode (refer to Note.2) and automatic operation (automatic operation signal OP = “1”).

> **NOTE**
> This parameter is valid when bit 1 (ARE) of parameter No. 7703 is set to 1.

The following table lists the parameter settings and corresponding operation.

ARE	ARO	Operation
1	0	During function mode
1	1	During function mode and automatic operation
0	0	During function mode or automatic operation
0	1	

> **NOTE**
> 1 Parameters ARE and ARO are valid when bit 3 (ART) of parameter No. 7702 is set to 1 (when the retract function executed when an alarm is issued).
> 2 The function mode described in the parameter ARE and ARO shows that the following functions are activated.
> - Electronic gear box(EGB)
> - Flexible synchronous control

	#7	#6	#5	#4	#3	#2	#1	#0
7704					UOC			ACR

[Input type] Parameter input
[Data type] Bit path

#0 ACR In the AI contour control mode, general purpose retract operation is:

0: Not Used.

1: Used.

#3 UOC When the U-axis control mode is released, the tool is:

0: Not moved along the U-axis to the position where the reference counter is 0.

1: Moved along the U-axis to the position where the reference counter is 0.

Use this parameter to change the U-axis mode.

> **NOTE**
> Before changing the mode, be sure to perform reference position return along the U-axis and spindle orientation to change the mode at the same position (origin along the U-axis).

	#7	#6	#5	#4	#3	#2	#1	#0
7705								SEGs

[Input type] Parameter input
[Data type] Bit spindle

#0 SEGs Simple spindle EGB function is:
0: Not used.
1: Used.
Set 1 for a serial spindle used as the slave axis for the simple spindle EGB function,.

7709	Axial feed axis number for helical gear compensation

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to Number of controlled axes
Specify which helical gear axial feed axis to use.

> **NOTE**
> If this parameter is 0 or a value out of the valid setting range, the Z-axis is assumed to be the axial feed axis.
> If there are two or more Z-axes used in parallel, specify which axis is to be used as the axial feed axis, using this parameter.

7710	Axis number of an axis to be synchronized using the method of command specification for a hobbing machine

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to Number of controlled axes
When there are several groups of axes to be synchronized (the axes for which bit 0 (SYNMOD) of parameter No. 2011 is set to 1), an axis for which to start synchronization is specified using the following command (for a hobbing machine):
G81 T t L ± *l* ;
t: Spindle speed ($1 \le t \le 5000$)
l: Number of synchronized axis rotations ($-250 \le l \le 250$)
Synchronization between the spindle and a specified axis is established with the ratio of ±*l* rotations about the synchronized axis to t spindle rotations.
t and *l* correspond to the number of teeth and the number of threads on the hobbing machine, respectively.
Above command is issued without setting this parameter when there are several groups of axes to be synchronized, the alarm PS1593, “EGB PARAMETER SETTING ERROR” is issued.

> **NOTE**
> 1 Set this parameter when there are two or more groups of servo and spindle EGBs in the same path. Set 0 when there is one group of EGBs in the same path.
> 2 When there are two or more groups of servo and spindle EGBs in the same path, setting a value outside the valid data range in this parameter causes alarm PS1593 to be issued.
> 3 For Series 16*i*, when a value outside the valid data range is set in this parameter, the fourth axis is assumed according to the specifications.
> 4 The setting of this parameter becomes valid after the power is turned off then back on.

		#7	#6	#5	#4	#3	#2	#1	#0
7731			EPA	HBR		ECN			EFX

[Input type] Parameter input
[Data type] Bit path

#0 EFX As the EGB command:
0: G80 and G81 are used.
1: G80.4 and G81.4 are used.

> **NOTE**
> When this parameter is set to 0, no canned cycle for drilling can be used.

#3 ECN When the automatic phase synchronization function for the electronic gear box is disabled, during EGB synchronization, the G81 or G81.5 command:
0: Cannot be issued again. (The alarm PS1595, "ILL-COMMAND IN EGB MODE" is issued.)
1: Can be issued again.

#5 HBR In EGB synchronization start command G81.4, the number of teeth is:
0: Specified in T.
1: Specified in R.

> **NOTE**
> This parameter is valid when bit 0 (EFX) of parameter No. 7731 is set to 1.

#6 EPA Automatic phase synchronization for the electronic gear box is performed in such a way that:
0: The machine coordinate 0 of the slave axis is aligned to the position of the master axis one-rotation signal.
1: The position of the slave axis at synchronization start is aligned to the position of the master axis one-rotation signal. (Specification of Series 16*i*)

7740	Feedrate during retraction

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets the feedrate during retraction for each axis.

7741	Retract amount

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the retract amount for each axis.

> **NOTE**
> The tool moves (is retracted) by the specified amount regardless of whether diameter or radius programming is specified.

7745	Time constant for linear acceleration/deceleration in retract operation for each axis

[Input type] Parameter input
[Data type] word axis
[Unit of data] msec
[Valid data range] 0 to 1000

This parameter sets an acceleration rate for linear acceleration/deceleration in retract operation based on the general-purpose retract function. Set a time (Time constant) used to reach the federate set in parameter No.7740 for each axis.

> **NOTE**
> This parameter is valid when bit 0 (ACR) of parameter No. 7704 is set to 1 to perform a retract operation in the AI contour control mode.

7772	Number of position detector pulses per rotation about the tool axis

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Detection unit
[Valid data range] 1 to 999999999

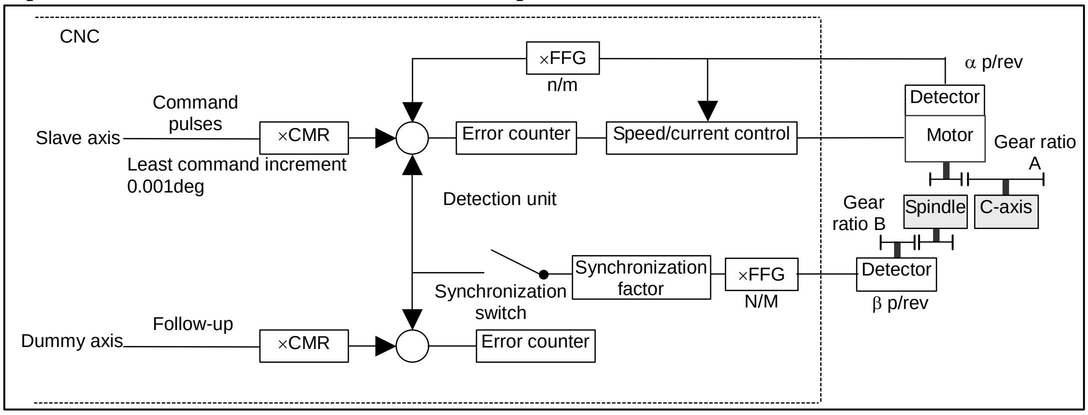
This parameter sets the number of pulses per rotation about the tool axis (on the spindle side), for the position detector.
For an A/B phase detector, set this parameter with four pulses equaling one A/B phase cycle.

7773	Number of position detector pulses per rotation about the workpiece axis

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Detection unit
[Valid data range] 1 to 999999999

This parameter sets the number of pulses per rotation about the workpiece axis (on the slave side), for the position detector.
Set the number of pulses output by the detection unit.
Set parameters Nos. 7772 and 7773 when using the G81 EGB synchronization command.

[Example 1] When the EGB master axis is the spindle and the EGB slave axis is the C-axis



Gear ratio of the spindle to the detector B:
1/1 (The spindle and detector are directly connected to each other.)
Number of detector pulses per spindle rotation β: 80,000 pulses/rev
(Calculated for four pulses for one A/B phase cycle)
FFG N/M of the EGB dummy axis: 1/1
Gear ratio of the C-axis A: 1/36 (One rotation about the C-axis to 36 motor rotations)
Number of detector pulses per C-axis rotation α: 1,000,000 pulses/rev
C-axis CMR: 1
C-axis FFG n/m: 1/100

In this case, the number of pulses per spindle rotation is:
$80000 \times 1/1 = 80000$
Therefore, set 80000 for parameter No. 7772.
The number of pulses per C-axis rotation in the detection unit is:
$1000000 \div 1/36 \times 1/100 = 360000$
Therefore, set 360000 for parameter No. 7773.

[Example 2] When the gear ratio of the spindle to the detector B is 2/3 for the above example (When the detector rotates twice for three spindle rotations)
In this case, the number of pulses per spindle rotation is:

$$80000 \times \frac{2}{3} = \frac{160000}{3}$$

160000 cannot be divided by 3 without a remainder. In this case, change the setting of parameter No. 7773 so that the ratio of the settings of parameters Nos. 7772 and 7773 indicates the value you want to set.

$$\frac{\text{No.7772}}{\text{No.7773}} = \frac{160000 / 3}{360000} = \frac{160000}{360000 \times 3} = \frac{160000}{1080000}$$

Therefore, set 160000 for parameter No. 7772 and 1080000 for parameter No. 7773.
As described above, all the settings of parameters Nos. 7772 and 7773 have to do is to indicate the ratio correctly. So, you can reduce the fraction indicated by the settings. For example, you may set 16 for parameter No. 7772 and 108 for parameter No. 7773 for this case.

7776	Feedrate during automatic phase synchronization for the workpiece axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg/min
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets the feedrate during automatic phase synchronization for the workpiece axis.
When this parameter is set to 0, the rapid traverse rate (parameter No. 1420) is used as the feedrate during automatic phase synchronization.

7777	Angle shifted from the spindle position (one-rotation signal position) which the workpiece axis uses as the reference of phase synchronization

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0.000 to 360.000 (when the increment system is IS-B)
This parameter sets the angle shifted from the spindle position (one-rotation signal position) which the workpiece axis uses as the reference of phase synchronization.

7778	Acceleration for acceleration/deceleration for the workpiece axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg/sec^2
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(For a millimeter machine, 0.0 to +100000.0, for an inch machine, 0.0 to +10000.0)
This parameter sets an acceleration for acceleration/deceleration for the workpiece axis.

NOTE
1. In the Series 16*i*, acceleration/deceleration for automatic phase matching is set by specifying a feedrate and a time constant in parameters Nos. 2135 and 2136 (Nos. 4384 and 4385 in the case of spindle EGB) separately; in the Series 30*i*, acceleration/deceleration is directly set in parameter No. 7778.
2. If this parameter is set to 0, specifying G81 results in an alarm PS1598, "EGB AUTO PHASE PARAMETER SETTING ERROR".

7782	Number of pulses from the position detector per EGB master axis rotation

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 1 to 999999999
For a slave axis, set the number of pulses generated from the position detector per EGB master axis rotation.
For an A/B phase detector, set this parameter with four pulses equaling one A/B phase cycle.

7783	Number of pulses from the position detector per EGB slave axis rotation

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 1 to 999999999

For a slave axis, set the number of pulses generated from the position detector per EGB slave axis rotation.
Set the number of pulses output by the detection unit.
Set this parameter when using the G81.5 EGB synchronization command.
The method for setting parameters Nos. 7782 and 7783 is the same as for parameters Nos. 7772 and 7773. For the method, see the description of parameters Nos. 7772 and 7773.

The ratio of the number of pulses for the master slave to that of pulses for the slave axis may be valid, but the settings of the parameters may not indicate the actual number of pulses. For example, the number of pulses may not be able to be divided without a remainder for the reason of the master and slave axis gear ratios as described in example 2. In this case, the following methods cannot be used for the G81.5 command:

G81.5 T_ C_ ; When the speed is specified for the master axis and the travel distance is specified for the slave axis
G81.5 P_ C0 L_ ; When the number of pulses is specified for the master axis and the speed is specified for the slave axis

7784	Numerator of a signal-based servo EGB synchronization ratio

[Input type] Parameter input
[Data type] 2-word axis
[Valid data range] -999999999 to 999999999

Set the numerator of a synchronization ratio for signal-based servo EGB synchronization.

The sign of this parameter specifies the direction in which the slave axis rotates.
When the sign is plus, the slave axis rotates in the positive direction (+ direction).
When the sign is minus, the slave axis rotates in the negative direction (- direction).

7785	Denominator of a signal-based servo EGB synchronization ratio

[Input type] Parameter input
[Data type] 2-word axis
[Valid data range] -999999999 to 999999999

Set the denominator of a synchronization ratio for signal-based servo EGB synchronization.

	#7	#6	#5	#4	#3	#2	#1	#0
7786							UFF	SVE

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#0 SVE Signal-based servo EGB synchronization is:
0: Disabled (servo and spindle synchronization is enabled).
1: Enabled (servo and spindle synchronization is disabled).

#1 UFF During U-axis synchronization, a interpolation command to between the U-axis and the other axes is
0: not available.
1: available.

> **NOTE**
> Set this parameter to 1, when a command like this is specified.
> Example) Axis Configuration: U(U-axis) Z(not U-axis)
> G01 U_ Z_ F_;

4.59 PARAMETERS OF AXIS CONTROL BY PMC (1 OF 4)

	#7	#6	#5	#4	#3	#2	#1	#0
8001	SKE	AUX	NCC		RDE	OVE		MLE

[Input type] Parameter input
[Data type] Bit path

#0 MLE Whether all axis machine lock signal MLK <Gn108> is valid for PMC-controlled axes
0: Valid
1: Invalid
The axis-by-axis machine lock signal MLKx depends on the setting of bit 1 of parameter No. 8006.

#2 OVE Signals related to dry run and override used in PMC axis control
0: Same signals as those used for the CNC
1: Signals specific to the PMC
The signals used depend on the settings of these parameter bits as indicated below.

Signals	Bit 2 (OVE) of parameter No. 8001 = 0 (same signals as those used for the CNC)	Bit 2 (OVE) of parameter No. 8001 = 1 (signals specific to the PMC)
Feedrate override signals	*FV0 to *FV7 <G012>	*EFOV0 to *EFOV7 <G151>
Override cancellation signal	OVC <G006.4>	EOVC <G150.5>
Rapid traverse override signals	ROV1,2 <G014.0,1>	EROV1,2 <G150.0,1> or *EROV0 to *EROV7 <G151>
Dry run signal	DRN <G046.7>	EDRN <G150.7>
Rapid traverse selection signal	RT <G019.7>	ERT <G150.6>

(The listed signal addresses when PMC signals are selected are for the 1st group. Actual addresses differs depending on the used group.)

#3 RDE Whether dry run is valid for rapid traverse in PMC axis control
0: Invalid
1: Valid

#5 NCC When the program specifies a move command for a PMC-controlled axis (with the controlled axis selection signal *EAX <Gn136> set to 1) not placed under PMC axis control:
0: CNC command is valid.
1: The alarm PS0130 is issued.

#6 AUX In PMC axis control, the auxiliary function command (12H) output size is:
0: 1 byte (0 to 255)
1: 2 bytes (0 to 65535)

#7 SKE Skip signal during axis control by the PMC
0: Uses the same signal SKIP <X004.7, X013.7, or X011.7> as CNC.
1: Uses dedicated axis control signal ESKIP <X004.6, X013.6, or X011.6> used by the PMC.

	#7	#6	#5	#4	#3	#2	#1	#0
8002	FR2	FR1	PF2	PF1	F10		DWE	RPD

[Input type] Parameter input
[Data type] Bit path

#0 RPD Rapid traverse rate for PMC-controlled axes
0: Feedrate specified with parameter No. 1420
1: Feedrate specified with the feedrate data in an axis control command by PMC

#1 DWE Minimum time which can be specified in a dwell command in PMC axis control when the increment system is IS-C
0: 1ms
1: 0.1ms

#3 F10 Least increment for the feedrate for cutting feed (per minute) in PMC axis control
The following settings are applied when bit 4 (PF1) of parameter No. 8002 is set to 0 and bit 5 (PF2) of parameter No. 8002 is set to 0.

	F10	IS-A	IS-B	IS-C	IS-D	IS-E
Millimeter input (mm/min)	0	10	1	0.1	0.01	0.001
	1	100	10	1	0.1	0.01
Inch input (inch/min)	0	0.1	0.01	0.001	0.0001	0.00001
	1	1	0.1	0.01	0.001	0.0001

#4 PF1
#5 PF2 Set the feedrate unit of cutting feedrate (feed per minute) for an axis controlled by the PMC.

Bit 5 (PF2) of parameter No. 8002	Bit 4 (PF1) of parameter No. 8002	Feedrate unit
0	0	1 / 1
0	1	1 / 10
1	0	1 / 100
1	1	1 / 1000

#6 FR1
#7 FR2 Set the feedrate unit for cutting feedrate (feed per rotation) for an axis controlled by the PMC.

Bit 7 (FR2) of parameter No. 8002	Bit 6 (FR1) of parameter No. 8002	Millimeter input (mm/rev)	Inch input (inch/rev)
0	0	0.0001	0.000001
1	1		
0	1	0.001	0.00001
1	0	0.01	0.0001

	#7	#6	#5	#4	#3	#2	#1	#0
8003					FEX			

[Input type] Parameter input
[Data type] Bit axis

NOTE
When this parameter bit is set, the power must be turned off before operation is continued.

#3 FEX The maximum feedrate that can be achieved by the machine during cutting feed or continuous feed in PMC axis control is:

0: Not extended.

1: Extended.

Restrictions

- Parameters for setting the time constants for linear acceleration/deceleration after interpolation and bell-shaped acceleration/deceleration after interpolation
  When as the acceleration/deceleration type, linear acceleration/ deceleration after interpolation or bell-shaped acceleration/ deceleration after interpolation is used for each of rapid traverse, cutting feed, and manual feed, the maximum allowable time constant is a half of the maximum value that can be set conventionally.
  The time constant parameters used are as follows:

Parameter No.	Meaning
1620	Time constant (T) used for linear acceleration/deceleration in rapid traverse for each axis, or time constant (T1) used for bell-shaped acceleration/deceleration in rapid traverse for each axis
1621	Time constant (T2) used for bell-shaped acceleration/deceleration in rapid traverse for each axis
1622	Time constant for acceleration/deceleration in cutting feed for each axis
1624	Time constant for acceleration/deceleration in jog feed for each axis
1626	Time constant for acceleration/deceleration in threading cycles for each axis
1769	Time constant for acceleration/deceleration after cutting feed interpolation in the mode of acceleration/deceleration before interpolation
5271 to 5274	Time constant for acceleration/deceleration in rigid tapping extraction (first to fourth gears)
5365 to 5368	Time constant for bell-shaped acceleration/deceleration in rigid tapping (first to fourth gears)

- VCMD waveform display function
  As the feedrate increases, more data is acquired for VCMD waveform display, which can prevent waveforms from being displayed correctly.

⚠ **CAUTION**

1 When this function is enabled, the feedrate is extended to the maximum value that can be specified for cutting feed or continuous feed in PMC axis control if CMR is 1. If CMR is greater than 1, the feedrate is limited to a value smaller than the maximum value that can be specified.

2 Note that the maximum motor speed may be exceeded depending on the feedrate specified.

	#7	#6	#5	#4	#3	#2	#1	#0
8004		NCI	DSL			JFM		

[Input type] Parameter input
[Data type] Bit path

#2 JFM This parameter sets the units used to specify feedrate data when continuous feed is specified in axis control by the PMC.

Increment system	Bit 2 (JFM) of No. 8004	Millimeter input (mm/min)	Inch input (inch/min)	Rotation axis (min^{-1})
IS-B	0	1	0.01	0.00023
	1	200	2.00	0.046
IS-C	0	0.1	0.001	0.000023
	1	20	0.200	0.0046

#5 DSL If the selection of an axis is changed when PMC axis selection is disabled:
0: An alarm PS0139, “CANNOT CHANGE PMC CONTROL AXIS” is issued.
1: The change is valid, and no alarm is issued for an unspecified group.

#6 NCI In axis control by the PMC, a position check at the time of deceleration is:
0: Performed.
1: Not performed.

	#7	#6	#5	#4	#3	#2	#1	#0
8005			IFV	EVP	DRR	R10	CDI	EDC

[Input type] Setting input
[Data type] Bit path

#0 EDC In axis control by the PMC, an external deceleration function is:
0: Disabled.
1: Enabled.

#1 CDI In axis control by the PMC, when diameter programming is specified for a PMC-controlled axis:
0: The amount of travel and feedrate are each specified with a radius.
1: The amount of travel is specified with a diameter while the feedrate is specified with a radius.
This parameter is valid when bit 3 (DIA) of parameter No. 1006 is set to 1 (A move command for each axis is based on diameter specification.)

#2 R10 When the bit 0 (RPD) of parameter No. 8002 is set to 1, the unit for specifying a rapid traverse rate for the PMC axis is:
0: 1 mm/min.
1: 10mm/min.

#3 DRR For cutting feed per rotation in PMC axis control, the dry run function is:
0: Disabled.
1: Enabled.

#4 EVP Speed command in PMC axis control is executed by:
0: Velocity control.
1: Position control.
This bit is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007 is 1).

#5 IFV When bit 2 (OVE) of parameter No. 8001 is set to 1 in PMC axis control, the feedrate override signal *EFOVx and the override cancel signal OVC are:
0: Used on a path-by-path basis. (The start groups (1st group, 5th group, ... 33rd group, 37th group) of each path are used.)
1: Used on a group-by-group basis.

	#7	#6	#5	#4	#3	#2	#1	#0
8006		EZR		EFD			MLS	

[Input type] Parameter input
[Data type] Bit path

#1 MLS When bit 0 (MLE) of parameter No. 8001 is set to 1 (to disable the all axis machine lock signal) in PMC axis control, axis-by-axis machine lock is:
0: Disabled.
1: Enabled.

#4 EFD When cutting feed (feed per minute) is used in PMC axis control, the specification unit of feedrate data is:
0: Unchanged (1 times).
1: 100 times greater.

NOTE
When this parameter is set to 1, bit 3 (F10) of parameter No. 8002 is invalid.

#6 EZR In PMC axis control, bit 0 (ZRNx) of parameter No. 1005 is:
0: Invalid.
With a PMC controlled axis, the alarm PS0224, “ZERO RETURN NOT FINISHED” is not issued.
1: Valid.
A reference position return state check is made on a PMC controlled axis as with an NC axis according to the setting of bit 0 (ZRNx) of parameter No. 1005.

	#7	#6	#5	#4	#3	#2	#1	#0
8007						VCP		

[Input type] Parameter input
[Data type] Bit path

#2 VCP Speed command in PMC axis control is:
0: FS15 type.
1: FS16 type.

	#7	#6	#5	#4	#3	#2	#1	#0
8008							PFE	EMRx

[Input type] Parameter input
[Data type] Bit axis

#0 EMRx When a PMC axis control command is issued in mirror image state, the mirror image is:
0: Not considered.
1: Considered.

This parameter is valid in the mirror image mode set with the mirror image signals MI1 to MI8 <G106.0 to G106.7> set to 1 or bit 0 (MIRx) of parameter No. 12 set to 1.
If a movement is made along the same axis by doubly specifying a command with the CNC and PMC axis control when this parameter is set to 0, and the mirror image mode is set, a coordinate shift can occur afterwards. So, do not attempt to make such a movement.

#1 PFE If an AI contour control permission signal (such as the advanced superimposition signal or the inter-path flexible synchronous mode select signal) <G531.4> is set to "1", advanced preview feed forward for PMC axis control rapid traverse (00h), cutting feed - feed per minute (01h), cutting feed - feed per revolution (02h), and cutting feed - sec/block specification (21h) is:
0: Disabled.
1: Enabled.

> **NOTE**
> This parameter is valid for rapid traverse (00h) when bit 3 (FFR) of parameter No. 1800 is 1 (advanced preview feed forward is enabled for rapid traverse).

8010	Selection of the DI/DO group for each axis controlled by the PMC

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 1 to 40
Specify the DI/DO group to be used to specify a command for each PMC-controlled axis.

For addresses of the fifth group and up, 1000 is added in steps of 4 groups.
For example:
The start address of the 10th group is <G2154>.
The start address of the 25th axis is <G6142>.

P8010	Description
1	DI/DO 1st group <G142 to G153> is used.
2	DI/DO 2nd group <G154 to G165> is used.
3	DI/DO 3rd group <G166 to G177> is used.
4	DI/DO 4th group <G178 to G189> is used.
5	DI/DO 5th group <G1142 to G1153> is used.
6	DI/DO 6th group <G1154 to G1165> is used.
:	:
13	DI/DO 13th group <G3142 to G3153> is used.
:	:
20	DI/DO 20th group <G4178 to G4189> is used.
21	DI/DO 21st group <G5142 to G5153> is used.
:	:
29	DI/DO 29th group <G7142 to G7153> is used.
:	:
35	DI/DO 35th group <G8166 to G8177> is used.
36	DI/DO 36th group <G8178 to G8189> is used.
37	DI/DO 37th group <G9142 to G9153> is used.
38	DI/DO 38th group <G9154 to G9165> is used.
39	DI/DO 39th group <G9166 to G9177> is used.
40	DI/DO 40th group <G9178 to G9189> is used.

> **NOTE**
> When a value other than the above is set, the axis is not controlled by the PMC.

		#7	#6	#5	#4	#3	#2	#1	#0
8011									XRT

[Input type] Parameter input
[Data type] Bit axis

#0 XRT The axis that uses the group specified by parameter No. 8010 is:
0: Not controlled by the real time custom macro.
1: Controlled by the real time custom macro.

> **NOTE**
> 1 This parameter is invalid for the axis for which 0 or a value outside the range is set by parameter No. 8010
> 2 When multiple axes are assigned to the same group by parameter No. 8010, these axes cannot be controlled by the real time custom macro. When multiple axes are assigned to the same group, be sure to set this bit to 0.
> 3 When this parameter No. 8011 is all 0s, the axis is used for PMC axis control.

		#7	#6	#5	#4	#3	#2	#1	#0
8013						ROP		OVR	

[Input type] Parameter input
[Data type] Bit axis

#1 OVR When bit 2 (OVE) of parameter No. 8001 is set to 1, for rapid traverse override in PMC axis control:
0: Rapid traverse override signals EROV2 and EROV1 <G150.1 and G150.0> for PMC axis control are used.
1: 1% step rapid traverse override signals *EROV7 to *EROV0 <G151> for PMC axis control are used.
(The listed signal addresses when PMC signals are selected are for the 1st group. Actual addresses differs depending on the used group.)

#3 ROP When rotation axis rollover is enabled for an axis controlled in PMC axis control, the direction in which a movement (rotation) is performed to reach an end point by a reference position return command 07H to 0AH (equivalent to G28, G30P2/P3/P4) is:
0: Determined by the sign of the specified value.
1: The direction in the shortest path.

> **NOTE**
> ROPx is valid only when bit 0 (ROAx) of parameter No. 1008 is set to 1 and bit 1 (RABx) of parameter No. 1008 is set to 0.

		#7	#6	#5	#4	#3	#2	#1	#0
8019									EOS

[Input type] Parameter input

[Data type] Bit

#0 EOS In external pulse synchronization (serial spindle synchronization) in PMC axis control, the serial spindle to be synchronized is:
0: The first spindle of path 1.
1: Any spindle.

> **NOTE**
> If EOS is set to 0, only the servo axis of path 1 can be specified.

8020	FL rate for reference position return along each axis in PMC axis control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
For each axis, this parameter sets a feedrate (FL rate) after deceleration for reference position return in PMC axis control.

> **NOTE**
> If 0 is specified, the value of parameter No. 1425 is used.

8022	Upper limit rate of feed per revolution during PMC axis control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets the upper limit rate of feed per revolution during PMC axis control.

8028	Time for acceleration/deceleration calculation when a feedrate is specified under PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 32767
When a feedrate is specified under PMC axis control, acceleration/deceleration can be set for parameter No. 8032 or this parameter. When 0 is set in parameter No. 8032, the specification of 1000 min^{-1} is assumed. When 0 is set in this parameter, the acceleration/deceleration function for feedrate specification is disabled.

8030	Time constant for exponential acceleration/deceleration in cutting feed or continuous feed under PMC axis control

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] msec
[Valid data range] 0 to 4000
For each axis, this parameter sets a time constant for exponential acceleration/deceleration in cutting feed or continuous feed under PMC axis control.

> **NOTE**
> When 0 is set in this parameter, the value set in parameter No. 1622 is used.
> The value set in parameter No. 1622 is used also for linear acceleration/deceleration after cutting interpolation.

8031	FL rate for exponential acceleration/deceleration in cutting feed or continuous feed under PMC axis control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

For each axis, this parameters sets a lower feedrate limit (FL rate) for exponential acceleration/deceleration in cutting feed or continuous feed under PMC axis control.

> **NOTE**
> When 0 is set in this parameter, the value set in parameter No. 1623 is used.
> However, be sure to set 0 in this parameter and parameter No. 1623 for all axes at all times except for special purposes. If a value other than 0 is specified, correct linear or circular figures cannot be obtained.

8032	Feedrate for acceleration/deceleration calculation when a feedrate is specified under PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 32767

When a feedrate is specified under PMC axis control, acceleration/deceleration can be set for this parameter or parameter No. 8028. When 0 is set in this parameter, the specification of 1000 min^{-1} is assumed. When 0 is set in parameter No. 8028, the acceleration/deceleration function for feedrate specification is disabled.

8040	Amount of a shift per one rotation of a servo motor of least input increment when speed command in PMC axis control is velocity control

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] mm, inch, degree (machine unit)
[Valid data range] 1 to 99999999

Set the amount of a shift per one rotation of a servo motor of least input increment when speed command in PMC axis control is velocity control.
This parameter is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007 is 1) and is executed by position control (bit 4 (EVP) of parameter No. 8005 is 1).

4.60 PARAMETERS OF MULTI-PATH CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
8100	NWP	DSB					IAL	RST

[Input type] Parameter input
[Data type] Bit machine group

#0 RST The pressing of the  key on the MDI panel is:
0: Valid for all paths.
1: Valid only for the path selected by the path selection signal.
The reset key on the MDI panel functions for all machine groups. So, in machine groups for which this parameter is set to 0, a reset can be performed for all paths. In machine groups for which this parameter is set to 1, a reset can be performed only for the path that is selected by the path select signal.

> **NOTE**
> The path by which reset becomes actually effective depends on the combination with bit 0 (MGR) of parameter No.8106 setting and this parameter.

#1 IAL Choice of an option concerning operation continuation when an alarm is issued, and choice of an option concerning the start of automatic operation in alarm state:
0: • When an alarm is issued, the operation is stopped with the other path(s) in same group placed in hold state.
• When the other path or paths in same group are placed in alarm state, automatic operation cannot be started.
1: • Even when an alarm is issued, the operation is continued without stopping the other path(s).
• Even when the other path or paths in same group are placed in alarm state, automatic operation can be started.

#6 DSB The inter-path single block check function is:
0: Disabled.
When a single block stop occurs with a path, no single block stop occurs with the other path(s).
1: Enabled.
When a single block stop occurs with a path, a feed hold stop occurs with all paths in the same machine group.

#7 NWP Servo activation is turned on:
0: Together with other machine groups. (Servo activation is not turned on until other machine groups are ready to turn on servo activation.)
1: Independently of other machine groups. (Each machine group turns on servo activation even if other machine groups are not ready to turn on servo activation.)

	#7	#6	#5	#4	#3	#2	#1	#0
8101						NAL	STW	

[Input type] Parameter input
[Data type] Bit path

#1 STW Waiting function by specifying start point is
- 0: not effective.
- 1: effective. (The option of the waiting function by specifying start point is necessary)

#2 NAL In the superimposed control of the high speed cycle machining, when the movement is not generated in the next block of the synchronous start block by waiting M code,
- 0: Synchronous start is unusable. (Alarm DS0069, "MISSING THE MOVE COMMAND ", is issued.)
- 1: Synchronous start is usable.

	#7	#6	#5	#4	#3	#2	#1	#0
8103							MWP	MWT

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 MWT As the signal interface for the waiting M code:
- 0: The path individual signal interface is used.
- 1: The path common signal interface is used.

This parameter can be selected only when 2-path control is used.

#1 MWP To specify a P command for the waiting M code/balance cut:
- 0: A binary value is used as conventionally done.
- 1: A path number combination is used.

	#7	#6	#5	#4	#3	#2	#1	#0
8106								MGR

[Input type] Parameter input
[Data type] Bit

 # 0 MGR When the RESET key on the MDI panel is pressed,
- 0: All machine groups are reset.
- 1: Only the machine groups to which the path selected by the path selection signal belongs are reset.

> **NOTE**
> The path by which reset becomes actually effective depends on the combination with bit 0 (RST) of parameter No.8100 setting and this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
8107								ESB

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 ESB External subprogram calls on the data server:
0: Do not support multipath operations.
1: Support multipath operations.

> **NOTE**
> To use multipath operations with external subprogram calls on the data server, set parameter No. 20 to 5.

8110	Waiting M code range (minimum value)
8111	Waiting M code range (maximum value)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 ,100to99999999

A range of M code values can be set by specifying a minimum waiting M code value (parameter No. 8110) and a maximum waiting M code value (parameter No. 8111).
(parameter No. 8110) ≤ (waiting M code) ≤ (parameter No. 8111)
Set 0 in these parameters when the waiting M code is not used.

8114	Top number of waiting M codes of high-speed type

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 ,100 to 99999999

Set the top number of waiting M codes of high-speed type.
Waiting M codes of high-speed type cannot be used when the setting value is 0 or out of range.

8115	Number of waiting M codes of high-speed type

[Input type] Parameter input
[Data type] word
[Valid data range] 0 to 32767

Set the number of waiting M codes of high-speed type.
Waiting M codes of high-speed type cannot be used when the setting value is 0 or out of range.

> **NOTE**
> Set the range of waiting M codes of high-speed type not to overlap with the range of other waiting M codes. The M codes are regarded as waiting M codes of high-speed type if overlapping.

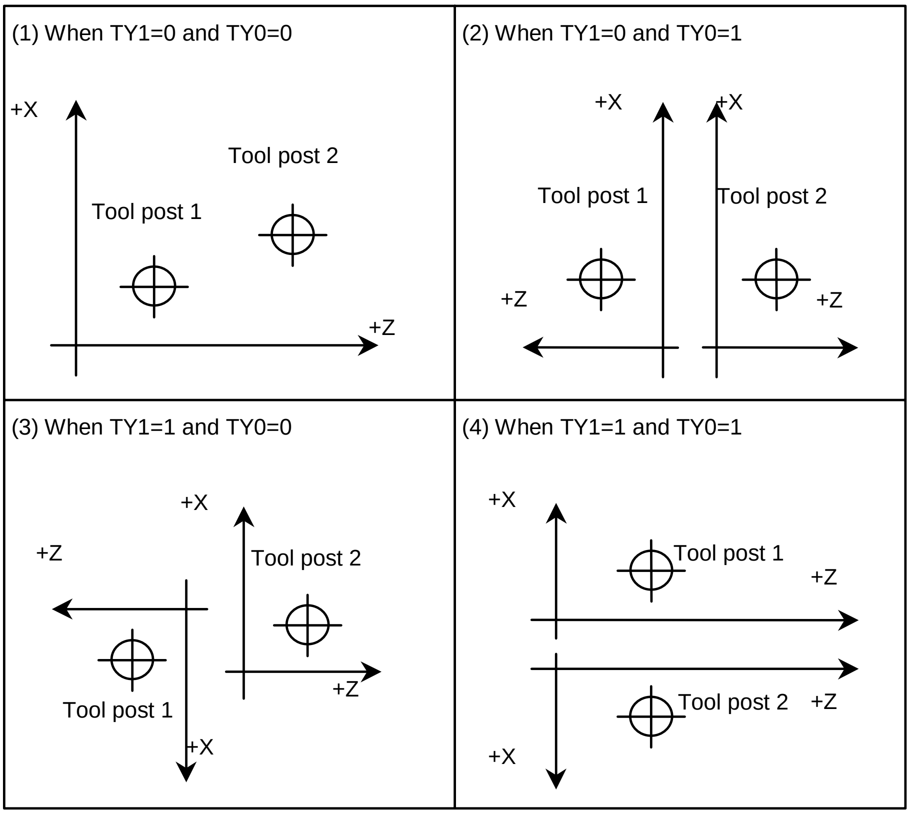
4.61 PARAMETERS OF INTERFERENCE CHECK BETWEEN PATHS

	#7	#6	#5	#4	#3	#2	#1	#0
8140	IPF		ZCL	IFE	IFM	IT0	TY1	TYO

[Input type] Parameter input
[Data type] Bit

#0 TY0 This parameter sets the coordinate system relationship between two tool posts based on the tool post of path 1.

#1 TY1 This parameter is used for checking the interference between two paths when bit 7 (IPF) of parameter No. 8140 is set to 0.



#2 IT0 When offset number 0 is specified by the T code,
- 0: Checking interference between paths is stopped until an offset number other than 0 is specified by the next T code.
- 1: Checking interference between paths is continued according to the previously specified offset number.

#3 IFM In manual mode, a interference check between paths is:
- 0: Not performed.
- 1: Performed.

#4 IFE Interference check between paths is:
- 0: Performed.
- 1: Not performed.

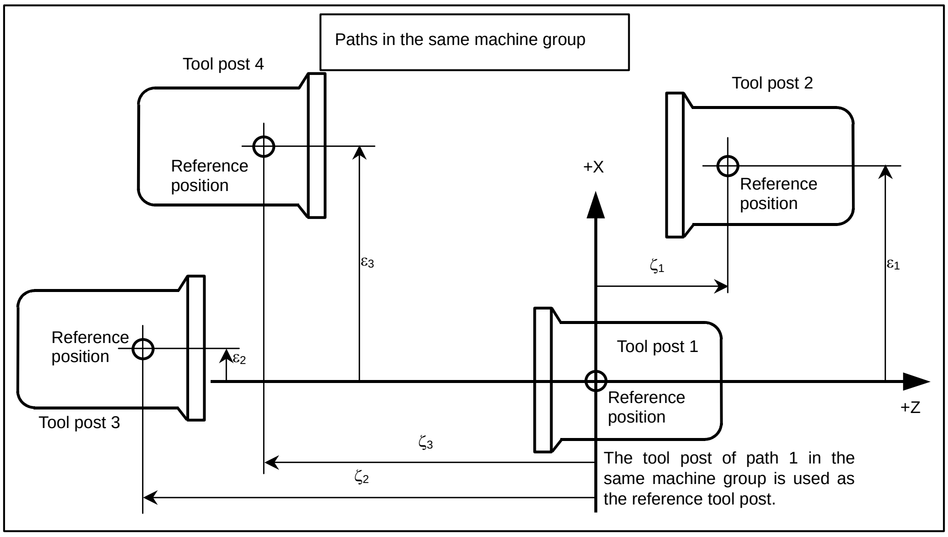
#5 ZCL Specifies whether interference along the Z axis is checked while checking interference between paths.
0: Checked.
1: Not checked (Only interference along the X axis is checked.)

#7 IPF In inter-path interference checking:
0: The interference between two paths is checked.
1: The interference among multiple paths is checked.
Even in two-path control, the specification of a multi-path interference check can be applied.
If this parameter is set to 0 when three or more paths are controlled, a two-path interference check is made only with path 1 and path 2.

8141	Distance along the X axis between the reference positions of tool post 1 and tool post n in the same machine group

8143	Distance along the Z axis between the reference positions of tool post 1 and tool post n in the same machine group

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Each of these parameters sets the distance between the reference positions of the tool post of path 1 and tool post of each path in the same machine group.
Set 0 in parameter No. 8141 and No. 8143 for tool post 1 of each machine group.
For the lathe system, only a Z-X coordinate system based on parameter No. 8141 and No. 8143 is used for setting.



In the example above, the same machine group contains tool posts for four paths. In the ZX plane coordinate system with its origin placed at the reference position of tool post 1 of path 1 in the same machine group, the position of the reference position of tool post 2 of path 2 is specified by setting the value ε_1 of the X component in parameter No. 8141 for path 2 and by setting the value ζ_1 of the Z component in parameter No. 8143 for path 2.

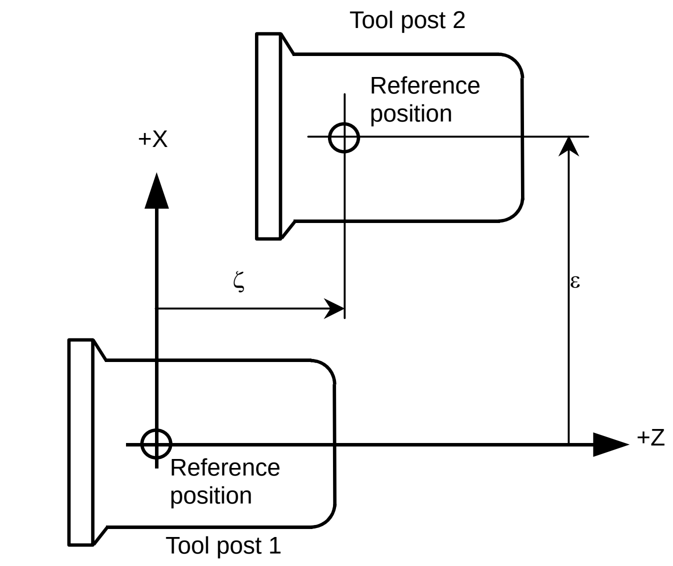
Similarly, In the ZX plane coordinate system with its origin placed at the reference position of tool post 1, the position of the reference position of tool post 3 of path 3 is specified by setting the value ε_2 of the X component in parameter No. 8141 for path 3 and by setting the value ζ_2 of the Z component in parameter No. 8143 for path 3. In the ZX plane coordinate system with its origin placed at the reference position of tool post 1, the position of the reference position of tool post 4 of path 4 is specified by setting the value ε_3 of the X component in parameter No. 8141 for path 4 and by setting the value ζ_3 of the Z component in parameter No. 8143 for path 4.
The unit of setting is the least input increment. For an axis based on diameter specification, make a setting using a diameter value.

> ⚠ **WARNING**
> Measure (ε_1, ζ_1), (ε_2, ζ_2), and (ε_3, ζ_3) in the state where reference position return operation is completed for all axes (the tool is at the reference position.)
> After modifying parameter No. 8141 and No. 8143 for each path, be sure to perform a reference position return operation along all axes in all paths. Otherwise, the internally stored positional relationships of the tool posts are not updated to the newly set parameter values.

8151	Distance along the X axis between the reference positions of tool posts 1 and 2

8152	Distance along the Z axis between the reference positions of tool posts 1 and 2

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters are used for checking the interference between two paths when bit 7 (IPF) of parameter No. 8140 is set to 0.
Each of these parameters sets the distance between the tool posts of two paths.



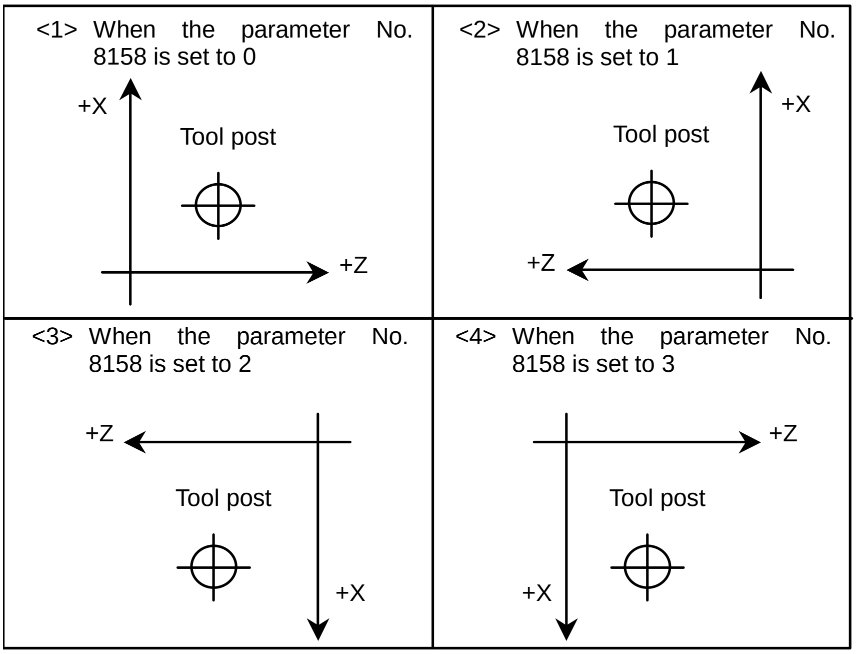
In the Z-X plane coordinate system with its origin at the represent position of tool post 1, set the X component value ε of the reference position of tool post 2 in parameter No. 8151 and set the Z component value ζ in parameter No. 8152.

> ⚠ **WARNING**
> After modifying the parameter values, perform a manual reference position return operation for both tool posts. Otherwise, the internally stored positional relationships of the two tool posts are not updated to the newly set parameter values.

8158	**Coordinate system pattern with the reference position based on the tool post of path 1 in the same machine group**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 3

This parameter is used for checking the interference among multiple paths when bit 7 (IPF) of parameter No. 8140 is set to 1.
This parameter sets a coordinate system pattern with the reference position based on the tool post of path 1 in the same machine group.



4.62 PARAMETERS OF SYNCHRONOUS/COMPOSITE CONTROL AND SUPERIMPOSED CONTROL (1 OF 3)

	#7	#6	#5	#4	#3	#2	#1	#0
8160	NRS	SPE	NCS	AXS				

[Input type] Parameter input
[Data type] Bit path

#4 AXS When the axis movement in-progress signal <Fn102> or the axis movement direction signal <Fn106> of the slave axis in superimposed control is output:
0: State output is performed according to the result of adding superimposed move pulses.
1: State output is performed according to the result of movement along each axis instead of superimposed move pulses.

#5 NCS If an overtravel alarm is issued for an axis under synchronous, composite, or superimposed control, synchronous, composite, or superimposed control is:
0: Released.
1: Not released.

> **NOTE**
> If this parameter is 1 for any one of the paths in a machine group, it is assumed to be 1 for all the paths.

#6 SPE The synchronization deviation is:
0: The difference between the positioning deviation of the master axis and that of the slave axis.
1: The difference between the positioning deviation of the master axis and that of the slave axis plus the acceleration/deceleration delay.

> **NOTE**
> 1 When the master and slave axes have different acceleration/deceleration time constants, set 1.
> 2 SPE is valid when bit 1 (SERx) of parameter No. 8162 is set to 1. SPE is used to find a synchronization deviation for comparison with parameter No. 8181.

#7 NRS When the system is reset, synchronous, composite, or superimposed control is:
0: Released.
1: Not released.

	#7	#6	#5	#4	#3	#2	#1	#0
8161	NSR		CRZ					NMR

[Input type] Parameter input
[Data type] Bit

#0 NMR When an axis subject to composite control is placed in servo-off state:
0: Composite control is stopped
1: Composite control is not stopped, provided bit 0 (FUP) of parameter No. 1819 is set to 1 to disable follow-up for the axis.

#5 CRZ If the state of the composite control signal is switched in composite control on two axes under Cs contour control, the reference position establishment state of the two axes in composite control is:
0: Maintained. (The unestablished state is not assumed.)
1: Assumed to be unestablished.

#7 NSR When servo-off occurs with an axis in synchronous control:
0: Synchronous control is canceled.
1: Synchronous control is not canceled if follow-up operation is disabled for the axis (with bit 0 (FUPx) of parameter No. 1819 set to 1).

	#7	#6	#5	#4	#3	#2	#1	#0
8162	MUMx	MCDx	MPSx	MPMx	OMRx	PKUx	SERx	SMRx

[Input type] Parameter input
[Data type] Bit axis

#0 SMRx Synchronous mirror-image control is:
0: Not applied. (The master and slave axes move in the same direction.)
1: Applied. (The master and slave axes move in opposite directions.)

#1 SERx The synchronization deviation is:
0: Not detected.
1: Detected.

NOTE
When both master and slave axes move in synchronization, the positioning deviations of the corresponding axes are compared with each other. If the difference is greater than or equal to the value specified in parameter No. 8181, an alarm occurs. When either axis is in the parking or machine-locked state, however, the synchronization deviation is not detected.

#2 PKUx In the parking state,

0: The absolute, relative, and machine coordinates are not updated.
1: The absolute and relative coordinates are updated. The machine coordinates are not updated.

NOTE
1 With an axis for which polar coordinate interpolation is specified, set this parameter to 1. If this parameter is set to 0, a coordinate shift can occur when a single block stop or feed hold is performed in the polar coordinate interpolation mode.
2 With an axis that is set to function as a synchronous master axis and synchronous slave axis at the same time (with bit 1 (SYWx) of parameter No. 8167), set this parameter to 1.
3 With an axis specified in the 3-dimensional coordinate conversion mode, set this parameter to 1. If this parameter is set to 0, the alarm PS0367, “3-D CONV. WAS COMMANDED IN SYNC MODE AS THE PARAMETER PKUx(NO.8162#2) IS 0.” is issued.

#3 OMRx Superimposed mirror-image control is:

0: Not applied. (The superimposed pulse is simply added.)
1: Applied. (The inverted superimposed pulse is added.)

#4 MPMx When composite control is started, the workpiece coordinate system is:

0: Not set automatically.
1: Set automatically.

NOTE
When the workpiece coordinate system is automatically set at the start of composite control, it is calculated from the following: Current machine coordinates and the workpiece coordinates at the reference point of each axis (parameter No. 8184).
When a workpiece coordinate system (G54 to G59, including additional workpiece coordinate systems) is used, however, instead of the coordinate value obtained by the above calculation, the workpiece coordinate value obtained by workpiece coordinate system presetting (equivalent to G92.1 IP 0) in the machine coordinate system of the other axis in composite control is set.

#5 MPSx When composite control is terminated, the workpiece coordinate system is:

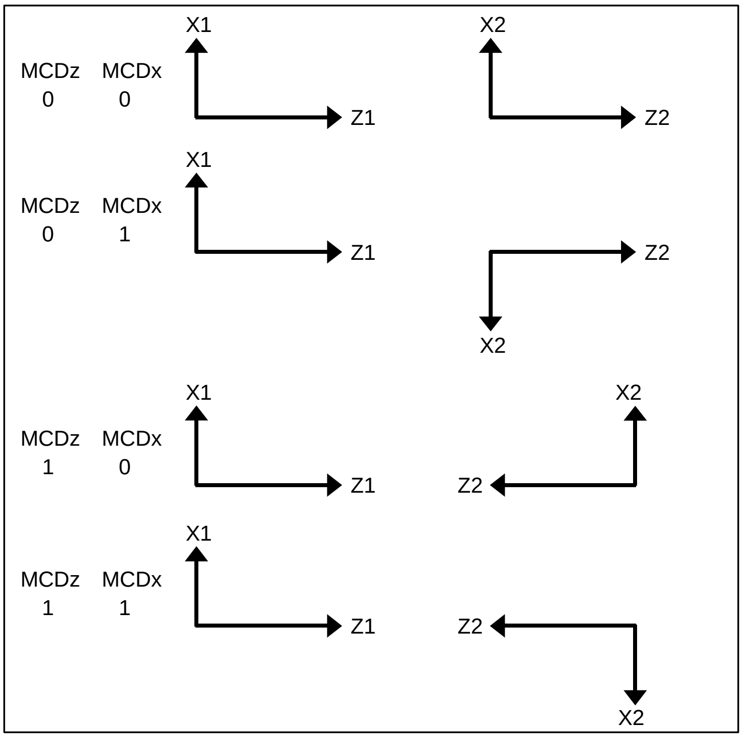
0: Not set automatically.
1: Set automatically.

> **NOTE**
> When the workpiece coordinate system is automatically set at the end of composite control, it is calculated from the following: Current machine coordinates and the workpiece coordinates at the reference point of each axis under composite control (parameter No. 1250)
> When a workpiece coordinate system (G54 to G59, including additional workpiece coordinate systems) is used, however, instead of the coordinate value obtained by the above calculation, the workpiece coordinate value obtained by workpiece coordinate system presetting (equivalent to G92.1 IP 0) in the machine coordinate system of the local axis is set.

#6 MCDx The axes to be replaced with each other under composite control have the coordinate systems placed:

0: In the same direction. Simple composite control is applied. (A movement is made in the same direction along the corresponding axis.)

1: In opposite directions. Mirror-image composite control is applied. (A movement is made in the reverse direction along the corresponding axis.)



#7 MUMx In composite control, a move command for the axis:

0: Can be specified.

1: Cannot be specified.

> **NOTE**
> Upon the execution of a move command along an axis for which MUMx is set to 1 during mixed control, alarm PS0353, "THE INSTRUCTION WAS DONE FOR THE AXIS WHICH WAS NOT ABLE TO MOVE." is issued. For example, when axis X1 and axis X2 are placed under composite control, and a command for axis X2 (motor for axis X1) is to be disabled, set MUMx for path 2 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
8163	NUMx	MMIx	SMIx	SCDx	SCMx	SPSx	SPMx	

[Input type] Parameter input
[Data type] Bit axis

#1 SPMx When synchronous control is started, automatic workpiece coordinate system setting for the master axis is
0: Not Performed.
1: Performed.

> **NOTE**
> When a workpiece coordinate system is automatically set at the start of synchronous control, the workpiece coordinate system is calculated from the current machine coordinates and the workpiece coordinates of each axis at the reference position set in parameter No. 8185.

#2 SPSx When synchronous control terminates, automatic workpiece coordinate system setting for the master axis is:
0: Not performed.
1: Performed.

> **NOTE**
> When a workpiece coordinate system is automatically set at the end of synchronous control, the workpiece coordinate system is calculated from the current machine coordinates and the workpiece coordinates for each axis at the reference position set in parameter No. 1250.

#3 SCMx When workpiece coordinates are calculated in synchronous control:
0: The workpiece coordinates are calculated from the machine coordinates of the slave axis.
1: The workpiece coordinates are calculated from the machine coordinates of the master axis and slave axis.

#4 SCDx The positive (+) directions of the master axis and slave axis in the coordinate system in synchronous control are:
0: Identical.
1: Opposite.
Set the parameters SPMx, SPSx, SCMx, and SCDx for the master axis. These settings are referenced during automatic workpiece coordinate setting for the master axis at the start of synchronous control.

#5 SMIx In synchronous control, the manual handle interruption amount for the master axis or the mirror image mode is:
0: Reflected in the slave axis.
1: Not reflected in the slave axis.

When this bit (SMIx) is set to 0
Manual handle interruption :
To the travel distance along the slave axis, the interruption amount of the master axis is also added.
Mirror image :
When mirror image is applied to the master axis, mirror image is also applied to the slave axis.

When this bit (SMIx) is set to 1
Manual handle interruption :
To the travel distance along the slave axis, the interruption amount of the master axis is not added.
Mirror image :
Even when mirror image is applied to the master axis, mirror image is not applied to the slave axis.

#6 MMIx For a composite control axis, manual handle interruption under composite control is:
0: Enabled.
1: Disabled.

#7 NUMx When neither synchronous control nor composite control is applied, a move command for the axis is:
0: Not disabled.
1: Disabled.

NOTE
If a move command is specified for an axis with NUMx set to 1 when neither synchronous control nor composite control is applied, alarm PS0353, "THE INSTRUCTION WAS DONE FOR THE AXIS WHICH WAS NOT ABLE TO MOVE." is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
8164		SOKx	OPSx		MCEx	MCSx	MWEx	MWSx
		SOKx	OPSx		MCEx	MCSx		

[Input type] Parameter input
[Data type] Bit axis

#0 MWSx In automatic workpiece coordinate system setting, performed when composite control is started, a workpiece shift and position offset are:
0: Not considered.
1: Considered.

NOTE
When bit 4 (MPMx) of parameter No. 8162 is set to 1 and workpiece coordinate system (G54 to G59, including additional workpiece coordinate system) is not used, MWSx is enabled.

#1 MWEx In automatic workpiece coordinate system setting, performed when composite control is canceled, a workpiece shift and position offset are:
0: Not considered.
1: Considered.

> **NOTE**
> When bit 5 (MPSx) of parameter No. 8162 is set to 1 and workpiece coordinate system (G54 to G59, including additional workpiece coordinate system) is not used, MWEx is enabled.

#2 MCSx A workpiece coordinate system automatically selected when composite control is started is:
0: The machine coordinate system of the other path under composite control as specified with parameter No. 8184.
1: The absolute coordinate system of the other path under composite control.

> **NOTE**
> When bit 4 (MPMx) of parameter No. 8162 is set to 1 and workpiece coordinate system (G54 to G59, including additional workpiece coordinate system) is not used, MCSx is enabled.

#3 MCEx A workpiece coordinate system automatically selected when composite control is stopped is:
0: The machine coordinate system of the other path under composite control as specified with parameter No. 1250.
1: The absolute coordinate system of the other path under composite control.

> **NOTE**
> When bit 5 (MPSx) of parameter No. 8162 is set to 1 and workpiece coordinate system (G54 to G59, including additional workpiece coordinate system) is not used, MCEx is enabled.

#5 OPSx When superimposed control is canceled, control in which an amount of movement along a master axis subject to superimposed control is added to the workpiece coordinate of a slave axis is:
0: Not applied.
1: Applied.

> **NOTE**
> When the workpiece coordinate system option is enabled, workpiece coordinate system presetting (equivalent to G92.1IP0) is performed to set up a coordinate system.

#6 SOKx If a master axis subject to superimposed control is also subject to synchronous control:
0: An alarm is issued when superimposed control is started during synchronous control.
1: No alarm is issued when superimposed control is started during synchronous control.

	#7	#6	#5	#4	#3	#2	#1	#0
8166							MIX	

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#1 MIX For composite control:
0: An interface for three paths or more is used. In this case, set the composite control axis selection signals MIX1 to MIX8 <Gn128.0 to Gn128.7> for the axis that is placed under composite control by parameter No. 8183, from 0 to 1 or from 1 to 0.
1: The conventional 2-path interface is used. (Composite control on three paths or more is disabled.) In this case, set parameter No. 8183 for path 2, and use the composite control axis selection signals MIX1 to MIX8 of path 1.

	#7	#6	#5	#4	#3	#2	#1	#0
8167		SPVx	SWSx	SWMx	SGSx	SGMx	SYWx	
		SPVx					SYWx	

[Input type] Parameter input
[Data type] Bit axis

#1 SYWx The axis is:
0: Not used as a master axis and slave axis at the same time.
1: Used as a master axis and slave axis at the same time.

#2 SGMx In automatic workpiece coordinate system setting at the start of synchronous control, a tool offset is:
0: Considered.
1: Not considered.

> **NOTE**
> SGMx is enabled when bit 1 (SPMx) of parameter No. 8163 is set to 1.

#3 SGSx In automatic workpiece coordinate system setting at the end of synchronous control, a tool offset is:
0: Considered.
1: Not considered.

> **NOTE**
> SGSx is enabled when bit 2 (SPSx) of parameter No. 8163 or bit 6 (SPVx) of parameter No. 8167 is set to 1.

#4 SWMx In automatic workpiece coordinate system setting at the start of synchronous control, a workpiece shift is:
0: Not considered.
1: Considered.

> **NOTE**
> SWMx is enabled when bit 1 (SPMx) of parameter No. 8163 is set to 1.

#5 SWSx In automatic workpiece coordinate system setting at the end of synchronous control, a workpiece shift is:
0: Not considered.
1: Considered.

> **NOTE**
> SWSx is enabled when bit 2 (SPSx) of parameter No. 8163 or bit 6 (SPVx) of parameter No. 8167 is set to 1.

#6 SPVx At the end of synchronous control, automatic workpiece coordinate system setting for the slave axis is:
0: Not performed.
1: Performed.

> **NOTE**
> When a workpiece coordinate system is automatically set at the end of synchronous control, the workpiece coordinate system is calculated from the current machine coordinates and the workpiece coordinates for each axis at the reference position set in parameter No. 1250.

	#7	#6	#5	#4	#3	#2	#1	#0
8168		WST	SFH			SVF	MSO	MPA

[Input type] Parameter input
[Data type] Bit

#0 MPA If an alarm concerning synchronous control, composite control, or superimposed control is issued:
0: All paths of the machine group to which the alarm occurrence path belongs are placed in feed hold state.
1: Only the path including the axis placed under synchronous control, composite control, or superimposed control is placed in the feed hold state.

#1 MSO When one of the following events occurs in synchronous control or composite control:
- The emergency stop signal *ESP <Gn008.4> is turned off.
- The servo-off signals SVF1 to SVF8 <Gn126.0 to Gn126.7> are turned on.
- A servo alarm is issued.

0: The synchronous or composite control mode is canceled and follow-up operation is not performed.
For the operation to be performed when the servo-off signal is turned on, however, the setting of bit 7 (NSR) of parameter No. 8161 is used in synchronous control or the setting of bit 0 (NMR) of parameter No. 8161 is used in composite control.

1: The synchronous or composite control mode is not canceled. The following operation is performed to perform follow-up operation:
When the emergency stop signal *ESP is turned off, the relevant path is determined and operation is performed so that the emergency stop signal *ESP is virtually turned off for the determined path.
When the servo-off signals SVF1 to SVF8 are turned on, the relevant axis is determined and operation is performed so that the servo-off signals SVF1 to SVF8 are virtually turned on for the determined axis.
When a servo alarm is issued, the relevant axis is determined and the alarm SV0003, "CONTINUATION OF SYNCHRONOUS OR COMPOSITE CONTROL DISABLED" is issued for the determined axis to stop moving the tool along the axis.
When bit 2 (SVF) of parameter No. 8168 is set to 1, this servo-off specification follows the SVF setting.

NOTE
This setting is valid also during operation. For all axes placed under synchronous or composite control, the emergency stop signal is turned off, the servo-off signal is turned on, or a servo alarm is issued.

#2 SVF When an axis under composite control is placed in the servo-off state:
0: Composite control is canceled.
1: Composite control is not canceled.

Follow-up specification follows the setting of bit 0 (FUPx) of parameter No. 1819.
When bit 2 (SVF) of parameter No. 8168 is set to 1, bit 0 (NMR) of parameter No. 8161 is invalid. Bit 1 (MSO) of parameter No. 8168, specification for servo-off, is also invalid.

NOTE
If a composite control axis is placed in the servo-off state when stopped, set this parameter to 1.

#5 SFH For high-speed cycle cutting or high-speed binary program operation, superimposed control is:
0: Not applied.
1: Applied.

NOTE
When parameter SFH is set to 0 and superimposed control is applied for high-speed cycle cutting or high-speed binary program operation, alarm DS0070, "SUPERIMPOSE FOR HIGH-SPEED CYCLE CANNOT BE USED" is issued.

#6 WST When a workpiece coordinate system is automatically set up for a slave axis at the end of synchronous control, workpiece coordinate system presetting is:
0: Not performed.
1: Performed.

NOTE
This parameter is valid when the workpiece coordinate system option is enabled, and bit 6 (SPV) of parameter No. 8167 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
8169		SESx				MRFx	MVMx	MDMx

[Input type] Parameter input
[Data type] Bit axis

#0 MDMx As machine coordinates in composite control:
0: Coordinates for the local path are displayed.
1: Coordinates for the other path in composite control are displayed.

#1 MVMx In composite control, machine coordinates (#5021 and above) to be read are:
0: Machine coordinates of the local path.
1: Machine coordinates of the other path in composite control.

#2 MRFx In composite control, the rapid traverse rate is:
0: The rapid traverse rate for the specified axis.
1: The rapid traverse rate for the axis along which a movement is made.

#6 SESx If a synchronization error is out of the tolerable range (specified with parameter No. 8181):
0: Alarm SV0407, “EXCESS ERROR”, is issued.
1: No alarm is issued. Instead, the excess synchronization error signal SEO<Fn559> is output.

SESx is valid when bit 1 (SERx) of parameter No. 8162 is 1. Specify the value of this parameter for the slave axis.

8180	Master axis with which an axis is synchronized under synchronous control

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 101, 102, 103, . . . , (path number)*100+(intra-path relative axis number) (101, 102, 103, . . . , 201, 202, 203, . . . , 1001, 1002, 1003, . . .)
This parameter sets the path number and intra-path relative axis number of the master axis with which each axis is synchronized. When zero is specified, the axis does not become a slave axis and is not synchronized with another axis. When an identical number is specified in two or more parameters, one master axis has two or more slave axes.

8181	Synchronization error limit of each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999
When the synchronization deviation detected (bit 1 (SERx) of parameter No. 8162 is set to 1), this parameter specifies the limit of the difference between the positioning deviation of the slave axis and that of the master axis. Set this parameter to the slave axis.

8183	Composite control axis of the other path in composite control for each axis

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 101, 102, 103, . . . , (path number)*100+(intra-path relative axis number) (101, 102, 103, . . . , 201, 202, 203, . . . , 1001, 1002, 1003, . . .)

This parameter sets with which axis each axis is to be placed under composite control. When zero is specified, control of the axis is not replaced under composite control. An identical number can be specified in two or more parameters, but composite control cannot be exercised for all of them at a time.

NOTE
When the two-path interface is used (bit 1 (MIX) of parameter No. 8166 is set to 1), set this parameter for path 2.

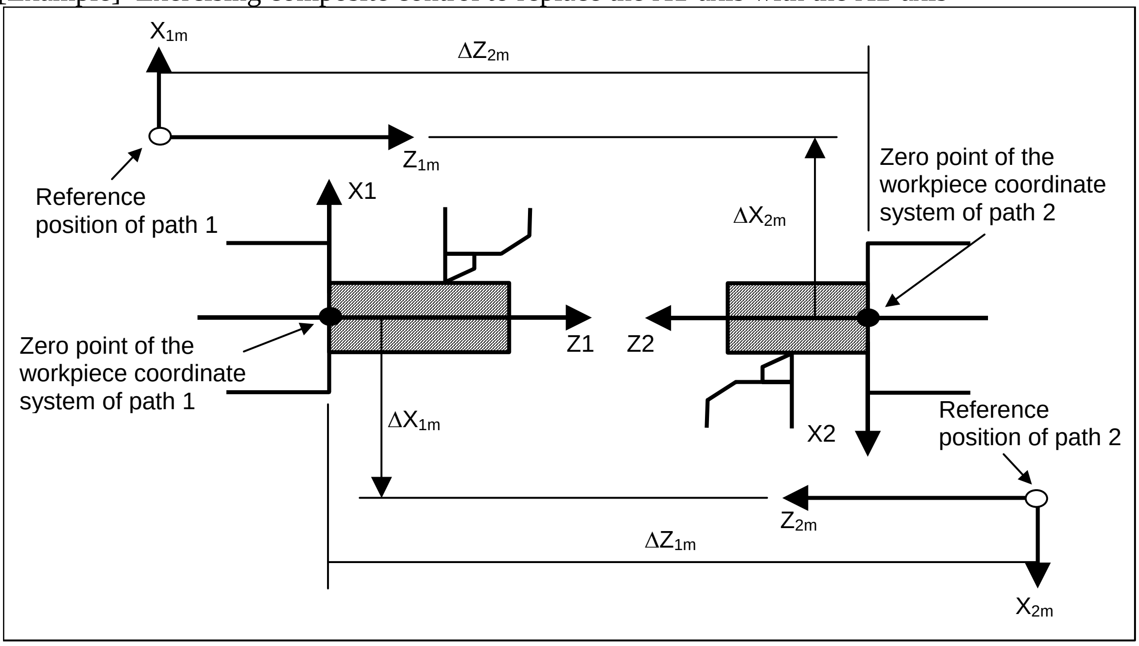
8184	Coordinates of the reference point of an axis on the coordinate system of another axis under composite control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter specifies the coordinates of the reference point of an axis on the coordinate system of another axis under composite control.

This parameter is valid when bit 4 (MPMx) of parameter No. 8162 is set to 1, and workpiece coordinate systems (G54 to G59, including additional workpiece coordinate systems) are not used.

[Example] Exercising composite control to replace the X1-axis with the X2-axis



(ΔX1m, ΔZ1m) are the coordinates of the reference point of path 2 on the workpiece coordinate system of path 1. (ΔX2m, ΔZ2m) are the coordinates of the reference point of path 1 on the workpiece coordinate system of path 2.

ΔX1m is specified for the parameter No. 8184x of path 1 and ΔX2m for the parameter No. 8184x of path 2.

If bit 4 (MPMx) of parameter No. 8162 is set to 1 when composite control is started, the workpiece coordinate system satisfying the following conditions is specified:

X1 = (Value specified for the X-axis of path 1) ± (Machine coordinate of X2)
  Plus when bit 6 (MCDx) of parameter No. 8162 of path 1 is set to 0
  Minus when bit 6 (MCDx) of parameter No. 8162 of path 1 is set to 1

X2 = (Value specified for the X-axis of path 2) ± (Machine coordinate of X1)
Plus when bit 6 (MCDx) of parameter No. 8162 of path 2 is set to 0
Minus when bit 6 (MCDx) of parameter No. 8162 of path 2 is set to 1
If bit 5 (MPSx) of parameter No. 8162 is set to 1 when composite control is terminated, the workpiece coordinate system satisfying the following conditions is specified:
X1 = (Parameter No. 1250 of path 1) + (Machine coordinate of X1)
X2 = (Parameter No. 1250 of path 2) + (Machine coordinate of X2)

8185	Workpiece coordinates on each axis at the reference position

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the workpiece coordinates on each master axis, subject to synchronous control, when the master and slave axes are at the reference position. This parameter is enabled when bit 1 (SPMx) of parameter No. 8163 is set to 1. Set this parameter for the master axis.

8186	Master axis under superimposed control

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 101, 102, 103, . . . , (path number)*100+(intra-path relative axis number) (101, 102, 103, . . . , 201, 202, 203, . . . , 1001, 1002, 1003, . . .)
This parameter sets the path number and intra-path relative axis number of a superimposed master axis for each axis when superimposed control is exercised. When zero is specified, the axis does not become a slave axis under superimposed control and the move pulse of another axis is not superimposed.
An identical number can be specified in two or more parameters to exercise superimposed control simultaneously. This means that superimposed control with one master axis and multiple slave axes is possible.
A slave axis may function as the master axis of another axis to allow three-generation superimposed control: parent (master axis) - child (slave axis/master axis) - grandchild (slave axis).

In this case, a movement along the child is made by its travel distance plus the travel distance of the parent, and a movement along the grandchild is made by its travel distance plus the travel distance of the child plus the travel distance of the parent.

Example of the relationship of parent (X1 of path 1) - child (X2 of path 2) - grandchild (X3 of path 3):
The travel distance of X1 is superimposed on X2, and the travel distances of X1 and X2 are further superimposed on X3.
Parameter No. 8186 (X axis) of path 2 = 101
Parameter No. 8186 (X axis) of path 3 = 201

8190	Rapid traverse rate of an axis under superimposed control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] Refer to standard parameter setting table (C)
(When the increment system is IS-B, 0 to +999000.0)
Set a rapid traverse rate for each of the axes when the rapid traverse override of the axes (master and slave axes) under superimposed control is 100%. The manual rapid traverse rate set in this parameter or the manual rapid traverse rate set in parameter No. 1424, whichever smaller, is used.
If this parameter is set to 0, the normal rapid traverse rate (parameter No. 1420) is used.

8191	F0 velocity of rapid traverse override of an axis under superimposed control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to standard parameter setting table (C)
(When the increment system is IS-B, 0 to +999000.0)
Set the F0 velocity of rapid traverse override of an axis under superimposed control (each of the master and slave axes).
If this parameter is set to 0, the F0 velocity of rapid traverse override in normal operation (parameter No. 1421) is used.

8192	Linear acceleration/deceleration time constant in rapid traverse of an axis under superimposed control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000
This parameter specifies the linear acceleration/deceleration time constant in rapid traverse for each of the axes (master and slave axes) under superimposed control.

8194	Maximum cutting feedrate in superimposed control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to standard parameter setting table (C)
(When the increment system is IS-B, 0 to +999000.0)
Set the maximum cutting feedrate that can be applied under superimposed control.
If this parameter is set to 0, the maximum cutting feedrate in normal operation (parameter No. 1430) is used.

4.63 PARAMETERS OF ANGULAR AXIS CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
8200					AZP	AZR		AAC

[Input type] Parameter input
[Data type] Bit path

NOTE
When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 AAC 0: Does not perform angular axis control.
1: Performs inclined axis control.

#2 AZR 0: The machine tool is moved along the Cartesian axis during manual reference position return along the slanted axis under angular axis control.
1: The machine tool is not moved along the Cartesian axis during manual reference position return along the slanted axis under angular axis control.

#3 AZP When a movement is made along the Cartesian axis due to a movement along the slanted axis, reference position return end signals for the Cartesian axis ZP1 to ZP8 <Fn094.0 to Fn094.7> are:
0: Not cleared.
1: Cleared.

	#7	#6	#5	#4	#3	#2	#1	#0
8201	ADG	A53				AO3	AO2	AOT

[Input type] Parameter input
[Data type] Bit path

NOTE
When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 AOT Stored stroke limit 1 under angular axis control is handled as:
0: Value in the slanted coordinate system.
1: Value in the Cartesian coordinate system.

#1 AO2 Stored stroke limit 2 under angular axis control is handled as:
0: Value in the slanted coordinate system.
1: Value in the Cartesian coordinate system.

#2 AO3 Stored stroke limit 3 under angular axis control is handled as:
0: Value in the slanted coordinate system.
1: Value in the Cartesian coordinate system.

#6 A53 So far, if a slanted axis is singly specified by a machine coordinate command (G53) in angular axis control, this parameter set to 0 specifies that "compensation is applied to the Cartesian axis", and this parameter set to 1 specifies that "a movement is made along the slanted axis only". However, the specification has been changed so that "a movement is made along the slanted axis only", regardless of whether this parameter is set to 0 or 1.

#7 ADG The contents of diagnosis data Nos. 306 and 307 are:
0: Not swapped. The slanted axis and Cartesian axis are displayed in this order.
1: Swapped. The Cartesian axis and slanted axis are displayed in this order.

	#7	#6	#5	#4	#3	#2	#1	#0
8209								ARF

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter bit is set, the power must be turned off before operation is continued.

#0 ARF In angular axis control, a movement from an intermediate point to the reference position in the G28/G30 command is:
0: Made in the angular coordinate system.
1: Made in the Cartesian coordinate system.

8210	Slant angle of a slanted axis in angular axis control

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] -180.000 to 180.000. However, angular axis control is disabled in the ranges -95.000 to -85.000 and 85.000 to 95.000 (in the case of IS-B).

8211	Axis number of a slanted axis subject to angular axis control
8212	Axis number of a Cartesian axis subject to slanted axis control

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to number of controlled axes
When angular axis control is to be applied to an arbitrary axis, these parameters set the axis numbers of a slanted axis and Cartesian axis. If 0 is set in either of the two parameters, the same number is set in the two parameters, or a number other than the controlled axis numbers is set in either of the two parameters, a slanted axis and Cartesian axis are selected as indicated in the following table:

	Slanted axis	Cartesian axis
M series	Y-axis (axis with 2 set in parameter No. 1022) of the basic three axes	Z-axis (axis with 3 set in parameter No. 1022) of the basic three axes
T series	X-axis (axis with 1 set in parameter No. 1022) of the basic three axes	Z-axis (axis with 3 set in parameter No. 1022) of the basic three axes

	#7	#6	#5	#4	#3	#2	#1	#0
8240	MST		SOV					

[Input type] Parameter input
[Data type] Bit path

#5 SOV G110 block:
0: Is overlapped with the next block.
1: Is not overlapped with the next block.

#7 MST If M code to start peripheral axis control is commanded :
0: Peripheral axis control is started after waiting for end signal (FIN).
1: Peripheral axis control is started without waiting for end signal (FIN).

	#7	#6	#5	#4	#3	#2	#1	#0
8242	AOM	AOP	GIN	G90				COF

[Input type] Parameter input
[Data type] Bit

#0 COF Setting of offset value of peripheral axis is :
0: Individual among peripheral axis control group 1 to 3.
1: Common to peripheral axis control group 1 to 3.

#4 G90 Movement command of peripheral axis control :
0: Depends on bit 0 (IA1, IA2, IA3) of the parameters Nos.11854, 11855 and 11856.
1: Does not depend on bit 0 (IA1, IA2, IA3) of the parameters Nos.11854, 11855 and 11856 (depends on modal information or program command).

#5 GIN Initial modal data of peripheral axis control :
0: Depends on bit 1 (MG1, MG2, MG3) of the parameters Nos.11854, 11855 and 11856, and bit 2 (MF1, MF2, MF3) of the parameters Nos.11854, 11855 and 11856.
1: Does not depend on bit 1 (MG1, MG2, MG3) of the parameters Nos.11854, 11855 and 11856, and bit 2 (MF1, MF2, MF3) of the parameters Nos.11854, 11855 and 11856 (depends on modal information).

#6 AOP If an alarm is issued in the path using peripheral axis control, the alarm DS2096, “ALARM OCCURRED IN MAIN PATH” is :
0: Issued to peripheral axis control.
1: Not issued to peripheral axis control.

#7 AOM If an alarm is issued to peripheral axis control, the alarm DS2097, “ALARM OCCURRED IN PERIPHERAL” is :
0: Issued in the path using peripheral axis control.
1: Not issued in the path using peripheral axis control.

	#7	#6	#5	#4	#3	#2	#1	#0
8243								MSA

[Input type] Parameter input
[Data type] Bit

#0 MSA In M code to start the first to sixth peripheral axis control program (peripheral axis control group 1 to 3), the same value in each group :
0: can not be set.
1: can be set.

4.64 PARAMETERS OF AXIS SYNCHRONOUS CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
8301				SYA				

[Input type] Parameter input
[Data type] Bit path

#4 SYA In the servo-off state in axis synchronous control, the limit of the difference between the positioning deviation of the master axis and that of the slave axis is:
0: Checked.
1: Not checked.

	#7	#6	#5	#4	#3	#2	#1	#0
8302	**SMA**							

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#7 SMA When an absolute position detector is attached, and bit 4 (APZx) of parameter No. 1815 for an axis in synchronous operation is set to 0, APZx of the pairing axis in synchronous operation is:
0: Not set to 0.
1: Set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
8303	**SOFx**			**SYPx**		**SAFx**	**ATSx**	**ATEx**

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 ATEx In axis synchronous control, automatic setting for grid positioning is:
0: Disabled
1: Enabled
The setting for the slave axis is available.

#1 ATSx In axis synchronous control, automatic setting for grid positioning is:
0: Not started
1: Started
The setting for the slave axis is available.

> **NOTE**
> When starting automatic setting for grid positioning, set ATSx to 1. Upon the completion of setting, ATSx is automatically set to 0.

#2 SAFx In axis synchronous control, a movement along a slave axis is:
0: Not added to actual feedrate display.
1: Added to actual feedrate display.
The setting for the slave axis is available.

#4 SYPx In axis synchronous control, some parameters must be set to the same value for the master and slave axes. When a value is set in such a parameter for the master axis:
0: The same value is not automatically set in the parameter for the slave axis.
1: The same value is automatically set in the parameter for the slave axis.

> **NOTE**
> 1 For the parameters that can be set automatically, refer to Subsection 1.6.10, "Automatic Setting of Parameters for Slave Axes", in Connection Manual (Function) (B-64483EN-1).
> 2 Set this parameter to the same value for both the master and slave axes.

#7 SOFx In axis synchronous control, the synchronization establishment function based on machine coordinates is:
0: Disabled.
1: Enabled.
The setting for the slave axis is available.
When using synchronization error compensation, set this parameter to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
8304	SYEx	SMSx	SCAx	MVBx	CLPx	ADJx	SMCx	SSAx

[Input type] Parameter input
[Data type] Bit axis

#0 SSAx When the one-direction synchronization establishment function under axis synchronous control is used:
0: The axis with a larger machine coordinate is used as the reference.
1: The axis with a smaller machine coordinate is used as the reference.

> **NOTE**
> 1 When this parameter is set, the power must be turned off before operation is continued.
> 2 Set this parameter to the same value for both the master and slave axes.

#1 SMCx When a value for 3-dimensional machine position compensation is set for the master axis under axis synchronous control, the same value is:
0: Not output for the slave axis.
1: Output for the slave axis.

> **NOTE**
> The setting for the slave axis is available. When this parameter is set to 1 for a slave axis, the same 3-dimensional machine position compensation value as for the master axis is always output for the slave axis during synchronous operation. The value is not output during normal operation, however.
> (For the slave axis, compensation is also canceled when synchronous operation is released.)

#2 ADJx In axis synchronous control, this parameter specifies an axis along which a movement is made in the correction mode.
0: A movement is not made in the correction mode along the axis.
1: A movement is made in the correction mode along the axis.
When this parameter is set to 1, the correction mode is set.
Along an axis with this parameter set to 1, a movement is made by a move command for the master axis.
Set this parameter for one of the master and slave axes.
When there are multiple slave axes for one master axis, set this parameter to 1 for an axis with which a synchronization error excessive alarm is issued for recovery. If an alarm is issued with multiple axes, modify this parameter after recovery of one axis to recover another axis.

#3 CLPx In axis feed synchronous control, synchronization error compensation is:
0: Disabled.
1: Enabled.
The setting for the slave axis is available.

#4 MVBx In the correction mode, a move command in a direction that increases a synchronization error is:
0: Ignored.
1: Valid.
When there are multiple slave axes for one master axis, an attempt to reduce the synchronous error of a slave axis by a movement along the master axis can increase the synchronization error of another slave axis. If this parameter is set to 0 in such a case, a movement can be made in neither direction along the master axis. In this case, set bit 2 (ADJx) of parameter No. 8304 to make a movement along a slave axis to perform a corrective operation.

#5 SCAx In axis synchronous control:
0: Synchronous operation is performed when the axis synchronous control manual feed selection signal SYNCJ <Gn140> or the axis synchronous control selection signal SYNC <Gn138> for slave axes is set to “1”.
1: Synchronous operation is performed at all times.
The setting for the slave axis is available.

#6 SMSx The synchronization error smooth suppress function is:
0: Disabled.
1: Enabled.
The setting for the slave axis is available.

#7 SYEx When external machine coordinate system shift is specified by external data input/output for the master axis in synchronous control, the slave axis is:
0: Not shifted.
1: Shifted by the same amount as specified for the master axis.
The setting for the slave axis is available.
This function is disabled during normal operation.

	#7	#6	#5	#4	#3	#2	#1	#0
8305				SLR		SRF	SSE	SSO

[Input type] Parameter input
[Data type] Bit path

#0 SSO The uni-directional synchronization function in axis synchronous control is:
0: Disabled.
1: Enabled.

#1 SSE After emergency stop, the uni-directional synchronization function in axis synchronous control is:
0: Enabled.
1: Disabled.

#2 SRF In axis synchronous control, G28, G30, and G53:
0: Make the same movement along the slave axis as a movement along the master axis.
1: Make movements along the slave axis and master axis independently to specified positions.

#4 SLR When G28 is specified for an axis under axis synchronous control for which the reference position is not established:
0: Alarm PS0213, "ILLEGAL COMMAND IN SYNCHRO-MODE" is issued.
1: Reference position return operation of low-speed type is performed.

	#7	#6	#5	#4	#3	#2	#1	#0
8306								SJR

[Input type] Parameter input
[Data type] Bit path

#0 SJR In synchronization establishment,
0: A machine coordinate difference between the master axis and slave axis is output at a time as command pulses (axis movements are performed without acceleration/deceleration).
1: Axis movements are executed with the feedrate of manual rapid traverse and the acceleration/deceleration after interpolation in rapid traverse.

NOTE
When the one-direction synchronization establishment function under axis synchronous control is used (bit 0 (SSO) of parameter No.8305 is set to 1), the machine coordinate difference for synchronization establishment is output as command pulses at a time, regardless of the setting of this parameter. Acceleration/deceleration is not applied to the axis movements in the one-direction synchronization establishment.

	#7	#6	#5	#4	#3	#2	#1	#0
8307								FSS

[Input type] Parameter input
[Data type] Bit type

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#0 FSS The slave axis of flexible synchronization control or the slave axis of superimposed control is:
0: Not used as the master axis of axis synchronous control.
1: Used as the master axis of axis synchronous control.

8311	Axis number of master axis in axis synchronous control

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to Number of controlled axes

Select a master axis in axis synchronous control. In the parameter for the slave axis, set the axis number of the master axis.

Example 1)

When one set of axis synchronous control is used:
When the master axis is the first axis (X-axis), and the slave axis is the third axis (Z-axis), set parameter No. 8311 as follows:

Parameter No. 8311	X (first axis)	= 0
Parameter No. 8311	Y (second axis)	= 0
Parameter No. 8311	Z (third axis)	= 1
Parameter No. 8311	A (fourth axis)	= 0

Example 2)

When three sets of axis synchronous control is used:
When the master axes are the first axis, second axis, and third axis, and the slave axes are the sixth axis, fifth axis, and fourth axis, set parameter No. 8311 as follows:

Parameter No. 8311	X (first axis)	= 0
Parameter No. 8311	Y (second axis)	= 0
Parameter No. 8311	Z (third axis)	= 0
Parameter No. 8311	A (fourth axis)	= 3
Parameter No. 8311	B (fifth axis)	= 2
Parameter No. 8311	C (sixth axis)	= 1

Example 3)

When the multiple slave axes of axis synchronous control are used in each path:
When the master axes are the first axis of the each path, and the slave axes are the fourth axis and fifth axis of the each path, set parameter No. 8311 as follows:

	Path-1		Path-2	
Parameter No.8311	X (first axis)	= 0	X (first axis)	= 0
Parameter No.8311	Y (second axis)	= 0	Y (second axis)	= 0
Parameter No.8311	Z (third axis)	= 0	Z (third axis)	= 0
Parameter No.8311	A (fourth axis)	= 1	A (fourth axis)	= 1
Parameter No.8311	B (fifth axis)	= 1	B (fifth axis)	= 1

8312	Enabling/disabling slave axis mirror image

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0, 100

When the slave axis mirror image is enabled on axis synchronous control, set this parameter to 100. If 0 is set in this parameter, the slave axis mirror image is disabled. The setting for the slave axis is available.

Example)

For reverse synchronization with the master axis being the third axis and the slave axis being the fourth axis, set parameter No. 8312 as follows:

Parameter No. 8312 X (first axis) = 0
Parameter No. 8312 Y (second axis) = 0
Parameter No. 8312 Z (third axis) = 0
Parameter No. 8312 A (fourth axis) = 100

> **NOTE**
> In synchronous operation with mirror image applied, synchronization error compensation, synchronization establishment, synchronization error checking, and correction mode cannot be used.

8314	Maximum allowable error in synchronization error check based on machine coordinates

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets a maximum allowable error in a synchronization error check based on machine coordinates. When the error between the master and slave axes in machine coordinates exceeds the value set in this parameter, the machine stops with the servo alarm (SV0005, “SYNC EXCESS ERROR (MCN)”).

The setting for the slave axis is available.

> **NOTE**
> Set 0 in this parameter when a synchronization error check is not made.

8323	Limit in positional deviation check in axis synchronous control

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

This parameter sets the maximum allowable difference between the master axis and slave axis position deviations. When the absolute value of a positional deviation difference exceeds the value set in this parameter in axis synchronous control, the alarm DS0001, “SYNC EXCESS ERROR (POS DEV)” is issued.

The setting for the slave axis is available. If 0 is specified in this parameter, no position deviation difference check is made.

8325	Maximum compensation value in synchronization establishment based on machine coordinates

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the maximum compensation value for synchronization. When a compensation value exceeding the value set in this parameter is detected, the servo alarm SV0001, "SYNC ALIGNMENT ERROR" is issued, and the synchronization establishment is not performed.
The setting for the slave axis is available. To enable this parameter, set the bit 7 (SOF) of parameter No.8303 to 1. When 0 is set in this parameter, synchronization establishment is not performed.

8326	Difference between master axis and slave axis reference counters

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999
The difference between the master axis reference counter and slave axis reference counter (master axis and slave axis grid shift) is automatically set when automatic setting for grid positioning is performed. Then, the difference is transferred together with an ordinary grid shift value to the servo system when the power is turned on. This parameter is set with a slave axis.

8327	Torque difference alarm detection timer

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] msec
[Valid data range] 0 to 4000
This parameter sets a time from the servo preparation completion signal, SA <Fn000.6>, being set to "1" until torque difference alarm detection is started in axis synchronous control.
When 0 is set in this parameter, the specification of 512 msec is assumed.
The setting for the slave axis is available.

8330	Multiplier for a maximum allowable synchronization error immediately after power-up

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 100
Until synchronization establishment is completed immediately after power-up, synchronization error excessive alarm 2 is checked using the maximum allowable error (parameter No. 8332) multiplied by the value set in this parameter.
If the result produced by multiplying the value of parameter No. 8332 by the value of this parameter exceeds 32767, the value is clamped to 32767.

8331	Maximum allowable synchronization error for synchronization error excessive alarm 1

[Input type] Parameter input
[Data type] 2-word axis

[Unit of data] Detection unit
[Valid data range] 1 to 32767

This parameter sets a maximum allowable synchronization error for synchronization error excessive alarm 1.
The setting for the slave axis is available.

8332	Maximum allowable synchronization error for synchronization error excessive alarm 2

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 1 to 32767

This parameter sets a maximum allowable synchronization error for synchronization error excessive alarm 2.
The setting for the slave axis is available.

8333	Synchronization error zero width for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 1 to 32767

When a synchronization error below the value set in this parameter is detected, synchronization error compensation is not performed.
The setting for the slave axis is available.

8334	Synchronization error compensation gain for each axis

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 1 to 1024

This parameter sets a synchronization error compensation gain.
Compensation pulses found by the following expression are output for the slave axis:
Compensation pulses = Synchronization error × (Ci/1024)
Ci: Compensation gain
The setting for the slave axis is available.

8335	Synchronization error zero width 2 for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets synchronization error zero width 2 for synchronization error smooth suppression.
The setting for the slave axis is available.

NOTE
Set a value less than the value set in parameter No. 8333.

8336	Synchronization error compensation gain 2 for each axis

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1024

This parameter sets synchronization error compensation gain 2 for synchronization error smooth suppression.
The setting for the slave axis is available.

> **NOTE**
> Set a value less than the value set in parameter No. 8334.

8337	M code for turning off synchronization in axis synchronous control
8338	M code for turning on synchronization in axis synchronous control

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 999999999

This parameter specifies an M code for switching between synchronous operation and normal operation.
The M code set in this parameter is not buffered.

> ⚠ **CAUTION**
> To switch between synchronous operation and normal operation, specify the M code set in parameter No. 8337 or 8338.

4.65 PARAMETERS OF SEQUENCE NUMBER COMPARISON AND STOP

8341	Program number subject to comparison and stop

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 1 to 99999999

This parameter sets the program number, including a sequence number, subject to sequence number comparison and stop. Parameter No. 8342 is used to set a sequence number subject to check termination.

8342	Sequence number subject to comparison and stop

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the sequence number subject to sequence number comparison and stop.
If the block containing the sequence number set with this parameter is executed while the program set with parameter No. 8341 is being executed, a single block stop occurs after the block is executed. At this time, the setting is automatically set to -1.

NOTE
1. When -1 is set in parameter No. 8342, comparison and stop is disabled.
2. Comparison and stop cannot be performed using a sequence number contained in a block (such as a macro statement, M98, and M99) that is processed only inside the CNC.
3. When a match is found with the sequence number of a block (such as an L specification of a canned cycle) that specifies the number of repeats, operation stops after executing as many times as the number of repeats.
4. If the sequence number set in parameter No. 8342 appears more than once in the program, operation stops at the block where the first match is found in the order of execution.

4.66 PARAMETERS OF CHOPPING/HIGH PRECISION OSCILLATION FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
8360	CHF			CHD		CVC		ROV

[Input type] Setting input
[Data type] Bit path

#0 ROV As rapid traverse override for a section from the chopping/oscillation start point to point R:
0: Chopping/oscillation override is used.
1: Rapid traverse override is used.

#2 CVC The feedrate along the chopping/oscillation axis is changed:
0: At the upper or lower dead point immediately after the feedrate change command is issued.
1: At the upper dead point immediately after the feedrate change command is issued.

#4 CHD On the chopping screen, the real upper point, the current position, the real lower point, the stroke counter and actual feed rate are:
0: Not displayed.
1: Displayed.

#7 CHF On the chopping screen, the chopping/oscillation feedrate:
0: Can be set.
1: Cannot be set.

8370	Chopping/oscillation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes
This parameter sets which servo axis the chopping/oscillation axis corresponds to.

8371	Chopping/oscillation reference point (point R)

[Input type] Parameter input

[Data type] Real path
[Unit of data] mm, inch, deg (input unit)
[Min. unit of data] Depend on the increment system of the chopping/oscillation axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
The data set in this parameter is absolute coordinates.

8372	Chopping/oscillation upper dead point

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, deg (input unit)
[Min. unit of data] Depend on the increment system of the chopping/oscillation axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
The data set in this parameter is absolute coordinates.

8373	Chopping/oscillation lower dead point

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, deg (input unit)
[Min. unit of data] Depend on the increment system of the chopping/oscillation axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
The data set in this parameter is absolute coordinates.

8374	Chopping feedrate/oscillation base feedrate

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, deg/min (input unit)
[Min. unit of data] Depend on the increment system of the chopping/oscillation axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets the chopping feedrate/oscillation base feedrate.

8375	Maximum chopping/oscillation feedrate

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, deg/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
The chopping/oscillation feedrate is clamped at this parameter setting. The maximum feedrate must be set for the chopping/oscillation axis. If this parameter is set to 0, no movement is made for chopping/oscillation.

NOTE
Set a value that is smaller than the rapid traverse rate (parameter No. 1420) to Maximum chopping/oscillation feedrate.

8376	Chopping compensation factor

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100

The value obtained by multiply the sum of the servo delay in an chopping operation and the acceleration/deceleration delay by the rate set in this parameter is used as chopping delay compensation. When this parameter is set to 0, chopping delay compensation is not applied.

8377	Chopping compensation start tolerance

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

In a chopping operation, compensation is applied when the difference between an amount of shortage at the upper dead point and that at the lower dead point due to the servo position control delay is less than the value set in this parameter. When this parameter is set to 0, compensation is not applied.

4.67 PARAMETERS OF AI CONTOUR CONTROL (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
8412			FDI				HIK	EST

[Input type] Parameter input
[Data type] Bit

#0 EST The simple NURBS interpolation start function is:
0: Disabled.
1: Enabled.

#1 HIK The high-precision knot command of NURBS interpolation is:
0: Disabled.
1: Enabled.

#5 FDI Parametric feedrate control of NURBS interpolation is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
8451	NOF			ZAG				

[Input type] Setting input
[Data type] Bit path

#4 ZAG The deceleration function based on cutting load in AI contour control (deceleration based on Z-axis fall angle) is:
0: Not performed.
1: Performed.
When this parameter is set to 1, be sure to set parameter Nos. 8456, 8457, and 8458.

#7 NOF In AI contour control, an F command is:
0: Not ignored.
1: Ignored.
When this parameter is set to 1, the specification of the maximum allowable feedrate set in parameter No. 8465 is assumed.

8456	Override for range 2 that is applied during deceleration according to the cutting load in AI contour control
8457	Override for range 3 that is applied during deceleration according to the cutting load in AI contour control
8458	Override for range 4 that is applied during deceleration according to the cutting load in AI contour control

[Input type] Setting input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 100

For the function of decelerating according to the cutting load in AI contour control, the override set in a parameter can be applied according to the angle at which the tool moves downward along the Z-axis. The feedrate obtained according to other conditions is multiplied by the override for the range containing angle θ at which the tool moves downward.
However, when bit 1 (ZG2) of parameter No. 19515 is set to 0, no parameter is available to range 1, and 100% is applied at all times. When bit 1 (ZG2) of parameter No. 19515 is set to 1, set an override value for range 1 in parameter No. 19516.

Range 1 $0° \leq \theta < 30°$
Range 2 $30° \leq \theta < 45°$
Range 3 $45° \leq \theta < 60°$
Range 4 $60° \leq \theta \leq 90°$

	#7	#6	#5	#4	#3	#2	#1	#0
8459					OVRB			

[Input type] Parameter input
[Data type] Bit path

#3 OVRB For deceleration based on a feedrate difference or acceleration rate in AI contour control, override is:
0: Disabled.
1: Enabled.
Usually, override is enabled for a specified feedrate, and AI contour control is applied to the specified feedrate. When this parameter is set to 1, override is applied to a feedrate placed under AI contour control.

8465	Maximum allowable feedrate for AI contour control

[Input type] Setting input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets the maximum allowable feedrate for contour control.

If a feedrate higher than the setting of this parameter is specified in the AI contour control mode, the feedrate is clamped to that set in this parameter.
If this parameter is set to 0, no clamping is performed.
When bit 7 (NOF) of parameter No. 8451 is set to 1, the tool moves, assuming that the feedrate set in this parameter is specified. If 0 is set in this parameter at this time, a movement is made at the specified feedrate.

8466	Maximum allowable feedrate for AI contour control (when a rotation axis is singly specified)

[Input type] Setting input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
This parameter sets the maximum allowable feedrate for AI contour control when a rotation axis is singly specified.
If a feedrate higher than the setting of this parameter is specified in the AI contour control mode, the feedrate is clamped to that set in this parameter.
If this parameter is set to 0, the feedrate is clamped to that set in parameter No. 8465.
When bit 7 (NOF) of parameter No. 8451 is set to 1 and a rotation axis is singly specified, the tool moves, assuming that the feedrate set in this parameter is specified. If 0 is set in this parameter at this time, the tool moves at the feedrate specified in parameter No. 8465.

8486	Maximum travel distance of a block where smooth interpolation or Nano smoothing is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter specifies a block length used as a reference to decide whether to apply smooth interpolation or Nano smoothing. If the line specified in a block is longer than the value set in the parameter, smooth interpolation or Nano smoothing is not applied to that block.

8487	Angle at which smooth interpolation or Nano smoothing is turned off

[Input type] Setting input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to 90
This parameter sets the angle used to determine whether to apply smooth interpolation or Nano smoothing.
At a point having a difference in angle greater than this setting, smooth interpolation or Nano smoothing is turned off.

8490	Minimum travel distance of a block where smooth interpolation or Nano smoothing is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis

[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a block length used to determine whether to apply smooth interpolation or Nano smoothing.
If the line specified in a block is shorter than the value set in this parameter, smooth interpolation or Nano smoothing is not applied to that block.

8491	Maximum tolerance for a block where smooth interpolation is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a tolerance for deciding whether to perform smooth interpolation.
For a block that has a tolerance greater than the value set in this parameter, smooth interpolation is not performed. When 0 is set in this parameter, a tolerance-based decision is not made.

8492	Minimum tolerance for a block where smooth interpolation is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a tolerance for deciding whether to perform smooth interpolation. For a block that has a tolerance less than the value set in this parameter, smooth interpolation is not performed.
Usually, set a value of about 1/10 of the maximum tolerance value (set in parameter No. 8491). When 0.0 is set, 1/10 of the maximum tolerance (set in parameter No. 8491) is used as a minimum tolerance. When a negative value is set, a minimum tolerance of 0.0 is assumed.

4.68 PARAMETERS OF HIGH-SPEED POSITION SWITCH (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
8500	HPE							

[Input type] Parameter input
[Data type] Bit path

#7 HPE The maximum number of high-speed position switches is:
0: 6.
1: 16.

	#7	#6	#5	#4	#3	#2	#1	#0
8501						HPD	HPS	HPF

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 HPF The output signal of a high-speed position switch is output to:
0: Address Y.
1: Address F.

#1 HPS The current position used with the high-speed position switch:
0: Considers a servo error.
1: Does not consider a servo error.

#2 HPD When a high-speed position switch of direction decision type has reached (not passed) a set coordinate in a specified direction, the switch:
0: Does not operate.
1: Operates.

	#7	#6	#5	#4	#3	#2	#1	#0
8504	E08	E07	E06	E05	E04	E03	E02	E01

	#7	#6	#5	#4	#3	#2	#1	#0
8505	E16	E15	E14	E13	E12	E11	E10	E09

[Input type] Parameter input
[Data type] Bit path

E01 to E16 These parameters specify whether to enable or disable each corresponding high-speed position switch.
The following table shows the correspondence between the bits and switches.
The settings of each bit have the following meaning:
0: The switch corresponding to the bit is enabled.
1: The switch corresponding to the bit is disabled (always outputs 0).

Parameter	Switch
E01	1st high-speed position switch
E02	2nd high-speed position switch
E03	3rd high-speed position switch
:	:
E16	16th high-speed position switch

	#7	#6	#5	#4	#3	#2	#1	#0
8508	D08	D07	D06	D05	D04	D03	D02	D01

	#7	#6	#5	#4	#3	#2	#1	#0
8509	D16	D15	D14	D13	D12	D11	D10	D09

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

D01 to D16 These parameters set the output type of each corresponding high-speed position switch.
The following table shows the correspondence between the bits and switches.
The settings of each bit have the following meaning:
0: The output type of the switch corresponding to the bit is normal.
1: The output type of the switch corresponding to the bit is decision by direction.

Parameter	Switch
D01	1st high-speed position switch
D02	2nd high-speed position switch
D03	3rd high-speed position switch
:	:
D16	16th high-speed position switch

	#7	#6	#5	#4	#3	#2	#1	#0
8512	A08	A07	A06	A05	A04	A03	A02	A01

	#7	#6	#5	#4	#3	#2	#1	#0
8513	A16	A15	A14	A13	A12	A11	A10	A09

[Input type] Parameter input
[Data type] Bit path

A01 to A16 These parameters set the passing direction in which each corresponding high-speed position switch is turned on.
The following table shows the correspondence between the bits and switches.
The settings of each bit have the following meaning:
0: The high-speed position switch is turned on when the tool passes through the coordinates for turning the switch on in the negative (-) direction.
1: The high-speed position switch is turned on when the tool passes through the coordinates for turning the switch on in the positive (+) direction.

Parameter	Switch
A01	1st high-speed position switch
A02	2nd high-speed position switch
A03	3rd high-speed position switch
:	:
A16	16th high-speed position switch

	#7	#6	#5	#4	#3	#2	#1	#0
8516	B08	B07	B06	B05	B04	B03	B02	B01

	#7	#6	#5	#4	#3	#2	#1	#0
8517	B16	B15	B14	B13	B12	B11	B10	B09

[Input type] Parameter input
[Data type] Bit path

B01 to B16 These parameters set the passing direction in which each corresponding high-speed position switch is turned off.
The following table shows the correspondence between the bits and switches.
The settings of each bit have the following meaning:
0: The high-speed position switch is turned off when the tool passes through the coordinates for turning the switch off in the negative (-) direction.
1: The high-speed position switch is turned off when the tool passes through the coordinates for turning the switch off in the positive (+) direction.

Parameter	Switch
B01	1st high-speed position switch
B02	2nd high-speed position switch
B03	3rd high-speed position switch
:	:
B16	16th high-speed position switch

8565	Output address of the high-speed position switch signal

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 126

This parameter sets a Y signal address to which the high-speed position switch signal is output. The Y signal addresses consisting of the value set in this parameter and the set value plus 1 are used.
If a nonexistent address is set, the high-speed position switch function is disabled. When bit 0 (HPF) of parameter No. 8501 is set to 1, however, this parameter has no effect.

8570	Controlled axis for which the first high-speed position switch function is performed
8571	Controlled axis for which the second high-speed position switch function is performed
to	
8579	Controlled axis for which the tenth high-speed position switch function is performed

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

Each of these parameters sets a controlled axis number for which each of the first to tenth high-speed position switch functions is performed.
Set 0 for the number corresponding to a high-speed position switch which is not to be used.

NOTE
For the 11th to 16th, see parameters Nos. 12201 to 12206.

8580	Maximum value of the operation range of the first high-speed position switch
8581	Maximum value of the operation range of the second high-speed position switch
to	
8589	Maximum value of the operation range of the tenth high-speed position switch

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the maximum value of the operation range of each of the first to tenth high-speed position switches. If such a setting that maximum value < minimum value is made, no operation range exists, so that the high-speed position switch does not operate.

> **NOTE**
> For the 11th to 16th, see parameters Nos. 12221 to 12226.

8590	Minimum value of the operation range of the first high-speed position switch
8591	Minimum value of the operation range of the second high-speed position switch
to	
8599	Minimum value of the operation range of the tenth high-speed position switch

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the minimum value of the operation range of each of the first to tenth high-speed position switches. If such a setting that maximum value < minimum value is made, no operation range exists, so that the high-speed position switch does not operate.

> **NOTE**
> For the 11th to 16th, see parameter Nos. 12241 to 12246.

4.69 OTHER PARAMETERS

	#7	#6	#5	#4	#3	#2	#1	#0
8650						EKY	CNA	RSK

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 RSK After the  key is pressed, the key code is:
0: Not passed to the application program.
1: Passed to the application program.

#1 CNA When a CNC alarm is issued while the user screen of C Language Executor is being displayed, automatic switching to the alarm screen is:
0: Determined by the setting of bit 7 (NPA) of parameter No. 3111.
1: Not performed, regardless of the setting of bit 7 (NPA) of parameter No. 3111.

#2 EKY The MDI key extension portion is:
0: Not read.
1: Read.

	#7	#6	#5	#4	#3	#2	#1	#0
8654	WGS		DCC	CRS	CTM	CGC	CXW	NVS

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 NVS When an MDI unit with a 10.4-inch LCD unit is used, the vertical soft keys on the CNC screen:
0: Can be used.
1: Cannot be used.

#1 CXW If no display unit is used, C Language Executor is started:
0: Simultaneously when the CNC screen display function is started.
1: Simultaneously when the CNC is started.

#2 CGC When the crt_setmode function is called, the graphic plane is:
0: Cleared.
1: Not cleared.

#3 CTM The task execution status monitor screen is:
0: Not displayed.
1: Displayed.

#4 CRS When C Language Executor is used, communication is:
0: Performed at lower than the specified baud rate of RS-232C (conventional specification).
1: Performed at the specified baud rate of RS-232C.

#5 DCC With the rs_status function of C Language Executor, the transmission stop status and reception stop status are:
0: Posted.
1: Not posted.

#7 WGS When C Language Executor is used, the win_getstat function for acquiring the status of multiwindow display is based on:
0: Series 30*i*/31*i*/32*i* specification.
1: Series 16*i*/18*i*/21*i* specification.

When the current status of window display is acquired using the win_getstat function with the Series 30*i*/31*i*/32*i* specification, the value of the window handle decremented by 1 is set in "winstack[ ]" for storing the stacking order of open windows, in "active" for storing the window handle of the currently active window, and in "selected" for storing the window handle of the currently selected window.
With the Series 16*i*/18*i*/21*i* specification, the value of the window handle is set.
With the Series 30*i*/31*i*/32*i* specification, the value of the window handle starts with 0 as 0, 1, 2, 3, 4, 5, 6, then 7.
With the 16*i*/18*i*/21*i* specification, the value of the window handle starts with 1 as 1, 2, 3, 4, 5, 6, 7, then 8.

	#7	#6	#5	#4	#3	#2	#1	#0
8655	RCC		HM2	HM1	CTS		MT2	MT1

[Input type] Parameter input
[Data type] Bit

NOTE
When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 MT1
#1 MT2 These parameters set the starting interval of the Middle-Level task used with C Language Executor.

MT2	MT1	Starting interval
0	0	2 times longer than the starting interval of the High-Level task
0	1	4 times longer than the starting interval of the High-Level task
1	0	8 times longer than the starting interval of the High-Level task
1	1	16 times longer than the starting interval of the High-Level task

#3 CTS When the crt_cncscrn function is executed from the main task of C Language Executor, the main task is:
0: Not stopped at the end of the function (is stopped after processing is performed for a very short time).
1: Stopped at the end of the function.

#4 HM1
#5 HM2 These parameters set time allocation between the High-Level task and Middle-Level task.

		Time allocation (ratio) between High-Level task and Middle-Level task	
HM1	HM2	High-level task	Middle-level task
0	0	3	1
0	1	5	3
1	0	1	1
1	1	3	5

#7 RCC When the rs_close function is executed in RS-232C communication of C Language Executor with DC control exercised in the transmission/reception mode:
0: Communication is ended after checking the DC code of the communication destination device.
1: Communication is ended without checking the DC code of the communication destination device.

8661	Size of variable area

NOTE
1 When this parameter is set, the power must be turned off before operation is continued.
2 When the setting of this parameter is modified, the variable area and SRAM disk are initialized.

[Input type] Parameter input
[Data type] Word path

[Unit of data] KByte
[Valid data range] 0 to 59(251)

This parameter sets the size of the static variable area that can share among each task for using in C Language Executor application. Set a size in steps of 1KB. The maximum specifiable size if 59KB (or 251KB when the C Language Executor additional SRAM option is selected). However, the total size of the variable area and the SRAM disk area should not exceed [Usable SRAM Size - 1]KB (namely, 63KB or 255KB). When the total size exceeds [Usable SRAM Size - 1]KB or the set value is illegal data range, C Language Executor application is not executed.

8662	Size of SRAM disk

NOTE
1. When this parameter is set, the power must be turned off before operation is continued.
2. When the setting of this parameter is modified, the SRAM disk is initialized.

[Input type] Parameter input
[Data type] Word path
[Unit of data] KByte
[Valid data range] 0 to 63(255)

This parameter sets the size of the SRAM disk for using in C Language Executor application. Set a size in steps of 1KB. The minimum size of the SRAM disk is 4KB. When this parameter set 0 to 3, the size of the SRAM disk becomes 4KB. The maximum specifiable size if 63KB (or 255KB when the C Language Executor additional SRAM option is selected). When the total size exceeds [Usable SRAM Size - 1]KB or the set value is illegal data range, C Language Executor application is not executed.

8663	Setting of time zone

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] sec
[Valid data range] -12×3600 to 12×3600

This parameter sets the time difference from the Greenwich time in seconds.
The time difference of Japan is -9 hours. So, set -32400 (= -9×3600) seconds.

	#7	#6	#5	#4	#3	#2	#1	#0
8706		MRD						

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#6 MRD The remote machine diagnosis is:
0: Not used.
1: Used by Fast Ethernet board.

8760	Program number of data input/output (Power Mate CNC manager)

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the program numbers of programs to be used for inputting and outputting slave data (parameters) when the Power Mate CNC manager function is used.
For a slave specified with I/O LINK channel m and group n, the following program number is used:
Setting + (m - 1) × 100 + n × 10

8781	Size of DRAM used with C Language Executor

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Unit of data] 64KByte
[Valid data range] 12 to 96

This parameter sets the size of the DRAM used with C Language Executor. Set a value not smaller than 768K bytes in steps of 64K bytes. If a value not within the valid data range is set, the specification of 0 is assumed.
When the specified value is 0, C Language Executor is not started.

> **NOTE**
> The actually usable size is limited by the RAM capacity and selected option(s).

8783	Size of DRAM used with C Language Executor (for application program with "EXP_DRAMSIZE = ON" enabled in MAKEFILE setting)

[Input type] Parameter input
[Data type] Word
[Unit of data] 64KByte
[Valid data range] 16 to 128

This parameter sets the size of the DRAM used with C Language Executor to operate a C Language Executor application program created with "EXP_DRAMSIZE = ON" enabled in MAKEFILE setting. Set a size not smaller than 1MB (a value not less than 16) in steps of 64K bytes. If a value not within the valid data range is set, the specification of 0 is assumed. When the specified value is 0, C Language Executor is not started.
If an application program created with "EXP_DRAMSIZE = OFF" enabled is loaded to the CNC, the setting of this parameter is not used. Instead, the setting of parameter No. 8781 for specifying the DRAM size used with C Language Executor is used.

	#7	#6	#5	#4	#3	#2	#1	#0
8801								
8802								
8803								
8804								
8805								

[Input type] Parameter input
[Data type] Bit path

8811	
to	
8813	

[Input type] Parameter input
[Data type] 2-word

8814	
to	
8816	

[Input type] Parameter input
[Data type] 2-word path

8820	
to	
8829	

[Input type] Parameter input
[Data type] Byte path

Parameters Nos. 8801 to 8805, 8811 to 8813, 8814 to 8816 and 8820 to 8829 are designed specifically for use by the machine tool builder, and the usage of these parameters varies from machine to machine. For details, refer to the manual issued by the machine tool builder.

4.70 PARAMETERS OF MAINTENANCE

	#7	#6	#5	#4	#3	#2	#1	#0
8900								PWE

[Input type] Setting input
[Data type] Bit

#0 PWE The setting, from an external device and MDI panel, of those parameters that cannot be set by setting input is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
8901	MEN							FAN

[Input type] Setting input
[Data type] Bit path

#0 FAN A fan motor error is:
0: Detected.
1: Not detected.

> **NOTE**
> Be sure to set this parameter to 0.

#7 MEN The periodic maintenance screen is:
0: Displayed.
1: Not displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
8903								PDM

[Input type] Parameter input
[Data type] Bit path

#0 PDM When the remaining time of an item falls to a value less than the percentage of the life specified in parameter No.8911, the life warning status on CNC status display area is
0: Not displayed.
1: Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
8906		MPM						

[Input type] Parameter input
[Data type] Bit

#6 MPM On the periodic maintenance screen,
0: the life time is counted in each path.
1: the life time is not counted in each path.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

8911	Percentage for life warning display on the periodic maintenance screen

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 99

On the periodic maintenance screen, if the remaining time of an item falls to a value less than the percentage of the life specified in this parameter, the item name and remaining time is displayed in red as a warning.

	#7	#6	#5	#4	#3	#2	#1	#0
8950								MEM

[Input type] Parameter input
[Data type] Bit

#0 MEM The memory contents display screen is:
0: Not displayed.
1: Is displayed.

4.71 PARAMETERS OF THE INCORRECT OPERATION PREVENTION FUNCTION

10000	**Lower limit 1 of tool offsets No. 01**
to	**to**
10019	**Lower limit 1 of tool offsets No. 20**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, without tool geometry/wear offsets, X-axis offset
- T series, with tool geometry/wear offsets, X-axis and geometry offsets
- M series, tool offset memory A offset
- M series, tool offset memory B and geometry offsets
- M series, tool offset memory C, geometry, and length offsets

10020	**Upper limit 1 of tool offsets No. 01**
to	**to**
10039	**Upper limit 1 of tool offsets No. 20**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, without tool geometry/wear offsets, X-axis offset
- T series, with tool geometry/wear offsets, X-axis and geometry offsets
- M series, tool offset memory A offset
- M series, tool offset memory B and geometry offsets
- M series, tool offset memory C, geometry, and length offsets

10040	**Lower limit 2 of tool offsets No. 01**
to	**to**
10059	**Lower limit 2of tool offsets No. 20**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, without tool geometry/wear offsets, Z-axis offset
- T series, with tool geometry/wear offsets, Z-axis and geometry offsets
- M series, tool offset memory C, geometry, and radius offsets

10060	Upper limit 2 of tool offsets No. 01
to	to
10079	Upper limit 2 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, without tool geometry/wear offsets, Z-axis offset
- T series, with tool geometry/wear offsets, Z-axis and geometry offsets
- M series, tool offset memory C, geometry, and radius offsets

10080	Lower limit 3 of tool offsets No. 01
to	to
10099	Lower limit 3 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, without tool geometry/wear offsets, tool nose radius offset
- T series, with tool geometry/wear offsets, tool nose radius and geometry offsets

10100	Upper limit 3 of tool offsets No. 01
to	to
10119	Upper limit 3 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, without tool geometry/wear offsets, tool nose radius offset
- T series, with tool geometry/wear offsets, tool nose radius and geometry offsets

10120	Lower limit 4 of tool offsets No. 01
to	to
10139	Lower limit 4 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, with tool geometry/wear offsets, X-axis and wear offsets
- M series, tool offset memory B and wear offsets
- M series, tool offset memory C, wear, and length offsets

10140	Upper limit 4 of tool offsets No. 01
to	to
10159	Upper limit 4 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the upper limits of the following offset values:

- T series, with tool geometry/wear offsets, X-axis and wear offsets
- M series, tool offset memory B and wear offsets
- M series, tool offset memory C, wear, and length offsets

10160	Lower limit 5 of tool offsets No. 01
to	to
10179	Lower limit 5 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the lower limits of the following offset values:

- T series, with tool geometry/wear offsets, Z-axis and wear offsets
- M series, tool offset memory C, wear, and radius offsets

10180	Upper limit 5 of tool offsets No. 01
to	to
10199	Upper limit 5 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the upper limits of the following offset values:

- T series, with tool geometry/wear offsets, Z-axis and wear offsets
- M series, tool offset memory C, wear, and radius offsets

10200	Lower limit 6 of tool offsets No. 01
to	to
10219	Lower limit 6 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)

[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the lower limits of the following offset values:

- T series, with tool geometry/wear offsets, tool noise radius and wear offsets

10220	Upper limit 6 of tool offsets No. 01
to	to
10239	Upper limit 6 of tool offsets No. 20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the upper limits of the following offset values:

- T series, with tool geometry/wear offsets, tool noise radius and wear offsets

10240	Lower limit 1 of a tool offset number range No. 01
to	to
10259	Lower limit 1 of a tool offset number range No. 20

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets
Each of these parameters sets the lower limit of a tool offset number range.
These parameters correspond to the tool offset lower/upper limits set in parameters Nos. 10000 to 10239.

10260	Upper limit 1 of a tool offset number range No. 01
to	to
10279	Upper limit 1 of a tool offset number range No. 20

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets
Each of these parameters sets the upper limit of a tool offset number range.
These parameters correspond to the tool offset lower/upper limits set in parameters Nos. 10000 to 10239.

10280	Lower limit 7 of tool offsets No. 01
to	to
10283	Lower limit 7 of tool offsets No. 04

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the lower limits of the following offset values:

- T series, without tool geometry/wear offsets, Y-axis offset
- T series, with tool geometry/wear offsets, Y-axis and geometry offsets

10284	Upper limit 7 of tool offsets No. 01
to	to
10287	Upper limit 7 of tool offsets No. 04

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the upper limits of the following offset values:

- T series, without tool geometry/wear offsets, Y-axis offset
- T series, with tool geometry/wear offsets, Y-axis and geometry offsets

10288	Lower limit 8 of tool offsets No. 01
to	to
10291	Lower limit 8 of tool offsets No. 04

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the lower limits of the following offset values:

- T series, with tool geometry/wear offsets, Y-axis and wear offsets

10292	Upper limit 8 of tool offsets No. 01
to	to
10295	Upper limit 8 of tool offsets No. 04

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the upper limits of the following offset values:

- T series, with tool geometry/wear offsets, Y-axis and wear offsets

10296	Lower limit 2 of a tool offset number range No. 01
to	to
10299	Lower limit 2 of a tool offset number range No. 04

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets
Each of these parameters sets the lower limit of a tool offset number range.
These parameters correspond to the tool offset lower/upper limits set in parameters Nos. 10280 to 10295.

10300	Upper limit 2 of a tool offset number range No. 01
to	to
10303	Upper limit 2 of a tool offset number range No. 04

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the upper limit of a tool offset number range.
These parameters correspond to the tool offset lower/upper limits set in parameters Nos. 10280 to 10295.

10304	Lower limit of workpiece zero point offsets No. 01
to	to
10309	Lower limit of workpiece zero point offsets No. 06

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the lower limit of workpiece zero point offset values.

10310	Upper limit of workpiece zero point offsets No. 01
to	to
10315	Upper limit of workpiece zero point offsets No. 06

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the upper limit of workpiece zero point offset values.

10316	Lower limit of a workpiece zero point offset range No. 01
to	to
10321	Lower limit of a workpiece zero point offset range No. 06

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the lower limit of a workpiece zero point offset range. For an additional workpiece coordinate system, set a value after adding 1000.
These parameters correspond to the workpiece zero point offset lower/upper limits set in parameters Nos. 10304 to 10315.

10322	Upper limit of a workpiece zero point offset range No. 01
to	to
10327	Upper limit of a workpiece zero point offset range No. 06

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the upper limit of a workpiece zero point offset range. For an additional workpiece coordinate system, set a value after adding 1000.
These parameters correspond to the workpiece zero point offset lower/upper limits set in parameters Nos. 10304 to 10315.

10328	Lower limit of workpiece shifts

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a workpiece shift lower limit.

10329	Upper limit of workpiece shifts

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a workpiece shift upper limit.

	#7	#6	#5	#4	#3	#2	#1	#0
10330		ASD	EBC	MID	HSC	ADC	PDC	IIC

[Input type] Parameter input
[Data type] Bit

#0 IIC At the time of incremental input, a confirmation message is:
0: Displayed.
1: Not displayed.

#1 PDC At the time of program deletion, a confirmation message is:
0: Displayed.
1: Not displayed.

#2 ADC At the time of deletion of all data, a confirmation message is:
0: Displayed.
1: Not displayed.

#3 HSC When a cycle start is executed halfway in the program, a confirmation message is:
0: Displayed.
1: Not displayed.

#4 MID Updated modal information is:
0: Highlighted.
1: Not highlighted.

#5 EBC Program sum checking is:
0: Disabled.
1: Enabled.

#6 ASD Axis state display is:
0: Enabled.
1: Disabled.

10331	Lower limit of external workpiece zero point offsets

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the lower limit of external workpiece zero point offsets.

10332	Upper limit of external workpiece zero point offsets

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the upper limit of external workpiece zero point offsets.

	#7	#6	#5	#4	#3	#2	#1	#0
10335								MSC

[Input type] Parameter input
[Data type] Bit path

#0 MSC A recheck on the intermediate block start of the incorrect operation prevention function is:
0: Enabled independently for each path.
1: Enabled for the local path and those paths for this parameter is set to 1.

4.72 PARAMETERS OF AUTOMATIC DATA BACKUP

	#7	#6	#5	#4	#3	#2	#1	#0
10340	EEB	EIB				AAP	ABI	ABP

[Input type] Parameter input
[Data type] Bit

#0 ABP Automatic data backup at power-on is:
0: Disabled.
1: Enabled.

#1 ABI Overwrite-protected backup data is:
0: Regarded as invalid.
1: Regarded as valid.

#2 AAP Backup of NC programs and directory information in FROM is:
0: Disabled.
1: Enabled.

#6 EIB When the CNC is turned on next, overwrite-protected backup data is:
0: Not updated.
1: Updated.

> **NOTE**
> This parameter is valid when 2 or a greater value is set in parameter No. 10342, and bit 1 (ABI) of parameter No. 10340 is set to 1.

#7 EEB When an emergency stop occurs, a backup operation is:
0: Not performed.
1: Performed.

> **NOTE**
> This parameter is valid when 1 or a greater value is set in parameter No. 10342.

10341	Interval at which automatic data backup is performed periodically

[Input type] Parameter input
[Data type] Word
[Unit of data] No unit
[Valid data range] 0 to 365

When automatic data backup is performed periodically, this parameter sets the interval as the number of days. When the power is turned on after a set number of days has passed from the date of the previous backup, a backup operation is performed. If 0 is set in this parameter, this function is disabled.

10342	Number of backup data items

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Unit of data] No unit
[Valid data range] 0 to 3

This parameter sets the number of backup data items. If 0 is specified, backup is not performed.

4.73 PARAMETERS OF AXIS CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
10345	HPW				HPA		L2D	

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#1 L2D When the forbidden area of the stored stroke check 2, 3 (Parameter No.1322, 1323) is set or it is changed by G22 command, the setting value for axes with diameter specification is:
0: Half of command value
1: Command value

#3 HPA When the PMC axis control is executed on the axis that is not related to the high-speed cycle machining during the high-speed cycle machining, the acceleration/deceleration after interpolation on the axis of the PMC axis control:
0: Cannot be applied.
1: Can be applied.

#7 HPW When the parameter is changed during high-speed cycle machining or high-speed binary program operation, the change of the parameter concerning the axis control is:
0: Not prohibited.
1: Prohibited.

⚠ CAUTION
1 Avoid the change of the parameter concerning the axis control during high-speed cycle machining or high-speed binary program operation. If the parameter is changed, Behavior is decided by this parameter.
2 When parameter HPW is set to 0, the execution of high-speed cycle machining or high-speed binary program operation might be interrupted. If there is no problem in use, the setting to parameter HPW=1 is recommended.

	#7	#6	#5	#4	#3	#2	#1	#0
10350	AOS		ECR		SOT			PSI

[Input type] Parameter input
[Data type] Bit

#0 PSI Pulse superimposed function is:
0: Disabled.
1: Enabled.

NOTE
Use the pulse superimposed mode switching signal PSIM <Gn578.7> to enable and disable the pulse superimposed function.

#3 SOT In chopping function by flexible synchronous control, stored stroke check 1 for slave axis of flexible synchronous control is:
0: Disabled.
1: Enabled.

#5 ECR In case of high-speed cycle machining, the magnification setting of the cycle repeat count for high-speed cycle machining data is
0: Disabled.
1: Enabled.

> **NOTE**
> 1 This parameter is valid, when number of controlled axes for high-speed cycle machining is 4 or less. If 5 or more axes are specified, alarm PS0115, "VARIABLE NO. OUT OF RANGE" is issued.
> 2 When the cycle repeat count is set to 0, the cycle is executed once regardless of the magnification setting of the cycle repeat count.
> 3 When the remaining repeat count for each cycle exceeds 32767, the remaining repeat count for each cycle of high-speed cycle machining operation information output function is output 32767.

#7 AOS When the number of control paths in a system is 2 or more, the high-speed cycle cutting function is:
0: Not executed.
1: Executed.

	#7	#6	#5	#4	#3	#2	#1	#0
10351						DWS		

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#2 DWS Dwell status signal DWL <Fn526.5> is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10359								
					KVD	KVC	KVB	KVA

[Input type] Parameter input
[Data type] Bit path

#0 KVA The gear ratio override signal of flexible synchronization group A is:
0: Disabled (fixed at 100%).
1: Enabled.

#1 KVB The gear ratio override signal of flexible synchronization group B is:
0: Disabled (fixed at 100%).
1: Enabled.

#2 KVC The gear ratio override signal of flexible synchronization group C is:
0: Disabled (fixed at 100%).
1: Enabled.

#3 KVD The gear ratio override signal of flexible synchronization group D is:
0: Disabled (fixed at 100%).
1: Enabled.

4.74 PARAMETERS OF PARALLEL AXIS CONTROL

10360	Bias value for the offset number of a tool offset for each axis

[Input type] Setting input
[Data type] Word axis
[Valid data range] 0 to the number of tool offsets

When parallel operation is performed, this parameter specifies a bias value for the offset number of a tool offset for each axis. The offset data to be used as a tool offset for an axis has a number obtained by adding a value set in this parameter for the axis to a specified offset number.

10361	Bias for the offset number of tool length compensation for each axis

[Input type] Setting input
[Data type] Word axis
[Valid data range] 0 to the number of tool offsets

When parallel operation is performed, this parameter specifies a bias value for the offset number of tool length compensation for each axis. The offset data to be used as the tool length compensation amount for an axis has a number obtained by adding a value set in this parameter for the axis to a specified offset number.

4.75 PARAMETERS OF AXIS SWITCHING

	#7	#6	#5	#4	#3	#2	#1	#0
10370								RPC

[Input type] Setting input
[Data type] Bit path

#0 RPC When a return from the reference position (G29) is made, axis switching is:
0: Disabled.
1: Enabled.

10371	Axis switching number

[Input type] Setting input
[Data type] Byte path
[Valid data range] 0 to 5

One of six types of axis switching can be selected by setting its axis switching number in this parameter. Programmed addresses X, Y, and Z correspond to machine axes x, y, and z as follows:

Axis switching No.	Programmed address		
	X	Y	Z
0	x	y	z

Axis switching No.	Programmed address		
	X	Y	Z
1	x	z	y
2	y	x	z
3	y	z	x
4	z	x	y
5	z	y	x

Axis switching number 0 indicates that axis switching is not performed.

4.76 PARAMETERS OF AXIS CONTROL BY PMC (2 OF 4)

	#7	#6	#5	#4	#3	#2	#1	#0
10410							EAX	NRT

[Input type] Parameter input
[Data type] Bit axis

#0 NRT In tool retract and recover or manual intervention and return, the axis is:
0: Subject to tool retract and recover or manual intervention and return.
1: Not subject to tool retract and recover or manual intervention and return.

#1 EAX When other axis is preset with the workpiece coordinate system preset signal while this axis is moving under the PMC axis control:
0: The alarm (PS1820), "ILLEGAL DI SIGNAL STATE" occurs.
1: An alarm doesn't occur.

4.77 PARAMETERS OF SCREEN DISPLAY COLORS (2 OF 2)

10421	RGB value of color palette 1 for text for color set 2
10422	RGB value of color palette 2 for text for color set 2
to	to
10435	RGB value of color palette 15 for text for color set 2

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 151515
Each of these parameters sets the RGB value of each color palette for text by specifying a 6-digit number as described below.
rrggbb: 6-digit number (rr: red data, gg: green data, bb: blue data)
The valid data range of each color is 0 to 15 (same as the tone levels on the color setting screen). When a number equal to or greater than 16 is specified, the specification of 15 is assumed.
[Example] When the tone level of a color is: red:1 green:2, blue:3, set 10203 in the parameter.

10461	RGB value of color palette 1 for text for color set 3
10462	RGB value of color palette 2 for text for color set 3
to	to
10475	RGB value of color palette 15 for text for color set 3

[Input type] Parameter input
[Data type] 2-word

[Valid data range] 0 to 151515

Each of these parameters sets the RGB value of each color palette for text by specifying a 6-digit number as described below.

rrggbb: 6-digit number (rr: red data, gg: green data, bb: blue data)

The valid data range of each color is 0 to 15 (same as the tone levels on the color setting screen). When a number equal to or greater than 16 is specified, the specification of 15 is assumed.

[Example] When the tone level of a color is: red:1 green:2, blue:3, set 10203 in the parameter.

4.78 PARAMETERS OF HIGH-SPEED SMOOTH TCP (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
10485								**STC**

[Input type] Setting input

[Data type] Bit path

#0 STC If, in a start block of Tool Center Point Control or Cutting Point Command (G43.4, G43.5, G43.8, G43.9), address "L" is omitted, Tool Center Point Control or Cutting Point Command is:

0: Started as normal Tool Center Point Control or Cutting Point Command.

1: Started as High-speed Smooth TCP (Rotation axes compensation).

10486	**First rotation axis compensation tolerance in High-speed Smooth TCP mode (G43.4L1, G43.5L1, G43.8L1, G43.9L1)**

[Input type] Setting input

[Data type] Real path

[Unit of data] degree

[Min. unit of data] Depend on the increment system of the reference axis

[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))

(When the increment system is IS-B, 0.0 to +999999.999)

If the first rotation axis is compensated in Rotation axes compensation (G43.4L1, G43.5L1, G43.8L1, G43.9L1), the maximum change from the specified value before compensation is limited by this setting.

The first rotation axis is the axis specified for parameter No. 19681.

If 0 is set in this parameter, the first rotation axis is not compensated.

If a value other than 0 is set in parameter No. 10490, this parameter is clamped with the value of parameter No. 10490 as the upper limit.

10487	**Second rotation axis compensation tolerance in High-speed Smooth TCP mode (G43.4L1, G43.5L1, G43.8L1, G43.9L1)**

[Input type] Setting input

[Data type] Real path

[Unit of data] degree

[Min. unit of data] Depend on the increment system of the reference axis

[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))

(When the increment system is IS-B, 0.0 to +999999.999)

If the second rotation axis is compensated in Rotation axes compensation (G43.4L1, G43.5L1, G43.8L1, G43.9L1), the maximum change from the specified value before compensation is limited by this setting.

The second rotation axis is the axis specified for parameter No. 19686.
If 0 is set in this parameter, the second rotation axis is not compensated.
If a value other than 0 is set in parameter No. 10491, this parameter is clamped with the value of parameter No. 10491 as the upper limit.

10490	Maximum first rotation axis compensation tolerance in High-speed Smooth TCP mode (G43.4L1, G43.5L1, G43.8L1, G43.9L1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
If a value other than 0 is set in this parameter and the setting of parameter No. 10486 is equal to or greater than the setting of this parameter, the setting of this parameter is regarded as the setting of parameter No. 10486.
If 0 is set in this parameter, parameter No. 10486 is not limited.

10491	Maximum second rotation axis compensation tolerance in High-speed Smooth TCP mode (G43.4L1, G43.5L1, G43.8L1, G43.9L1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
If a value other than 0 is set in this parameter and the setting of parameter No. 10487 is equal to or greater than the setting of this parameter, the setting of this parameter is regarded as the setting of parameter No. 10487.
If 0 is set in this parameter, parameter No. 10487 is not limited.

4.79 PARAMETERS OF DUAL CHECK SAFETY (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
10500					STP		APM	AVM

10501	
to	to
10596	

These parameters are related to Dual Check Safety.
See Dual Check Safety CONNECTION MANUAL (B-64483EN-2) for details.

4.80 PARAMETERS OF WAVEFORM DIAGNOSIS

Parameters Nos. 10600 to 10719 shown below hold initial values and values set through screen manipulations during waveform diagnosis.
These parameters are set by the CNC. So, never input values from the parameter screen.

	#7	#6	#5	#4	#3	#2	#1	#0
10600								

[Input type] Parameter input
[Data type] Bit

10601	
to	to
10719	

[Input type] Parameter input
[Data type] Byte / 2-word

4.81 LATHE/MACHINING CENTER G CODE SYSTEM SWITCHING FUNCTION(1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
10730								TMDx

[Input type] Parameter input
[Data type] Bit axis

#0 TMDx In the M code of the lathe/machining center G code system switching function, the diameter/radius programming is
0: Not switched.
1: Switched.

4.82 PARAMETERS OF THREE-DIMENSIONAL ROTARY ERROR COMPENSATION

10770	1st linear compensation axis for three-dimensional rotary error compensation
10771	2nd linear compensation axis for three-dimensional rotary error compensation
10772	3rd linear compensation axis for three-dimensional rotary error compensation

NOTE
When these parameters are set, Power must be turned off/on.
When the parameter 3RP(No.10797#0)=1, the turning off/on the power is not needed.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes
The linear compensation axes for three-dimensional rotary error compensation are set.

NOTE
As for the two rotary axes, the axes set in the parameters No.19681(1st rotary axis) and No.19686(2nd rotary axis) are used.

10775	**Number of compensation points for 1st linear compensation axis of three-dimensional rotary error compensation**
10776	**Number of compensation points for 2nd linear compensation axis of three-dimensional rotary error compensation**
10777	**Number of compensation points for 3rd linear compensation axis of three-dimensional rotary error compensation**
10778	**Number of compensation points for 1st rotary compensation axis of three-dimensional rotary error compensation**
10779	**Number of compensation points for 2nd rotary compensation axis of three-dimensional rotary error compensation**

NOTE
When these parameters are set, Power must be turned off/on. When the parameter 3RP(No.10797#0)=1, the turning off/on the power is not needed.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0, 2 to 100

The number of compensation points for each axis for three-dimensional rotary error compensation is set.
The two rotary axes for the parameter No.10778 and No.10779 are the axes set in the parameters No.19681(1st rotary axis) and No.19686(2nd rotary axis)

NOTE
The total number of the compensation points ((No.10775*No.10776*No.10777) + (No.10778*No.10779)) must be less than 7812.

10780	**Number of compensation point at reference point of 1st linear axis for three-dimensional rotary error compensation**
10781	**Number of compensation point at reference point of 2nd linear axis for three-dimensional rotary error compensation**
10782	**Number of compensation point at reference point of 3rd linear axis for three-dimensional rotary error compensation**
10783	**Number of compensation point at reference point of 1st rotary axis for three-dimensional rotary error compensation**
10784	**Number of compensation point at reference point of 2nd rotary axis for three-dimensional rotary error compensation**

NOTE
When these parameters are set, Power must be turned off/on. When the parameter 3RP(No.10797#0)=1, the turning off/on the power is not needed.

[Input type] Parameter input
[Data type] Byte path

[Valid data range] 0 to Number of compensation point of each axis
The number of compensation point at reference point (parameter No.1240) of each axis is set within 1 to the number of compensation points. (Not a total compensation point)
The two rotary axes for the parameter No.10783 and No.10784 are the axes set in the parameters No.19681(1st rotary axis) and No.19686(2nd rotary axis).

10785	**Magnification of compensation for linear axis translational error compensation value[ΔX1, ΔY1, ΔZ1]**
10786	**Magnification of compensation for linear axis rotary error compensation value [ΔI1, ΔJ1, ΔK1]**
10787	**Magnification of compensation for rotary axis translational error compensation value[ΔX2, ΔY2, ΔZ2]**
10788	**Magnification of compensation for rotary axis rotary error compensation value [ΔI2, ΔJ2, ΔK2]**

[Input type] Parameter input
[Data type] Integer path
[Unit of data] 0.01
[Valid data range] 0 to 10000
Magnifications of compensation for each axis translational/rotary error compensation value are set. (If smaller than 0 or larger than 10000, the magnification is become 1 time. If 0 is set, the magnification is become 0 time.)

10790	**Compensation interval of 1st linear compensation axis for three-dimensional rotary error compensation**
10791	**Compensation interval of 2nd linear compensation axis for three-dimensional rotary error compensation**
10792	**Compensation interval of 3rd linear compensation axis for three-dimensional rotary error compensation**
10793	**Compensation interval of 1st rotary compensation axis for three-dimensional rotary error compensation**
10794	**Compensation interval of 2nd rotary compensation axis for three-dimensional rotary error compensation**

NOTE
When these parameters are set, Power must be turned off/on. When the parameter 3RP(No.10797#0)=1, the turning off/on the power is not needed.

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (Machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting (A))
(When the increment system is IS-B, +0.001 to +999999.999)
Compensation intervals for three-dimensional rotary error compensation are set.
The two rotary axes for the parameter No.10793 and No.10794 are the axes set in the parameters No.19681(1st rotary axis) and No.19686(2nd rotary axis).

	#7	#6	#5	#4	#3	#2	#1	#0
10796	**3RT**					**3M3**	**3M2**	**3M1**

[Input type] Parameter input
[Data type] Bit path

#0 3M1
#1 3M2
#2 3M3

When three-dimensional rotary error compensation is used in the following case, the relation between linear axis and rotary axis (tool and table / work-piece) is set.
- 5-axis machine of Mixed type
- 4-axis machine
- 3-axis machine

Structure type	Parameter setting value bit 2/1/0	Relation between linear axis and rotary axis (tool and table / work-piece) (X:1st linear axis, Y:2nd linear axis, Z:3rd linear axis, B:1st rotary axis (Tool rotation axis) / Tool side, C:2nd rotary axis (Table rotation axis) / Work-piece side)
(1)	000	B structure moving on XYZ moving
(2)	001	B structure moving on XY moving C structure moving on Z moving
(3)	010	B structure moving on XZ moving C structure moving on Y moving
(4)	011	B structure moving on X moving C structure moving on YZ moving
(5)	100	B structure moving on YZ moving C structure moving on X moving
(6)	101	B structure moving on Y moving C structure moving on XZ moving
(7)	110	B structure moving on Z moving C structure moving on XY moving
(8)	111	C structure moving on XYZ moving

#7 3RT The tool axis direction compensation of three-dimensional rotary error compensation is:
0: Disabled.
1: Enabled.

> **NOTE**
> This parameter is valid when the parameter No.19680 is set to 2 (tool rotation type).

	#7	#6	#5	#4	#3	#2	#1	#0
10797								**3RP**

> **NOTE**
> When these parameters are set, Power must be turned off/on.

[Input type] Parameter input
[Data type] Bit path

#0 3RP When the parameter (No.10770 to 10796) of the three-dimensional rotary error compensation is setting, the turning off the power is:
0: Needed.
1: Not needed.

> **NOTE**
> Please set to 0 in the path that doesn't use three-dimensional rotary error compensation is setting.

4.83 PARAMETERS OF 3-DIMENSIONAL ERROR COMPENSATION

10800	First compensation axis for 3-dimensional error compensation
10801	Second compensation axis for 3-dimensional error compensation
10802	Third compensation axis for 3-dimensional error compensation

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes

These parameters set three compensation axes for applying 3-dimensional error compensation.

10803	Number of compensation points for 3-dimensional error compensation (first compensation axis)
10804	Number of compensation points for 3-dimensional error compensation (second compensation axis)
10805	Number of compensation points for 3-dimensional error compensation (third compensation axis)

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 2 to 100

These parameters set the number of compensation points for each axis for 3-dimensional error compensation.

10806	Compensation point number of the reference position for 3-dimensional error compensation (first compensation axis)
10807	Compensation point number of the reference position for 3-dimensional error compensation (second compensation axis)
10808	Compensation point number of the reference position for 3-dimensional error compensation (third compensation axis)

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path

[Valid data range] 1 to number of compensation points
These parameters set the compensation point number of the reference position (parameter No.1240) for each axis for 3-dimensional error compensation.

10809	Magnification for 3-dimensional error compensation (first compensation axis)
10810	Magnification for 3-dimensional error compensation (second compensation axis)
10811	Magnification for 3-dimensional error compensation (third compensation axis)

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 100
These parameters set the magnification for each axis for 3-dimensional error compensation. (If 0 is set, the magnification is become 0 time.)

10812	Compensation interval for 3-dimensional error compensation (first compensation axis)
10813	Compensation interval for 3-dimensional error compensation (second compensation axis)
10814	Compensation interval for 3-dimensional error compensation (third compensation axis)

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, +0.001 to +999999.999)
These parameters set the compensation interval for each axis for 3-dimensional error compensation.

4.84 PARAMETERS OF 3-DIMENSIONAL MACHINE POSITION COMPENSATION

	#7	#6	#5	#4	#3	#2	#1	#0
10830					AMC			3MC

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit path

#0 3MC 3-dimensional machine position compensation is:
0: Disabled.
1: Enabled.

#3 AMC Moving axis and compensation axis of 3-dimensional machine position compensation are:
0: Specified as the same axis.
1: Specified as the separate axis.

10831	**Axis number of compensation axis 1 subject to 3-dimensional machine position compensation**
10832	**Axis number of compensation axis 2 subject to 3-dimensional machine position compensation**
10833	**Axis number of compensation axis 3 subject to 3-dimensional machine position compensation**

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes
These parameters set the axis numbers of the compensation axes subject to 3-dimensiontal machine position compensation. When these parameters are set to 0, compensation is not performed.

10834	**Machine coordinates of compensation point 1 for compensation axis 1 subject to 3-dimensional machine position compensation**
to	**to**
10843	**Machine coordinates of compensation point 10 for compensation axis 1 subject to 3-dimensional machine position compensation**
10844	**Machine coordinates of compensation point 1 for compensation axis 2 subject to 3-dimensional machine position compensation**
to	**to**
10853	**Machine coordinates of compensation point 10 for compensation axis 2 subject to 3-dimensional machine position compensation**
10854	**Machine coordinates of compensation point 1 for compensation axis 3 subject to 3-dimensional machine position compensation**
to	**to**
10863	**Machine coordinates of compensation point 10 for compensation axis 3 subject to 3-dimensional machine position compensation**

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Valid data range] -999999999 to 999999999
These parameters set the machine coordinates of the compensation points subject to 3-dimensional machine position compensation.

NOTE

1 Set the machine positions of compensation points 1 to 10 so that the following condition is met:
   Compensation point 1 < Compensation point 2 < ... < Compensation point 10
   If a position that does not meet this condition is set, the corresponding compensation point and the subsequent ones will be invalid.
   At least two points must be set.

2 If 10 compensation points are not required, set the machine positions of as many compensation points as necessary, starting with compensation point 1. For those compensation points that are not necessary, they can be set to meet the condition described in NOTE 1 so that they can be excluded from compensation.

3 This function is effective to linear axes only.

4 Outside the compensation range specified with the machine coordinates that have been set, the compensation values of boundary compensation points are always maintained. If compensation is not to be performed outside the compensation range, set the compensation values of boundary compensation points to 0.

10864	**Compensation value 1 of compensation point 1 for compensation axis 1 subject to 3-dimensional machine position compensation**
to	**to**
10873	**Compensation value 10 of compensation point 10 for compensation axis 1 subject to 3-dimensional machine position compensation**
10874	**Compensation value 1 of compensation point 1 for compensation axis 2 subject to 3-dimensional machine position compensation**
to	**to**
10883	**Compensation value 10 of compensation point 10 for compensation axis 2 subject to 3-dimensional machine position compensation**
10884	**Compensation value 1 of compensation point 1 for compensation axis 3 subject to 3-dimensional machine position compensation**
to	**to**
10893	**Compensation value 10 of compensation point 10 for compensation axis 3 subject to 3-dimensional machine position compensation**

NOTE

When these parameters are changed, re-calculated compensation amount is output at once.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

These parameters set the compensation values for the respective compensation points.

10894	**Axis number of moving axis 1 subject to 3-dimensional machine position compensation**
10895	**Axis number of moving axis 2 subject to 3-dimensional machine position compensation**

10896	Axis number of moving axis 3 subject to 3-dimensional machine position compensation

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

These parameters set the axis number of the moving axes subject to 3-dimensiontal machine position compensation. When these parameters are set to 0, compensation is not performed.

NOTE
These parameters are valid when bit 0 (3MC) of parameter No.10830 is set to 1 and bit 3 (AMC) of parameter No.10830 is set to 1 (Moving axis and compensation axis are specified as the separate axis).

4.85 PARAMETERS OF ROTATION AREA INTERFERENCE CHECK (1 OF 2)

10900	Axis number of the first axis of the plane on which group D is moved

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)

Setting value)
1 to 32 : controlled axes on own path
101 to 132 : controlled axes on path1
201 to 232 : controlled axes on path2
:
901 to 932 : controlled axes on path9
1001 to 1032 : controlled axes on path10

This parameter sets the axis number of the first axis of the group-D movement plane.
Set the axis number of the axis parallel to the first axis of the group-A movement plane.
If there is no relevant movement axis, set 0.

10901	Axis number of the second axis of the plane on which group D is moved

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)

Setting value)

1 to 32	: controlled axes on own path
101 to 132	: controlled axes on path1
201 to 232	: controlled axes on path2
:	
901 to 932	: controlled axes on path9
1001 to 1032	: controlled axes on path10

This parameter sets the axis number of the second axis of the group-D movement plane.
Set the axis number of the axis parallel to the second axis of the group-A movement plane.
If there is no relevant movement axis, set 0.

10902	Axis number of the rotary axis on which group D is rotated

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)

Setting value)

1 to 32	: controlled axes on own path
101 to 132	: controlled axes on path1
201 to 232	: controlled axes on path2
:	
901 to 932	: controlled axes on path9
1001 to 1032	: controlled axes on path10

This parameter sets the axis number of a rotation axis used for rotating group-D.
If there is no relevant rotary axis, set 0.

NOTE
All the controlled axes which belong to group-D must be assigned to be the same path.

10903	Maximum point of rectangle 1 of group D in the first axis
10904	Minimum point of rectangle 1 of group D in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 1 of group D in the first axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

10905	Maximum point of rectangle 1 of group D in the second axis
10906	Minimum point of rectangle 1 of group D in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 1 of group D in the second axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

10907	Maximum point of rectangle 2 of group D in the first axis
10908	Minimum point of rectangle 2 of group D in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 2 of group D in the first axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

10909	Maximum point of rectangle 2 of group D in the second axis
10910	Minimum point of rectangle 2 of group D in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 2 of group D in the second axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

10911	Maximum point of rectangle 3 of group D in the first axis
10912	Minimum point of rectangle 3 of group D in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 3 of group D in the first axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

10913	Maximum point of rectangle 3 of group D in the second axis
10914	Minimum point of rectangle 3 of group D in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 3 of group D in the second axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

10915	Maximum point of rectangle 4 of group D in the first axis
10916	Minimum point of rectangle 4 of group D in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 4 of group D in the first axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

10917	Maximum point of rectangle 4 of group D in the second axis
10918	Minimum point of rectangle 4 of group D in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 4 of group D in the second axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

10919	Rotation center in the first axis when group-D is rotated
10920	Rotation center in the second axis when group-D is rotated

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the rotation center when group D is rotated.
Set the distances from the machine zero point after reference position return has been performed for group-D movement axes.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

10921	Reference angular displacement of the rotation axis of group D

[Input type] Parameter input
[Data type] Real
[Unit of data] degree (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the coordinate value (reference angular displacement) of the rotation axis when rectangle areas of group D are set for the interference check function.
If there is no relevant rotation axis, set 0.

4.86 PARAMETERS OF BUILT-IN 3D INTERFERENCE CHECK

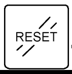
	#7	#6	#5	#4	#3	#2	#1	#0
10930	TFU	ENO	IIA	ICN	ICV	ICT	ICD	ICE

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 ICE Built-in 3D interference check function is:
- 0: Enabled.
- 1: Disabled.

However, the setting related to 3D interference check is effective.
This parameter can disable built-in 3D interference check function. This parameter allows 3D interference check setting to be made while a movement is being made on an axis, even before the setting of built-in 3D interference check function is not completed.

> **NOTE**
> With a machine that uses built-in 3D interference check function, set 0 to ICE usually. If ICE is 1, the alarm (PS0494), “3DCHK FUNCTION INVALID” is issued at power-on time. This alarm can be reset by pressing the MDI keys 
>
> and 
>
> .

#1 ICD Built-in 3D interference check setting screen is:
- 0: Displayed.
- 1: Not displayed.

#2 ICT The method for built-in 3D interference check function to find tool offset number changed is:
- 0: The PMC window (function code 431)
- 1: The tool management function with the PMC window (function code 329)

#3 ICV In built-in 3D interference function, when 0 is specified for the figure number of valid figure of the 3D interference check:
- 0: Figure 1 is effective.
- 1: No figure. (Removed from interference check target)

#4 ICN In the method of notifying the tool change for built-in 3D interference function,, which is specified by bit 2 (ICT) of parameter No.10930, when 0 is specified for the tool offset number, or the first spindle number of tool management function:
- 0: Tool figure and tool-holder figure are not changed.
- 1: The tool is removed from the interference check target, and tool holder figure follows parameters Nos.10960 to 10963.

#5 IIA In built-in 3D interference function, in case bit 2 (ICT) of parameter No.10930 is 0, if the specified tool offset number is invalid:
- 0: Alarm PS0492, "3DCHK FIG. ILLEGAL: [Target name]", is issued.
  (The figure of interference check target is invalid.)
- 1: Alarm PS0492 is not issued and tool figure and tool-holder figure are not changed.
  It can be confirmed whether figure is invalid by the completion code of the PMC window (function code 431).

#6 ENO In built-in 3D interference check function, when the number of controlled paths is 1, the number of object is:
- 0: Three.
- 1: Six.

#7 TFU The update function of the tool figure by built-in 3D interference check setting change signal TDICHG <G0519.4> is:
0: Invalid.
1: Valid.

	#7	#6	#5	#4	#3	#2	#1	#0
10931	TDIC107	TDIC106	TDIC105	TDIC104	TDIC103	TDIC102	TDIC101	TDIC100

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC100 In built-in 3D interference check function, check for interference between tool 1 and tool holder 1 is:
0: Disabled.
1: Enabled.

#1 TDIC101 In built-in 3D interference check function, check for interference between tool 1 and object 1 is:
0: Enabled.
1: Disabled.

#2 TDIC102 In built-in 3D interference check function, check for interference between tool 1 and object 2 is:
0: Enabled.
1: Disabled.

#3 TDIC103 In built-in 3D interference check function, check for interference between tool 1 and object 3 is:
0: Enabled.
1: Disabled.

#4 TDIC104 In built-in 3D interference check function, check for interference between tool holder 1 and object 1 is:
0: Enabled.
1: Disabled.

#5 TDIC105 In built-in 3D interference check function, check for interference between tool holder 1 and object 2 is:
0: Enabled.
1: Disabled.

#6 TDIC106 In built-in 3D interference check function, check for interference between tool holder 1 and object 3 is:
0: Enabled.
1: Disabled.

#7 TDIC107 In built-in 3D interference check function, check for interference between object 1 and object 2 is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10932							TDIC109	TDIC108

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC108 In built-in 3D interference check function, check for interference between object 1 and object 3 is:
0: Disabled.
1: Enabled.

#1 TDIC109 In built-in 3D interference check function, check for interference between object 2 and object 3 is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10933	TDIC207	TDIC206	TDIC205	TDIC204	TDIC203	TDIC202	TDIC201	TDIC200

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC200 In built-in 3D interference check function, check for interference between tool 1 and tool object 4 is:
0: Enabled.
1: Disabled.

#1 TDIC201 In built-in 3D interference check function, check for interference between tool 1 and object 5 is:
0: Enabled.
1: Disabled.

#2 TDIC202 In built-in 3D interference check function, check for interference between tool 1 and object 6 is:
0: Enabled.
1: Disabled.

#3 TDIC203 In built-in 3D interference check function, check for interference between tool holder 1 and object 4 is:
0: Enabled.
1: Disabled.

#4 TDIC204 In built-in 3D interference check function, check for interference between tool holder 1 and object 5 is:
0: Enabled.
1: Disabled.

#5 TDIC205 In built-in 3D interference check function, check for interference between tool holder 1 and object 6 is:
0: Enabled.
1: Disabled.

#6 TDIC206 In built-in 3D interference check function, check for interference between object 1 and object 4 is:
0: Disabled.
1: Enabled.

#7 TDIC207 In built-in 3D interference check function, check for interference between object 1 and object 5 is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10934	TDIC215	TDIC214	TDIC213	TDIC212	TDIC211	TDIC210	TDIC209	TDIC208

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC208 In built-in 3D interference check function, check for interference between object 1 and object 6 is:
0: Disabled.
1: Enabled.

#1 TDIC209 In built-in 3D interference check function, check for interference between object 2 and object 4 is:
0: Disabled.
1: Enabled.

#2 TDIC210 In built-in 3D interference check function, check for interference between object 2 and object 5 is:
0: Disabled.
1: Enabled.

#3 TDIC211 In built-in 3D interference check function, check for interference between object 2 and object 6 is:
0: Disabled.
1: Enabled.

#4 TDIC212 In built-in 3D interference check function, check for interference between object 3 and object 4 is:
0: Disabled.
1: Enabled.

#5 TDIC213 In built-in 3D interference check function, check for interference between object 3 and object 5 is:
0: Disabled.
1: Enabled.

#6 TDIC214 In built-in 3D interference check function, check for interference between object 3 and object 6 is:
0: Disabled.
1: Enabled.

#7 TDIC215 In built-in 3D interference check function, check for interference between object 4 and object 5 is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10935	TDIC223	TDIC222	TDIC221	TDIC220	TDIC219	TDIC218	TDIC217	TDIC216

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC216 In built-in 3D interference check function, check for interference between object 4 and object 6 is:
0: Disabled.
1: Enabled.

#1 TDIC217 In built-in 3D interference check function, check for interference between object 5 and object 6 is:
0: Disabled.
1: Enabled.

#2 TDIC218 In built-in 3D interference check function, check for interference between tool 1 and tool 2 is:
0: Enabled.
1: Disabled.

#3 TDIC219 In built-in 3D interference check function, check for interference between tool 1 and tool holder 2 is:
0: Enabled.
1: Disabled.

#4 TDIC220 In built-in 3D interference check function, check for interference between tool holder 1 and tool 2 is:
0: Enabled.
1: Disabled.

#5 TDIC221 In built-in 3D interference check function, check for interference between tool holder 1 and tool holder 2 is:
0: Enabled.
1: Disabled.

#6 TDIC222 In built-in 3D interference check function, check for interference between object 1 and tool 2 is:
0: Enabled.
1: Disabled.

#7 TDIC223 In built-in 3D interference check function, check for interference between object 1 and tool holder 2 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10936	TDIC231	TDIC230	TDIC229	TDIC228	TDIC227	TDIC226	TDIC225	TDIC224

[Input type] Parameter input
[Data type] Bit

⚠ **CAUTION**
This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC224 In built-in 3D interference check function, check for interference between object 2 and tool 2 is:
0: Enabled.
1: Disabled.

#1 TDIC225 In built-in 3D interference check function, check for interference between object 2 and tool holder 2 is:
0: Enabled.
1: Disabled.

#2 TDIC226 In built-in 3D interference check function, check for interference between object 3 and tool 2 is:
0: Enabled.
1: Disabled.

#3 TDIC227 In built-in 3D interference check function, check for interference between object 3 and tool holder 2 is:
0: Enabled.
1: Disabled.

#4 TDIC228 In built-in 3D interference check function, check for interference between object 4 and tool 2 is:
0: Enabled.
1: Disabled.

#5 TDIC229 In built-in 3D interference check function, check for interference between object 4 and tool holder 2 is:
0: Enabled.
1: Disabled.

#6 TDIC230 In built-in 3D interference check function, check for interference between object 5 and tool 2 is:
0: Enabled.
1: Disabled.

#7 TDIC231 In built-in 3D interference check function, check for interference between object 5 and tool holder 2 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10937						TDIC234	TDIC233	TDIC232

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC232 In built-in 3D interference check function, check for interference between object 6 and tool 2 is:
0: Enabled.
1: Disabled.

#1 TDIC233 In built-in 3D interference check function, check for interference between object 6 and tool holder 2 is:
0: Enabled.
1: Disabled.

#2 TDIC234 In built-in 3D interference check function, check for interference between tool 2 and tool holder 2 is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10938	TDIC307	TDIC306	TDIC305	TDIC304	TDIC303	TDIC302	TDIC301	TDIC300

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to "1".

#0 TDIC300 In built-in 3D interference check function, check for interference between tool 1 and tool 3 is:
0: Enabled.
1: Disabled.

#1 TDIC301 In built-in 3D interference check function, check for interference between tool 1 and tool holder 3 is:
0: Enabled.
1: Disabled.

#2 TDIC302 In built-in 3D interference check function, check for interference between tool holder 1 and tool 3 is:
0: Enabled.
1: Disabled.

#3 TDIC303 In built-in 3D interference check function, check for interference between tool holder 1 and tool holder 3 is:
0: Enabled.
1: Disabled.

#4 TDIC304 In built-in 3D interference check function, check for interference between object 1 and tool 3 is:
0: Enabled.
1: Disabled.

#5 TDIC305 In built-in 3D interference check function, check for interference between object 1 and tool holder 3 is:
0: Enabled.
1: Disabled.

#6 TDIC306 In built-in 3D interference check function, check for interference between object 2 and tool 3 is:
0: Enabled.
1: Disabled.

#7 TDIC307 In built-in 3D interference check function, check for interference between object 2 and tool holder 3 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10939	TDIC315	TDIC314	TDIC313	TDIC312	TDIC311	TDIC310	TDIC309	TDIC308

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC308 In built-in 3D interference check function, check for interference between object 3 and tool 3 is:
0: Enabled.
1: Disabled.

#1 TDIC309 In built-in 3D interference check function, check for interference between object 3 and tool holder 3 is:
0: Enabled.
1: Disabled.

#2 TDIC310 In built-in 3D interference check function, check for interference between object 4 and tool 3 is:
0: Enabled.
1: Disabled.

#3 TDIC311 In built-in 3D interference check function, check for interference between object 4 and tool holder 3 is:
0: Enabled.
1: Disabled.

#4 TDIC312 In built-in 3D interference check function, check for interference between object 5 and tool 3 is:
0: Enabled.
1: Disabled.

#5 TDIC313 In built-in 3D interference check function, check for interference between object 5 and tool holder 3 is:
0: Enabled.
1: Disabled.

#6 TDIC314 In built-in 3D interference check function, check for interference between object 6 and tool 3 is:
0: Enabled.
1: Disabled.

#7 TDIC315 In built-in 3D interference check function, check for interference between object 6 and tool holder 3 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10940				TDIC320	TDIC319	TDIC318	TDIC317	TDIC316

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC316 In built-in 3D interference check function, check for interference between tool 2 and tool 3 is:
0: Enabled.
1: Disabled.

#1 TDIC317 In built-in 3D interference check function, check for interference between tool 2 and tool holder 3 is:
0: Enabled.
1: Disabled.

#2 TDIC318 In built-in 3D interference check function, check for interference between tool holder 2 and tool 3 is:
0: Enabled.
1: Disabled.

#3 TDIC319 In built-in 3D interference check function, check for interference between tool holder 2 and tool holder 3 is:
0: Enabled.
1: Disabled.

#4 TDIC320 In built-in 3D interference check function, check for interference between tool 3 and tool holder 3 is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10941	TDIC407	TDIC406	TDIC405	TDIC404	TDIC403	TDIC402	TDIC401	TDIC400

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC400 In built-in 3D interference check function, check for interference between tool 1 and tool 4 is:
0: Enabled.
1: Disabled.

#1 TDIC401 In built-in 3D interference check function, check for interference between tool 1 and tool holder 4 is:
0: Enabled.
1: Disabled.

#2 TDIC402 In built-in 3D interference check function, check for interference between tool holder 1 and tool 4 is:
0: Enabled.
1: Disabled.

#3 TDIC403 In built-in 3D interference check function, check for interference between tool holder 1 and tool holder 4 is:
0: Enabled.
1: Disabled.

#4 TDIC404 In built-in 3D interference check function, check for interference between object 1 and tool 4 is:
0: Enabled.
1: Disabled.

#5 TDIC405 In built-in 3D interference check function, check for interference between object 1 and tool holder 4 is:
0: Enabled.
1: Disabled.

#6 TDIC406 In built-in 3D interference check function, check for interference between object 2 and tool 4 is:
0: Enabled.
1: Disabled.

#7 TDIC407 In built-in 3D interference check function, check for interference between object 2 and tool holder 4 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10942	TDIC415	TDIC414	TDIC413	TDIC412	TDIC411	TDIC410	TDIC409	TDIC408

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC408 In built-in 3D interference check function, check for interference between object 3 and tool 4 is:
0: Enabled.
1: Disabled.

#1 TDIC409 In built-in 3D interference check function, check for interference between object 3 and tool holder 4 is:
0: Enabled.
1: Disabled.

#2 TDIC410 In built-in 3D interference check function, check for interference between object 4 and tool 4 is:
0: Enabled.
1: Disabled.

#3 TDIC411 In built-in 3D interference check function, check for interference between object 4 and tool holder 4 is:
0: Enabled.
1: Disabled.

#4 TDIC412 In built-in 3D interference check function, check for interference between object 5 and tool 4 is:
0: Enabled.
1: Disabled.

#5 TDIC413 In built-in 3D interference check function, check for interference between object 5 and tool holder 4 is:
0: Enabled.
1: Disabled.

#6 TDIC414 In built-in 3D interference check function, check for interference between object 6 and tool 4 is:
0: Enabled.
1: Disabled.

#7 TDIC415 In built-in 3D interference check function, check for interference between object 6 and tool holder 4 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10943	TDIC423	TDIC422	TDIC421	TDIC420	TDIC419	TDIC418	TDIC417	TDIC416

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIC416 In built-in 3D interference check function, check for interference between tool 2 and tool 4 is:
0: Enabled.
1: Disabled.

#1 TDIC417 In built-in 3D interference check function, check for interference between tool 2 and tool holder 4 is:
0: Enabled.
1: Disabled.

#2 TDIC418 In built-in 3D interference check function, check for interference between tool holder 2 and tool 4 is:
0: Enabled.
1: Disabled.

#3 TDIC419 In built-in 3D interference check function, check for interference between tool holder 2 and tool holder 4 is:
0: Enabled.
1: Disabled.

#4 TDIC420 In built-in 3D interference check function, check for interference between tool 3 and tool 4 is:
0: Enabled.
1: Disabled.

#5 TDIC421 In built-in 3D interference check function, check for interference between tool 3 and tool holder 4 is:
0: Enabled.
1: Disabled.

#6 TDIC422 In built-in 3D interference check function, check for interference between tool holder 3 and tool 4 is:
0: Enabled.
1: Disabled.

#7 TDIC423 In built-in 3D interference check function, check for interference between tool holder 3 and tool holder 4 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10944								TDIC424

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to "1".

#0 TDIC424 In built-in 3D interference check function, check for interference between tool 4 1 and tool holder 4 is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10945	TDIR107	TDIR106	TDIR105	TDIR104	TDIR103	TDIR102	TDIR101	TDIR100

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to "1".

#0 TDIR100 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool 1 and tool holder 1 is:
0: Enabled.
1: Disabled.

#1 TDIR101 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool 1 and object 1 is:
0: Enabled.
1: Disabled.

#2 TDIR102 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool 1 and object 2 is:
0: Enabled.
1: Disabled.

#3 TDIR103 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool 1 and object 3 is:
0: Enabled.
1: Disabled.

#4 TDIR104 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool holder 1 and object 1 is:
0: Enabled.
1: Disabled.

#5 TDIR105 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool holder 1 and object 2 is:
0: Enabled.
1: Disabled.

#6 TDIR106 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool holder 1 and object 3 is:
0: Enabled.
1: Disabled.

#7 TDIR107 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 1 and object 2 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10946							TDIR109	TDIR108

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR108 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 1 and object 3 is:
0: Enabled.
1: Disabled.

#1 TDIR109 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and object 3 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10947	TDIR207	TDIR206	TDIR205	TDIR204	TDIR203	TDIR202	TDIR201	TDIR200

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR200 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 1 and tool object 4 is:
0: Enabled.
1: Disabled.

#1 TDIR201 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 1 and object 5 is:
0: Enabled.
1: Disabled.

#2 TDIR202 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool 1 and object 6 is:
0: Enabled.
1: Disabled.

#3 TDIR203 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool holder 1 and object 4 is:
0: Enabled.
1: Disabled.

#4 TDIR204 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool holder 1 and object 5 is:
0: Enabled.
1: Disabled.

#5 TDIR205 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between tool holder 1 and object 6 is:
0: Enabled.
1: Disabled.

#6 TDIR206 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between object 1 and object 4 is:
0: Enabled.
1: Disabled.

#7 TDIR207 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between object 1 and object 5 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10948	TDIR215	TDIR214	TDIR213	TDIR212	TDIR211	TDIR210	TDIR209	TDIR208

[Input type] Parameter input
[Data type] Bit

⚠ **CAUTION**
This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to "1".

#0 TDIR208 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is "1", check for interference between object 1 and object 6 is:
0: Enabled.
1: Disabled.

#1 TDIR209 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and object 4 is:
0: Enabled.
1: Disabled.

#2 TDIR210 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and object 5 is:
0: Enabled.
1: Disabled.

#3 TDIR211 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and object 6 is:
0: Enabled.
1: Disabled.

#4 TDIR212 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and object 4 is:
0: Enabled.
1: Disabled.

#5 TDIR213 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and object 5 is:
0: Enabled.
1: Disabled.

#6 TDIR214 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and object 6 is:
0: Enabled.
1: Disabled.

#7 TDIR215 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 4 and object 5 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10949	TDIR223	TDIR222	TDIR221	TDIR220	TDIR219	TDIR218	TDIR217	TDIR216

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR216 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 4 and object 6 is:
0: Enabled.
1: Disabled.

#1 TDIR217 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 5 and object 6 is:
0: Enabled.
1: Disabled.

#2 TDIR218 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 1 and tool 2 is:
0: Enabled.
1: Disabled.

#3 TDIR219 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 1 and tool holder 2 is:
0: Enabled.
1: Disabled.

#4 TDIR220 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 1 and tool 2 is:
0: Enabled.
1: Disabled.

#5 TDIR221 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 1 and tool holder 2 is:
0: Enabled.
1: Disabled.

#6 TDIR222 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 1 and tool 2 is:
0: Enabled.
1: Disabled.

#7 TDIR223 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 1 and tool holder 2 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10950	TDIR231	TDIR230	TDIR229	TDIR228	TDIR227	TDIR226	TDIR225	TDIR224

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR224 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and tool 2 is:
0: Enabled.
1: Disabled.

#1 TDIR225 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and tool holder 2 is:
0: Enabled.
1: Disabled.

#2 TDIR226 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and tool 2 is:
0: Enabled.
1: Disabled.

#3 TDIR227 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and tool holder 2 is:
0: Enabled.
1: Disabled.

#4 TDIR228 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 4 and tool 2 is:
0: Enabled.
1: Disabled.

#5 TDIR229 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 4 and tool holder 2 is:
0: Enabled.
1: Disabled.

#6 TDIR230 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 5 and tool 2 is:
0: Enabled.
1: Disabled.

#7 TDIR231 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 5 and tool holder 2 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10951						TDIR234	TDIR233	TDIR232

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR232 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 6 and tool 2 is:
0: Enabled.
1: Disabled.

#1 TDIR233 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 6 and tool holder 2 is:
0: Enabled.
1: Disabled.

#2 TDIR234 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 2 and tool holder 2 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10952	TDIR307	TDIR306	TDIR305	TDIR304	TDIR303	TDIR302	TDIR301	TDIR300

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR300 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 1 and tool 3 is:
0: Enabled.
1: Disabled.

#1 TDIR301 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 1 and tool holder 3 is:
0: Enabled.
1: Disabled.

#2 TDIR302 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 1 and tool 3 is:
0: Enabled.
1: Disabled.

#3 TDIR303 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 1 and tool holder 3 is:
0: Enabled.
1: Disabled.

#4 TDIR304 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 1 and tool 3 is:
0: Enabled.
1: Disabled.

#5 TDIR305 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 1 and tool holder 3 is:
0: Enabled.
1: Disabled.

#6 TDIR306 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and tool 3 is:
0: Enabled.
1: Disabled.

#7 TDIR307 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and tool holder 3 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10953	TDIR315	TDIR314	TDIR313	TDIR312	TDIR311	TDIR310	TDIR309	TDIR308

[Input type] Parameter input
[Data type] Bit

⚠ **CAUTION**
This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR308 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and tool 3 is:
0: Enabled.
1: Disabled.

#1 TDIR309 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and tool holder 3 is:
0: Enabled.
1: Disabled.

#2 TDIR310 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 4 and tool 3 is:
0: Enabled.
1: Disabled.

#3 TDIR311 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 4 and tool holder 3 is:
0: Enabled.
1: Disabled.

#4 TDIR312 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 5 and tool 3 is:
0: Enabled.
1: Disabled.

#5 TDIR313 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 5 and tool holder 3 is:
0: Enabled.
1: Disabled.

#6 TDIR314 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 6 and tool 3 is:
0: Enabled.
1: Disabled.

#7 TDIR315 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 6 and tool holder 3 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10954				**TDIR320**	**TDIR319**	**TDIR318**	**TDIR317**	**TDIR316**

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR316 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 2 and tool 3 is:
0: Enabled.
1: Disabled.

#1 TDIR317 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 2 and tool holder 3 is:
0: Enabled.
1: Disabled.

#2 TDIR318 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 2 and tool 3 is:
0: Enabled.
1: Disabled.

#3 TDIR319 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 2 and tool holder 3 is:
0: Enabled.
1: Disabled.

#4 TDIR320 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 3 and tool holder 3 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10955	TDIR407	TDIR406	TDIR405	TDIR404	TDIR403	TDIR402	TDIR401	TDIR400

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR400 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 1 and tool 4 is:
0: Enabled.
1: Disabled.

#1 TDIR401 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 1 and tool holder 4 is:
0: Enabled.
1: Disabled.

#2 TDIR402 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 1 and tool 4 is:
0: Enabled.
1: Disabled.

#3 TDIR403 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 1 and tool holder 4 is:
0: Enabled.
1: Disabled.

#4 TDIR404 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 1 and tool 4 is:
0: Enabled.
1: Disabled.

#5 TDIR405 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 1 and tool holder 4 is:
0: Enabled.
1: Disabled.

#6 TDIR406 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and tool 4 is:
0: Enabled.
1: Disabled.

#7 TDIR407 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 2 and tool holder 4 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10956	TDIR415	TDIR414	TDIR413	TDIR412	TDIR411	TDIR410	TDIR409	TDIR408

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR408 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and tool 4 is:
0: Enabled.
1: Disabled.

#1 TDIR409 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 3 and tool holder 4 is:
0: Enabled.
1: Disabled.

#2 TDIR410 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 4 and tool 4 is:
0: Enabled.
1: Disabled.

#3 TDIR411 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 4 and tool holder 4 is:
0: Enabled.
1: Disabled.

#4 TDIR412 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 5 and tool 4 is:
0: Enabled.
1: Disabled.

#5 TDIR413 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 5 and tool holder 4 is:
0: Enabled.
1: Disabled.

#6 TDIR414 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 6 and tool 4 is:
0: Enabled.
1: Disabled.

#7 TDIR415 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between object 6 and tool holder 4 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10957	TDIR423	TDIR422	TDIR421	TDIR420	TDIR419	TDIR418	TDIR417	TDIR416

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR416 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 2 and tool 4 is:
0: Enabled.
1: Disabled.

#1 TDIR417 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 2 and tool holder 4 is:
0: Enabled.
1: Disabled.

#2 TDIR418 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 2 and tool 4 is:
0: Enabled.
1: Disabled.

#3 TDIR419 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 2 and tool holder 4 is:
0: Enabled.
1: Disabled.

#4 TDIR420 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 3 and tool 4 is:
0: Enabled.
1: Disabled.

#5 TDIR421 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool 3 and tool holder 4 is:
0: Enabled.
1: Disabled.

#6 TDIR422 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 3 and tool 4 is:
0: Enabled.
1: Disabled.

#7 TDIR423 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool holder 3 and tool holder 4 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10958								TDIR424

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIR424 In built-in 3D interference check function, during cutting feed, canned cycle or 3D interference check between specified targets disable signal TDISD is “1”, check for interference between tool4 1 and tool holder 4 is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
10959							3DF	TTD

[Input type] Parameter input
[Data type] Bit

#0 TTD In built-in 3D interference check function, when the tool of the tip figure is automatically made, “tool setting” data in the tool geometry size data is:
0: not considered.
1: considered.

#1 3DF In built-in 3D interference check function, output format of move axis information is:
0: format 1.
1: format 2.

10960	Figure number of tool holder 1 in built-in 3D interference check function

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of tool holder 1 figures
In built-in 3D interference check function, the figure number of tool holder 1 is specified when tool 1 is removed from the interference check target by means that 0 is specified for the tool offset number, or the first spindle number of tool management function.
When this parameter is 0, tool holder 1 is removed from the interference check target.
This parameter is active when bit 4 (ICN) of parameter No.10930 is 1.

10961	Figure number of tool holder 2 in built-in 3D interference check function

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of tool holder 2 figures
In built-in 3D interference check function, the figure number of tool holder 2 is specified when tool 2 is removed from the interference check target by means that 0 is specified for the tool offset number, or the first spindle number of tool management function.
When this parameter is 0, tool holder 2 is removed from the interference check target.
This parameter is active when bit 4 (ICN) of parameter No.10930 is 1.

10962	Figure number of tool holder 3 in built-in 3D interference check function

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of tool holder 3 figures

In built-in 3D interference check function, the figure number of tool holder 3 is specified when tool 3 is removed from the interference check target by means that 0 is specified for the tool offset number, or the first spindle number of tool management function.
When this parameter is 0, tool holder 3 is removed from the interference check target.
This parameter is active when bit 4 (ICN) of parameter No.10930 is 1.

10963	Figure number of tool holder 4 in built-in 3D interference check function

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of tool holder 4 figures

In built-in 3D interference check function, the figure number of tool holder 4 is specified when tool 4 is removed from the interference check target by means that 0 is specified for the tool offset number, or the first spindle number of tool management function.
When this parameter is 0, tool holder 4 is removed from the interference check target.
This parameter is active when bit 4 (ICN) of parameter No.10930 is 1.

10965	Margin width in built-in 3D interference check

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

In built-in 3D interference check function, set interference check margin width. If this parameter is set to 0, margin width is automatically calculated according to the interference check processing time. If this parameter is set to negative value, margin width becomes 0.

	#7	#6	#5	#4	#3	#2	#1	#0
10966	TDISH14	TDIST14	TDISH13	TDIST13	TDISH12	TDIST12	TDISH11	TDIST11

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIST11 In built-in 3D interference check function, when tool 1 and object 1 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#1 TDISH11 In built-in 3D interference check function, when tool holder 1 and object 1 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#2 TDIST12 In built-in 3D interference check function, when tool 2 and object 1 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#3 TDISH12 In built-in 3D interference check function, when tool holder 2 and object 1 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#4 TDIST13 In built-in 3D interference check function, when tool 3 and object 1 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#5 TDISH13 In built-in 3D interference check function, when tool holder 3 and object 1 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#6 TDIST14 In built-in 3D interference check function, when tool 4 and object 1 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#7 TDISH14 In built-in 3D interference check function, when tool holder 4 and object 1 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

	#7	#6	#5	#4	#3	#2	#1	#0
10967	TDISH24	TDIST24	TDISH23	TDIST23	TDISH22	TDIST22	TDISH21	TDIST21

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to "1".

#0 TDIST21 In built-in 3D interference check function, when tool 1 and object 2 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#1 TDISH21 In built-in 3D interference check function, when tool holder 1 and object 2 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#2 TDIST22 In built-in 3D interference check function, when tool 2 and object 2 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#3 TDISH22 In built-in 3D interference check function, when tool holder 2 and object 2 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#4 TDIST23 In built-in 3D interference check function, when tool 3 and object 2 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#5 TDISH23 In built-in 3D interference check function, when tool holder 3 and object 2 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#6 TDIST24 In built-in 3D interference check function, when tool 4 and object 2 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#7 TDISH24 In built-in 3D interference check function, when tool holder 4 and object 2 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

	#7	#6	#5	#4	#3	#2	#1	#0
10968	TDISH34	TDIST34	TDISH33	TDIST33	TDISH32	TDIST32	TDISH31	TDIST31

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIST31 In built-in 3D interference check function, when tool 1 and object 3 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#1 TDISH31 In built-in 3D interference check function, when tool holder 1 and object 3 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#2 TDIST32 In built-in 3D interference check function, when tool 2 and object 3 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#3 TDISH32 In built-in 3D interference check function, when tool holder 2 and object 3 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#4 TDIST33 In built-in 3D interference check function, when tool 3 and object 3 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#5 TDISH33 In built-in 3D interference check function, when tool holder 3 and object 3 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#6 TDIST34 In built-in 3D interference check function, when tool 4 and object 3 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#7 TDISH34 In built-in 3D interference check function, when tool holder 4 and object 3 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

	#7	#6	#5	#4	#3	#2	#1	#0
10969	TDISH44	TDIST44	TDISH43	TDIST43	TDISH42	TDIST42	TDISH41	TDIST41

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to “1”.

#0 TDIST41 In built-in 3D interference check function, when tool 1 and object 4 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#1 TDISH41 In built-in 3D interference check function, when tool holder 1 and object 4 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#2 TDIST42 In built-in 3D interference check function, when tool 2 and object 4 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#3 TDISH42 In built-in 3D interference check function, when tool holder 2 and object 4 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#4 TDIST43 In built-in 3D interference check function, when tool 3 and object 4 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#5 TDISH43 In built-in 3D interference check function, when tool holder 3 and object 4 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#6 TDIST44 In built-in 3D interference check function, when tool 4 and object 4 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#7 TDISH44 In built-in 3D interference check function, when tool holder 4 and object 4 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

	#7	#6	#5	#4	#3	#2	#1	#0
10970	TDISH54	TDIST54	TDISH53	TDIST53	TDISH52	TDIST52	TDISH51	TDIST51

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to "1".

#0 TDIST51 In built-in 3D interference check function, when tool 1 and object 5 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#1 TDISH51 In built-in 3D interference check function, when tool holder 1 and object 5 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#2 TDIST52 In built-in 3D interference check function, when tool 2 and object 5 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#3 TDISH52 In built-in 3D interference check function, when tool holder 2 and object 5 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#4 TDIST53 In built-in 3D interference check function, when tool 3 and object 5 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#5 TDISH53 In built-in 3D interference check function, when tool holder 3 and object 5 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#6 TDIST54 In built-in 3D interference check function, when tool 4 and object 5 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#7 TDISH54 In built-in 3D interference check function, when tool holder 4 and object 5 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

	#7	#6	#5	#4	#3	#2	#1	#0
10971	TDISH64	TDIST64	TDISH63	TDIST63	TDISH62	TDIST62	TDISH61	TDIST61

[Input type] Parameter input
[Data type] Bit

> ⚠ **CAUTION**
> This parameter is not updated until the power supply is turned off once or built-in 3D interference check setting change signal TDICHG<G0519.4> is set to "1".

#0 TDIST61 In built-in 3D interference check function, when tool 1 and object 6 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#1 TDISH61 In built-in 3D interference check function, when tool holder 1 and object 6 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#2 TDIST62 In built-in 3D interference check function, when tool 2 and object 6 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#3 TDISH62 In built-in 3D interference check function, when tool holder 2 and object 6 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#4 TDIST63 In built-in 3D interference check function, when tool 3 and object 6 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#5 TDISH63 In built-in 3D interference check function, when tool holder 3 and object 6 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#6 TDIST64 In built-in 3D interference check function, when tool 4 and object 6 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

#7 TDISH64 In built-in 3D interference check function, when tool holder 4 and object 6 interfere,
0: OT alarm occurs.
1: OT alarm does not occur, and interference is notified by the signal.

4.87 PARAMETERS OF SPINDLE CONTROL WITH SERVO MOTOR

	#7	#6	#5	#4	#3	#2	#1	#0
11000	SRV		SOA				FSR	SPC

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 SPC SV speed control mode of spindle control with servo motor is:
0: Position control type.
1: Velocity control type.

#1 FSR The axis to be subjected to servo motor-based spindle control is of a:
0: Semi-closed system.
1: Full-closed system.

#5 SOA The servo axis used by the spindle control with servo motor is:
0: used as a control axis (move command is enabled).
1: used as a servo axes for spindle use (move command is disabled).
This parameter is only effective on FANUC Series 32*i*-B.

> **NOTE**
> When the designation of servo axes for spindle use (option) is effective, it is necessary to set this parameter in the axis more than the specified number of servo axes for spindle use. The alarm PW0036 "ILLEGAL SETTING FOR SERVO MOTOR SPINDLE" occurs when this parameter setting is not correctly done.

#7 SRV Spindle control with servo motor are:
0: Not performed.
1: Performed

> **NOTE**
> When spindle control with servo motor are used for an axis, parameter No. 11010 must also be set for the axis.

	#7	#6	#5	#4	#3	#2	#1	#0
11001						DDM	TCR	SRB

[Input type] Parameter input
[Data type] Bit axis

#0 SRB Acceleration/deceleration after interpolation in cutting feed during rigid tapping with servo motor is:
0: Linear acceleration/deceleration.
1: Bell-shaped acceleration/deceleration.

#1 TCR In SV speed control mode, time constant of acceleration/deceleration after interpolation for spindle control with servo motor or spindle control with Cs contour control is:
0: The parameter No. 1622.
(Time constant of acceleration/deceleration in cutting feed for each axis)
1: The parameter No. 11016.
(Time constant of acceleration/deceleration in SV speed control mode for each axis)
Set this parameter for the axis to be placed under spindle control with servo motor or spindle control with Cs contour control.

#2 DDM The motor used for spindle control with servo motor is:
0: Not a DD motor.
1: A DD motor.

	#7	#6	#5	#4	#3	#2	#1	#0
11002								NSP

[Input type] Parameter input
[Data type] Bit axis

#0 NSP When SV speed control mode is canceled, spindle indexing is:
0: Executed.
1: Not executed.

	#7	#6	#5	#4	#3	#2	#1	#0
11005					SSY			SIC

[Input type] Parameter input
[Data type] Bit

#0 SIC Spindle indexing is:
0: Performed based on absolute coordinates.
1: Performed based on machine coordinates.

#3 SSY Spindle synchronous control with servo motor is:
0: Disabled.
1: Enabled.

11010	Spindle number used by spindle control with servo motor or spindle control with Cs contour control

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to maximum number of controlled spindles
This parameter sets a spindle number for a servo axis for which spindle control with servo motor or spindle control with Cs contour control are performed.

> **NOTE**
> Set a spindle number for the axes set in bits 6 and 7 of parameter No. 11000. For axes for which spindle control with servo motor or spindle control with Cs contour control are not performed, set 0.

11011	Movement of spindle control with servo motor axis per revolution

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets a movement of axis per revolution for which spindle control with servo motor or spindle control with Cs contour control are performed.

11012	Spindle indexing speed for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

In spindle control with servo motor or spindle control with Cs contour control, set the spindle indexing speed for each axis.
If 0 is set, the spindle indexing speed is assumed to be the setting of parameter No. 11020 (speed (S_0) for switching acceleration/ deceleration for each axis).

11013	Positioning deviation limit for each axis in movement

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets the limit of positional deviation for each axis during movement in spindle control with servo motor or spindle control with Cs contour control.

11014	Positioning deviation limit for each axis in the stopped state

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets the limit of positional deviation at stop for each axis in spindle control with servo motor or spindle control with Cs contour control.

11015	Maximum motor speed

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

This parameter sets the maximum motor speed applicable when spindle control with servo motor or spindle control with Cs contour control are performed.

11016	Time constant of acceleration/deceleration in SV speed control mode for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

In spindle control with servo motor or spindle control with Cs contour control, set the time constant of acceleration/deceleration after interpolation in cutting feed for SV speed control mode. Set the time constant used for exponential acceleration/deceleration in cutting feed, bell-shaped acceleration/deceleration after interpolation or linear acceleration/deceleration after interpolation in cutting feed for each axis. Type of acceleration/deceleration is applied by bits 0 (CTLx) and 1 (CTBx) of parameter No. 1610.

11017	FL rate of exponential acceleration/deceleration in SV speed control mode for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

In spindle control with servo motor or spindle control with Cs contour control, this parameter sets the lowest feedrate (FL rate) in exponential acceleration/deceleration for velocity control.

Set this parameter for the target axis for spindle control with servo motor or spindle control with Cs contour control.

11020	Acceleration/deceleration switching speed (S_0) for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

In spindle control with servo motor or spindle control with Cs contour control, this parameter sets the speed at which acceleration/ deceleration is changed to perform rotation control. (First step)

11021	Acceleration/deceleration switching speed (S_1) for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

In spindle control with servo motor or spindle control with Cs contour control, this parameter sets the speed at which acceleration/ deceleration is changed to perform rotation control. (Second step)

11030	Individual acceleration / deceleration 1 (Leg 1)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] min^{-1}/s
[Valid data range] 0 to 100000

In spindle control with servo motor or spindle control with Cs contour control, this parameter sets acceleration/deceleration to be applied to perform rotation control. When the speed ranges from 0 to acceleration switching speed 1, acceleration/deceleration 1 is applied. Acceleration switching speed 1 is the speed set in parameter No. 11020.

11031	Individual acceleration / deceleration 2 (Leg 2)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] min^{-1}/s
[Valid data range] 0 to 100000

In spindle control with servo motor or spindle control with Cs contour control, this parameter sets acceleration/deceleration to be applied to perform rotation control. When the speed ranges from acceleration switching speed 1 to acceleration switching speed 2, acceleration/ deceleration 2 is applied. Acceleration switching speed 1 and acceleration switching speed 2 are the speeds set in parameter Nos. 11020 and 11021, respectively.

11032	Individual acceleration / deceleration 3 (Leg 3)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] min^{-1}/s
[Valid data range] 0 to 100000

In spindle control with servo motor or spindle control with Cs contour control, this parameter sets acceleration/deceleration to be applied to perform rotation control. When the speed ranges from acceleration switching speed 2 to the maximum speed, acceleration/deceleration 3 is applied. Acceleration switching speed 2 is the speed set in parameter No. 11021.

(When rotation command 8-step acceleration/deceleration in spindle control with Cs contour control is enabled)

In spindle control with servo motor or spindle control with Cs contour control, this parameter sets acceleration/deceleration to be applied to perform rotation control. When the speed ranges from acceleration switching speed 2 to acceleration switching speed 3, acceleration/deceleration 3 is applied. Acceleration switching speed 2 and acceleration switching speed 3 are the speeds set in parameter Nos. 11021 and 11022, respectively.

11050	Maximum allowable acceleration rate in acceleration/deceleration before interpolation for each axis in rigid tapping

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, $inch/sec^2$, $degree/sec^2$ (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)

(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, 0.0 to +10000.0)

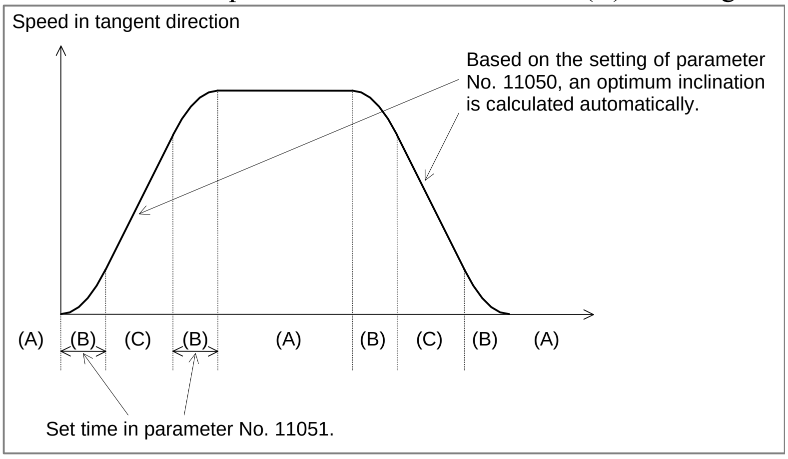
Set a maximum allowable acceleration rate in acceleration/ deceleration before interpolation for each axis.

If a value greater than 100000.0 is set, the value is clamped to 100000.0. If 0 is set, the specification of 100000.0 is assumed. If 0 is set for all axes, however, acceleration/deceleration before interpolation is not performed.

11051	Acceleration change time of bell-shaped acceleration/deceleration before interpolation in rigid tapping

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 200

Set an acceleration change time of bell-shaped acceleration/ deceleration before interpolation (time for changing from the state of constant federate (A) to the state of constant acceleration/deceleration (C) at the acceleration rate calculated from the acceleration rate set in parameter No. 11050: time of (B) in the figure below).



11052	Time constant for acceleration/deceleration after cutting feed interpolation in the acceleration/deceleration before interpolation mode in rigid tapping

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

In the acceleration/deceleration before interpolation mode as in AI contour control, not the ordinary time constant (parameter No. 1622) but the value of this parameter is used.
Be sure to specify the same time constant value for all axes except for a special application.
If different values are set, correct linear and circular figures cannot be obtained.

11060	Time constant for acceleration/deceleration after cutting feed interpolation in rigid tapping (first gear)
11061	Time constant for acceleration/deceleration after cutting feed interpolation in rigid tapping (second gear)
11062	Time constant for acceleration/deceleration after cutting feed interpolation in rigid tapping (third gear)
11063	Time constant for acceleration/deceleration after cutting feed interpolation in rigid tapping (fourth gear)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

For the time constants in rigid tapping with servo motors, parameters Nos. 11060 to 11063 are used, not parameters Nos. 5261 to 5264.
Set these parameters with a live tool axis in rigid tapping.

11065	Time constant for acceleration/deceleration after cutting feed interpolation in rigid tapping extraction (first gear)
11066	Time constant for acceleration/deceleration after cutting feed interpolation in rigid tapping extraction (second gear)
11067	Time constant for acceleration/deceleration after cutting feed interpolation in rigid tapping extraction (third gear)
11068	Time constant for acceleration/deceleration after cutting feed interpolation in rigid tapping extraction (fourth gear)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

If bit 2 (TDR) of parameter No. 5201 is set to 1, for the time constants in rigid tapping extraction with servo motors, parameters Nos. 11065 to 11068 are used, not parameters Nos. 5271 to 5274.
Set these parameters with a live tool axis in rigid tapping.

11090	Path number with which the rotation of each spindle is specified

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to 10

When a path is specified for spindle commands, this parameter sets a path number with which the rotation of a spindle can be specified.
0: Spindle commands can be issued from all paths.
1 to 10: Spindle commands can be issued from a set path.

NOTE
1 This parameter is valid when SPSP<Gn536.7> is set to “1”.
2 If the setting is illegal, an alarm PS5305, “ILLEGAL SPINDLE NUMBER” is issued when a spindle command is issued from any one of the paths.
3 This setting does not apply to spindle commands using the spindle select signals SWS1 to SWS4<Gn027.0 to Gn027.2, Gn026.3>.

4.88 PARAMETERS OF PATH TABLE OPERATION

11100	M code for Path Table Operation

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 1 to 99999999

M code for starting Path Table Operation is specified. The value should be out of the waiting M-code (Less than Parameter No.8110 or larger than parameter No.8111.)

11101	Tolerance between actual position and command value of Path Table start block

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)

[Valid data range] 0 or 9-digit of least input increment. In case of IS-B, the valid value is 0 or 0.001 to +999999.999.
At the start of the Path Table Operation, the difference between the actual axis coordinate and the axis command value is checked. If the difference exceeds the parameter, the alarm is generated. If 0 is set in the parameter, no check is carried out.

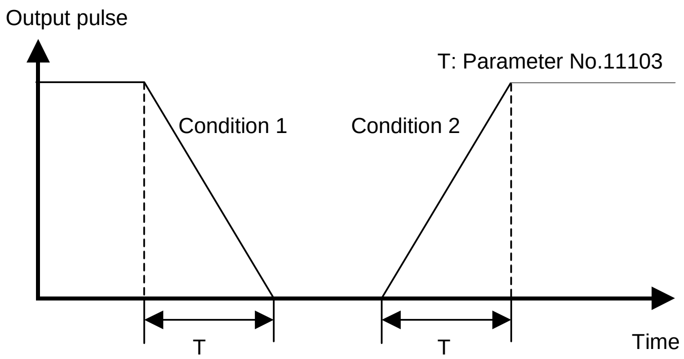
11102	Tolerance between actual spindle speed and command value of Path Table start block

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0, 1 to +99999999
At the start of the Path Table Operation, the difference between the actual spindle speed and commanded spindle speed at the spindle command table is checked. If the difference exceeds the parameter, the alarm is generated. If 0 is set in the parameter, no check is carried out.

NOTE
In case of the slave spindle of synchronized spindle control or constant surface speed control, no check is carried out.

11103	Time constant of Path Table Operation in deceleration stop or restart

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767
The time constant for feed hold, reset or alarm status in Path Table Operation, is set (Condition 1). The time constant for restart in Path Table Operation, is set(Condition 2). The parameter is set in path(head) 1. The parameter is common to all path(head).



NOTE
When setting the larger value in this parameter, the deceleration time expands and the distance to stop becomes longer. This parameter is not effective for the emergency stop or servo alarm stop.

	#7	#6	#5	#4	#3	#2	#1	#0
11104							PSM	PCA

[Input type] Parameter input
[Data type] Bit

#0 PCA When the Path Table operation mode, the position command and the standard coordinate command is:

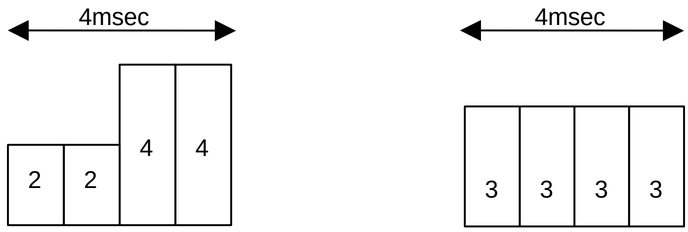
0: input unit of the value of the machine coordinate system.
1: input unit of the value of the workpiece coordinate system.

#1 PSM In Path Table Operation, smoothing of axis movement commands is:

0: not executed.
1: executed.

When bit 1 (PSM) of parameter No.11104 is set to 1, the reductive effect of torque command by acceleration/deceleration after interpolation becomes larger because the timing of changing speed by axis movement commands is in every 4msec. If bit 1 (PSM) of parameter No.11104 is set, set the time constant of acceleration/deceleration after interpolation (parameter No.11110) too. As the time constant of acceleration/deceleration after interpolation is larger, the reductive effect of torque command by bit 1 (PSM) of parameter No.11104 becomes larger.

Parameter PSM = 0 Parameter PSM = 1
Speed changes in every 1msec. Speed changes in every 4msec.



11108	The amount of a change in the override every 4msec for Path Table Operation

[Input type] Parameter input
[Data type] Byte
[Unit of data] %
[Valid data range] 0, 1 to 100

The amount of a change in the Path Table override every 4msec. When this parameter is set to 1, it takes 400msec until the actual override is 0% if the Path Table override signal G0520 is changed from 100% to 0%. When this parameter value is 0,this function becomes invalid.

	#7	#6	#5	#4	#3	#2	#1	#0
11109							PBBx	

[Input type] Parameter input
[Data type] Bit axis

#1 PBBx Acceleration/deceleration after interpolation in Path Table Operation:

0: linear acceleration/deceleration is applied.
1: bell-shaped acceleration/deceleration is applied.

11110	Time constant of acceleration/deceleration after cutting feed interpolation in Path Table Operation

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

Set the time constant of acceleration/deceleration after interpolation in Path Table Operation. The time constant of bell-shaped acceleration/deceleration after cutting feed interpolation or linear acceleration/deceleration after cutting feed interpolation for each axis is set. Acceleration/deceleration type is selected with bit 1 (PBBx) of parameter No.11109.

11113	Action when feed hold is detected during the table of spindle position reference being executed

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0, 1

When feed hold is detected during the table of spindle position reference being executed:

0: Alarm PS0452, "ILLEGAL PATH TABLE OPERATION" (detail alarm No.74) is issued, and Path Table Operation of all paths is stopped. The spindle is not stopped.

1: The feed hold of Path Table Operation in all paths is invalid. The spindle is not stopped. If feed hold signal *SP<Gn008.5> is "0" when all tables of spindle position reference is finished, feed hold becomes valid. The stop by reset and the stop by the alarm are valid. The feed hold is valid for the path which is not in Path Table Operation.

NOTE

Feed hold is as follows.

- Feed hold with feed hold signal *SP<Gn008.5> = "0"
- Feed hold when CNC mode is switched from MEM mode to the manual operation mode as JOG mode.
- Feed hold by the alarm occurred in the other path (bit 1 (IAL) of parameter No.8100 = 0).
  (However, if Path Table Operation is executed in the path, Path Table Operation of all paths is stopped.)

4.89 PARAMETERS OF WORKPIECE SETTING ERROR COMPENSATION (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
11200					WSK		CL2	RCM

[Input type] Setting input
[Data type] Bit path

#0 RCM When workpiece setting error compensation is performed with a 5-axis machine, tool direction compensation (compensation for a rotation axis) is:

0: Not performed.

1: Performed.

NOTE

In case that tilted working plane indexing and tool center point control are used together, set this parameter to 1.

#1 CL2 In case that rotation axis is compensated during workpiece setting error compensation, the selected position among the multiple candidates of compensated positions is:

0: The position where the path from the current position doesn't pass the singular point.
At this time, the movement range set in parameter Nos. 19741 to 19744 is not considered.

1: The position that is the nearest to the specified position (whose workpiece setting error is not compensated) in consideration of two rotation axis.
At this time, the movement range set in parameter Nos. 19741 to 19744 is considered.

#3 WSK If, during workpiece setting error compensation, system variables #100151 to #100182 (skip coordinates) are read,

0: Values in the workpiece coordinate system can be read.
1: Values in the workpiece setting coordinate system can be read.

This parameter is also applied to system variables #5061 to #5080 (skip coordinates).

11201	The number of decimal places of rotation direction errors in workpiece setting error compensation

[Input type] Setting input
[Data type] Byte path
[Valid data range] 0 to 8

This parameter sets the number of decimal places of rotation direction errors in workpiece setting error compensation.

Parameter No. 11201	1	2	3	4
Least input increment (deg)	0.1	0.01	0.001	0.0001
Maximum settable value (deg)	±99,999,999.9	±9999,999.99	±999,999.999	±99,999.9999

Parameter No. 11201	5	6	7	8
Least input increment (deg)	0.00001	0.000001	0.0000001	0.00000001
Maximum settable value (deg)	±9,999.99999	±999.999999	±99.9999999	±9.99999999

Note, however, that a value from 1 to 8 can be specified in this parameter.
If a value not within the specifiable range is specified in this parameter, the least input increment of the reference axis is followed.

Unit system of reference axis	IS-A	IS-B	IS-C	IS-D	IS-E
Least input increment (deg)	0.01	0.001	0.0001	0.00001	0.000001
Maximum settable value (deg)	±999,999.99	±999,999.999	±99,999.9999	±9,999.99999	±999.999999

11204	Angle to decide singular posture (for Workpiece setting error compensation)

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A)
(When the increment system is IS-B, -999999.999 to +999999.999)

When Tool direction is compensated (bit 0 (RCM) of parameter No. 11200 is set to 1), in the case that Tool center point control is active during Workpiece setting error compensation, 3-dimension coordinates system conversion or Tilted working plane indexing command, rotary axes are compensated. Then, compensation may be different when the tool is in singular posture.
When the angle between the tool posture and the singular posture is less than this parameter, the compensation is done regarding tool posture as singular posture.

4.90 PARAMETERS OF LINEAR INCLINATION COMPENSATION FUNCTION

11208	Numerator for determining the trend of the approximation error line of linear inclination compensation a

11209	Denominator for determining the trend of the approximation error line of linear inclination compensation b

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] None
[Valid data range] -999999999 to 999999999
These parameters sets the numerator and denominator for determining the trend of the approximation error line of linear inclination compensation.

11210	Reference position of linear inclination compensation DST_0

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the machine position DST_0 as the reference point for performing linear inclination compensation.

11211	Linear inclination compensation value CMP_0

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -32767 to 32767
This parameter sets the linear inclination compensation value, CMP_0, not dependent on the machine position.

4.91 PARAMETERS OF TILTED WORKING PLANE INDEXING COMMAND

11220	Minimum distance used for determining a plane when a tilted working plane indexing command with three points is specified

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)

[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))

(When the increment system is IS-B, 0.0 to +999999.999)

When a tilted working plane indexing command with three points is specified, if the distance (used for determining a place) between a straight line passing two points and the remaining one point is short, the plane is unstable. In this parameter, set the minimum distance used for determining a plane. If the distance is shorter than the value set in this parameter, an alarm PS5457, "G68.2/G68.3 FORMAT ERROR" is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
11221		3CS		CFW	TLC	3DW	D3R	MTW

[Input type] Parameter input

[Data type] Bit path

#0 MTW Multiple tilted working plane indexing commands are:

0: Not used.

1: Used.

#1 D3R In the 3-dimensional coordinate system conversion mode, tilted working plane indexing command mode, or workpiece setting error compensation mode, rapid traverse in canned cycle for drilling is:

0: Performed in the cutting feed mode.

1: Performed in the rapid traverse mode.

#2 3DW If, in the 3-dimensional coordinate system conversion mode, workpiece coordinate system selection using a G code is specified, the selection:

0: Operates in accordance with conventional specifications. (The workpiece coordinate system difference is reflected in the program coordinate system direction.)

1: Operates in accordance with the same specifications as those of workpiece coordinate system selection (bit 6 (3TW) of parameter No. 1205 = 1) during the tilted working plane indexing command. (The workpiece coordinate system difference is reflected in the workpiece coordinate system direction.)

> ⚠ **CAUTION**
> If this parameter is set to 1, only G54 to G59 and G54.1 can be specified. If G52 and G92 are specified, alarm PS5462, "ILLEGAL COMMAND (G68.2/G69)" is issued.
> If G54 to G59 and G54.1 are specified, buffering is suppressed.

#3 TLC During tool length compensation, 3-dimensional coordinate conversion:

0: Cannot be used.

1: Can be used.

#4 CFW If the end point of tool axis direction control (G53.1/G53.6) directed using the tilted working plane indexing command is a singular point:

0: The second rotation axis does not operate.

1: The second rotation axis is controlled in such a way that the second feature coordinate system and workpiece coordinate system match with each other in direction.

#6 3CS The spindle speed calculation of constant surface speed control during the 3-dimensional coordinate system conversion / the tilted working plane indexing is :
0: Based on the workpiece coordinate system.
1: Based on the program coordinate system (3-dimensional coordinate system conversion) / the feature coordinate system (Tilted working plane indexing).

4.92 PARAMETERS OF AXIS CONTROL/INCREMENT SYSTEM (2 OF 3)

	#7	#6	#5	#4	#3	#2	#1	#0
11222	PDM					IMG	CIM	NIM

[Input type] Parameter input
[Data type] Bit path

#0 NIM Automatic conversion of a coordinate system by an inch/metric conversion command (G20 or G21) is:
0: Not performed.
1: Performed.

#1 CIM When an inch/metric conversion command (G20 or G21) is specified, if the workpiece coordinate system is shifted by the shift amount as described below:
0: An alarm PS1298, "ILLEGAL INCH/METRIC CONVERSION" is issued.
1: Clearing is performed.

If bit 0 (NIM) of parameter No. 11222 is set to 1, or if bit 2 (IRF) of parameter No. 14000 is set to 1, this parameter clears the following:
- Manual intervention made when the manual absolute signal is off
- Issuance of a move command with the machine locked
- Movement by handle interrupt
- Operation with a mirror image
- Shifting of a workpiece coordinate system when a local coordinate system or workpiece coordinate system is set up

#2 IMG Inch/metric conversion is:
0: Performed with the G20/G21 (G70/G71).
1: Not performed with the G20/G21 (G70/G71).

NOTE
If bit 2 of parameter No. 11222 is 1 (inch/metric conversion with G20/G21 is disabled), only bit 2 of parameter No. 0 can be used to perform inch/metric conversion. If bit 2 of parameter No.0 = 0, the metric system is used. If bit 2 of parameter No.0 = 1, the inch system is used.

#7 PDM When switching between diameter and radius specification is made with the function for dynamic switching of diameter/radius specification, coordinates in the machine coordinate system select command (G53) are:
0: Switched between diameter and radius specification.
1: Set according to the setting of bit 3 (DIAx) of parameter No. 1006.

4.93 PARAMETERS OF DI/DO (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
11223						OPS	TRS	

[Input type] Parameter input
[Data type] Bit path

#1 TRS In threading cycle retraction, when a block that specifies return to the start point of the threading cycle is executed, threading signal THRD <Fn002.3> is:
0: Set to “0”.
1: Set to “1”.

#2 OPS In the MEM mode, when a sequence number search operation ([N SEARCH]) is performed, automatic operation signal OP <Fn000.7> is:
0: Kept “0”.
1: Set to “1”.

4.94 PARAMETERS OF FEEDRATE CONTROL AND ACCELERATION/DECELERATION CONTROL

11230	Distance to the 4th step in positioning by optimum acceleration for each axis D4
11231	Distance to the 5th step in positioning by optimum acceleration for each axis D5
11232	Distance to the 6th step in positioning by optimum acceleration for each axis D6

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Valid data range] Refer to the standard parameter setting table (B)
When using the function for switching the rapid traverse rate, time constant, and loop gain according to the positioning distance, this parameter sets the positioning distance for each axis.

NOTE
1 To use this parameter, set bit 0 (OADx) of parameter No. 6131 to 1.
2 If 0 is set in all of parameters Nos. 6136 to 6138 and 11230 to 11232, this function is disabled.
3 The settings must satisfy the following: D1<D2<D3<D4<D5<D6.
4 Switching in up to seven steps is possible. When up to four steps are used, for example, set parameters so that expression D1<D2<D3 is satisfied, and set a maximum value (such as +999999.999 mm) for D4, D5, and D6.
5 For axes with diameter specification, set a diameter value. If 10.000 mm is set for an axis with diameter specification, for example, switching is made when a movement takes place over a distance of 10.000 mm in diameter.
6 In parameters Nos. 6136 to 6138 and 11230 to 11232, set a distance for each axis. Block lengths must not be specified in these parameters.

	#7	#6	#5	#4	#3	#2	#1	#0
11240			RRB	ARB				FAE

[Input type] Parameter input
[Data type] Bit path

#0 FAE During positioning when the AI contour control mode is canceled, the optimum torque acceleration/deceleration is:
0: Disabled.
1: Enabled.

#4 ARB Acceleration/deceleration before interpolation for rapid traverse in AICC mode off is:
0: Disabled.
1: Enabled.

> **NOTE**
> This parameter is enabled when the parameters for which acceleration/deceleration before interpolation for rapid traverse is enabled are set. (Refer to bit 5 (FRP) of parameter No.19501.)

#5 RRB Acceleration/deceleration before interpolation for rapid traverse in rigid tap is:
0: Disabled.
1: Enabled.

> **NOTE**
> This parameter is enabled when acceleration/deceleration before interpolation for rapid traverse is valid. (Refer to bit 5 (FRP) of parameter No.19501.)

11242	Time constant of acceleration/deceleration after interpolation of acceleration/deceleration before rapid traverse interpolation

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

This parameter is used for the time constant of acceleration/deceleration before rapid traverse interpolation.
Be sure to specify the same time constant value for all axes except for a special application. If different time constants are set, a correct linear line cannot be obtained.

4.95 PARAMETERS OF PROGRAM RESTART (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
11250	OAA	SAV	SPR	MTO	MCO	BOU	TOU	

[Input type] Parameter input
[Data type] Bit path

#1 TOU When the program restart auxiliary function output function is applied in a lathe system, T codes are:
0: Not output to the MDI program.
1: Output to the MDI program.

> **NOTE**
> In a machining center system, they are output regardless of the parameter setting.

#2 BOU When the program restart auxiliary function output function is applied in a lathe system, B codes (second auxiliary function) are:
0: Not output to the MDI program.
1: Output to the MDI program.

> **NOTE**
> In a machining center system, they are output regardless of the parameter setting.

#3 MCO If, in the program restart auxiliary function output function, multiple MSTB codes are specified in the program to restart (or multiple M codes are specified), the output to the MDI program is as follows:
0: Each code is output to a single block.
1: All specified codes are output to a single block.
In either case, the output is in MSTB order.

#4 MTO In the program restart auxiliary function output function, modal T codes are:
0: Not output to the MDI program.
1: Output to the MDI program.

#5 SPR Suppress motion is:
0: Disabled.
1: Enabled.

#6 SAV The suppress motion state is:
0: Not saved to a parameter.
1: Saved to a parameter.

 # 7 OAA In the program restart output function, the approach to the program restart position for each arbitrary axis is:
0: Not used.
1: Used.

	#7	#6	#5	#4	#3	#2	#1	#0
11251				NPN				

[Input type] Parameter input
[Data type] Bit

#4 NPN In the quick program restart function, when restarting operations on the way of the subprogram, the subprogram name is :
0: specified.
1: not specified.

> **NOTE**
> When NPN is set to 1, automatic operation is restarted from the block of the specified sequence number that exists in the main program or the subprogram.

4.96 PARAMETERS OF TOOL CENTER POINT CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
11260	TRC	TFD		TDG		AAI		TCS

[Input type] Parameter input
[Data type] Bit path

#0 TCS If bit 6 (TOS) parameter No. 5006 = 0 and bit 2 (TOP) of parameter No. 11400 = 0, tool center point control cancel (G49) is:
0: Performed by axis movement.
1: Performed by coordinate system shift.

<table>
<tr><th>Parameter</th><th>Tool center point control command</th><th>Cancellation of tool center point control</th></tr>
<tr><td>Bit 6 (TOS) of parameter No.5006 = 0
and
Bit 2 (TOP) of parameter No.11400 = 0,
Bit 0 (TCS) of parameter No.11260 = 0</td><td>Axis movement type</td><td>Axis movement type</td></tr>
<tr><td>TOS = 0 and TOP = 0,
TCS = 1</td><td>Axis movement type</td><td>Coordinate system shift type</td></tr>
<tr><td>TOS = 1 or TOP = 1,
TCS = 0</td><td rowspan="2">Coordinate system shift type</td><td rowspan="2">Coordinate system shift type</td></tr>
<tr><td>TOS = 1 or TOP = 1,
TCS = 1</td></tr>
</table>

#2 AAI When tool center point control(G43.4/G43.5), or cutting point command (G43.8/G43.9) is commanded, AI contour control:
0: does not become active automatically.
1: becomes active automatically.

#4 TDG The distance to go during tool center point control is displayed in:
0: the table coordinate system.
1: the machine coordinate system.

> **NOTE**
> Even if TDG = 0, the distance to go in the machine coordinate system is displayed in the following modes:
> - 3-dimensional coordinate system conversion
> - Tilted working plane indexing command
> - Workpiece setting error compensation

#6 TFD The actual cutting feedrate displayed during tool center point control is:
0: Control point feedrate.
1: Tool center point feedrate.

#7 TRC Rapid traverse during tool during tool center point control results in:
0: Tool path where tool center point control is enabled.
1: Tool path where tool center point control is disabled.

> **NOTE**
> This parameter is regarded as being set to 0 in the following modes:
> 1) 3-dimensional coordinate system conversion
> 2) Tilted working plane indexing command
> 3) Workpiece setting error compensation
> 4) Cutting point command
> If 1 is set in this parameter, manual intervention cannot be performed in rapid traverse during tool center point control. If manual intervention is performed, alarm PS5421," ILLEGAL COMMAND IN G43.4/G43.5" is issued at the cycle start after manual intervention.

11261	The amount of a retract operation in the tool axis direction during tool retract and return

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the amount of a retract operation in the tool axis direction when G10.6 is specified alone during tool retraction and return (during tool center point control and workpiece setting error compensation). The retract operation is performed by using the value set in this parameter in an incremental manner. This data is valid only when bit 2 (RPS) of parameter No. 7040 is set to 1. If 0 is set in this parameter, a retract operation in the tool axis direction is not performed, but a retract operation is performed according to the setting of parameter No. 7041.

11262	Angle decided to result in a special point posture (cutting point command)

[Input type] Parameter input
[Data type] Real path
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

If the angle formed by the tool posture and the vertical direction of the cutting plane is equal to or less than the value set in this parameter, the tool posture is regarded as a posture close to a special point. In the event of a posture close to a special point, the "vector pointing to the center point from the specified point" is fixed with the "vector pointing to the center point from the cutting point" immediately before the posture close to a special point.

11263	Time constant of acceleration/deceleration after rapid traverse interpolation in tool center point control mode and in workpiece setting error compensation mode

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec

[Valid data range] 0 to 4000

This parameter is used for the time constant of rapid traverse in tool center point control mode and in workpiece setting error compensation mode.

Be sure to specify the same time constant value for all axes except for a special application. If different time constant values are set, a correct linear line cannot be obtained.

4.97 PARAMETERS OF MACHINE CONFIGURATION SELECTING FUNCTION

11266	Active machine configuration set number

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 10

The number of machine configuration sets that can be used in all paths is up to 10.

When the total number of the sets exceeds 10, the set number is assigned in order with small path number by priority.

Example)

In case of setting as the followings, Path1: 6sets, Path2: 8sets, Path3: 4sets.

Actually the set number is assigned as the followings, Path1: 6sets, Pathe2: 4sets, Path3: 0set.

In case of setting all zero for all paths, 10 sets are used for the 1st path.

> **NOTE**
> When this parameter is set, the saved machine configuration data is cleared. The backup to external devices is recommended before it is set.

	#7	#6	#5	#4	#3	#2	#1	#0
11268								ADXx

[Input type] Parameter input
[Data type] Bit axis

#0 ADXx In tool center point control / cutting point command, the axis which is specified by this parameter is

0: not included in commanded feedrate.
1: included in commanded feedrate.

> **NOTE**
> - It is not necessary to set this parameter for the basic three axes. Even if this parameter for the basic three axes is set, it makes no effect.
> - In case that expansion of axis move command in tool center point control is used and parameter ADF(No.11269#2)=1, all the non 5-axis machining control axes are included in commanded feedrate regardless of the setting of parameter ADXx.

	#7	#6	#5	#4	#3	#2	#1	#0
11269	MSF				ON1	ADF	TCC	

[Input type] Parameter input
[Data type] Bit path

#1 TCC When G41/G42 is specified in tool center point control mode, it is regarded as
0: cutter compensation and tool nose radius compensation, 3-dimensional tool compensation.
1: 3-dimensional cutter compensation (tool side offset).

#2 ADF In case that expansion of axis move command in tool center point control is used, this parameter determines whether all the non 5-axis machining control axes are included in commanded feedrate or not.
0: Parameter ADXx(No.11268#0) determines whether each non 5-axis machining control axis is included in commanded feedrate or not.
1: All the non 5-axis machining control axes are included in commanded feedrate.

> **NOTE**
> - "Non 5-axis machining control axis" means the axis which is not subject to tool center point control / cutting point command.
> - In case that the number of non 5-axis machining control axes are two or more and some of them should be included in commanded feedrate but others should be not, set parameter ADF=0 and set parameter ADXx(No.11268#0) for each axis individually.

#3 ON1 When cutting point command is used with tool compensation memory C of machining center system, the specification method of tool length, radius and corner-R is:
0: Specified individually by two tool offset numbers.
1: Specified collectively by one tool offset numbers.

#7 MSF When G code (G10.8L3) of the switching machine configuration is specified with the option of the machine configuration selecting function
0: Disabled. The alarm PS0010 "IMPROPER G-CODE" is issued.
1: Enabled.

4.98 PARAMETERS OF COORDINATE SYSTEM (2 OF 2)

11275	The top number of M code used to turn on each axis workpiece coordinate system preset signal

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 999999999

Specify the top number of M code for turning 1 each axis workpiece coordinate system preset signal <Gn358> during automatic operation.
When the specified M codes are within the range specified with this parameter and parameter No. 11276, each axis workpiece coordinate system preset signal is checked and preset workpiece coordinate system for axis that the signal is turned "1".
The specified M codes prevent buffering.

> **NOTE**
> When each axis workpiece coordinate system preset signals are turned 1 more than two signals by an M code, please turn 1 the signals of all axis at the same timing. If the timing is different, only the axis of the first signal turned 1 is preset.
> If you want to turn 1 the signals at the different timing, please specify M code separately.

11276	The number of M code used to turn on each axis workpiece coordinate system preset signal

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 999

Specify the number of M code for turning 1 each axis workpiece coordinate system preset signal <Gn358> during automatic operation.
For example, when parameter No. 11275 = 100 and parameter No. 11276 = 10 are set, From M100 to M109 are used for turning 1 each axis workpiece coordinate system preset signal.
When 0 is set, the number of M code is assumed to be 1.

> **NOTE**
> Set only M code that is not used for another function.
> (M00 to 05, 30, 98, 99, M code used to call the subprogram, etc.)

	#7	#6	#5	#4	#3	#2	#1	#0
11277			PWR					WPA

[Input type] Parameter input
[Data type] Bit path

#0 WPA When an M code for turning on the workpiece coordinate system preset signal for an axis is specified, but the signal is not turned on, or an auxiliary function lock is provided:
0: An alarm PS1820, "ILLEGAL DI SIGNAL STATE" is issued.
1: An alarm is not issued.

When bit 6 (PGS) of parameter No. 3001 is set to 0 (M, S, T, and B codes are not output in the high speed program check mode), if an M code for turning on the workpiece coordinate system preset signal for an axis is specified, the system follows the setting of this parameter.

#5 PWR When bit 3 (PPD) of parameter No. 3104 is set to 0,
0: The axis is preset with 0.
1: The axis is preset with machine coordinates.

> **NOTE**
> This parameter is valid when bit 3 (PPD) of parameter No. 3104 is set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
11279								WAB

[Input type] Parameter input
[Data type] Bit

#0 WAB When the incremental mode (G91) is selected in the G-code system B/C of the lathe system, if the setting of the workpiece coordinate system (G92) is commanded, the setting of the workpiece coordinate system is executed with:
0: Incremental value.
1: Absolute value.

4.99 PARAMETERS OF SYNCHRONOUS/COMPOSITE CONTROL AND SUPERIMPOSED CONTROL (2 OF 3)

	#7	#6	#5	#4	#3	#2	#1	#0
11284		SKP						SSH

[Input type] Parameter input
[Data type] Bit

#0 SSH During superimposed control, manual handle interruption to the slave axis is:
0: Disabled.
1: Enabled.

#6 SKP In high-speed cycle machining superimposition control, skips and multi-step skips with the master axis under superimposition control are:
0: Unusable.
1: Usable.
However, it is not possible to include positional deviation in system variables (#5061 to #5080) for skip positions. The parameter can be used only to stop movement.

4.100 PARAMETERS OF PROGRAMS (2 OF 4)

11290	M code preventing buffering 11
11291	M code preventing buffering 12
11292	M code preventing buffering 13
11293	M code preventing buffering 14
11294	M code preventing buffering 15
11295	M code preventing buffering 16
11296	M code preventing buffering 17

11297	M code preventing buffering 18
11298	M code preventing buffering 19
11299	M code preventing buffering 20

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999

Set M codes that prevent buffering the following blocks. If processing directed by an M code must be performed by the machine without buffering the following block, specify the M code.
M00, M01, M02, and M30 always prevent buffering even when they are not specified in these parameters.

4.101 PARAMETERS OF DISPLAY AND EDIT (2 OF 5)

	#7	#6	#5	#4	#3	#2	#1	#0
11300	MUC	ATH	MPH	FPI	ASH			

[Input type] Parameter input
[Data type] Bit

#3 ASH When the actual feedrate is read with FOCAS2 and the PMC window:
0: Data that has been updated at conventional intervals (approximately 32 ms) is read.
1: Data that has been updated at short intervals is read.
If this parameter is set to 1, the machine coordinates of the machine unit with the delay in acceleration/deceleration and the servo delay considered are read for all axes, regardless of the setting of bit 7 (EMP) of parameter No. 11313.

> **NOTE**
> When quick response is not required in particular for display operation and so on, normally set this parameter to 0 to reduce the load on the CNC.

#4 FPI In the number of registered programs, which is obtained by the cnc_rdproginfo() function:
0: The number of initial folders is included.
1: The number of initial folders is not included.

#5 MPH When the machine coordinates of the machine unit with the delay in acceleration/deceleration and the servo delay not considered are read with FOCAS2 and the PMC window:
0: Data that has been updated at conventional intervals (approximately 32 ms) is read.
1: Data that has been updated at short intervals is read.

> **NOTE**
> When quick response is not required in particular for display operation and so on, normally set this parameter to 0 to reduce the load on the CNC.

#6 ATH When the disturbance load torque data are read with FOCAS2 and the PMC window:
0: Data that has been updated at conventional intervals (approximately 32 ms) is read.
1: Data that has been updated at short intervals is read.

> **NOTE**
> When quick response is not required in particular for display operation and so on, normally set this parameter to 0 to reduce the load on the CNC.

#7 MUC When the modal data are read with FOCAS2 and the PMC window:
0: Data that has been updated at conventional intervals (approximately 32 ms) is read.
1: Data that has been updated at short intervals is read.

> **NOTE**
> When quick response is not required in particular for display operation and so on, normally set this parameter to 0 to reduce the load on the CNC.

	#7	#6	#5	#4	#3	#2	#1	#0
11302	CPG	FPF	PES	ADC	SMD	SDG	SPR	SPG

[Input type] Parameter input
[Data type] Bit

#0 SPG Initially, the program screen is:
0: Displayed full-screen.
1: Displayed in a window.

#1 SPR Initially, the parameter screen is:
0: Displayed full-screen.
1: Displayed in a window.

#2 SDG Initially, the diagnosis screen is:
0: Displayed full-screen.
1: Displayed in a window.

#3 SMD The MDI program screen is:
0: Displayed according to the setting of bit 0 (SPG) of parameter No. 11302.
1: Displayed in a window.

If this parameter is set to 0, the first display mode entered after the power is turned on is determined according to the setting of bit 0 (SPG) of parameter No. 11302. Depending on the display mode, the MDI program screen is displayed full-screen or in a window. Also, the screen display can be dynamically switched between the full-screen mode and the window mode by interacting with the program screen in another mode.

If this parameter is set to 1, the MDI program screen is always displayed in a window, and it is impossible to switch between the full-screen mode and the window mode by operations.

#4 ADC When all alarms have been eliminated, or the message key is pressed on the alarm screen:
0: The screen display does not change.
1: The screen display changes to the screen displayed before the alarm screen.

#5 PES After a program search operation is performed on the program list screen:
0: The cursor moves to a program on the list screen.
1: A specified program is selected as the main program, and the screen display changes to the edit screen.

#6 FPF Folders that can be used by program management are:
0: Not limited to other than the path folder corresponding to a selected path.
1: Limited to other than the path folder corresponding to a selected path.

#7 CPG PROG function screen selection is:
0: Not changed according to the CNC mode.
1: Changed according to the CNC mode.

	#7	#6	#5	#4	#3	#2	#1	#0
11303			ISQ	DPM	BDP	DVP	SRC	LDP

[Input type] Parameter input
[Data type] Bit

#0 LDP The servo load meter axis display:
0: Interacts with the axis display of coordinate values.
1: Does not interact with the axis display of coordinate values.

#1 SRC In program character editing, blocks not yet saved are:
0: Not saved at the time of reset.
1: Saved at the time of reset.

#2 DVP On the program list screen, path folders are displayed:
0: As many as the maximum number of paths that can be set in the system.
1: As many as the number of valid paths.

#3 BDP When a single-block stop occurs, on the program screen and program check screen:
0: The block next to the block that has been executed is displayed at the beginning.
1: The block that has been executed is displayed at the beginning.

NOTE
Only MEM operation is enabled.

#4 DPM During MDI program execution, blocks that call an execution macro are:
0: Not displayed.
1: Displayed.

#5 ISQ During MDI editing, automatic sequence number insertion is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
11304	CFP				ON8		GGD	PGR

[Input type] Parameter input
[Data type] Bit

NOTE
When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 PGR When the path select signal is changed, the screen of the multi path simultaneous display group:
0: Is not switched.
1: Is switched to the display group including the selected path.

#1 GGD The G code guidance screen is:
0: Not displayed.
1: Displayed.

#3 ON8 Program numbers are:
0: Four digits long.
1: Eight digits long.

NOTE
If program numbers are changed from eight digits to four digits, all programs will be automatically deleted from program memory.
If this parameter is changed from 1 to 0 and the power is turned off and back on, the following message appears on the IPL screen.
For the Series 30*i*/31*i*/32*i* (with personal computer function with Windows CE) and for the CNC screen display function, the message appears on the IPL screen of NCBOOT32.exe. To delete them, enter 1. Otherwise, enter 0.
PARAMETER NO.11304#3 IS CHANGED.
ALL PROGRAM FILE MUST BE CLEARED.
CLEAR FILE OK ? (NO=0, YES=1)

#7 CFP Folders that can be used by program management are:
0: Not limited to the path folder corresponding to a selected path.
1: Limited to the path folder corresponding to a selected path.

Folders to be used are limited by bit 6 (FPF) of parameter No. 11302 and bit 7 (CFP) of parameter No. 11304 as follows:

Table 4.101 Folders that are made usable in a program list by parameter setting

		Bit 6 (FPF) of parameter No. 11302	
		0	**1**
Bit 7 (CFP) of parameter No. 11304	**0**	Unlimited	Under path folder
	1	Path folder only	Path folder only

11305	Maximum number of simultaneously displayed axes

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 2

By setting this parameter, the maximum number of simultaneously displayed axes at the current position can be changed. A value set in this parameter corresponds to the maximum number of simultaneously displayed axis as follows:

Max. number of simultaneously displayed axes	**5**	**10**	**20**
Setting	0	1	2

A value other than 1 and 2 is assumed to be 0.

11307	**Display sequence of the coordinates in current position display**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 5

This parameter sets the display sequence of the coordinates of a position displayed on the following screens:

10.4", 15", and 19" display units
- Total position display screen
- Total position display on each screen

8.4" display unit
- Total position display screen

When the maximum number of simultaneously displayed axes is set to 20 (when 2 is set in parameter No. 11305), two sets of coordinates are displayed simultaneously as the current position display on each screen.

When the first set is displayed, switching to the second set can be made by pressing 

then pressing the chapter selection soft key being selected.

When the above operation is performed again, the displayed set changes to the first set.
The display sequence of coordinates corresponds to the parameter setting as follows:

<8.4", 10.4", and 15" display units>

Display sequence of coordinates / **Setting**	**1**	**2**	**3**	**4**
0	Relative coordinates	Absolute coordinates	Machine coordinates	Remaining travel distance
1	Relative coordinates	Machine coordinates	Absolute coordinates	Remaining travel distance
2	Relative coordinates	Remaining travel distance	Absolute coordinates	Machine coordinates
3	Absolute coordinates	Machine coordinates	Relative coordinates	Remaining travel distance
4	Absolute coordinates	Remaining travel distance	Relative coordinates	Machine coordinates
5	Machine coordinates	Remaining travel distance	Relative coordinates	Absolute coordinates

<19" display unit>

Setting \ Display sequence of coordinates	1	2	3	4
0	Absolute coordinates	Relative coordinates	Remaining travel distance	Machine coordinates
1	Absolute coordinates	Relative coordinates	Machine coordinates	Remaining travel distance
2	Relative coordinates	Absolute coordinates	Remaining travel distance	Machine coordinates
3	Relative coordinates	Absolute coordinates	Machine coordinates	Remaining travel distance
4	Relative coordinates	Machine coordinates	Remaining travel distance	Relative coordinates
5	Relative coordinates	Machine coordinates	Remaining travel distance	Absolute coordinates

If the setting is beyond the valid data range, 0 is assumed.
When the multipath simultaneous display function is enabled (parameter No. 13131 is set to a nonzero value, and parameter No. 13132 is set to 1 or a greater value), this parameter becomes invalid.

	#7	#6	#5	#4	#3	#2	#1	#0
11308	DGH	ABH	SPH	PGS	FPD	EAS	COW	DOP

[Input type] parameter input
[Data type] Bit

#0 DOP If an alarm is issued in a path not being displayed:
0: The screen display does not change to the alarm screen.
1: The screen display changes to the alarm screen.

#1 COW When the file of specified name already exists on memory card or USB memory,
0: It is not overwritten
Memory card : Alarm SR1973, “FILE ALREADY EXIST” is generated.
USB memory : Warning message, “FILEALREADYEXIST” is displayed.
1: It is overwritten.
Even when COW = 1, a confirmation message is displayed before overwriting.

> **NOTE**
> When the overwritten file is read only attribute, it is not possible to overwrite even if bit 1 (COW) of parameter No. 11308 = 1.

#2 EAS When an extended axis name or extended spindle name is used in a path, subscripts for axis names or spindle names in that path:
0: Cannot be used.
1: Can be used.

#3 FPD On the program screen and program check screen, blocks already executed are:
0: Not displayed.
1: Displayed.

> **NOTE**
> This parameter is effective at bit 1 (APD) of parameter No.11350=0.

#4 PGS In program search operation:
0: A specified program name is searched for.
1: An O number program is searched for with "O" omitted.

#5 SPH When the spindle speed data are read with FOCAS2 or the PMC window:
0: Data that has been updated at conventional intervals (approximately 32 ms) is read.
1: Data that has been updated at short intervals is read.

> **NOTE**
> When quick response is not required in particular for display operation and so on, normally set this parameter to 0 to reduce the load on the CNC.

#6 ABH When the absolute coordinates data are read with FOCAS2 or the PMC window:
0: Data that has been updated at conventional intervals (approximately 32 ms) is read.
1: Data that has been updated at short intervals is read.

> **NOTE**
> When quick response is not required in particular for display operation and so on, normally set this parameter to 0 to reduce the load on the CNC.

#7 DGH When the Remaining travel distance data are read with FOCAS2 or the PMC window:
0: Data that has been updated at conventional intervals (approximately 32 ms) is read.
1: Data that has been updated at short intervals is read.

> **NOTE**
> When quick response is not required in particular for display operation and so on, normally set this parameter to 0 to reduce the load on the CNC.

11310	Selection of a PMC that performs read and write operations with an external touch panel

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 3

This parameter selects an PMC for read and write operations among three PMCs, which are the first PMC, second PMC, and third PMC.
0, 1 : First PMC
2 : Second PMC
3 : Third PMC

> **NOTE**
> 1 It is impossible to perform read and write operations with more than one PMC at the same time.
> 2 When this parameter is set, the power must be turned off before operation is continued.
> 3 The second PMC and third PMC are optional.

4.102 PARAMETERS OF EMBEDDED MACRO (1 OF 2)

11311	Password for embedded macro

[Input type] Parameter input
[Data type] 2-word
[Valid date range] 0 to 99999999

The password to set the attribute of the folder for the embedded macro (MTB1 folder) is set. When the values other than 0 are set to this parameter and the value is different from the parameter No. 11312 of the key word, the attribute of the MTB1 folder is locked.
Thereafter, the attribute of the MTB1 folder is locked unless the same value as the password is set to the key word. Moreover, the value of the password cannot be changed.

- When the key is open,
  The attribute of the MTB1 folder can be changed.
- When it locks or the key is not set,
  The attribute of the MTB1 folder can not be changed.

11312	Key word for embedded macro

[Input type] Parameter input
[Data type] 2-word
[Valid date range] 0 to 99999999

The key word in order to set the attribute of the folder for the embedded macro (MTB1 folder) is set.

NOTE
The value is not displayed even if the parameter is set. Moreover, when the power is turned off, this parameter becomes 0.

4.103 PARAMETERS OF DISPLAY AND EDIT (3 OF 5)

	#7	#6	#5	#4	#3	#2	#1	#0
11317								PON

[Input type] Locked parameter
[Data type] Bit

#0 PON Program number O8-digit is:
0: Invalid.
1: Valid.

NOTE
This parameter is set by CNC automatically. Therefore, it is impossible to set by MDI operation.
To judge if program number O8-digit is valid by user application, refer to this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
11318		RTC			FIL	DFM	MLD	POC

[Input type] Parameter input

[Data type] Bit

#0 POC When the pattern data input function is used, on the custom macro screen a comment is:
0: Displayed in the lower part of the screen.
1: Displayed on the right side of the screen.

> **NOTE**
> This parameter is not used when a 15" or 19" display unit is used.

#1 MLD On the program list screen, division of the screen display is:
0: Disabled.
1: Enabled.

> **NOTE**
> This parameter is valid when a 10.4", 15", or 19" display unit is used.

#2 DFM On the program list screen, of the soft key character strings when devices are selected and selected device name character strings, the character strings related to the memory card are:
0: Not changed.
1: Changed.

Soft key character strings when devices are selected (10.4"/15"/19" display unit)

	DFM=0	DFM=1
Mode	**Name**	**Name**
EDIT	MEMCARD	M CARD EDIT
Other than EDIT		M CARD OPER.
EDIT	MEMORY CARD	M CARD I/O
Other than EDIT		M CARD DNC

Soft key character strings when devices are selected (8.4" display unit)

	DFM=0	DFM=1
Mode	**Name**	**Name**
EDIT	MEMCARD	MC-EDT
Other than EDIT		MC-OP.
EDIT	M-CARD	MC-I/O
Other than EDIT		MC-DNC

Selected device name character strings

DFM=0	DFM=1
MEMCARD	MC-PROG
M_CARD	MC-FILE

#3 FIL When you operate Get/Put of the data server:
0: The forwarded file name is specified at the cursor position of the list screen.
1: The file name specification is enabled from the keyin buffer.
(The same specification as FS16*i*)

#6 RTC On the program list screen, a file selected by a selection operation:
0: Can be copied repeatedly.
1: Cannot be copied repeatedly.

	#7	#6	#5	#4	#3	#2	#1	#0
11320	PGM	DTS					IDC	DHN

[Input type] Parameter input
[Data type] Bit path

#0 DHN On the program check screen, HD.T and NX.T, and a T number are:
0: Not displayed at the same time.
1: Displayed at the same time.
If DHN is set to 1, HD.T, NX.T, and T are displayed regardless of the setting of bit 2 (PCT) of parameter No. 3108.

#1 IDC The soft key [UPDATA ALL ID], which updates ID information on the servo or spindle information screen as a batch, is:
0: Not displayed.
1: Displayed.

NOTE
IDC is effective only if bit 0 (IDW) of parameter No. 13112 is set to 1.

#6 DTS The actual spindle speed and T code are:
0: Not displayed.
1: Always displayed.

#7 PGM In the high speed program check mode, the machine position is displayed with:
0: Actual machine coordinates. (Machine position relative to the reference position)
1: Machine coordinates for the program check.

11321	Spindle tool name (1st character)
11322	Spindle tool name (2nd character)
11323	Spindle tool name (3rd character)
11324	Spindle tool name (4th character)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] See the character-code correspondence table.
The name of the spindle tool (HD.T) displayed on the program check screen can be changed.
Any character string consisting of numeric characters, alphabetical characters, katakana characters, and symbols with a maximum length of four characters can be displayed.

> **NOTE**
> For characters and codes, see Appendix A, "CHARACTER-CODE CORRESPONDENCE TABLE".
> If the first character is 0 or an illegal character code, "HD.T" is displayed.

11325	Next machining tool name (1st character)
11326	Next machining tool name (2nd character)
11327	Next machining tool name (3rd character)
11328	Next machining tool name (4th character)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] See the character-code correspondence table.

The name of the next machining tool (NX.T) displayed on the program check screen can be changed.

Any character string consisting of numeric characters, alphabetical characters, katakana characters, and symbols with a maximum length of four characters can be displayed.

> **NOTE**
> For characters and codes, see Appendix A, "CHARACTER-CODE CORRESPONDENCE TABLE".
> If the first character is 0 or an illegal character code, "NX.T" is displayed.

4.104 PARAMETERS OF GRAPHIC DISPLAY (2 OF 5)

	#7	#6	#5	#4	#3	#2	#1	#0
11329	GST		AER	GTF	BGM	GTL	DPC	

[Input type] Parameter input
[Data type] Bit path

#1 DPC The coordinates displayed on each of the PATH GRAPHIC, ANIMATION GRAPHIC, and PATH GRAPHIC (TOOL POSITION) screens of the dynamic graphic display function are:
0: Absolute coordinates.
1: Machine coordinates.

#2 GTL When animated simulation is performed with the dynamic graphic display function, drawing at positions with tool length compensation considered is:
0: Not performed.
1: Performed.

#3 BGM Coordinates used by the dynamic graphic display function are:
0: Absolute coordinates.
1: Machine coordinates.

#4 GTF When the tool path is drawn with the dynamic graphic display function, drawing at positions with tool compensation (tool length compensation and tool radius/tool nose radius compensation) considered is:
0: Performed.
1: Not performed.

#5 AER When the tool path is drawn with the dynamic graphic display function, automatic erasure at the start of drawing is:
0: Not performed.
1: Performed.

#7 GST When drawing cannot be performed for a command with the dynamic graphic display function:
0: The command is ignored, and drawing continues without stopping drawing.
1: Drawing stops.

11330	Magnification of drawing in dynamic graphic display

[Input type] Parameter input
[Data type] Word path
[Unit of data] 0.01
[Valid data range] 1 to 10000
This parameter sets the magnification of the drawing range in the dynamic graphic display function.

11331	Screen center coordinate value in the drawing range in dynamic graphic display

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the coordinate value of the center of the drawing range in the dynamic graphic display function.

NOTE
If bit 3 (BGM) of parameter No. 11329 is set to 1, set the coordinate value on each axis in the machine coordinate system.

11334	Rotation angle of the drawing coordinate system in dynamic graphic display (vertical direction)

[Input type] Parameter input
[Data type] Word path
[Unit of data] degree
[Valid data range] -360 to 360
This parameter sets the rotation angle (vertical direction) of the drawing coordinate system in the dynamic graphic display function.

11335	Rotation angle of the drawing coordinate system in dynamic graphic display (horizontal direction)

[Input type] Parameter input
[Data type] Word path
[Unit of data] degree

[Valid data range] -360 to 360
This parameter sets the rotation angle of the drawing coordinate system in the dynamic graphic display function (the angle of rotation about the vertical axis on the screen, that passes the center position of the blank).

11336	Drawing color of the tool path in tool path drawing in dynamic graphic display

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 7
This parameter sets the color in which the tool path is drawn with the dynamic graphic display function.

11337	Color of the cursor indicating the tool position on the PATH GRAPHIC (TOOL POSITION) screen of dynamic graphic display

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 7
This parameter sets the color of the cursor indicating the tool position on the PATH GRAPHIC (TOOL POSITION) screen of the dynamic graphic display function.

11341	Drawing color of a blank figure in dynamic graphic display

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 7
This parameter sets the color in which a blank figure is drawn with the dynamic graphic display function.

11342	Rotation angle of the drawing coordinate system of dynamic graphic display (screen center)

[Input type] Parameter input
[Data type] Word path
[Unit of data] degree
[Valid data range] -360 to 360
This parameter sets the rotation angle of the drawing coordinate system in dynamic graphic display (the angle of rotation about the vertical axis on the screen plane, that passes the center position of the blank).

11343	Blank figure in dynamic graphic display

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1
This parameter sets the type of a blank figure in dynamic graphic display.

Setting	Figure
0	Cylinder or hollow cylinder (parallel to the Z-axis)
1	Rectangular parallelepiped

11344	Blank reference position in dynamic graphic display

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)

[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the reference position of a blank in the dynamic graphic display function by using coordinate values in the workpiece coordinate system.

> **NOTE**
> If bit 3 (BGM) of parameter No. 11329 is set to 1, set coordinate values in the machine coordinate system.

11345	Blank dimension I in dynamic graphic display
11346	Blank dimension J in dynamic graphic display
11347	Blank dimension K in dynamic graphic display

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.000 to +999999.999)
These parameters set the dimensions of a blank in the dynamic graphic display function according to the blank figure as follows:

Blank type	Dimension I	Dimension J	Dimension K
Cylinder	Column diameter	0	Column length
Hollow cylinder	Diameter of outer circle of cylinder	Diameter of inner circle of cylinder	Cylinder length
Rectangular prism	Length in X-axis direction	Length in Y-axis direction	Length in Z-axis direction

11348	Drawing color of a tool in animated simulation in dynamic graphic display

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 7
This parameter sets the color in which a tool is drawn during animated simulation in the dynamic graphic display function.

	#7	#6	#5	#4	#3	#2	#1	#0
11349	PDM		DAS	YGW	WNS	GSP	ABC	

[Input type] Parameter input
[Data type] Bit

#1 ABC In animated simulation in the dynamic graphic display function, when a fine boring cycle or back boring cycle, which is a hole machining canned cycle, is performed, the movement for a shift at the hole bottom is:
0: Not drawn.
1: Drawn.

#2 GSP In tool path drawing in the dynamic graphic display function, the drawing start position is:
0: The end position of a block that makes a movement for the first time.
1: The current position.

> **NOTE**
> When G92, G52, or G92.1 (for machining center systems) or G50, G52, or G50.3 (for lathe systems) is specified at the beginning of a program to be drawn, the position specified in this G code is assumed to be the drawing start position.

#3 WNS In the dynamic graphic display function, P-CODE workpiece number search is:
0: Disabled.
1: Enabled.

> **NOTE**
> A macro executor option, or a macro executor + C Language Executor options are required.

#4 YGW If Y-axis offset geometry and wear compensation is enabled, switching between the tool geometry and wear compensation screens is performed with
0: Soft key [SWITCH].
1: Soft key [WEAR]/[GEOMETRY].

#5 DAS When the multi path program edit screen is displayed first after power is turn on, the scroll mode is:
0: single scroll mode.
1: simultaneous scroll mode.

#7 PDM When the pattern data input function is enabled, variable name and comment are:
0: Displayed on the custom macro screen only if the menu is selecting.
1: Always displayed on the custom macro screen.

4.105 PARAMETERS OF DISPLAY AND EDIT (4 OF 5)

	#7	#6	#5	#4	#3	#2	#1	#0
11350		QLS	PAD	9DE		PNE	APD	

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#1 APD The display of the program under execution is:
0: A display containing look-ahead blocks.
1: A text display.

#2 PNE Path name expansion display function is:
0: Disabled.
1: Enabled.

> **NOTE**
> This parameter is invalid if the number of paths is 1.
> It is effective to 10.4", 15", and 19" display units.

#4 9DE On 8.4" display unit, the maximum number of axes that can be displayed on a single screen is:
0: 4.
1: 5.

#5 PAD On the pitch error compensation screen, axis names are:
0: Not displayed.
1: Displayed.

#6 QLS The machining quality level adjustment screen is:
0: Not displayed.
1: Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
11351		GTD		3DD			COL	

[Input type] Parameter input
[Data type] Bit

#1 COL At the detail off screen of program list, the comment of program is:
0: Not displayed.
1: Displayed.

> **NOTE**
> It is effective to 10.4", 15", and 19" display units.

#4 3DD The setting screen for the 3-dimensional machine position compensation function is:
0: Not displayed.
1: Displayed.

#6 GTD On the parameter screen, group names are:
0: Not displayed.
1: Displayed.

> **NOTE**
> If this parameter is changed, the change will take effect when a screen other than the parameter screen is displayed and the parameter screen is displayed again.

	#7	#6	#5	#4	#3	#2	#1	#0
11352					MPC			PNI

[Input type] Parameter input
[Data type] Bit path

#0 PNI The display by the path name enlarged display function is:
0: A normal display.
1: A reverse display.

> **NOTE**
> This parameter is effective to 10.4", 15", and 19" display units.

#3 MPC In this path, the batch making and the batch selection of the multi-path program management function are
0: effective.
1: invalid.

In the multi-path program management function, the main program in the path that is set parameter MPC=1 is removed from the object of the batch making and batch selection. Please set parameter MPC=1 in the path that should not be machined.

	#7	#6	#5	#4	#3	#2	#1	#0
11353							SDE	SEK

[Input type] Parameter input
[Data type] Bit

#0 SEK When the power is turned on, or when the clear state is present, sequence numbers are:
0: Not maintained.
1: Maintained.

> **NOTE**
> During a subprogram call, the sequence number of the subprogram is maintained.

#1 SDE Sequence numbers on the screen are displayed with:
0: 5 digits.
1: 8 digits.

	#7	#6	#5	#4	#3	#2	#1	#0
11354	HPM			DPC	SOH	SAH	CRS	

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#1 CRS While data transmission is awaited using the DPRNT/BPRNT of the custom macro or macro executor, screen switching is:
0: Not possible.
1: Possible.

#2 SAH When the storage capacity for history data is exceeded due to non-alarm history, alarm history will be:
0: Erased.
1: Erased, except the most recent 50 items of history data.

#3 SOH When the storage capacity for history data is exceeded due to data other than external operator message history, external operator message history will be:
0: Erased.
1: Retained.

> **NOTE**
> 1 The settings of bit 2 (SAH) of parameter No. 11354 and bit 3 (SOH) of parameter No. 11354 will be effective the next time the power is turned on. At this time, all history data (operation history, alarm history, and external operator message history) will be erased.
> 2 With the settings of bit 2 (SAH) of parameter No. 11354 and bit 3 (SOH) of parameter No. 11354, the number of history data items that can be retained varies. The number of history data items that can be recorded as follows:
> SAH=0, SOH=0 . . . Approx. 8000 items
> SAH=1, SOH=0 . . . Approx. 7400 items
> SAH=0, SOH=1 . . . Approx. 7500 items
> SAH=1, SOH=1 . . . Approx. 6900 items
> (*) The numbers of items above are those if only key operation history is recorded.

#4 DPC In the screen title, program comments corresponding to O-numbers are:
0: Displayed.
1: Not displayed.

#7 HPM High-speed program management is:
0: Disabled.
1: Enabled.

> **NOTE**
> 1 There are no changes about the display of programs and the editing operation method of programs.
> 2 In cases that this function is enabled, if the power supply is turned off without saving, the changed programs data is not saved.
> The program selection by the following operation also is not saved.
> - MDI operation
> - External workpiece number search
> - External program number search
> Please perform saving operation by FOCAS2/ C Language Library, if it is necessary to preserve the changed programs data/ the program selection after the power supply is turned off.
> 3 Program saving can be executed by calling with the exclusive function on condition that all paths are EDIT mode.
> 4 If the power supply is turned off during saving the programs, all programs are deleted. In this case, an alarm PS0519, "PROGRAM FILES ARE BROKEN AND CLEARED", occurs when the power supply is turned ON next.
> 5 In automatic data backup function, if this function is enabled, the setting of parameter AAP (No.10340#2) should be 0.
> 6 When the embedded macro program is registered, the setting of parameter HPM (No.11354#7) should be 0.

> **NOTE**
> 7 This function can be enabled only on CNC program storage memory (CNC_MEM device).
> 8 If this function is enabled, MANUAL GUIDE *i* cannot be used.

	#7	#6	#5	#4	#3	#2	#1	#0
11355				SCM	MTS		CDA	DSN

[Input type] Parameter input
[Data type] Bit

#0 DSN The spindle names displayed on the spindle setting screen, the spindle adjustment screen, and the spindle monitor screen are:
0: Spindle numbers in the path plus the numbers indicating types such as MAIN and SUB. (Conventional specifications)
1: Names set in parameters.

#1 CDA When a 15" or 19" display unit are used,
0: A normal screen display is employed.
1: A screen display specifically for CNC display units for automotive is employed.

#3 MTS The function for switching between simultaneous multi-path display and single-path display is:
0: Disabled.
1: Enabled.

#4 SCM In the initial state, the custom macro screen is:
0: A small screen display.
1: A full screen display.

	#7	#6	#5	#4	#3	#2	#1	#0
11356	DPD		EPC	SFS	DCT			TLD

[Input type] Parameter input
[Data type] Bit

#0 TLD When the protection signal is enabled, the deletion of the tool life management screen is:
0: Disabled.
1: Enabled.

> **NOTE**
> The 8-level data protection function cannot be disabled.

#3 DCT In the displaying the program being executed, the comment control statement display is:
0: Not available.
1: Available.

> **NOTE**
> This parameter is available, when the bit 1 (ADP) of parameter No. 11350 is set to 1.

#4 SFS The soft key of 8.4” screen is displayed:
0: Up to 6 characters.
1: Up to 12 characters. The display font of soft key becomes small.

> **NOTE**
> 1 When this parameter is set, the power must be turned off before operation is continued.
> 2 This function is not effective at following conditions.
> - The soft key of conversational macro screen.
> - When the virtual MDI key function is enabled.

 # 5 EPC Display prepared and original programs on the same screen is:
0: Not available.
1: Available.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#7 DPD When the external subprogram is executed, the display of look-ahead blocks are:
0: Analyzed blocks.
1: Input blocks.

11358	Power-On Checksum

[Input type] Parameter input
[Data type] 2-word
When parameter checksum function is effective, checksum value which is calculated at power-on is set.

0 is set when the parameter checksum function is invalid.

11359	Standard Checksum

[Input type] Parameter input
[Data type] 2-word
Checksum value which is calculated at when parameter checksum function is changed from invalid to effective is set. It is used as standard value, when checksum is executed at power-on.

0 or last parameter checksum value is set when the parameter checksum function is invalid.

11360	Calculation Data

[Input type] Parameter input
[Data type] 2-word
The date when the parameter checksum function is changed to effective is set.
The number of 8 digits which show year, month and day is set.
First 4 digits show year. Second 2 digits show month. Last 2 digits show day.

0 or last day when parameter checksum function was changed to effective is set when the parameter checksum function is invalid.

11361	Calculation Time

[Input type] Parameter input
[Data type] 2-word

The time when the parameter checksum function is changed to effective is set.
The number of 6 digits which show hour, minute and second is set.
First 2 digits show hour. Second 2 digits show minute. Last 2 digits show second.

0 or the last time when parameter checksum function has been changed to effective is set when the parameter checksum function is invalid.

	#7	#6	#5	#4	#3	#2	#1	#0
11362								GSF

[Input type] Parameter input
[Data type] Bit path

#0 GSF In the lathe/machining center G code system switching function, the mode display is:
0: Shown in T-MODE (turning mode)/M-MODE (milling mode).
1: Not shown.

	#7	#6	#5	#4	#3	#2	#1	#0
11364	FLI	FLC	NSM	FLD	FDR			SFB

[Input type] Parameter input
[Data type] Bit

#0 SFB Folder made by template program function or multi-path program management function:
0: Should be set to the foreground folder and the background folder by an operator.
1: Becomes to the foreground folder and the background folder automatically.

> **NOTE**
> When the item of "CAN NOT ENTER MULTIPATH PROG FOLDER" is effective in the operation confirmation function setting screen, this parameter is invalid.

#3 FDR If a program or a folder exists in the target folder when the deletion operation is done specifying the folder:
0: The folder is not deleted.
1: The folder and programs/folders in the target folder are deleted.

#4 FLD In input operation on the program editing screen and the program folder screen, the registration folder of the program is:
0: The folder that has been selected on each screen.
1: The folder shown by folder information in input file.

> **NOTE**
> This parameter is available, when bit 7 (FLI) of parameter No.11364 is set to 1.

#5 NSM When the program is read:
0: The main program is changed.
1: The main program is not changed..

#6 FLC On the program folder screen, when the program folder screen is displayed again after the screen switching, path switching and the device switching are done:

0: The cursor position moves to the head of the folder.
1: The cursor position stays at original position.

> **NOTE**
> This function is available from the cursor position in the program folder screen displayed after this parameter is set to 1.

#7 FLI On the program editing screen and the program folder screen, input/output operation of the program targets:

0: The foreground or background folder.
1: The folder that has been selected on each screen.

> **NOTE**
> 1 This parameter is valid only to the internal program memory of the CNC (The device name is "CNC_MEM").
> 2 When this bit is set to 1, the input/Output all programs and folders function is available.
> When this bit is set to 0, the input/Output all programs and folders function is not available. Therefore, only usual I/O operation is possible.

	#7	#6	#5	#4	#3	#2	#1	#0
11365	D40	D39	D38	D37	D36	D35	D34	D33

	#7	#6	#5	#4	#3	#2	#1	#0
11366	D48	D47	D46	D45	D44	D43	D42	D41

	#7	#6	#5	#4	#3	#2	#1	#0
11367	D56	D55	D54	D53	D52	D51	D50	D49

[Input type] Parameter input
[Data type] Bit path

D33 to D56 These bits set the G code groups to be displayed on the program check screen.
The correspondence between the bits and G code groups is as given in the table below.
The settings of each bit have the meanings below.

0: The G code group corresponding to the bit is displayed.
1: The G code group corresponding to the bit is not displayed.

Parameter	G code group
D33	33
D34	34
D35	35
to	to
D56	56

	#7	#6	#5	#4	#3	#2	#1	#0
11368		APM	PWC	FNA	DAA			

[Input type] Parameter input
[Data type] Bit

#3 DAA The axis name used with axis type alarms is one set using parameter No.:
0: 1020.
1: 3132.

> **NOTE**
> 1 Even when this parameter is 1, an axis name set in parameter No. 1020 is used if the value of parameter No. 3132 is 0.
> 2 If an extended axis name is in use, only the first letter in it is replaced.
> 3 Even if this parameter is 1, an axis name set in parameter No. 1020 is used on the operation history screen and alarm history screen.
> 4 When value of this parameter is set, the value will be available after the power is turned off.

#4 FNA On the fixture offset screen:
0: All axis are displayed.
1: Only the axis necessary for setting is displayed.

#5 PWC Power consumption monitoring screen is:
0: Disabled.
1: Enabled

#6 APM Bar-graph display that shows the total of power consumption is:
0: Enabled.
1: Disabled

> **NOTE**
> This parameter is effective at parameter PWC(No.11368#5)=1.

	#7	#6	#5	#4	#3	#2	#1	#0
11369				CSD				

[Input type] Parameter input
[Data type] Bit

#4 CSD System variable (#1000-#8499, #10000-#89999, #100000-#199999) is:
0: Not displayed on the custom macro screen.
1: Displayed on the custom macro screen.

	#7	#6	#5	#4	#3	#2	#1	#0
11370			DHS			RPD		

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#2 RPD During executing the program backward by manual handle retrace, the block displayed at the start of the program is:
0: The block being executed.
1: The block just before the block being executed.

> **NOTE**
> This parameter is effective at bit 1 (APD) of parameter No.11350=0 and bit 3 (FPD) of parameter No.11308=1, or bit 1 (APD) of parameter No.11350=1.

#5 DHS When the program is not save in the high-speed program management function, warning is:
0: Not displayed in the status display.
1: Displayed in the status display.

11371	The scale of entire power consumption bar-graph in warning message area

[Input type] Parameter input
[Data type] Word
[Unit of data] kW
[Valid data range] 0 to 32767
Set the scale of entire power consumption bar-graph in warning message area by the absolute value.
When 0 is specified, the parameter 2281#0 and #1 (for servo) and parameter 4541#1 and #2 (for spindle) are checked, and the maximum motor output value is used as the scale.
Example) If 3000 is set, the bar-graph shows the range from -3000 to 3000.

	#7	#6	#5	#4	#3	#2	#1	#?
11372	MSH				MSM			

[Input type] Parameter input
[Data type] Bit

#3 MSM The machine state monitoring screen
0: is not displayed.
1: is displayed.

#7 MSH The machine state history screen
0: is not displayed.
1: is displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
11374			CDE	PCB				AIC

[Input type] Parameter input
[Data type] Bit

#0 AIC If EOB code is included in comment block when program is read,
0: alarms are not generated.
1: the alarm PS0518 is generated.

#4 PCB In the program folder screen, the programs are copied or moved
0: By the new method.
1: By the old method.

#5 CDE Call stack display is:
0: Available.
1: Not available.

	#7	#6	#5	#4	#3	#2	#1	#0
11375	AMW							DMP

[Input type] Parameter input
[Data type] Bit

#0 DMP The program protection function on the data server is:
0: Enabled
1: Disabled
When this parameter is set to 1, the following editing operations are disabled:
(1) Program deletion (Even when deletion of all programs is specified, programs with program numbers 8000 to 8999 are not deleted.)
(2) Program output (Even when outputting all programs is specified, programs with program numbers 8000 to 8999 are not output.)
(3) Program number search
(4) Program editing of registered programs
(5) Program registration
(6) Program copy
(7) Program move
(8) File input/output by GET/PUT/LIST-GET/LIST-PUT operation from PC
(9) Memory card format
(10) File input/output by FTP operation from PC
(11) File rename by FTP operation from PC
(12) File deletion by FTP operation from PC

> ⚠ **CAUTION**
> The CF card can be mounted on other CNC and PC by pulling out the CF card for the data server. Therefore, the content of the program cannot be protected. It is protection for the unauthorized operation prevention, and not protection for security.

#7 AMW The accuracy of writing the custom macro or the P code macro variable with FOCAS2 function is
0: Not Improved
1: Improved
The FOCAS2 function to which accuracy can be improved by this parameter is as follows.
- cnc_wrmacro : Write custom macro variable
- cnc_wrmacror : Write custom macro variables(area specified)
- cnc_wrpmacro : Write P code macro variable
- cnc_wrpmacror : Write P code macro variable (area specified)

11376	Time-out period of USB memory

[Input type] Parameter input
[Data type] Word
[Unit of data] sec
[Valid data range] 0 to 32767

Set the time-out period of the USB memory. Please adjust this parameter according to the USB memory.

> **NOTE**
> When 0 is set in this parameter, it is assumed to 30.

11378	PMC path number of PMC signal No.1 for the machine state monitoring function
to	to
11381	PMC path number of PMC signal No.4 for the machine state monitoring function

[Input type] Parameter input
[Data type] Byte
[Data range] 0 to 5 and 9

The PMC path number of the PMC signal for the machine state monitoring function is set.
The value and the PMC path number that can be set are as follows.

No.11378 to 11381	PMC Path Number
0	Unsetting
1	1st PMC
2	2nd PMC
3	3rd PMC
4	4th PMC
5	5th PMC
9	Dual Check Safety

11382	Address kind of PMC signal No.1 for the machine state monitoring function
to	to
11385	Address kind of PMC signal No.4 for the machine state monitoring function

[Input type] Parameter input
[Data type] Byte
[Data range] 0 to 10

Address kind of PMC signal for the machine state monitoring function is set.
The value and the address kind that can be set are as follows.

No.11382 to 11385	Address Kind
0	Unsetting
1	X
2	Y
3	G
4	F
5	A
6	R
7	T
8	K
9	C
10	D

11386	Address number of PMC signal No.1 for the machine state monitoring function
to	to
11389	Address number of PMC signal No.4 for the machine state monitoring function

[Input type] Parameter input
[Data type] Byte

[Data range] Refer to PMC Programming Manual (B-64513EN) for detail.
Address number of PMC signal for the machine state monitoring function is set.

	#7	#6	#5	#4	#3	#2	#1	#0
11391		RPW				ZSS	TRE	

[Input type] Parameter input
[Data type] Bit

#1 TRE In the folder screen, the program folder tree is
0: Available.
1: Not available.

#2 ZSS In outputting CNC parameters, whether parameters which equal to zero are output or not is
0: Not decided by soft-keys. Whether or not is decided by parameter PRM (No.0010#1).
1: Decided by soft-keys.

NOTE
Parameter PRM (No.0010#1) does not work when this parameter equals to one. The following table shows the relation between parameters (No.0010#1 and No.11391#2) and whether parameters which equal to zero are output or not.

		ZSS (No.11391#2)	
		0	1
PRM (No. 0010#1)	0	Output	Whether or not is decided by soft-keys [ALL]/[NON-0].
	1	Not output	

#6 RPW When changing a password on Parameter screen, confirmation message is
0: Displayed.
1: Not displayed.

NOTE
When this function is valid, a password need to be input twice.

11392	Scale for PCM bar graph of servo axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] 0.001kWh
[Valid data range] 0 to 9999999
Specify the absolute value of maximum/minimum scale for the bar graph of each servo axis in power consumption monitoring screen.
Specify integer from 1 to 9999999.
4 digits from the top are displayed in power consumption monitoring screen, though the value of bar graph is estimated by using this parameter itself.

e.g.) If 9999999 is specified, -9999kW/9999kW are displayed.
If 11100 is specified, -11.10kW/11.10kW are displayed.

If 0 is specified, the scale is decided by the parameter (No.2281#0 and #1) automatically.

11393	Scale for PCM bar graph of spindle axis

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] 0.001kWh
[Valid data range] 0 to 9999999

Specify the absolute value of maximum/minimum scale for the bar graph of each spindle axis in power consumption monitoring screen.
Specify integer from 1 to 9999999.
4 digits from the top are displayed in power consumption monitoring screen, though the value of bar graph is estimated by using this parameter itself.

e.g.) If 9999999 is specified, -9999kW/9999kW are displayed.
If 11100 is specified, -11.10kW/11.10kW are displayed.

If 0 is specified, the scale is decided by the parameter (No.4541#1 and #2) automatically.

	#7	#6	#5	#4	#3	#2	#1	#0
11394								AND

[Input type] Parameter input
[Data type] Bit axis

#0 AND Power consumption of each servo axis is
0: Displayed.
1: Not Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
11395								SND

[Input type] Parameter input
[Data type] Bit spindle

#0 SND Power consumption of each spindle axis is
0: Displayed.
1: Not Displayed.

11397	Minimum torque overrides at acceleration/deceleration in spindle speed control mode

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] %
[Valid data range] 0 to 100

Set minimum torque override at acceleration/deceleration in spindle speed control mode.
This value corresponds to Eco level 3 (when bit 0 (ELV) of the parameter No.24303 is set to 0) or Eco level 7 (when bit 0 (ELV) of the parameter No.24303 is set to 1).

When torque override is set to 50%, for example, time constant for acceleration/deceleration gets twice.
Note that 0% is considered as 100%.
If eco-machining is not necessary, please set 0 or 100 in this parameter.

When bit 0 (PWE) of the parameter No.8900 is set to 1, this value can be changed on Eco setting screen.

> **NOTE**
> This parameter requires the option of Energy saving level selecting function.

11398	Minimum torque overrides at acceleration/deceleration in spindle synchronization control mode

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] %
[Valid data range] 0 to 100

Set minimum torque override at acceleration/deceleration in spindle synchronization control mode.
This value corresponds to Eco level 3 (when bit 0 (ELV) of the parameter No.24303 is set to 0) or Eco level 7 (when bit 0 (ELV) of the parameter No.24303 is set to 1).

When torque override is set to 50%, for example, time constant for acceleration/deceleration gets twice.
Note that 0% is considered as 100%.
If eco-machining is not necessary, please set 0 or 100 in this parameter.

When bit 0 (PWE) of the parameter No.8900 is set to 1, this value can be changed on Eco setting screen.

> ⚠ **CAUTION**
> Machine or work can be damaged by out-of-synchronization when torque overrides of spindles in synchronization control mode differ from each other. This is because this function differs the time constant for acceleration/deceleration in spindle synchronization mode.
> Set a common value for spindles belonging to the same group of synchronization.

> **NOTE**
> This parameter requires the option of Energy saving level selecting function.

11399	Conversion factor from power consumption (kWh) to carbon-dioxide emission (kg)

[Input type] Parameter input
[Data type] Word
[Unit of data] 0.001kgCO2/kWh
[Valid data range] 0 to 1000

Specify conversion factor from power consumption (kWh) to carbon-dioxide emission (kg). Adjust the value to correspond to power supplying circumstances in the area where a machine is used.
If 0 or invalid value is specified, 0.555kgCO2/kWh is used as the conversion factor.

> **NOTE**
> This parameter requires the option of Energy saving level selecting function.

4.106 PARAMETERS OF TOOL COMPENSATION (2 OF 3)

	#7	#6	#5	#4	#3	#2	#1	#0
11400						TOP	NO5	
						TOP		

[Input type] Parameter input
[Data type] Bit path

#1 NO5 The fifth axis offset function is:
0: Not used.
1: Used.

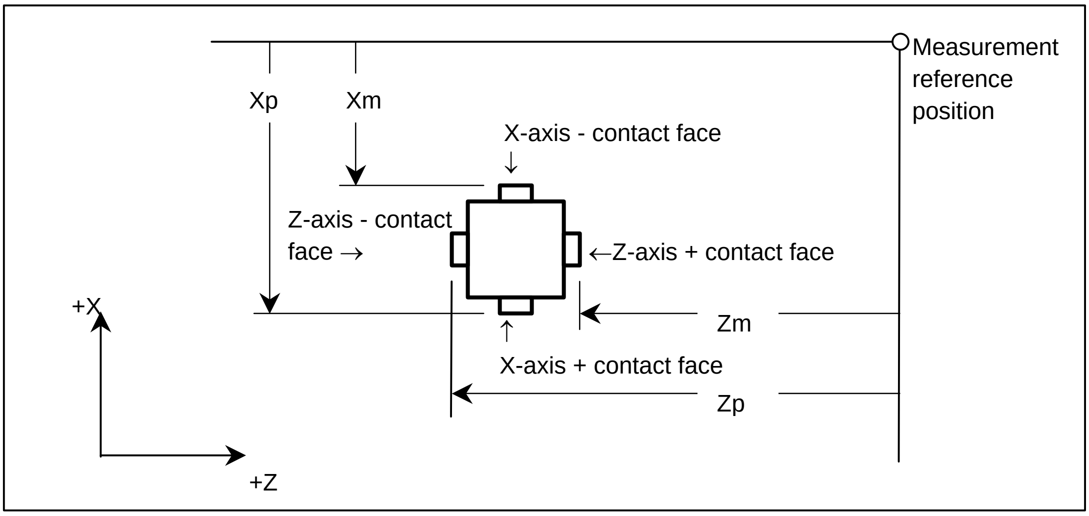
#2 TOP Set a tool length compensation or tool offset operation.
0: Tool length compensation or tool offset operation is performed by an axis movement.
1: Tool length compensation or tool offset operation is performed by shifting the coordinate system.

> **NOTE**
> This parameter is an-individual path parameter having the same function as bit 6 (TOS) of parameter No. 5006.
> To use different compensation types for individual paths, set the parameter TOS with 0 and specify a compensation type for each path separately, using the parameter TOP. If the parameter TOS is 1, the parameter TOP is assumed to be 1 even if it is 0.

11401	Distance to the + contact ace of the touch sensor
11402	Distance to the - contact ace of the touch sensor

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

These parameters are for the function of direct input of offset value measured B.
These parameters set the distances (with signs) to the respective contact faces of the sensor from the measurement reference position.
For angular axis control, set the distances in the orthogonal coordinate system.



	#7	#6	#5	#4	#3	#2	#1	#0
11403				MMT		OFN		
		WNM				OFN		

[Input type] Parameter input
[Data type] Bit path

#2 OFN In Y-axis offset and 4th / 5th offset, the specification address of the data input/output and the programable data input is
0: Default specification address ‘Y’,’E’ and ’F’.
1: Address of axis name (parameter No.1020).

NOTE
1 The axis name that can be used as a specification address is only 'A', and 'B'.
If specification address 'A'or'B' is used, the address 'V' (incremental command of Y-axis offset) cannot be used.
2 When setting is the following condition, the default specification address 'Y','E'and'F' is used.
- Parameter No.1020 is set to axis name other than 'A(65)' or 'B(66)'.
- An extended axis name is used.
3 When bit 2 of parameter No.11403 is set to 1, conventional offset data cannot be read.If conventional offset data is read, Please set 0 to bit 2 of parameter No.11403.

#4 MMT If the tool offset for milling and turning function is used, the compensation values acquired with machining center system measurement functions are regarded as:
0: Tool length compensation values.
1: Tool position compensation values.
If, in a machining center system measurement function,
the X-axis direction of the tool is measured with MMT being set to 0, this results in the Z-axis/length (tool length compensation value).
the X-axis direction of the tool is measured with MMT being set to 1, this results in the tool position compensation value in the X-axis direction.

#6 WNM In the tool length/workpiece zero point measurement function, the automatic reference position return operation after tool length compensation value measurement is:
0: Disabled.
1: Enabled.

11411	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 01
11412	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 02
11413	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 03
11414	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 04
11415	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 05
11416	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 06
11417	Number of the workpiece coordinate system used as the reference for workpiece setting error amount No. 07

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 1300
These parameters set the numbers of the workpiece coordinate systems used as the reference for the respective workpiece setting errors.
For G54 to G59, set 54 to 59. For G54.1P1 to G54.1P300, set 1001 to 1300.
If 0 is set in one of these parameters, the workpiece setting error corresponding to that parameter cannot be used in multiple workpiece coordinate systems.

11419	The interval of the tool offset number with tool compensation memory A and B

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to [(the maximum number of tool compensation values)-1]/2 (omit the figures after the decimal fractions)

For cutting point command
When cutting point command is used with tool compensation memory A and B of machining center system, the tool offset number of each compensation value is as follows.
- Tool offset number of tool length compensation value
H code
- Tool offset number of tool radius compensation value
H code + (parameter No. 11419)
- Tool offset number of corner-R compensation value
H code + 2 * (parameter No. 11419)

When parameter No. 11419 is 0, the interval of the offset number is 1.
If parameter No. 11419 is smaller than 0, alarm PS5464, "ILLEGAL COMMAND IN G43.8/G43.9", occurs when cutting point command starts.

If parameter No. 11419 is larger than [(the maximum number of tool compensation values)-1]/2, alarm PS0030, "ILLEGAL OFFSET NUMBER", occurs when cutting point command starts.

For 3-dimentional cutter compensation taking into account the tool figure
When 3-dimentional cutter compensation taking into account the tool figure is used with tool compensation memory A and B of machining center system, the tool offset number of each compensation value is as follows.
- Tool offset number of the cutter compensation
  D(R) code
- Tool offset number of the corner-R
  D(R) code + parameter No.11419

When the parameter No. 11419 is set to 0, interval of the tool offset number is regarded as 1.

4.107 PARAMETERS OF OPTIMUM TORQUE ACCELERATION/DECELERATION FOR RIGID TAPPING

	#7	#6	#5	#4	#3	#2	#1	#0
11420								RAU

[Input type] Parameter input
[Data type] Bit path

#0 RAU Optimum torque acceleration/deceleration function for rigid tapping is
0: Disabled.
1: Enabled.

11421	Maximum acceleration of the optimum acceleration/deceleration for rigid tapping (gear 1)
11422	Maximum acceleration of the optimum acceleration/deceleration for rigid tapping (gear 2)
11423	Maximum acceleration of the optimum acceleration/deceleration for rigid tapping (gear 3)
11424	Maximum acceleration of the optimum acceleration/deceleration for rigid tapping (gear 4)

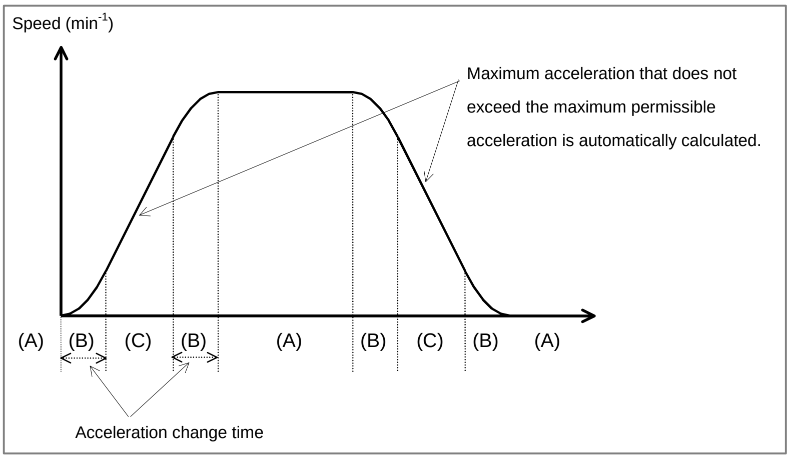
[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] rev/sec^2
[Valid data range] 0 to 10000.0
These parameters set maximum accelerations.

11425	Acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (gear 1)
11426	Acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (gear 2)
11427	Acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (gear 3)
11428	Acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (gear 4)

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] msec

[Valid data range] 0 to 200

These parameters set the acceleration change time of bell-shaped acceleration/deceleration in optimum acceleration/deceleration for rigid tapping (time taken for the change from the constant speed state (A) to the acceleration state (C) with the acceleration calculated from the optimum acceleration/deceleration for rigid tapping, i.e., the time indicated by (B) in the figure below).



11429	Spindle speed at P1 in optimum acceleration/deceleration for rigid taping (gear 1)
11430	Spindle speed at P2 in optimum acceleration/deceleration for rigid taping (gear 1)
11431	Spindle speed at P3 in optimum acceleration/deceleration for rigid taping (gear 1)
11432	Spindle speed at P1 in optimum acceleration/deceleration for rigid taping (gear 2)
11433	Spindle speed at P2 in optimum acceleration/deceleration for rigid taping (gear 2)
11434	Spindle speed at P3 in optimum acceleration/deceleration for rigid taping (gear 2)
11435	Spindle speed at P1 in optimum acceleration/deceleration for rigid taping (gear 3)
11436	Spindle speed at P2 in optimum acceleration/deceleration for rigid taping (gear 3)
11437	Spindle speed at P3 in optimum acceleration/deceleration for rigid taping (gear 3)
11438	Spindle speed at P1 in optimum acceleration/deceleration for rigid taping (gear 4)
11439	Spindle speed at P2 in optimum acceleration/deceleration for rigid taping (gear 4)
11440	Spindle speed at P3 in optimum acceleration/deceleration for rigid taping (gear 4)

[Input type] Parameter input
[Data type] Byte spindle
[Unit of data] %
[Valid data range] 0 to 100

These parameters set the spindle speeds at P1 to P3 of acceleration points P0 to P4 as ratios to the maximum spindle speed (parameters Nos. 5241 to 5244). The spindle speed at P0 is 0, while the spindle speed at P4 is the maximum spindle speed. Any acceleration setting points where 0 is set will be skipped.

11441	Permissible acceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 1)
11442	Permissible acceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 1)
11443	Permissible acceleration at P2 in optimum acceleration/deceleration for rigid tapping (gear 1)
11444	Permissible acceleration at P3 in optimum acceleration/deceleration for rigid tapping (gear 1)
11445	Permissible acceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 1)
11446	Permissible acceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 2)
11447	Permissible acceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 2)
11448	Permissible acceleration at P2 in optimum acceleration/deceleration for rigid tapping (gear 2)
11449	Permissible acceleration at P3 in optimum acceleration/deceleration for rigid tapping (gear 2)
11450	Permissible acceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 2)
11451	Permissible acceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 3)
11452	Permissible acceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 3)
11453	Permissible acceleration at P2 in optimum acceleration/deceleration for rigid tapping (gear 3)
11454	Permissible acceleration at P3 in optimum acceleration/deceleration for rigid tapping (gear 3)
11455	Permissible acceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 3)
11456	Permissible acceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 4)
11457	Permissible acceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 4)
11458	Permissible acceleration at P2 in optimum acceleration/deceleration for rigid tapping (gear 4)
11459	Permissible acceleration at P3 in optimum acceleration/deceleration for rigid tapping (gear 4)
11460	Permissible acceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 4)

[Input type] Parameter input
[Data type] Byte spindle
[Unit of data] %
[Valid data range] 0 to 100

These parameters set the permissible accelerations at acceleration setting points P0 to P4 as ratios to the maximum acceleration (parameters Nos. 11421 to 11424). At any acceleration setting points where 0 is set, 100% is assumed.

11461	Permissible deceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 1)
11462	Permissible deceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 1)
11463	Permissible deceleration at P2 in optimum acceleration/deceleration for rigid tapping (gear 1)
11464	Permissible deceleration at P3 in optimum acceleration/deceleration for rigid tapping (gear 1)
11465	Permissible deceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 1)
11466	Permissible deceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 2)

11467	Permissible deceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 2)
11468	Permissible deceleration at P2 in optimum acceleration/deceleration for rigid tapping (gear 2)
11469	Permissible deceleration at P3 in optimum acceleration/deceleration for rigid tapping (gear 2)
11470	Permissible deceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 2)
11471	Permissible deceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 3)
11472	Permissible deceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 3)
11473	Permissible deceleration at P2 in optimum acceleration/deceleration for rigid tapping (gear 3)
11474	Permissible deceleration at P3 in optimum acceleration/deceleration for rigid tapping (gear 3)
11475	Permissible deceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 3)
11476	Permissible deceleration at P0 in optimum acceleration/deceleration for rigid tapping (gear 4)
11477	Permissible deceleration at P1 in optimum acceleration/deceleration for rigid tapping (gear 4)
11478	Permissible deceleration at P2 in optimum acceleration/deceleration for rigid tapping (gear 4)
11479	Permissible deceleration at P3 in optimum acceleration/deceleration for rigid tapping (gear 4)
11480	Permissible deceleration at P4 in optimum acceleration/deceleration for rigid tapping (gear 4)

[Input type] Parameter input
[Data type] Byte spindle
[Unit of data] %
[Valid data range] 0 to 100

These parameters set the permissible decelerations at acceleration setting points P0 to P4 as ratios to the maximum acceleration (parameters Nos. 11421 to 11424). At any acceleration setting points where 0 is set, 100% is assumed.

4.108 PARAMETERS OF ARBITRARY SPEED THREADING

	#7	#6	#5	#4	#3	#2	#1	#0
11485							RMT	AST

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 AST Arbitrary speed threading is:
0: Disabled.
1: Enabled.

#1 RMT Re-machining thread is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
11486						AMM	ART	ADQ

[Input type] Parameter input
[Data type] Bit path

#0 ADQ Command for shifting the threading start angle by address Q in re-machining thread is:
0: Disabled.
1: Enabled.

#1 ART Arbitrary speed threading mode is:
0: Canceled by reset.
1: Not canceled by reset.

> **NOTE**
> 1 In case of this parameter is 0, if reset operation is executed in arbitrary speed threading mode, Cs contour control change signal CON <Gn027.7> or Cs contour control change signals in each axis CONS <Gn274.0 to 3> must be set to "0".
> 2 In case of this parameter is 1, if reset operation is executed in arbitrary speed threading mode, Cs contour control change signal CON <Gn027.7> or Cs contour control change signals in each axis CONS <Gn274.0 to 3> must be maintained to "1". If it cancels the arbitrary speed threading mode, M code of cancel the arbitrary speed threading (No.11488) must be specified and Cs contour control change signal CON <Gn027.7> or Cs contour control change signals in each axis CONS <Gn274.0 to 3> must be set to "0".

#2 AMM In arbitrary speed threading mode, M code to start arbitrary speed threading mode is
0: Disable to command (Alarm (PS0529) "THREADING COMMAND IMPOSSIBLE" occurs).
1: Enabled to command.

> **NOTE**
> In case of this parameter is 1, M code to start arbitrary speed threading can be re-commanded in arbitrary speed threading mode. Arbitrary speed threading mode is already selected. So process to change to arbitrary speed threading is not performed, but M code is output. Please operate properly with PMC ladder.

11487	M code to start arbitrary speed threading mode

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] None
[Valid data range] 0 to 99999999
This parameter sets the M code to start arbitrary speed threading mode.

> **NOTE**
> 1 The parameter setting must not be the same as the M code used for any other function.

> **NOTE**
> 2 When this parameter is set to 0, this function is invalid.
> 3 If the same value is set for two or more Cs contour control axes within the path, the alarm PS0531, "THREADING PARAMETER ERROR" is issued.
> 4 The M code set in this parameter prevents buffering.

11488	M code to cancel arbitrary speed threading mode

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] None
[Valid data range] 0 to 99999999
This parameter sets the M code to cancel arbitrary speed threading mode.

> **NOTE**
> 1 The parameter setting must not be the same as the M code used for any other function.
> 2 When this parameter is set to 0, this function is invalid.
> 3 If the same value is set for two or more Cs contour control axes within the path, the alarm PS0531, "THREADING PARAMETER ERROR" is issued.
> 4 The M code set in this parameter prevents buffering.

11489	Acceleration in arbitrary speed threading

[Input type] Parameter input
[Data type] Real axes
[Unit of data] mm/sec^2, inch/sec^2, degree/sec^2 (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0.
When the machine system is inch system, 0.0 to +10000.0.)
This parameter sets acceleration of major axis in arbitrary speed threading.
If this parameter is set to 0, acceleration is assumed to 100000.0.

11490	Spindle speed arrival level in arbitrary speed threading

[Input type] Parameter input
[Data type] word path
[Unit of data] min^{-1}
[Valid data range] 0 to 32767
Threading is started if the spindle speed is arrived within the level set in this parameter.

> **NOTE**
> Threading is not started if the spindle speed is not arrived within the level set in this parameter.

11492	Adjusting parameter 1 for arbitrary speed threading (position error of servo)

[Input type] Parameter input
[Data type] word path

[Unit of data] 0.01%
[Valid data range] -32768 to 32767 (If this parameter is set to 0, the setting is assumed to 10000.)
Thread start position compensation for arbitrary speed threading made fine adjustments by this parameter. It is a multiplier to adjust the position error of servo which is calculated by CNC.

11493	Adjusting parameter 2 for arbitrary speed threading (position error of spindle)

[Input type] Parameter input
[Data type] word path
[Unit of data] 0.01%
[Valid data range] -32768 to 32767 (If this parameter is set to 0, the setting is assumed to 10000.)
Thread start position compensation for arbitrary speed threading made fine adjustments by this parameter. It is a multiplier to adjust the position error of spindle which is calculated by CNC.

11496	Measurement result of thread groove

[Input type] Parameter input
[Data type] Real axis

[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Measurement result of thread groove is stored.

> **NOTE**
> This parameter stores measurement result of thread groove. Don't input this parameter.

4.109 PARAMETERS OF PROGRAMS (3 OF 4)

	#7	#6	#5	#4	#3	#2	#1	#0
11501						MSC		

[Input type] Parameter input
[Data type] Bit path

#2 MSC The machine lock shift value check in automatic operation is :
0: Not applied.
1: Applied.

> **NOTE**
> 1 This function is invalid for the axis in the machine lock state.

> **NOTE**
> 2 The followings can be commanded with the machine lock shift value remained.
> - Automatic reference position return (The middle point is not specified)
> - Workpiece coordinate system preset
> - Local coordinate system setting
> - Machine coordinate system setting
> - Coordinate system setting
> - Workpiece coordinate system setting (Axis movement is not specified)
>
> 3 In other automatic operation, if there is no movement in the machine coordinate system, the alarm is not issued.
> 4 This function is invalid for the dummy axis. (Parameter KSV(No.11802#4)=1 or DMY(No.2009#0)=1)

	#7	#6	#5	#4	#3	#2	#1	#0
11502	IPW	CTC		PSU	CMS	WPP		

[Input type] Parameter input
[Data type] Bit

#2 WPP Programmable parameter input (G10)-based parameter re-setting that requires power-off is:
0: Disabled.
1: Enabled.

> **NOTE**
> Setting bit 2 (WPP) of parameter No. 11502 to 1 enables programmable parameter input (G10)-based parameter re-setting that requires power-off even when "PARAMETER WRITE " is disabled.

#3 CMS If the cycle start of MEM/RMT mode is commanded without reset while executing subprogram/macro call of the MDI mode:
0: The alarm is not generated.
1: The alarm PS0525, "subprogram/macro calling." is generated.

#4 PSU Programmable parameter input(G10L50/52) is:
0: executed by normal speed.(conventional specification)
1: executed by high speed.

#6 CTC During axis moving, the time constant of rapid traverse linear acceleration/deceleration for each axis (parameter No. 1620) is:
0: Write-disabled.
1: Write-enabled.

#7 IPW The advanced preview feed-forward coefficient (parameter No. 2092) and bit 0 (SMR) of parameter No. 8162 for specifying whether to apply a mirror image during synchronization control are:
0: Write-disabled during axis moving.
1: Write-enabled if the corresponding axis is stopped.

	#7	#6	#5	#4	#3	#2	#1	#0
11505								ISU

[Input type] Setting input
[Data type] Bit

#0 ISU When an USB memory card is selected as an I/O device, data input/output is performed using
0: ASCII codes.
1: ISO codes.

> ⚠ **WARNING**
> 1 Unless data is input using ASCII codes, set this parameter to 1 to input or output data using ISO codes.
> 2 Data input/output with ASCII codes is dangerous because parity information is not included and a data error during the data input/output is not detected.

	#7	#6	#5	#4	#3	#2	#1	#0
11506								PCU

[Input type] Parameter input
[Data type] Bit

#0 PCU If there is a USB memory interface on the CNC side, the USB memory interface used when the CNC screen display function is started via the HSSB interface is on the:
0: CNC side.
1: PC side.

> **NOTE**
> 1 With the PC function, a USB memory interface on the PC side is used regardless of the setting of this parameter if there is no USB memory interface on the CNC main unit side.
> 2 This parameter is valid only when the CNC screen display function is active via the HSSB interface.
> When setting 1 to this parameter, the CNC screen display function must always be executed via the HSSB interface.
> 3 When using the CNC screen display function via the Ethernet interface, set 0.
> 4 When this parameter is set, the power must be turned off before operation is continued.

11530	Warning value (common to ch1, ch2, and ch3) for I/O link retry counter

[Input type] Parameter input
[Data type] Byte
[Unit of data] Correction counter value/8 hours
[Valid data range] 0 to 128
Recommended setting = 0
Set a warning value for the I/O link communication retry counter.
When the value in the 8-hour error correction counter becomes higher than or equal to the setting, warning signal is output.

If the setting is 0, monitoring is performed on a 5 occurrences/8 hours basis.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

11531	Warning value for the ECC correction counter (SRAM)

[Input type] Parameter input
[Data type] Byte
[Unit of data] Correction counter value/8 hours
[Valid data range] 0 to 128

Recommended setting = 0
Set a warning value for the SRAM correction counter.
When the value in the 8-hour error correction counter becomes higher than or equal to the setting, warning signal is output.
If the setting is 0, monitoring is performed on a 5 occurrences/8 hours basis.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

11532	Warning value for the number of embedded-Ethernet error detection occurrences

[Input type] Parameter input
[Data type] Byte
[Unit of data] Number of detection occurrences/minute
[Valid data range] 0 to 128

Recommended setting = 0
Set a warning value for the number of embedded Ethernet error detection occurrences.
When the number of 1- minute error detection occurrences becomes higher than or equal to the setting, warning signal is output.
If the setting is 0, monitoring is performed on a 10 occurrences/minute basis.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

11533	Warning value for the number of fast Ethernet error detection occurrences

[Input type] Parameter input
[Data type] Byte
[Unit of data] Number of detection occurrences/minute
[Valid data range] 0 to 128

Recommended setting = 0
Set a warning value for the number of fast Ethernet error detection occurrences.
When the number of 1-minute error detection occurrences becomes higher than or equal to the setting, warning signal is output.
If the setting is 0, monitoring is performed on a 10 occurrences/minute basis.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

11534	Warning value (common to FL-net boards 1 and 2) for the number of FL-net error detection occurrences

[Input type] Parameter input
[Data type] Byte
[Unit of data] Number of detection occurrences/minute
[Valid data range] 0 to 128

Recommended setting = 0
Set a warning value for the number of FL-net error detection occurrences.
When the number of 1- minute error detection occurrences becomes higher than or equal to the setting, the warning signal is output.
If the setting is 0, monitoring is performed on a 3 occurrences/minute basis.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

	#7	#6	#5	#4	#3	#2	#1	#0
11549								APS

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit

#0 APS Automatic setting function of PS control axis, automatic setting of parameter is
0: Not performed.
1: Performed.

> **NOTE**
> After completing the automatic setting of PS control axis, this parameter becomes 0.

11550	M code of removal command for Flexible path axis assignment

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 32767

When the signal type of flexible path axis assignment is used, M code of the removal command is set in each path.

11551	M code of assignment command for Flexible path axis assignment

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 32767

When the signal type of flexible path axis assignment is used, M code of the assignment command is set in each path.

11552	M code of exchange command for Flexible path axis assignment

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 32767

When the signal type of flexible path axis assignment is used, M code of the exchange command is set in each path.

11553	The address of command in user area of internal relay(R)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 7999

When the signal type of flexible path axis assignment is used, the address of command in user area of internal relay (R) is set in each axis. 3 bytes are used from a set value with each axis.

> **NOTE**
> 1 Set the value that becomes the multiple of 4. (0, 4, 8, …)
> 2 The range of the R address differs depending on the PMC used and the memory size. Check the specifications of the PMC, and set a value within the valid range.
> (Example: R addresses in the range from R0 to R7999 if memory B of the first PMC is used.)

11554	Internal relay user area (R) address for individual-axis information

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input

[Data type] Word axis
[Valid data range] 0 to 7999

Set an internal relay user area (R) address for information to be output about an individual axis. The information is output only about the axis specified with this parameter. Three bytes starting at the setting are used for each axis.

> **NOTE**
> 1 The setting must be a multiple of 4 (4, 8, …).
> 2 This function is disabled if the parameter is 0.
> 3 When performing multipath control, be careful to keep the data addresses of each path from overlapping with those of the other paths.
> 4 The R address area varies depending on the PMC used and its memory. Be sure to select values within the usable range by checking the specifications of the PMC. (Example: R addresses in the range from R0 to R7999 if memory B of the first PMC is used.)

11555	Flexible path axis assignment specified axis name

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 256

When the axis selected by bit0 (PAN) of parameter No.11564 is assigned, the specified axis name is used.

11556	Flexible path axis assignment specified axis name 2

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 256

When the axis selected by bit0 (PAN) of parameter No.11564 is assigned, the specified axis name is used. If the extended axis name is effective (bit0 (EEA) of parameter No.1000=1), this value becomes the second character of the axis name. Otherwise, this value becomes the subscript of the axis name.

11557	Flexible path axis assignment specified axis name 3

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 256

When the axis selected by bit0 (PAN) of parameter No.11564 is assigned, the specified axis name is used. If the extended axis name is effective (bit0 (EEA) of parameter No.1000=1), this value becomes the third character of the axis name. When the second axis name is not set, the third axis name becomes invalid.

11560	Identification number for an axis to be subjected to flexible path axis assignment

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis

[Valid data range] 0 to 32767

Set an identification number for an axis to be subjected to flexible path axis assignment. The value specified corresponds to a program-specified address P(Q,R) value.

	#7	#6	#5	#4	#3	#2	#1	#0
11561				FAC	FAM	FAO	FAW	FAR

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 FAR The flexible path axis assignment is:
0: Disabled.
1: Enabled.

> **NOTE**
> Setting the parameter FAR erases all history data (operation history, alarm history, and external operator message history) the next time the power is turned on.

#1 FAW If an axis acquisition command is issued for an axis yet to be freed in flexible path axis assignment:
0: The command waits for the axis to be freed.
1: Alarm PS0514, "ILLEGAL COMMAND IN FLEXIBLE PATH AXIS ASSIGNMENT", is issued.

#2 FAO If the power is turned off and on again with flexible path axis assignment in effect, the axis configuration is:
0: Returned to the initial state (specified with parameter No. 0981).
1: Kept in the most recent state.

#3 FAM The method of command specification used by programs in flexible path axis assignment is:
0: Identification number method.
1: Axis name method.

#4 FAC If the axis removal command is issued for an axis which already removed, or assigned to the another path in flexible path axis assignment:
0: Alarm PS0514, "ILLEGAL COMMAND IN FLEXIBLE PATH AXIS ASSIGNMENT", is issued..
1: The command is ignored.

	#7	#6	#5	#4	#3	#2	#1	#0
11562							FAN	

[Input type] Parameter input
[Data type] Bit axis

#1 FAN In flexible path axis assignment, axis names used after exchange are:
0: Those previously set for each axis.
1: Those set for the other axes in exchange pairs.

> **NOTE**
> The parameter FAN is invalid when an axis acquisition command for flexible path axis assignment is issued. The name set for each axis is inherited.

	#7	#6	#5	#4	#3	#2	#1	#0
11563		RRS		FAX	WUA	NMF		CSG

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 CSG Flexible path axis assignment is commanded:
- 0: By G code command.
- 1: By PMC signal setting.

 # 2 NMF Direct assignment mode signal DASN<G0536.5> is:
- 0: Not used.
- 1: Used.

 # 3 WUA In direct assign mode of the flexible path axis assignment, if removal command could not execute,
- 0: The alarm DS0080, "ILLEGAL COMMAND IN FLEXIBLE PATH AXIS ASSIGNMENT", occurs.
- 1: Wait execution of the axis removal.

#4 FAX In flexible path axis assignment, if the target axis of the assignment command is already exists on the target path,
- 0: The alarm PS0514, "ILLEGAL COMMAND IN FLEXIBLE PATH AXIS ASSIGNMENT", occurs.
- 1: the command is ignored.

 # 6 RRS When reset is executed, the axis assignment changed by Flexible path axis assignment
- 0: Is not changed.
- 1: Is returned to its initial assignment.

	#7	#6	#5	#4	#3	#2	#1	#0
11564								PAN

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 PAN The name of the axis which assigned to each path is
- 0: Not changed.
- 1: Changed to the specific name selected in each path.

This setting is available on only one axis in a path.

	#7	#6	#5	#4	#3	#2	#1	#0
11600			AX1	D3A		D3IT	D3MV	

[Input type] Parameter input
[Data type] Bit path

#1 D3MV In following modes, axis moving signals is:
- 3-dimensional coordinate system conversion
- Tilted working plane indexing
- Workpiece setting error compensation
- Tool center point control

0: The signals for axes on programming coordinate system.
1: The signals for axes on workpiece coordinate system.

If this parameter is set to 0 and machine type is table rotation type, axis moving signals in tool center point control mode is the signals for axes on table coordinate system.

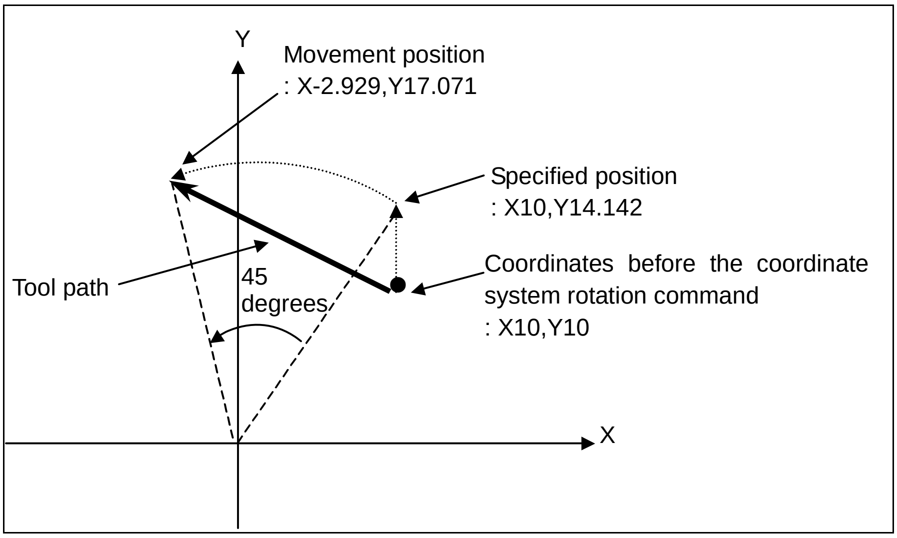
#2 D3IT In the 3-dimensional coordinate system conversion mode, the valid interlock signals (interlock signal for each axis (*ITx) or interlock signal for each axis direction (MITx, PITx)) are:
0: The signals for all of the target axes for 3-dimensional coordinate system conversion.
1: The signals for axes along which a movement is made during 3-dimensional coordinate system conversion.

#4 D3A In 3-dimensional coordinate system conversion cancellation, if the compensation vector has not been canceled:
0: Alarm PS5462, "ILLEGAL COMMAND (G68.2/G69)", is issued.
1: No alarm is issued.

#5 AX1 If, in coordinate system rotation mode, a 1-axis command is issued in absolute mode,
0: First, the specified position is calculated in the coordinate system before rotation, and then the coordinate system is rotated.
1: First, the coordinate system is rotated, and then the tool moves to the specified position in the coordinate system.
(FS16*i*/18*i*/21*i* compatible specification)

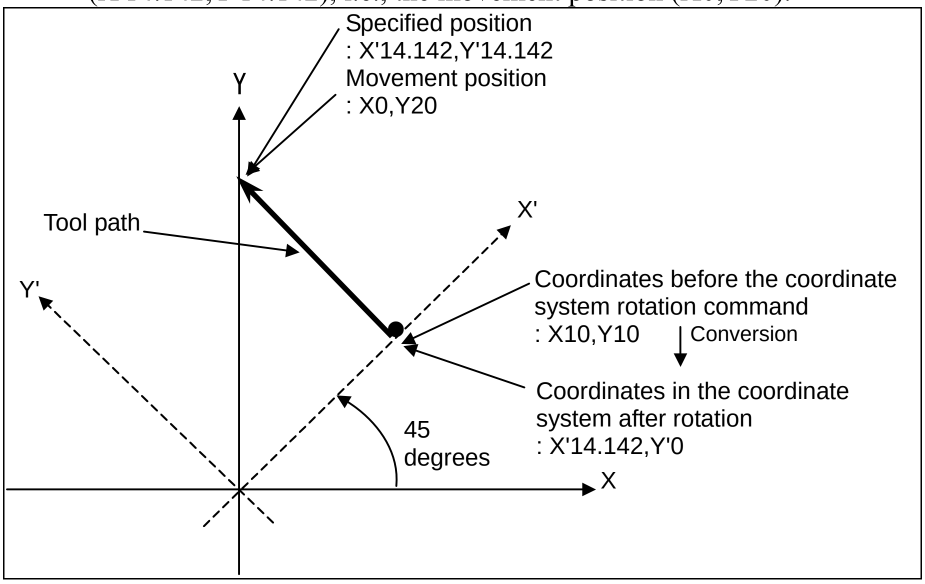
[Example] G90 G0 X0 Y0
G01 X10. Y10. F6000
G68 X0 Y0 R45. ....Coordinate system rotation command
Y14.142 ....1-axis command (1)
G69

When the bit 5 (AX1) of parameter No. 11600 is set to 0:
In the coordinate system (XY) before rotation, the specified position is calculated, and then the coordinate system is rotated. Thus, for the command in (1), the position on the X-axis that is not specified is assumed to be X10, so that the specified position is (X10,Y14.142). Then, the tool moves to the movement position (X-2.929,Y17.071) resulting from 45-degree rotation.



When the bit 5 (AX1) of parameter No. 11600 is set to 1:

The command in (1) converts the coordinates before the coordinate system rotation command, (X10,Y10), into the coordinates (X'14.142,Y'0) in the coordinate system rotated by 45 degrees (X'Y'). Then, the tool moves to the specified position (X'14.142,Y'14.142), i.e., the movement position (X0,Y20).



	#7	#6	#5	#4	#3	#2	#1	#0
11601		SBN						

[Input type] Parameter input
[Data type] Bit

#6 SBN When the dual position feedback and the monitoring semi-full error is used in servo function, the smooth backlash compensation is executed :

0: According to the setting of bit 4 of parameter No.2206 and bit 5 of parameter No.2010.
1: In the semi-closed loop side.

	#7	#6	#5	#4	#3	#2	#1	#0
11602			NCP	NDO				

[Data type] Bit path

#4 NDO If a normal direction control cancel command (G40.1) block contains a cutting feed command and the next block also contains a cutting feed command:
0: The next block performs movement after a deceleration stop.
1: The next block performs movement without waiting for a deceleration stop.

#5 NCP If there is a non-threading block between two threading blocks, the second threading block:
0: Waits until the spindle one-rotation signal and the spindle speed arrival signal (SAR) are detected.
1: Does not wait until the spindle one-rotation signal and the spindle speed arrival signal (SAR) are detected unless a G code in non-threading group 01 is issued. (FS16*i* compatible specification)

11604	Number of look-ahead blocks for high-speed processing

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 1000
Set the number of look-ahead blocks for each path used in high-speed processing.

NOTE
1 When this parameter is set, the power must be turned off before operation is continued.
2 This parameter can set up to 600 look-ahead blocks for high-speed processing. Extending the number to up to 1000 blocks (optional) enables up to 1000 look-ahead blocks to be set.
3 If the parameter is 0 for all paths, it is assumed that the maximum number of blocks is set for the first path.
4 High-speed processing is usable for up to two paths with up to 12 axes.

	#7	#6	#5	#4	#3	#2	#1	#0
11630						TFR	MDE	FRD

[Input type] Parameter input
[Data type] Bit path

#0 FRD The minimum command unit of the rotation angles of coordinate rotation and 3-dimensional coordinate system conversion is:
0: 0.001 degree.
1: 0.00001 degree. (1/100,000)

#1 MDE In the MDI mode, the external device subprogram call (M198) is:
0: Disabled.
1: Enabled.

NOTE
If instructing M198 at the parameter MDE(No.11630#1)=0, the alarm PS1081"EXT DEVICE SUB PROGRAM CALL MODE ERROR" is generated.

#2 TFR The minimum command unit of the rotation angles of the tilted working plane indexing command is:
0: 0.001 degree.
1: 0.00001 degree.

11631	M code 1 to protect
11632	M code 2 to protect
11633	M code 3 to protect
11634	M code 4 to protect
11635	M code 5 to protect
11636	M code 6 to protect
11637	M code 7 to protect
11638	M code 8 to protect
11639	M code 9 to protect
11640	M code 10 to protect

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999 (except 30, 98, and 99)
In connection with the M code protect function, these parameters set the M codes (auxiliary functions) to be permitted for execution from macro programs only.

> **NOTE**
> Set 0 in any of the parameters that are not used.

11641	M code start number to protect (1st set)
11643	M code start number to protect (2nd set)
11645	M code start number to protect (3rd set)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999 (except 30, 98, and 99)

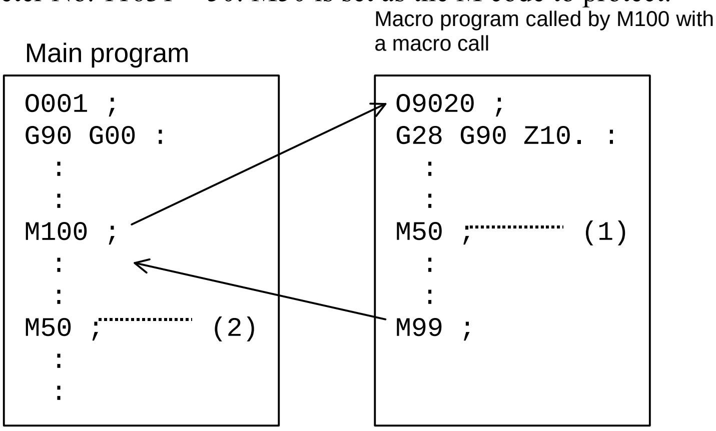
11642	Number of M codes to protect (1st set)
11644	Number of M codes to protect (2nd set)
11646	Number of M codes to protect (3rd set)

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 32767
In connection with the M code protect function, these parameters set the M codes (auxiliary functions) to be permitted for execution from macro programs only. Set an M code number and the number of consecutive M codes.
Up to three such sets can be set.
Any sets in which either the M code number or the number of M codes is out of range are invalid.

[Example of setting]

	1st set	2nd set	3rd set
M code	No. 11641=50	No. 11643=150	No. 11645=900
Number of codes	No. 11642=10	No. 11644=5	No. 11646=30
M codes to protect	M50 to M59	M150 to M154	M900 to M929

[Example of use] Parameter No. 11631 = 50: M50 is set as the M code to protect.



In this example, the following takes place:

(1) The M50 command specified for protection is specified from within a program called with a macro call and is, therefore, executable.

(2) The M50 command specified for protection is specified from within the main program and is, therefore, not executable. (Alarm PS0501, "THE COMMANDED M-CODE CAN NOT BE EXECUTED", is issued.)

NOTE

1 Macro calls that can execute the M codes (auxiliary functions) specified for protection are as follows:
- Macro call using a G/M code
- Macro call using a macro interruption
- Macro call using a T/S/second auxiliary function code (With this function, they are treated as macro calls.)

2 The calls below cannot execute the M codes specified for protection.
- Macro call using a G65/G66/G66.1
- Subprogram call (except a T/S/second auxiliary function code.)

3 M code commands from execution macros are always executable.

4 It is possible to specify the target M codes (auxiliary functions) from a subprogram in a state in which a macro call is already executed.

[Example] Main program
→ Macro call
→ Subprogram call
(M code command)

The target M code is specified from a subprogram called from a macro program and is, therefore, executable.

5 M code commands in MDI mode are also checked in the same way.

NOTE

6 This function is invalid to the following M codes:
- M00, M01, M02, M30, M98, M99

11647	The local variable number corresponding to the axis address

[Input type] Parameter input
[Data type] Byte axis
[Unit of data] No unit
[Valid data range] 0 to 33

The address as an argument of the macro call is allocated to local variable number.
By this parameter, the address of axis name expansion can be the argument of the macro call.

	#7	#6	#5	#4	#3	#2	#1	#0
11648								M99

[Input type] Parameter input
[Data type] Bit

#0 M99 When the M99 is executed in the single block operation :
0: Operating stops after executing the previous return block.
1: Operating stops before executing the previous return block.

This function is effective only for M99 commanded in the following programs.
- Execution macro of macro executor
- Programs in "//CNC_MEM/SYSTEM" folder (*1)
- Programs in "//CNC_MEM/MTB1" folder (Embedded macro) (*1)
- Programs in "//CNC_MEM/MTB2" folder(*1)
- Programs of O number within the range specified by parameter 11656 and 11658.

(*1) It is effective only to the program put on the right under of each folder. When the subfolder is made and the program is put, parameter M99 is invalid to such a program.

	#7	#6	#5	#4	#3	#2	#1	#0
11651	DCO							

[Input type] Parameter input
[Data type] Bit path

#7 DCO During dry run, the cutting time is:
0: Not counted.
1: Counted.

11656	The first O number of the program for parameter M99(No.11648#0) make effective

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 99999999

Specify the first O number for parameter M99(No.11648#0) make effective.
When this parameter is 0, the specification of O number in which parameter M99 is made effective is invalid.

11657	The number of programs for parameter M99(No.11648#0) make effective

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 99999999
Specify the number of programs for parameter M99(No.11648#0) make effective.
When this parameter is 0, the specification of O number in which parameter M99 is made effective is invalid.

4.110 PARAMETERS OF MACHINING QUALITY LEVEL ADJUSTMENT

11681	Smoothing level currently selected when nano smoothing is used

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 10
This parameter sets the smoothing level currently selected when nano smoothing or nano smoothing 2 is used.

11682	Tolerance when nano smoothing is used (smoothing level 1)
11683	Tolerance when nano smoothing is used (smoothing level 10)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
Each of these parameters sets a tolerance value when nano smoothing is used.
It is necessary to set the value of both level1 and level10.

11684	Tolerance of rotary axes when nano smoothing 2 is used (smoothing level 1)
11685	Tolerance of rotary axes when nano smoothing 2 is used (smoothing level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
Each of these parameters sets tolerances of rotary axes when nano smoothing 2 is used.
It is necessary to set the value of both level1 and level10.

11686	Standard value of smoothing level when nano smoothing is used

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 10
Set standard value of smoothing level when nano smoothing or nano smoothing 2 is used.
When the power is turned on or the system is reset, the smoothing level
0 : keeps its value.

1 to 10 : becomes the level set to this parameter.

11687	Standard value of precision level when AI contour control is used

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 10
Set standard value of precision level when AI contour control is used.
When the power is turned on or the system is reset, the precision level
0 : keeps its value.
1 to 10 : becomes the level set to this parameter.

4.111 PARAMETERS OF WORKPIECE SETTING ERROR COMPENSATION (2 OF 2)

11750	Tolerance for assuming that the workpiece setting error Δa is 0
11751	Tolerance for assuming that the workpiece setting error Δb is 0
11752	Tolerance for assuming that the workpiece setting error Δc is 0

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Least input increment of the error in the rotation direction in workpiece setting error compensation (see the explanation of parameter No. 11201)
[Unit of data] 0 to 999999999
If the absolute value of the error in the rotation axis in workpiece setting error compensation is equal to or less than the setting of the corresponding one of these parameters, the error in the rotation direction is regarded as 0.
If the setting is negative, its absolute value is used.
The least input increment of the error in the rotation direction depends on the setting of parameter No. 11201.
For a machine with a table rotation axis, these parameters are effective to the errors Δa, Δb, and Δc in the rotation direction, respectively, when the table rotation axis position in the workpiece coordinate system is 0.

11753	Upper limit on the workpiece setting error Δa
11754	Upper limit on the workpiece setting error Δb
11755	Upper limit on the workpiece setting error Δc

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A)
(When the increment system is IS-B, -999999.999 to +999999.999)
If a value other than 0 is set in one of these parameters, and the corresponding error in the rotation axis in workpiece setting error compensation is equal to or greater than the setting of that parameter, alarm PS0517, "SETTING ERROR AMOUNT IS OUT OF RANGE" is issued when workpiece setting error compensation is started.
The least input increment of these parameters adheres to the reference axis regardless of the setting of parameter No. 11201.

For a machine with a table rotation axis, these parameters are effective to the errors Δa, Δb, and Δc in the rotation direction, respectively, when the table rotation axis position in the workpiece coordinate system is 0.

11756	**Lower limit on the workpiece setting error Δa**
11757	**Lower limit on the workpiece setting error Δb**
11758	**Lower limit on the workpiece setting error Δc**

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A)
(When the increment system is IS-B, -999999.999 to +999999.999)

If a value other than 0 is set in one of these parameters, and the corresponding error in the rotation axis in workpiece setting error compensation is equal to or less than the setting of that parameter, alarm PS0517, "SETTING ERROR AMOUNT IS OUT OF RANGE" is issued when workpiece setting error compensation is started.

The least input increment of these parameters adheres to the reference axis regardless of the setting of parameter No. 11201.

For a machine with a table rotation axis, these parameters are effective to the errors Δa, Δb, and Δc in the rotation direction, respectively, when the table rotation axis position in the workpiece coordinate system is 0.

	#7	#6	#5	#4	#3	#2	#1	#0
11768						ALH	WS3	

[Input type] Parameter input
[Data type] Bit path

#1 WS3 The machine that uses the workpiece setting error compensation is
0: 5-axis machine or 4-axis machine.
1: 3-axis machine.

> **NOTE**
> 1 This parameter is valid when parameter No. 19680 is set to 0.
> 2 If this parameter is invalid, the setting of the parameter (No.19680 to 19696) for 5-axis machining function is valid. The alarm related to 5-axis machining function is issued when there is an error in parameter setting.
> 3 If this parameter is valid, the setting of parameter No.19680-No.19696 is invalid, and it operates as 3-axis machine while workpiece setting error compensation.

#2 ALH In case tilted working plane indexing and tool center point control are used together or workpiece setting error compensation is used, when the movement of a hypothetical axis is made in order to compensate tool direction correctly,
0: the alarm is not generated.
1: the alarm is generated.

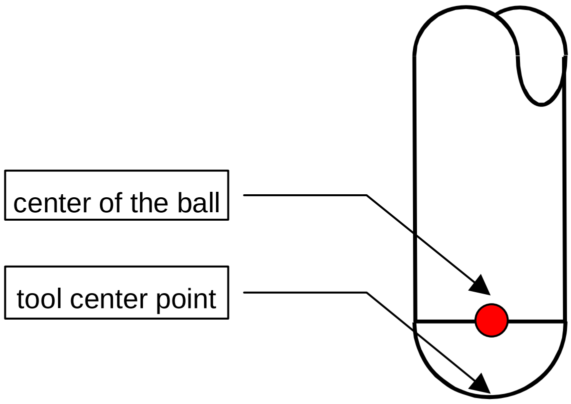
4.112 PARAMETERS OF HIGH-SPEED SMOOTH TCP (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
11775				BAL				TP2

[Input type] Setting input
[Data type] Bit path

#0 TP2 At the TCP starting block(G43.4, G43.5, G43.8L1, G43.9L1), when the address P is omitted, in accordance with the parameter TPC(No.19604#0),
0: Tool center point control or Tool posture control (G43.4P1, G43.5P1, G43.8L1, G43.9L1) is effective.
1: Tool center point control or Smooth control (G43.4P3, G43.5P3, G43.8P3, G43.9P3) is effective.

#4 BAL In the 3-dimentional cutter compensation taking into account the tool figure, the command point of Ball-end mill is
0: Center of the ball.
1: Tool center point



11776	Tolerance of Tool center point or Cutting point path for High-speed Smooth TCP (G43.4P3, G43.5P3, G43.8P3, G43.9P3)

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
In Smooth control (G43.4P3, G43.5P3, G43.8P3, G43.9P3), paths of Tool center point are paths within this parameter from the commanded linear paths of Tool center points.
When the data 0 is set in this parameter, paths are calculated assuming that the data 0.02 is set in this parameter.

11777	Tolerance of Tool posture control point path for High-speed Smooth TCP (G43.4P3, G43.5P3, G43.8P3, G43.9P3)

[Input type] Setting input
[Data type] Real path
[Unit of data] degree (input unit)
[Min. unit of data] Depend on the increment system of the reference axis

[Valid data range] 0 to 90

In High-speed Smooth TCP (G43.4P3, G43.5P3, G43.8P3, G43.9P3), angles between surfaces of High-speed Smooth TCP and planes of traditional Tool posture control(planes between starting tool posture and ending tool posture of a block) are within this parameter.

When the data 0 is set in this parameter, paths are calculated assuming that the data 0.02 is set in this parameter.

11778	Longest block length to enable Smoothing of High-speed Smooth TCP (G43.4P3, G43.5P3, G43.8P3, G43.9P3)

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))

(When the increment system is IS-B, 0.0 to +999999.999)

The longest block length (Maximum block length) of Tool center points to enable Smoothing of High-speed Smooth TCP (G43.4P3, G43.5P3, G43.8P3, G43.9P3) is set.

At blocks whose lengths are longer than this parameter, Smoothing of High-speed Smooth TCP is temporarily canceled.

When the data 0 is set in this parameter, the decision to cancel Smoothing with blocks lengths is not done.

11779	Maximum angle between blocks to enable Smoothing of High-speed Smooth TCP (G43.4P3, G43.5P3, G43.8P3, G43.9P3)

[Input type] Setting input
[Data type] Real path
[Unit of data] degree (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to 180

Maximum angle between blocks of Tool center points to enable Smoothing of Smooth control (G43.4P3, G43.5P3, G43.8P3, G43.9P3) is set. When angles between blocks are larger, Smoothing of High-speed Smooth TCP (G43.4P3, G43.5P3, G43.8P3, G43.9P3) is temporarily canceled.

When the data 0 is set in this parameter, the decision to cancel Smoothing with angles between blocks is done assuming that the data 90 is set in this parameter.

4.113 PARAMETERS OF SERVO (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
11802		RVL		KSV		SWF		CPY

[Input type] Parameter input
[Data type] Bit axis

NOTE
When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 CPY When a change from a semi-closed loop to a closed loop is made by the SEMIx signal, and when the SEMIx signal indicates a closed loop at power-on, the absolute coordinate value in the semi-closed loop is:
0: Not replaced by the absolute coordinate value in the closed loop.
1: Replaced by the absolute coordinate value in the closed loop.

#2 SWF When switching between the semi-closed loop and closed loop is performed by the SEMIx signal, re-creation of coordinate values on the detector on the loop side set after switching is:
0: Not performed.
1: Performed.

#4 KSV Servo axis is:
0: Enabled.
1: Disabled.

> **NOTE**
> 1 This setting is effective regardless of the value of parameter No. 1023.
> 2 If this setting is made for the axis subject to Cs axis contour/spindle positioning, Cs axis contour/spindle positioning will be disabled.

#6 RVL In case of using the rotary scale without rotary data to the linear axis type, an absolute position detector or a rotary scale with distance-coded reference marks (serial) is:
0: Not available.
1: Available.

> **NOTE**
> 1 Please use this parameter with a linear axis.
> 2 This parameter is effective when the parameter RVS(No.1815#0) is 1.
> 3 Set the parameter No.1869 to the amount of one rotation.

	#7	#6	#5	#4	#3	#2	#1	#0
11803						TSF	CDP	STH

[Input type] Parameter input
[Data type] Bit axis

#0 STH The dual position feedback turning mode is:
0: Disabled.
1: Enabled.

> **NOTE**
> Before the dual position feedback turning mode function can be used, a setting to enable dual position feedback is required in addition to the setting of this bit.

#1 CDP Dual position feedback compensation clamping is:
0: Not performed.
1: Performed.

> **NOTE**
> Before the dual position feedback compensation clamp function can be used, a setting to enable dual position feedback is required in addition to the setting of this bit.

#2 TSF Under tandem control, the servo of the slave axis is turned off:
0: Together with that of the master axis.
1: Independently of that of the master axis.

> **NOTE**
> 1 Use this parameter for the slave axis under tandem control.
> 2 Specify this parameter when both the master and slave axes under tandem control are at a stop.
> 3 Setting this parameter to 1 requires consideration on the ladder side, because the servo of the slave axis is turned off independently of, rather than together with, that of the master axis.

11807	VRDY-OFF alarm detection time when emergency stop is canceled

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Unit of data] sec
[Valid data range] 0 to 30

This parameter sets the VRDY-OFF alarm detection time when emergency stop is canceled. It is considered that 3sec is set when 0, 1, and 2 are set.

11810	The amount of the movement per one motor rotation of linear axis type (each axis)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

In case of using the rotary scale without rotary data to the linear axis type, set the amount of the movement per one motor rotation. When 0 is set in this parameter, 360. is assumed.

NOTE

1 This parameter is effective in the axis that satisfies all the following conditions.
- Linear axis
- Parameter RVS(No.1815#0)=1
- Parameter RVL(No.11802#6)=1

2 This parameter is available for the axis with an absolute position detector (absolute Pulsecoder) or a rotary scale with distance-coded reference marks (serial).

3 If this parameter is changed, the correspondence between the machine position and the absolute position detector is lost. Bit 4 (APZ) of parameter No.1815 is set to 0, and an alarm DS0300, "APC ALARM: NEED REF RETURN" is issued. The cause that sets bit 4 (APZ) of parameter No.1815 to 0 is indicated in diagnostic data No.310#0.

4.114 PARAMETERS OF AXIS CONTROL BY PMC (3 OF 4)

	#7	#6	#5	#4	#3	#2	#1	#0
11850	IFH							CMI

[Input type] Parameter input
[Data type] Bit path

#0 CMI If, in PMC axis control, a rapid traverse rate is specified with the axis control block data signal, with bit 0 (RPD) of parameter No. 8002 being set to 1, the rapid traverse rate is:
0: Always treated as being in millimeters.
1: Dependent on the setting of bit 0 (INM) of parameter No. 1001.

#7 IFH When bit 2 (OVE) of parameter No. 8001 is set to 1 in PMC axis control, the 1% rapid traverse override signals *EROVs are:
0: On a path-by-path basis. (The first groups in the individual paths (first, fifth, ninth, ..., 33rd, and 37th groups) are used.)
1: On a group-by-group basis.

Depending on this parameter and bit 1 (OVR) of parameter No. 8013, selected signals are as given in the table below.
(The signal addresses are those in the first path, and the actual addresses differ depending on the group used.)

	Bit 7 (IFH) of No. 11850 = 0 (*EROVs are on a path-by-path basis.)	Bit 7 (IFH) of No. 11850 = 1 (*EROVs are on a group-by-group basis.)
Bit 1 (OVR) of No. 8013 = 0	EROV1, EROV2 <G150.0, G150.1>	EROV1, EROV2 <G150.0, G150.1>
Bit 1 (OVR) of No. 8013 = 1	*EROV<G151>	*EROVA<G151> *EROVB<G163> *EROVC<G175> *EROVD<G187>

NOTE

Overrides are clamped at up to 100%.

	#7	#6	#5	#4	#3	#2	#1	#0
11851							TC1	SO1

	#7	#6	#5	#4	#3	#2	#1	#0
11852							TC2	SO2

	#7	#6	#5	#4	#3	#2	#1	#0
11853							TC3	SO3

[Input type] Parameter input
[Data type] Bit

#0 SO1
SO2
SO3 When S command is commanded in peripheral axis control program of peripheral axis control group 1 (group 2, group 3) :
0: S code is outputted, but the speed command is not outputted to the spindle.
1: S code is outputted, and the speed command is outputted to the spindle.

> **NOTE**
> If SO1 (SO2, SO3) is set to 0, output of S code does not depend on other parameter concerning output of S code. But if SO1 (SO2, SO3) is set to 1, output of S code depends on other parameter concerning output of S code.

#1 TC1
TC2
TC3 Specification of T code command of peripheral axis control group 1 (group 2, group 3) is :
0: The same specification as the parameter No.11860 (No.11861, No.11862).
1: The same specification as normal T code command.

	#7	#6	#5	#4	#3	#2	#1	#0
11854				GT1	WT1	MF1	MG1	IA1

	#7	#6	#5	#4	#3	#2	#1	#0
11855				GT2	WT2	MF2	MG2	IA2

	#7	#6	#5	#4	#3	#2	#1	#0
11856				GT3	WT3	MF3	MG3	IA3

[Input type] Parameter input
[Data type] Bit

#0 IA1
IA2
IA3 Peripheral axis control program of peripheral axis control group 1 (group 2, group 3) is :
0: Incremental programming.
1: Absolute programming.

#1 MG1
MG2
MG3 When peripheral axis control is started, initial modal data of peripheral axis control group 1 (group 2, group 3) is :
0: G00 mode (rapid traverse).
1: G01 mode (cutting feed).

#2 MF1
MF2
MF3 When peripheral axis control is started, initial modal data of peripheral axis control group 1 (group 2, group 3) is :
0: G94(M series)/G98(T series) (feed per minute)
1: G95(M series)/G99(T series) (feed per revolution)

#3 WT1
WT2
WT3 Tool wear compensation of peripheral axis control group 1 (group 2, group 3) is performed by :
0: Moving the tool.
1: Shifting the coordinate system.

#4 GT1
GT2
GT3 Tool geometry compensation of peripheral axis control group 1 (group 2, group 3) is performed by :
0: Moving the tool.
1: Shifting the coordinate system.

	#7	#6	#5	#4	#3	#2	#1	#0
11857					FM1	DI1	GC1	GB1

	#7	#6	#5	#4	#3	#2	#1	#0
11858					FM2	DI2	GC2	GB2

	#7	#6	#5	#4	#3	#2	#1	#0
11859					FM3	DI3	GC3	GB3

[Input type] Parameter input
[Data type] Bit

#0 GB1
GB2
GB3
#1 GC1
GC2
GC3 Setting of G code system of peripheral axis control group 1 (group 2, group 3) :

GB1(GB2, GB3)	GC1(GC2, GC3)	G code system
0	0	G code system depends on setting the parameter bit 6 (GSB) and bit 7 (GSC) of the parameter (No.3401).
1	0	G code system B
0	1	G code system C
1	1	G code system A

#2 DI1
DI2
DI3 The each override signal that is applied peripheral axis control group 1(group 2, group3) is :
0: The signal of path that is set by parameter No.3040 (No.3041, No.3042).
1: The signal of area that is set by parameter No.3037 (No.3038, No.3039).

> **NOTE**
> After the setting of bit 2 (DI1 (DI2, DI3)) of parameter No.11857 (No.11858, No.11859) is changed, the address of override signal which is effective for peripheral axis control is switched after turn off.

#3 FM1
FM2
FM3 Program format of peripheral axis control group 1(group 2, group3) is :
0: Series 15 format
1: Series 16 format

11860	T code of tool offset cancel of peripheral axis control group 1
11861	T code of tool offset cancel of peripheral axis control group 2
11862	T code of tool offset cancel of peripheral axis control group 3

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 99999999

T code of tool offset cancel of peripheral axis control group 1 (group 2, group 3) is set. When T(setting value+1) to T(setting value+9) is commanded, tool offset is performed. If the setting value is 0 or out of range, the setting of this parameter is disabled.

11863	Clearance value in peck drilling cycle G83 for peripheral axis of peripheral axis control group 1
11864	Clearance value in peck drilling cycle G83 for peripheral axis of peripheral axis control group 2
11865	Clearance value in peck drilling cycle G83 for peripheral axis of peripheral axis control group 3

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set a clearance value of peck drilling cycle (G83) for peripheral axis control group 1 (group 2, group 3). When the value except for 0 is set to, the setting value is used. When the setting value is 0, the value of parameter No.5115 whose path is set by parameters Nos.3040 to 3042 is used.

11866	M code to start the first peripheral axis control program (peripheral axis control group 1)
11867	M code to start the second peripheral axis control program (peripheral axis control group 1)

11868	M code to start the third peripheral axis control program (peripheral axis control group 1)

11869	M code to start the fourth peripheral axis control program (peripheral axis control group 1)

11870	M code to start the fifth peripheral axis control program (peripheral axis control group 1)

11871	M code to start the sixth peripheral axis control program (peripheral axis control group 1)

11872	M code to start the first peripheral axis control program (peripheral axis control group 2)

11873	M code to start the second peripheral axis control program (peripheral axis control group 2)

11874	M code to start the third peripheral axis control program (peripheral axis control group 2)

11875	M code to start the fourth peripheral axis control program (peripheral axis control group 2)

11876	M code to start the fifth peripheral axis control program (peripheral axis control group 2)

11877	M code to start the sixth peripheral axis control program (peripheral axis control group 2)

11878	M code to start the first peripheral axis control program (peripheral axis control group 3)

11879	M code to start the second peripheral axis control program (peripheral axis control group 3)

11880	M code to start the third peripheral axis control program (peripheral axis control group 3)

11881	M code to start the fourth peripheral axis control program (peripheral axis control group 3)

11882	M code to start the fifth peripheral axis control program (peripheral axis control group 3)

11883	M code to start the sixth peripheral axis control program (peripheral axis control group 3)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 3 to 99999999 (except for M code having limited use such as M30, M98, M99)

Set M code which starts registered peripheral axis control program.
If the setting value is 0 or out of range, the first to the sixth programs of peripheral axis control group cannot be started.

NOTE
1. The setting value of these parameters are set to O number of the first to third programs which are registered by G101 to G103 and G100.
2. In order to start the fourth to sixth program, the programs whose O number is the same value as the value of these parameters have to be registered.
3. Different value has to be set to each parameter. Setting value has not been duplicated.

11884	Peripheral axis 1 (peripheral axis control group 1)

11885	Peripheral axis 2 (peripheral axis control group 1)

11887	Peripheral axis 1 (peripheral axis control group 2)

11888	Peripheral axis 2 (peripheral axis control group 2)

11890	Peripheral axis 1 (peripheral axis control group 3)

11891	Peripheral axis 2 (peripheral axis control group 3)

[Input type] Parameter input
[Data type] word
[Valid data range] 101, 102, 103, ..., (path number)*100+(intra-path relative axis number) (101, 102, 103, ..., 201, 202, 203, ..., 1001, 1002, 1003, ...)

Set the path number which a peripheral axis belongs to and the intra-path relative axis number of peripheral axis control group 1 to 3.
If the setting value is 0 or out of range, the axis is disabled.

Example)
If the fifth axis in path 1 is set to peripheral axis 1 of peripheral axis control group 1, the parameter No.11884 is set to 105.

> **NOTE**
> 1 This parameter cannot be changed during peripheral axis control.
> 2 The following settings are prohibited.
> - A peripheral axis is assigned to two or more peripheral axis control groups.
> - An axis in a path and another axis in another path are assigned to a peripheral axis control group.

11893	Waiting M codes of peripheral axis control group 1

11894	Waiting M codes of peripheral axis control group 2

11895	Waiting M codes of peripheral axis control group 3

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 ,100 to 99999999

Set the top number of waiting M code which is used between peripheral axis control group 1 to 3 and the commanding path.
Waiting M codes are set from (setting value) to (setting value + 4).
Setting of this parameter is invalid
Setting of this parameter is not effective if the setting value is out of range or 0.

> **NOTE**
> 1 It is not necessary to specify the path by address P unlike a usual waiting M codes.
> 2 Alarm PS0160 "MISMATCH WAITING M-CODE" occurs if the usual waiting M code is specified in peripheral axis control.
> 3 Same number of usual waiting M code cannot be specified. When the same number of usual waiting M code is specified, the M code is not considered as waiting M codes of peripheral axis control.

4.115 PARAMETERS OF PMC

11900	PMC of execution order 1 in the multi-path PMC function
11901	PMC of execution order 2 in the multi-path PMC function
11902	PMC of execution order 3 in the multi-path PMC function
11903	PMC of execution order 4 in the multi-path PMC function
11904	PMC of execution order 5 in the multi-path PMC function

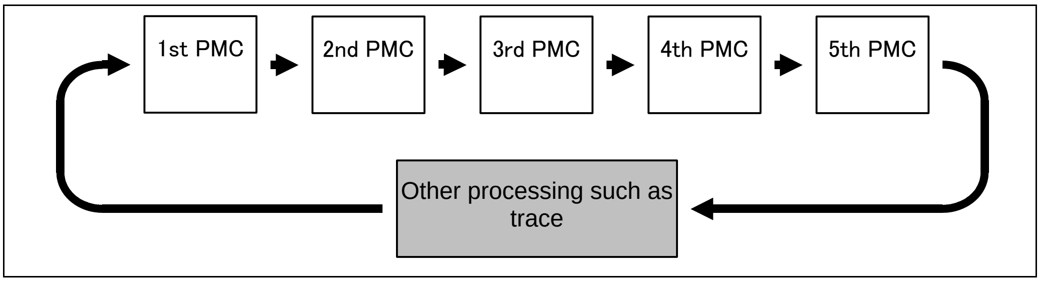
NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 5

Each of these parameters sets the execution order of each PMC when the multi-path PMC function is used.

Setting value	PMC system
0	Initial setting (see below)
1	First PMC
2	Second PMC
3	Third PMC
4	Fourth PMC
5	Fifth PMC

When 0 is set in all of these parameters, the initially set execution order shown below is used.



Initial setting of multi-path PMC execution order

⚠ CAUTION
If any of these parameters is nonzero, a duplicate or missing number results in the PMC alarm "ER50 PMC EXECUTION ORDER ERROR", thus disabling all the PMCs from starting.

11905	Execution time percentage (%) of PMC of execution order 1 in the multi-path PMC function
11906	Execution time percentage (%) of PMC of execution order 2 in the multi-path PMC function
11907	Execution time percentage (%) of PMC of execution order 3 in the multi-path PMC function
11908	Execution time percentage (%) of PMC of execution order 4 in the multi-path PMC function
11909	Execution time percentage (%) of PMC of execution order 5 in the multi-path PMC function

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Unit of data] %
[Valid data range] 0 to 100

Each of these parameters sets the execution time percentage (%) of each PMC when the multi-path PMC function is used.

When 0 is set in all of these parameters, the following initially set execution time percentage values are used:

Initial setting of execution time percentages in the multi-path PMC function

Quantity of PMCs	PMC of execution order 1	PMC of execution order 2	PMC of execution order 3	PMC of execution order 4	PMC of execution order 5
One path	100%				
Two paths	85%	15%			
Three paths	75%	15%	10%		
Four paths	70%	10%	10%	10%	
Five paths	60%	10%	10%	10%	10%

> **NOTE**
> 1 If a too small value is specified in these parameters, the first level may not be started for each scan.
> 2 Even if you input the same program in both second and third paths PMC, the scan time of both programs may not correspond because of changing of the waiting time by execution timing.
> 3 If the sum of these parameter settings exceeds 100, the PMC alarm "ER51 PMC EXECUTION PERCENTAGE ERROR" occurs, thus disabling all PMC from starting.
> 4 When the PMC memory sharing mode is used, the execution times of the shared PMC systems are totaled up, and sharing programs are executed successively in the total time.

11910	I/O Link channel 1 input/output addresses
11911	I/O Link channel 2 input/output addresses
11912	I/O Link channel 3 input/output addresses

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

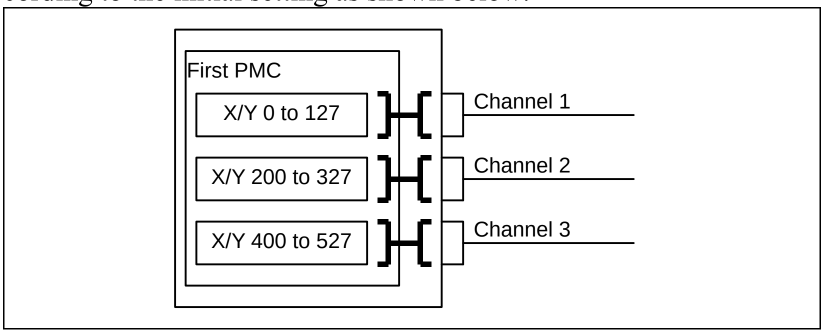
[Input type] Parameter input
[Data type] Word
[Valid data range] 0, 100 to 103, 200 to 203, 300 to 303, 400 to 403, 500 to 503, 900

Each of these parameters sets I/O Link input/output addresses.
No I/O Link input/output address needs to be set for any channel using the I/O Link *i*.

Input/output addresses of I/O Link channels

Setting value	Input/output address
0	Initial setting (see below)
100	X0 to 127/Y0 to 127 of the first PMC
101	X200 to 327 / Y200 to 327 of the first PMC
102	X400 to 527 / Y400 to 527 of the first PMC
103	X600 to 727 / Y600 to 727 of the first PMC
200	X0 to 127 / Y0 to 127 of the second PMC
201	X200 to 327 / Y200 to 327 of the second PMC
202	X400 to 527 / Y400 to 527 of the second PMC
203	X600 to 727 / Y600 to 727 of the second PMC
300	X0 to 127 / Y0 to 127 of the third PMC
301	X200 to 327 / Y200 to 327 of the third PMC
302	X400 to 527 / Y400 to 527 of the third PMC
303	X600 to 727 / Y600 to 727 of the third PMC
400	X0 to 127 / Y0 to 127 of the fourth path PM
401	X200 to 327 / Y200 to 327 of the fourth path PM
402	X400 to 527 / Y400 to 527 of the fourth path PM
403	X600 to 727 / Y600 to 727 of the fourth path PM
500	X0 to 127 / Y0 to 127 of the fifth path PM
501	X200 to 327 / Y200 to 327 of the fifth path PM
502	X400 to 527 / Y400 to 527 of the fifth path PM
503	X600 to 727 / Y600 to 727 of the fifth path PM
900	X0 to 127/Y0 to 127 of the dual check safety PMC

When all of these parameters are set to 0, all channels are assigned to the first PMC according to the initial setting as shown below.



Initial input/output address setting for each I/O Link channel

> ⚠ **CAUTION**
> 1 If a duplicate number is set when a value other than 0 is set in any of these parameters, PMC alarm “ER52 I/O LINK CHANNEL ASSIGNMENT ERROR” is issued, and none of the PMCs can be started.
> 2 If a parameter is not set, the assignment of PMC addresses to the channel is disabled.

11915	**Input/output addresses of the second block of I/O Link channel 1**
11916	**Input/output addresses of the second block of I/O Link channel 2**
11917	**Input/output addresses of the second block of I/O Link channel 3**

NOTE

When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0, 100 to 103, 200 to 203, 300 to 303, 400 to 403, 500 to 503

Each of these parameters sets input/output addresses of dual assignment of an I/O Link channel.

No I/O Link input/output address needs to be set for any channel using the I/O Link *i*.

Input/output addresses of dual assignment of each I/O Link channel

Setting	Input/output address
0	Does not perform assignment of two blocks of an I/O Link channel.
100	X0 to 127/Y0 to 127 of the first PMC
101	X200 to 327/Y200 to 327 of the first PMC
102	X400 to 527/Y400 to 527 of the first PMC
103	X600 to 727/Y600 to 727 of the first PMC
200	X0 to 127/Y0 to 127 of the second PMC
201	X200 to 327/Y200 to 327 of the second PMC
202	X400 to 527/Y400 to 527 of the second PMC
203	X600 to 727/Y600 to 727 of the second PMC
300	X0 to 127/Y0 to 127 of the third PMC
301	X200 to 327/Y200 to 327 of the third PMC
302	X400 to 527/Y400 to 527 of the third PMC
303	X600 to 727/Y600 to 727 of the third PMC
400	X0 to 127 / Y0 to 127 of the fourth path PM
401	X200 to 327 / Y200 to 327 of the fourth PMC
402	X400 to 527 / Y400 to 527 of the fourth PMC
403	X600 to 727 / Y600 to 727 of the fourth PMC
500	X0 to 127 / Y0 to 127 of the fifth PMC
501	X200 to 327 / Y200 to 327 of the fifth PMC
502	X400 to 527 / Y400 to 527 of the fifth PMC
503	X600 to 727 / Y600 to 727 of the fifth PMC

When these parameters are set to 0, assignment of two blocks of an I/O Link channel is not performed.

⚠ **CAUTION**

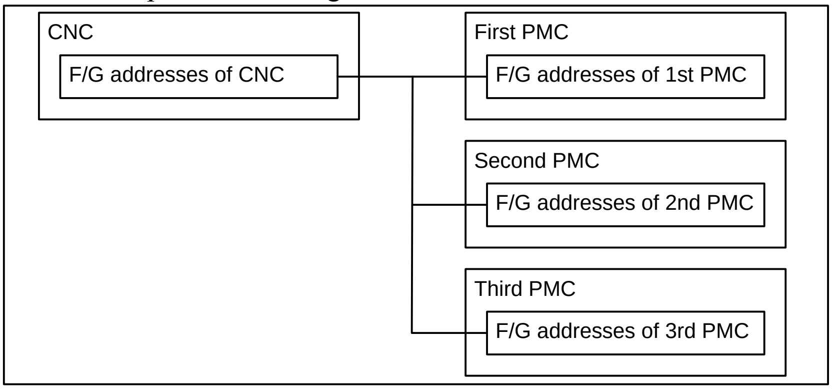
1 If a duplicate number is set in these parameters and parameter Nos. 11910 to 11912, PMC alarm "ER52 I/O LINK CHANNEL ASSIGNMENT ERROR" is issued, and none of the PMCs can be started.
2 The dual check safety PMC (DCSPMC) uses the first block of channel 3. In this case, never assign the second block of that channel to safety signals in the first to fifth PMCs.

11920	**Input/output addresses of NC-PMC interface 1**
11921	**Input/output addresses of NC-PMC interface 2**
11922	**Input/output addresses of NC-PMC interface 3**
11923	**Input/output addresses of NC-PMC interface 4**
11924	**Input/output addresses of NC-PMC interface 5**
11925	**Input/output addresses of NC-PMC interface 6**
11926	**Input/output addresses of NC-PMC interface 7**
11927	**Input/output addresses of NC-PMC interface 8**
11928	**Input/output addresses of NC-PMC interface 9**
11929	**Input/output addresses of NC-PMC interface 10**

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0, 100 to 109, 200 to 209, 300 to 309, 400 to 409, 500 to 509

Each of these parameters assigns PMC F/G addresses to CNC F/G addresses.



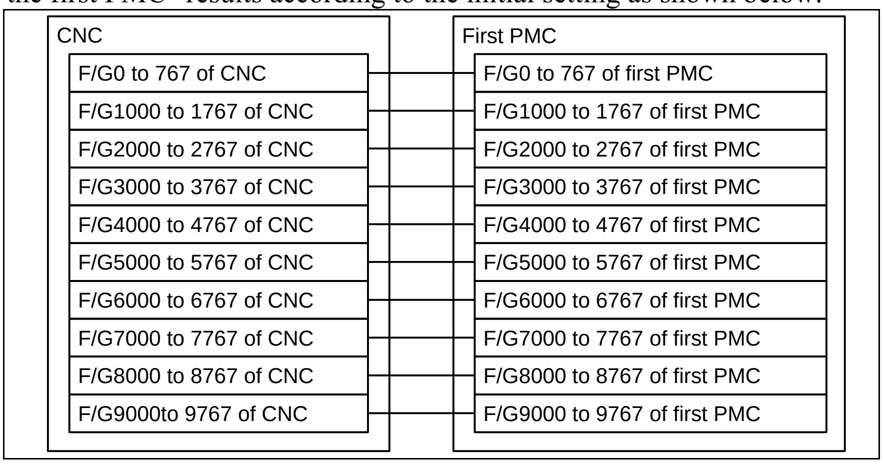
Concept of NC-PMC interface assignment

Input/output addresses of NC-PMC interfaces

Setting value	Input/output address
0	Initial setting (see below)
100	F0to767 / G0to767 of the first PMC
101	F1000to1767 / G1000to1767 of the first PMC
102	F2000to2767 / G2000to2767 of the first PMC
103	F3000to3767 / G3000to3767 of the first PMC
104	F4000to4767 / G4000to4767 of the first PMC
105	F5000to5767 / G5000to5767 of the first PMC
106	F6000to6767 / G6000to6767 of the first PMC
107	F7000to7767 / G7000to7767 of the first PMC
108	F8000to8767 / G8000to8767 of the first PMC
109	F9000to9767 / G9000to9767 of the first PMC
200	F0to767 / G0to767 of the second PMC
201	F1000to1767 / G1000to1767 of the second PMC
202	F2000to2767 / G2000to2767 of the second PMC

Setting value	Input/output address
203	F3000to3767 / G3000to3767 of the second PMC
204	F4000to4767 / G4000to4767 of the second PMC
205	F5000to5767 / G5000to5767 of the second PMC
206	F6000to6767 / G6000to6767 of the second PMC
207	F7000to7767 / G7000to7767 of the second PMC
208	F8000to8767 / G8000to8767 of the second PMC
209	F9000to9767 / G9000to9767 of the second PMC
300	F0to767 / G0to767 of the third PMC
301	F1000to1767 / G1000to1767 of the third PMC
302	F2000to2767 / G2000to2767 of the third PMC
303	F3000to3767 / G3000to3767 of the third PMC
304	F4000to4767 / G4000to4767 of the third PMC
305	F5000to5767 / G5000to5767 of the third PMC
306	F6000to6767 / G6000to6767 of the third PMC
307	F7000to7767 / G7000to7767 of the third PMC
308	F8000to8767 / G8000to8767 of the third PMC
309	F9000to9767 / G9000to9767 of the third PMC
400	F0 to 767 / G0 to 767 of the fourth PMC
401	F1000 to 1767 / G1000 to 1767 of the fourth PMC
402	F2000 to 2767 / G2000 to 2767 of the fourth PMC
403	F3000 to 3767 / G3000 to 3767 of the fourth PMC
404	F4000 to 4767 / G4000 to 4767 of the fourth PMC
405	F5000 to 5767 / G5000 to 5767 of the fourth PMC
406	F6000 to 6767 / G6000 to 6767 of the fourth PMC
407	F7000 to 7767 / G7000 to 7767 of the fourth PMC
408	F8000 to 8767 / G8000 to 8767 of the fourth PMC
409	F9000 to 9767 / G9000 to 9767 of the fourth PMC
500	F0 to 767 / G0 to 767 of the fifth PMC
501	F1000 to 1767 / G1000 to 1767 of the fifth PMC
502	F2000 to 2767 / G2000 to 2767 of the fifth PMC
503	F3000 to 3767 / G3000 to 3767 of the fifth PMC
504	F4000 to 4767 / G4000 to 4767 of the fifth PMC
505	F5000 to 5767 / G5000 to 5767 of the fifth PMC
506	F6000 to 6767 / G6000 to 6767 of the fifth PMC
507	F7000 to 7767 / G7000 to 7767 of the fifth PMC
508	F8000 to 8767 / G8000 to 8767 of the fifth PMC
509	F9000 to 9767 / G9000 to 9767 of the fifth PMC

When 0 is set in all of these parameters, "F/G addresses of the CNC = F/G addresses of the first PMC" results according to the initial setting as shown below.



Initial setting of NC-PMC interfaces

> ⚠ **CAUTION**
> 1 If any of these parameters is nonzero, a duplicate number results in the PMC alarm "ER54 NC-PMC I/F ASSIGNMENT ERROR", thus disabling all the PMCs from starting.
> 2 If any of these parameters is not specified, no PMC address can be allocated to the F/G address of the CNC corresponding to that parameter.

11930	Execution interval of ladder level 1

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0, 1, 2, 4 ,8

This parameter sets the execution interval of ladder level 1.

Setting	Description
1	Executed at intervals of 1 ms.
2	Executed at intervals of 2 ms.
4	Executed at intervals of 4 ms.
0, 8	Executed at intervals of 8 ms.

> ⚠ **CAUTION**
> If an invalid value is set to this parameter, the PMC alarm “ER55 LADDER EXECUTION CYCLE SETTING ERROR” is issued and all PMCs are not started.

	#7	#6	#5	#4	#3	#2	#1	#0
11931	NMC		LDV			DTM	M16	PCC

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 PCC For a multipath PMC, ladder execution and stop are:
0: Controlled individually for each PMC path.
1: Controlled simultaneously for all PMC paths.

> **NOTE**
> When the PMC memory sharing mode is used, ladder execution and stop are controlled simultaneously for all PMC paths, regardless of the setting of this parameter.

#1 M16 For external data inputs and external messages, the maximum number of external alarm messages and external operator messages that can be displayed is:
0: 4.
1: 16.

#2 DTM Monitoring of the DeviceNet communication normal signal is:
0: Not available.
1: Available.

#5 LDV Ladder dividing management function is:
0: Not available
1: Available

#7 NMC When the PMC alarm "ER09 PMC LABEL CHECK ERROR" occurs, the nonvolatile memory of PMC is cleared by:
0: Turning on power of CNC with pressing "O" and "Z" MDI keys.
1: Turning on power of CNC without any operation.

> **NOTE**
> Set NMC = 0 generally.
> If you change some PMC setting, such as number of PMC paths, PMC memory type, etc., the PMC alarm "ER09 PMC LABEL CHECK ERROR" occurs and nonvolatile memory of PMC have to be cleared. To clear the nonvolatile memory of PMC, you have to turn on power of CNC with pressing "O" and "Z" MDI keys generally. If NMC = 1, the nonvolatile memory of PMC is cleared automatically at the turning on power of CNC when the PMC alarm "ER09" occurs. Please note that the setting NMC = 1 may cause undesirable clear of nonvolatile memory of PMC by unintended change of PMC setting.

11932	Interface between PMCs

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0, 1, 2, 3
This parameter sets the PMCs that use the PMC-to-PMC interface.

Setting	Meaning
0	The PMC-to-PMC interface is not used.
1	The PMC-to-PMC interface is used between the 1st PMC and the 2nd PMC.
2	The PMC-to-PMC interface is used between the 1st PMC and the 3rd PMC.
3	The PMC-to-PMC interface is used between the 2nd PMC and the 3rd PMC.

> ⚠ **CAUTION**
> If a value beyond the valid data range is set in this parameter, PMC alarm "ER57 MULT PATH PMC I/F ASSIGNMENT ERROR" is issued, and none of the PMCs can be started.
> Similarly, when a PMC specified in this parameter is not present, PMC alarm "ER57 MULT PATH PMC I/F ASSIGNMENT ERROR" is issued, and none of the PMCs can be started.

> **NOTE**
> This function cannot be used for PMCs for which the PMC memory sharing mode is set.

	#7	#6	#5	#4	#3	#2	#1	#0
11933							**C2T**	**C1T**

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

C1T to C2T Set a communication method for the I/O Link channels. The following table lists the bit-to-channel correspondence.

Parameter	Description
C1T	Communication method for channel 1
C2T	Communication method for channel 2

The meaning of each bit is as follows:
0: The I/O Link is used.
1: The I/O Link *i* is used.

Specify the parameters according to the communication method used on each channel as listed below.

Channel	Communication method	Parameter setting
Channel 1	I/O Link	Bit 0 (C1T) of parameter No. 11933 = 0
	I/O Link *i*	Bit 0 (C1T) of parameter No. 11933 = 1
Channel 2	I/O Link	Bit 1 (C2T) of parameter No. 11933 = 0
	I/O Link *i*	Bit 1 (C2T) of parameter No. 11933 = 1

> **NOTE**
> To use each channel with the I/O Link, set up also “I/O Link input/output address” (Nos. 11910 to 11912).

11934	DeviceNet communication normal signal monitoring start time

[Input type] Parameter input
[Data type] Word
[Unit of data] sec
[Valid data range] 0 - 32767 (Recommended value = 0)

Monitoring of the DeviceNet normal signal starts when the time set in this parameter elapses after power-on.
When this setting is 0 or negative value, monitoring of the signal starts after 60 seconds from power-on.

11936	The number of PMC paths

NOTE
Once this parameters is re-set, it is necessary to turn the power off and on again.

[Data type] Byte
[Valid data range] 0, 1, 2, 3, 4, 5
This item specifies the number of PMC paths within the option of multi-path PMC function. When the value is 0 or out of valid data range, all of PMC paths which is specified by a multi-path PMC option is effective.

	#7	#6	#5	#4	#3	#2	#1	#0
11937	P24	P23	P22	P21	P14	P13	P12	P11

[Input type] Parameter input
[Data type] Bit
Input and output signals of network devices, such as Profibas, Profinet or iPendant etc., can be assigned to X/Y address area, such as X0-X127/Y0-Y127 or X200-327/Y200-327 etc. Network devices can be assigned to the X/Y address area to which any I/O Link and I/O Link *i* devices are not assigned.
When you assign network device to X/Y address area, you have to set 1 to this parameter for the corresponding area.

#0 P11 X/Y 0 to 127 of the 1st path PMC are:
0: Not used.
1: Used.

#1 P12 X/Y 200 to 327 of the 1st path PMC are:
0: Not used.
1: Used.

#2 P13 X/Y 400 to 527 of the 1st path PMC are:
0: Not used.
1: Used.

#3 P14 X/Y 600 to 727 of the 1st path PMC are:
0: Not used.
1: Used.

#4 P21 X/Y 0 to 127 of the 2nd path PMC are:
0: Not used.
1: Used.

#5 P22 X/Y 200 to 327 of the 2nd path PMC are:
0: Not used.
1: Used.

#6 P23 X/Y 400 to 527 of the 2nd path PMC are:
0: Not used.
1: Used.

#7 P24 X/Y 600 to 727 of the 2nd path PMC are:
0: Not used.
1: Used.

	#7	#6	#5	#4	#3	#2	#1	#0
11938	P44	P43	P42	P41	P34	P33	P32	P31

[Input type] Parameter input
[Data type] Bit

#0 P31 X/Y 0 to 127 of the 3rd path PMC are:
0: Not used.
1: Used.

#1 P32 X/Y 200 to 327 of the 3rd path PMC are:
0: Not used.
1: Used.

#2 P33 X/Y 400 to 527 of the 3rd path PMC are:
0: Not used.
1: Used.

#3 P34 X/Y 600 to 727 of the 3rd path PMC are:
0: Not used.
1: Used.

#4 P41 X/Y 0 to 127 of the 4th path PMC are:
0: Not used.
1: Used.

#5 P42 X/Y 200 to 327 of the 4th path PMC are:
0: Not used.
1: Used.

#6 P43 X/Y 400 to 527 of the 4th path PMC are:
0: Not used.
1: Used.

#7 P44 X/Y 600 to 727 of the 4th path PMC are:
0: Not used.
1: Used.

	#7	#6	#5	#4	#3	#2	#1	#0
11939					P54	P53	P52	P51

[Input type] Parameter input
[Data type] Bit

#0 P51 X/Y 0 to 127 of the 5th path PMC are:
0: Not used.
1: Used.

#1 P52 X/Y 200 to 327 of the 5th path PMC are:
- 0: Not used.
- 1: Used.

#2 P53 X/Y 400 to 527 of the 5th path PMC are:
- 0: Not used.
- 1: Used.

#3 P54 X/Y 600 to 727 of the 5th path PMC are:
- 0: Not used.
- 1: Used.

NOTE

1 Once these parameters is re-set, it is necessary to turn the power off and on again.

2 This parameter should be set only for the X /Y address area to which the network device is assigned, because this parameter may affect the ladder execution performance.

3 Network devices cannot be assigned to the X/Y address area to which any I/O Link and I/O Link *i* are assigned.

4 In case of using I/O Link *i*, assign network devices to the X/Y address area to which any I/O Link *i* devices are not assigned, set this parameter for corresponding area.

5 In case of using I/O Link and the parameter Nos.11910 to 11912 are set to 0 (default setting), I/O Link devices are assigned to X0-X127/Y0-Y127, X200-X327/Y200-Y327 and X400-X527/Y400-Y527 area of 1st PMC path. In this case for 1st PMC path, network devices can only be assigned to X600-X727/Y600-Y727 area.
If parameters Nos.11910 to 11912 are not set to all 0, assign network devices accordingly to the X/Y address area to which any I/O Link channels are not assigned, set this parameter for corresponding area.

Example) Setting when I/O Link channel 1 is assigned to X0-X127/Y0-Y127 of 1st PMC path, and network device is assigned to X200-327/Y200-327

Parameter No.11910 = 100
No.11911 = 0
No.11912 = 0
No.11937#1 = 1

11940	PMC memory type of the first PMC
11941	PMC memory type of the second PMC
11942	PMC memory type of the third PMC
11943	PMC memory type of the fourth PMC
11944	PMC memory type of the fifth PMC

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Data type] Byte
[Valid data range] -1, 0, 1, 2, 3, 4

These parameters select the type of PMC memory. For the specifications of the PMC memory types, see Subsection 2.1.1, "Basic Specifications" in PMC Programming Manual (B-64513EN).

Setting	Meaning
0	The PMC memory set as the standard setting is used.
1	PMC memory A is used.
2	PMC memory B is used.
3	PMC memory C is used.
4	PMC memory D is used.
-1	The 2nd to 5th PMCs share the PMC memory with the 1st PMC.

The following table lists the PMC memory types that can be selected for each PMC path:

1st path PMC	2nd to 5th path PMC	Remark
PMC-memory B (default) PMC-memory C	PMC-memory A (default) PMC-memory B PMC-memory C Shared with 1st path PMC	You can specify up to three paths both of PMC-memory B and C in total.
PMC-memory D	Shared with 1st path PMC	

⚠ CAUTION
1 If the value set in any of these parameters is beyond the valid data range, PMC alarm "ER58 PMC MEMORY TYPE SETTING ERROR" is issued, and none of the PMCs can be started.
2 When the PMC memory type has been changed, the PMC battery-powered memory must be initialized. For this reason, before changing the PMC memory type, back up PMC parameters. For how to initialize the PMC battery-powered memory, refer to Section 2.7, "BATTERY-BACKED-UP DATA", in "PMC Programming Manual" (B-64513EN).

NOTE
To use PMC memory C or PMC memory D, specify the option "Nonvolatile PMC data table area expansion (40KB)". Without this option, no area starting at D10000 could be preserved.

11945	PMC path that is applied the "level 1 execution period 1ms/2ms"

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Valid data range] 0, 1 to 5

When using both of the "level 1 execution period 1ms/2ms" and the "Multi-path PMC function", specify a PMC path that is applied the "level 1 execution period 1ms/2ms".

If 0 is set to this parameter, the 1st path PMC is selected.

> ⚠ **CAUTION**
> Setting this parameter to an invalid value results in the PMC alarm "ER55 LADDER EXECUTION CYCLE SETTING ERROR", thus disabling all PMCs from starting.

> **NOTE**
> When you use the Ladder dividing management function, please set No.11946 too.

11946	Divided ladder that is applied the "level 1 execution period 1ms/2ms"

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Data type] Byte
[Valid data range] 0, 1 to 99

When using both of the "level 1 execution period 1ms/2ms" and the "Ladder dividing management function", specify a Divided ladder (or Main ladder) that is applied the "level 1 execution period 1ms/2ms".
If 0 is set to this parameter, the Main ladder is selected.

> ⚠ **CAUTION**
> Setting this parameter to an invalid value results in the PMC alarm "ER55 LADDER EXECUTION CYCLE SETTING ERROR", thus disabling all PMCs from starting.

> **NOTE**
> When you use the Multh-path PMC function, please set No.11945 too.

11950	
to	to
11957	
11960	
to	to
11967	
11970	
to	to
11977	
11980	
to	to
11987	

These parameters are related to Dual Check Safety.
See Dual Check Safety CONNECTION MANUAL (B-64483EN-2) for details.

4.116 PARAMETERS OF EMBEDDED MACRO (2 OF 2)

12020	**G code number for the embedded macro (first)**
12023	**G code number for the embedded macro (second)**
12026	**G code number for the embedded macro (third)**
12029	**G code number for the embedded macro (fourth)**
12032	**G code number for the embedded macro (fifth)**
12035	**G code number for the embedded macro (sixth)**
12038	**G code number for the embedded macro (seventh)**
12041	**G code number for the embedded macro (eighth)**
12044	**G code number for the embedded macro (ninth)**
12047	**G code number for the embedded macro (tenth)**

[Input type] Parameter input
[Data type] Word path
[Valid date range] 1 to 999

12021	**Macro program number for the embedded macro (first)**
12024	**Macro program number for the embedded macro (second)**
12027	**Macro program number for the embedded macro (third)**
12030	**Macro program number for the embedded macro (fourth)**
12033	**Macro program number for the embedded macro (fifth)**
12036	**Macro program number for the embedded macro (sixth)**
12039	**Macro program number for the embedded macro (seventh)**
12042	**Macro program number for the embedded macro (eighth)**
12045	**Macro program number for the embedded macro (ninth)**
12048	**Macro program number for the embedded macro (tenth)**

[Input type] Parameter input
[Data type] 2-word path
[Valid date range] 1 to 9999

12022	Number of G code macro for embedded macro (first)
12025	Number of G code macro for embedded macro (second)
12028	Number of G code macro for embedded macro (third)
12031	Number of G code macro for embedded macro (fourth)
12034	Number of G code macro for embedded macro (fifth)
12037	Number of G code macro for embedded macro (sixth)
12040	Number of G code macro for embedded macro (seventh)
12043	Number of G code macro for embedded macro (eighth)
12046	Number of G code macro for embedded macro (ninth)
12049	Number of G code macro for embedded macro (tenth)

[Input type] Parameter input
[Data type] Word path
[Valid date range] 1 to 255

The data of the macro call by G code added by the embedded macro is set. G code number and the macro program number for it are set, and the number of G codes is set.
These sets can be set up to ten. If G code number duplicates, it gives priority from former set. The set that the G code number or the macro program number or numbers is 0 is invalid.

[Example] In case that the range of macro program number is 7000 to 8999:

	First group	Second group	Third group
G code	No. 12020=100	No. 12023=150	No. 12026=900
Program number	No. 12021=8000	No. 12024=7500	No. 12027=8300
Number	No. 12022=10	No. 12025=5	No. 12028=30

The following program is called by each G code.

G code	Called program
G100 toG109	O8000 to O8009
G150 to G154	O7500 to O7504
G900 to G929	O8300 to O8329

NOTE
The parameter value is regarded as 0, when each parameter is set a out of range value.

4.117 PARAMETERS OF HIGH-SPEED POSITION SWITCH (2 OF 2)

12201	Controlled axis for which the eleventh high-speed position switch function is performed
12202	Controlled axis for which the twelfth high-speed position switch function is performed
12203	Controlled axis for which the thirteenth high-speed position switch function is performed
12204	Controlled axis for which the fourteenth high-speed position switch function is performed
12205	Controlled axis for which the fifteenth high-speed position switch function is performed
12206	Controlled axis for which the sixteenth high-speed position switch function is performed

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

Each of these parameters sets a controlled axis number for which each of the eleventh to sixteenth high-speed position switch functions is performed.
Set 0 for the number corresponding to a high-speed position switch which is not to be used.

12221	Maximum value of the operation range of the eleventh high-speed position switch
12222	Maximum value of the operation range of the twelfth high-speed position switch
12223	Maximum value of the operation range of the thirteenth high-speed position switch
12224	Maximum value of the operation range of the fourteenth high-speed position switch
12225	Maximum value of the operation range of the fifteenth high-speed position switch
12226	Maximum value of the operation range of the sixteenth high-speed position switch

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the maximum value of the operation range of each of the eleventh to sixteenth high-speed position switches. If such a setting that maximum value < minimum value is made, no operation range exists, so that the high-speed position switch does not operate.

12241	Minimum value of the operation range of the eleventh high-speed position switch
12242	Minimum value of the operation range of the twelfth high-speed position switch
12243	Minimum value of the operation range of the thirteenth high-speed position switch
12244	Minimum value of the operation range of the fourteenth high-speed position switch
12245	Minimum value of the operation range of the fifteenth high-speed position switch
12246	Minimum value of the operation range of the sixteenth high-speed position switch

[Input type] Parameter input

[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the minimum value of the operation range of each of the eleventh to sixteenth high-speed position switches. If such a setting that maximum value < minimum value is made, no operation range exists, so that the high-speed position switch does not operate.

4.118 PARAMETERS OF MALFUNCTION PROTECTION

12255	Maximum servo motor speed

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

This parameter sets a maximum servo motor speed. When the value set in this parameter is exceeded, the servo motor stops with the alarm DS0004. When 0 is set in this parameter, the specification of a maximum allowable value (999000 for IS-B) is assumed.

12256	Maximum servo motor acceleration rate

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

This parameter sets a maximum servo motor acceleration rate. When the value set in this parameter is exceeded, the servo motor stops with the alarm DS0005. When 0 is set in this parameter, alarm check is not performed.

4.119 PARAMETERS OF MANUAL HANDLE (2 OF 2)

12300	X address of the 1st. manual pulse generator
12301	X address of the 2nd. manual pulse generator
12302	X address of the 3rd. manual pulse generator
12303	X address of the 4th. manual pulse generator
12304	X address of the 5th. manual pulse generator

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input

[Data type] Word
[Valid data range] -1, 0 to 127, 200 to 327, 400 to 527, 600 to 727

To set X address of manual pulse generator connected with I/O Link in PMC.
When the manual pulse generator is not connected, set -1 to this parameter.

	PMC Path	X Address
1st. manual pulse generator	No. 12340	No. 12300
2nd. manual pulse generator	No. 12341	No. 12301
3rd. manual pulse generator	No. 12342	No. 12302
4th. manual pulse generator	No. 12343	No. 12303
5th. manual pulse generator	No. 12344	No. 12304

Parameters No. 12340 to 12344 must be set as value showed in next table.

Value	PMC Path
0	1st. PMC
1	
2	2nd. PMC
3	3rd. PMC

NOTE
Set these parameters when bit 1 (HDX) of parameter No. 7105 is set to 1. When HDX = 0, these parameters are automatically set. If a manual handle is not connected when HDX = 0, -1 is set automatically.

12310	States of the manual handle feed axis selection signals when tool axis direction handle feed/interrupt and table-based vertical direction handle feed/interrupt are performed

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes

This parameter sets the states of the manual handle feed axis selection signal (HS1A to HS1E for the first manual handle) or the manual handle interrupt axis selection signal (HS1IA to HS1IE for the first manual handle) to perform tool axis direction handle feed/interrupt and table-based vertical direction handle feed/interrupt.
The handle for which the signal states are set is determined by parameter No. 12323.

<Table of correspondence with the manual handle feed axis selection signals>
If parameter No. 12323 is set to 1, the states of the manual handle feed axis selection signals or manual handle interrupt axis selection signals for the first manual handle in the 3-dimensional manual feed (handle feed) mode and corresponding parameter settings are listed in the table below. When the first manual handle pulse generator is turned after setting the signals corresponding to the value set in the parameter, operation is performed in the specified mode.
If the value set in the parameter is larger than number of controlled axes, the movement is not generated.

HS1E (HS1IE)	HS1D (HS1ID)	HS1C (HS1IC)	HS1B (HS1IB)	HS1A (HS1IA)	Parameter (No. 12310)
0	0	0	0	1	1
0	0	0	1	0	2
0	0	0	1	1	3
0	0	1	0	0	4
0	0	1	0	1	5
0	0	1	1	0	6
0	0	1	1	1	7

HS1E (HS1IE)	HS1D (HS1ID)	HS1C (HS1IC)	HS1B (HS1IB)	HS1A (HS1IA)	Parameter (No. 12310)
0	1	0	0	0	8
0	1	0	0	1	9
0	1	0	1	0	10
0	1	0	1	1	11
0	1	1	0	0	12
0	1	1	0	1	13
0	1	1	1	0	14
0	1	1	1	1	15
1	0	0	0	0	16
1	0	0	0	1	17
1	0	0	1	0	18
1	0	0	1	1	19
1	0	1	0	0	20
1	0	1	0	1	21
1	0	1	1	0	22
1	0	1	1	1	23
1	1	0	0	0	24

If parameter No. 12323 is set to 2 to 5, replace 1 in HS1A to HS1E and HS1IA to HS1IE above with 2 to 5.

12311	States of the manual handle feed axis selection signals when a movement is made in the first axis direction in tool axis normal direction handle feed/interrupt and table-based horizontal direction handle feed/interrupt

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes

This parameter sets the states of the manual handle feed axis selection signals (HS1A to HS1E for the first manual handle) or the manual handle interrupt axis selection signal (HS1IA to HS1IE for the first manual handle) when a movement is made in the first axis direction. (For settings, see "Table of correspondence with the manual handle feed axis selection signals" in the description of parameter No. 12310.)
The handle for which the signal states are set is determined by parameter No. 12323.

The table below indicates the relationships of tool axis directions, first axis directions, and second axis directions.

Parameter No. 19697	Tool axis directions	First axis directions	Second axis directions
1	X	Y	Z
2	Y	Z	X
3	Z	X	Y

Note, however, that the table above indicates the directions applicable when the angles of all rotation axes are set to 0.
In tool axis direction/tool axis normal direction feed (not table-based), the directions indicated above assume that 0 is set in parameter No. 19698 and No. 19699. When a rotation axis has made a turn or a nonzero value is set in these parameters in tool axis direction/tool axis normal direction feed, the relevant directions are inclined accordingly.

12312	States of the manual handle feed axis selection signals when a movement is made in the second axis direction in tool axis normal direction handle feed/interrupt and table-based horizontal direction handle feed/interrupt

[Input type] Parameter input

[Data type] Byte path
[Valid data range] 1 to Number of controlled axes

This parameter sets the states of the manual handle feed axis selection signals (HS1A to HS1E for the first manual handle) or the manual handle interrupt axis selection signals (HS1IA to HS1IE for the first manual handle) when a movement is made in the second axis direction. (For settings, see "Table of correspondence with the manual handle feed axis selection signals" in the description of parameter No. 12310.)
The handle for which the signal states are set is determined by parameter No. 12323.

12313	States of the manual handle feed axis selection signals when the first rotation axis is turned in tool tip center rotation handle feed/interrupt

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes

This parameter sets the states of the manual handle feed axis selection signals (HS1A to HS1E for the first manual handle) or the manual handle interrupt axis selection signals (HS1IA to HS1IE for the first manual handle) when the first rotation axis is turned in tool tip center rotation handle feed or interrupt. (For settings, see "Table of correspondence with the manual handle feed axis selection signals" in the description of parameter No. 12310.)
The handle for which the signal states are set is determined by parameter No. 12323.

12314	States of the manual handle feed axis selection signals when the second rotation axis is turned in tool tip center rotation handle feed/interrupt

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes

This parameter sets the states of the manual handle feed axis selection signals (HS1A to HS1E for the first manual handle) or the manual handle interrupt axis selection signals (HS1IA to HS1IE for the first manual handle) when the second rotation axis is turned in tool tip center rotation handle feed or interrupt. (For settings, see "Table of correspondence with the manual handle feed axis selection signals" in the description of parameter No. 12310.)
The handle for which the signal states are set is determined by parameter No. 12323.

12318	Tool length in 3-dimensional machining manual feed

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a tool length when tool tip center rotation feed is performed with the 3-dimensional machining manual feed function and when the 3-dimensional machining manual feed screen is displayed.

NOTE
Specify a radius value to set this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
12319							CAT	CAC

[Input type] Parameter input
[Data type] Bit path

#0 CAC If a workpiece coordinate system offset is set for the rotation axis, the coordinate system of the rotation axis used to calculate the 3-dimensional manual feed is:
0: Machine coordinate system.
For those parameters Nos. 19680 to 19714 used to configure the machine that depend on the coordinates of the rotation axis, set the values assumed when the machine coordinates of the rotation axis are 0.
1: Workpiece coordinate system.
For those parameters Nos. 19680 to 19714 used to configure the machine that depend on the coordinates of the rotation axis, set the values assumed when the workpiece coordinates of the rotation axis are 0.

#1 CAT If a workpiece coordinate system offset is set for the rotation axis, the coordinate system of the rotation axis used to calculate the thermal growth compensation along tool vector is:
0: Machine coordinate system.
For those parameters Nos. 19680 to 19714 used to configure the machine that depend on the coordinates of the rotation axis, set the values assumed when the machine coordinates of the rotation axis are 0.
1: Workpiece coordinate system.
For those parameters Nos. 19680 to 19714 used to configure the machine that depend on the coordinates of the rotation axis, set the values assumed when the workpiece coordinates of the rotation axis are 0.

	#7	#6	#5	#4	#3	#2	#1	#0
12320	EM4					JFR	FLL	TWD

[Input type] Setting input
[Data type] Bit path

#0 TWD The directions of 3-dimensional machining manual feed (other than tool tip center rotation feed) when the tilted working plane indexing is issued are:
0: Same as those not in the tilted working plane indexing. That is, the directions are:
Tool axis normal direction 1 (table-based horizontal direction 1)
Tool axis normal direction 2 (table-based horizontal direction 2)
Tool axis direction (table-based vertical direction)
1: X, Y, and Z directions in the feature coordinate system.

#1 FLL The directions of tool axis normal direction feed or table-based horizontal direction feed in the 3-dimensional machining manual feed mode are:
0: Tool axis normal direction 1 (table-based horizontal direction 1) and tool axis normal direction 2 (table-based horizontal direction 2).
1: Longitude direction and latitude direction.

Bit 1 (FLL) of parameter No. 12320	Bit 0 (TWD) of parameter No. 12320	Directions of 3-dimensional machining manual feed
0	0	Conventional directions

Bit 1 (FLL) of parameter No. 12320	Bit 0 (TWD) of parameter No. 12320	Directions of 3-dimensional machining manual feed
0	1	When the tilted working plane indexing is issued: X, Y, and Z directions in the feature coordinate system When the command is not issued: Conventional directions
1	0	Longitude direction and latitude direction
1	1	When the tilted working plane indexing is issued: X, Y, and Z directions in the feature coordinate system When the command is not issued: Longitude direction and latitude direction

#2 JFR As the feeedrate of 3-dimensional machining manual feed (jog feed or incremental feed) :
0: The dry run rate (parameter No. 1410) is used.
1: The jog feedrate (parameter No. 1423) is used.

#7 EM4 Manual handle feed amount selection signal MP4 is:
0: Disabled.
1: Enabled.

12321	Normal axis direction

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 3

When a tilted working plane indexing (G68.3) is issued to perform 3-dimensional machining manual feed in the latitude direction, longitude direction, and tool axis direction, this parameter sets an axis parallel to the normal direction.
1 : Positive (+) X-axis direction
2 : Positive (+) Y-axis direction
3 : Positive (+) Z-axis direction
0 : Reference tool axis direction (parameter No. 19697)

12322	Angle used to determine whether to assume the tool axis direction to be parallel to the normal direction (parameter No. 12321)

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to 90

When a tilted working plane indexing (G68.3) is issued to perform 3-dimensional machining manual feed in the latitude direction, longitude direction, and tool axis direction, if the angle between the tool axis direction and normal direction (parameter No. 12321) is too small, the tool axis direction is assumed to be parallel to the normal direction (parameter No. 12321). This parameter sets the maximum angle at which the tool axis direction is assumed to be parallel to the normal direction.
When this parameter is set to 0 or a value outside the valid range, it is set to 1 degree.

12323	Number of a manual handle used for 3-dimensional machining manual feed

[Input type] Setting input
[Data type] Byte path
[Valid data range] 0 to 5

When 3-dimensional machining manual feed (handle feed) is performed, set the number of the manual handle to be used.
When the second or third manual handle is used for 3-dimensional machining manual feed, the option for manual handle feed with 2/3 handles is required.
When the fourth or fifth manual handle is used for 3-dimensional machining manual feed, the option for manual handle feed with 4/5 handles is required.
If 0 or the number of an unavailable handle is set, the first handle is assumed.

	#7	#6	#5	#4	#3	#2	#1	#0
12330	G17	G16	G15	G14	G13	G12	G11	G10
12331	G1F	G1E	G1D	G1C	G1B	G1A	G19	G18
12332	G27	G26	G25	G24	G23	G22	G21	G20
12333	G2F	G2E	G2D	G2C	G2B	G2A	G29	G28
12334	G37	G36	G35	G34	G33	G32	G31	G30
12335	G3F	G3E	G3D	G3C	G3B	G3A	G39	G38
12336	G47	G46	G45	G44	G43	G42	G41	G40
12337	G4F	G4E	G4D	G4C	G4B	G4A	G49	G48

[Input type] Parameter input
[Data type] Bit

NOTE
When at least one of these parameters is set, the power must be turned off before operation is continued.

G10 to G4F When the Power Mate or I/O Link β is connected to the I/O Link, these bits set whether to transfer pulses from manual pulse generators connected to the I/O Link to the Power Mate or I/O Link β.

The setting of each bit has the following meaning:
0: Pulses are transferred.
1: Pulses are not transferred.

The bits and the corresponding I/O Link channel numbers and group numbers are listed below:

Parameter	Channel number	Group number
G10	1	0
G11	1	1
G12	1	2
:	:	:
G1F	1	15
:	:	:
G4F	4	15

12340	PMC path of the 1st. manual pulse generator connected with I/O Link

12341	PMC path of the 2nd. manual pulse generator connected with I/O Link

12342	PMC path of the 3rd. manual pulse generator connected with I/O Link
12343	PMC path of the 4th. manual pulse generator connected with I/O Link
12344	PMC path of the 5th. manual pulse generator connected with I/O Link

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 3

Referring to parameters Nos. 12300 to 12304.

12350	Manual handle feed magnification m in each axis

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 2000

For each axis, this parameter sets the magnification m when manual handle feed movement selection signals MP1 = 0, MP2 = 1.

> **NOTE**
> When value is set to 0 for this parameter, the parameter No. 7113 is valid.

12351	Manual handle feed magnification n in each axis

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 2000

For each axis, this parameter sets the magnification when manual handle feed movement selection signals MP1 = 1, MP2 = 1.

> **NOTE**
> When value is set to 0 for this parameter, the parameter No. 7114 is valid.

4.120 PARAMETERS OF SYNCHRONOUS/COMPOSITE CONTROL AND SUPERIMPOSED CONTROL (3 OF 3)

12600	Identification Number for synchronous, composite and superimposed control with program command

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0,1 to 32767

Set identification numbers that can be specified with P,Q addresses.
The axis whose identification number is 0 cannot become under synchronous /composite /superimposed control by CNC program.
The same identification number cannot be set to two or more axes through all paths.
When the same identification number is set, alarm PS5339 occurs at G50.4/G50.5/G50.6/G51.4/G51.5/G51.6 block.

12605	Minimum waiting synchronous start M code in superimposed control for high-speed cycle machining

[Input type] Parameter input

[Data type] 2-word
[Valid data range] 0, 100 to 99999999

This parameter sets the waiting synchronous start M code to use if high-speed cycle machining or axis moving due to high-speed binary operation is to be started in synchronization with the superimposition command for an arbitrary operation path. For the waiting synchronous start M code, specify an M code that causes a synchronous start in the range of waiting M codes (parameters Nos. 8110 to 8111).
Set in this parameter the minimum M code that causes a synchronous start.

> **NOTE**
> Maximum M code that causes a synchronous start is set to parameter No. 8111.

4.121 PARAMETERS OF AXIS CONTROL BY PMC (4 OF 4)

	#7	#6	#5	#4	#3	#2	#1	#0
12730								PTC

[Input type] Parameter input
[Data type] Bit path

#0 PTC Linear acceleration/deceleration time constant of continuous feed operation based on a speed command in PMC axis control is:
0: Normal.
1: Extended.
This bit is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007 is 1).

12731	Time constant 2 of linear acceleration/deceleration in velocity command continuous feed under PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec/1000min^{-1}
[Valid data range] 0 to 32767

If 0 is specified, the time constant at a given feedrate becomes invalid, and acceleration/deceleration is not performed.
This parameter is valid only when the PMC axis control velocity command follows the FS16 specifications (when bit 2 (VCP) of parameter No. 8007 is set to 1), and the time constant of linear acceleration/deceleration in velocity command continuous feed under PMC axis control is expanded (when bit 0 (PTC) of parameter No. 12730 is set to 1).

12732	Time constant 3 of linear acceleration/deceleration in velocity command continuous feed under PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec/1000min^{-1}
[Valid data range] 0 to 32767

If 0 is specified, the time constant at a given feedrate becomes invalid, and acceleration/deceleration is not performed.

This parameter is valid only when the PMC axis control velocity command follows the FS16 specifications (when bit 2 (VCP) of parameter No. 8007 is set to 1), and the time constant of linear acceleration/deceleration in velocity command continuous feed under PMC axis control is expanded (when bit 0 (PTC) of parameter No. 12730 is set to 1).

12733	4th time constant of linear acceleration/deceleration of continuous feed operation based on a speed command in PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec/1000min^{-1}
[Valid data range] 0 to 32767

When this parameter is set 0, 4th time constant data is not available, and then acceleration / deceleration of speed command is not available in from 3rd feedrate to 4th feedrate.
This parameter is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007 is 1) and linear acceleration/deceleration time constant of continuous feed operation based on a speed command in PMC axis control is extended (bit 0 (PTC) of parameter No. 12730 is 1).

12734	5th time constant of linear acceleration/deceleration of continuous feed operation based on a speed command in PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec/1000min^{-1}
[Valid data range] 0 to 32767

When this parameter is set 0, 5th time constant data is not available, and then acceleration / deceleration of speed command is not available in from 4th feedrate to 5th feedrate.
This parameter is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007 is 1) and linear acceleration/deceleration time constant of continuous feed operation based on a speed command in PMC axis control is extended (bit 0 (PTC) of parameter No. 12730 is 1).

12735	1st feedrate for changing time constant of continuous feed operation based on a speed command in PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 32767

Set feedrate parameters as following.
No. 12735 < No. 12736 < No. 12737 < No. 12738.
This parameter is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007) and linear acceleration/deceleration time constant of continuous feed operation based on a speed command in PMC axis control is extended (bit 0 (PTC) of parameter No. 12730 is 1).

12736	2nd feedrate for changing time constant of continuous feed operation based on a speed command in PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 32767

Set feedrate parameters as following.
No. 12735 < No. 12736 < No. 12737 < No. 12738.

This parameter is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007) and linear acceleration/deceleration time constant of continuous feed operation based on a speed command in PMC axis control is extended (bit 0 (PTC) of parameter No. 12730 is 1).

12737	3rd feedrate for changing time constant of continuous feed operation based on a speed command in PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 32767

Set feedrate parameters as following.
No. 12735 < No. 12736 < No. 12737 < No. 12738.
This parameter is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007) and linear acceleration/deceleration time constant of continuous feed operation based on a speed command in PMC axis control is extended (bit 0 (PTC) of parameter No. 12730 is 1).

12738	4th feedrate for changing time constant of continuous feed operation based on a speed command in PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 32767

Set feedrate parameters as following.
No. 12735 < No. 12736 < No. 12737 < No. 12738.
This parameter is available when speed command in PMC axis control is FS16 type (bit 2 (VCP) of parameter No. 8007) and linear acceleration/deceleration time constant of continuous feed operation based on a speed command in PMC axis control is extended (bit 0 (PTC) of parameter No. 12730 is 1).

4.122 PARAMETERS OF EXTERNAL DECELERATION POSITIONS EXPANSION

	#7	#6	#5	#4	#3	#2	#1	#0
12750							EX5	EX4

[Input type] Parameter input
[Data type] Bit path

#0 EX4 External deceleration function setting 4 is:
0: Disabled.
1: Enabled.

#1 EX5 External deceleration function setting 5 is:
0: Disabled.
1: Enabled.

12751	External deceleration rate setting 4 in cutting feed

[Input type] Parameter input
[Data type] Real path

[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set external deceleration rate 4 for cutting feed or positioning of linear interpolation type (G00).

12752	External deceleration rate setting 4 for each axis in rapid traverse

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set external deceleration rate 4 for each axis in rapid traverse.

12753	Maximum manual handle feedrate setting 4 for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set a maximum manual handle feedrate 4 for each axis.

12754	External deceleration rate setting 5 in cutting feed

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set external deceleration rate 5 for cutting feed or positioning of linear interpolation type (G00).

12755	External deceleration rate setting 5 for each axis in rapid traverse

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set external deceleration rate 5 for each axis in rapid traverse.

12756	Maximum manual handle feedrate setting 5 for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Set a maximum manual handle feedrate 5 for each axis.

4.123 PARAMETERS OF DISPLAY AND EDIT (5 OF 5)

12801	**Operation history signal selection address type (No. 01)**
to	**to**
12820	**Operation history signal selection address type (No. 20)**

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 4

These parameters set operation history signal selection address types Nos. 1 to 20.
The correspondence between address types and settings is as given in the table below.

Address type	Parameter value
Not selected.	0
X	1
G	2
Y	3
F	4

Nos. 1 to 20 correspond to Nos. 1 to 20 on the operation history signal selection screen.
These parameters are paired with other parameters as given below.

No.	PMC path number	Address type	Address number	Bit number
01	No. 24901	No. 12801	No. 12841	No. 12881
02	No. 24902	No. 12802	No. 12842	No. 12882
03	No. 24903	No. 12803	No. 12843	No. 12883
…		…	…	…
20	No. 24920	No. 12820	No. 12860	No. 12900

NOTE

1 Operation history signals that can be selected and deselected with parameters are for the first 20 of 60 sets. If an operation history signal is specified from the operation history signal selection screen, the PMC path number is fixed at the first PMC.

2 To deselect a signal, set 0.
At this time, 0 is set as the initial value in the address number (Nos. 12841 to 12860) and the bit number (Nos. 12881 to 12900) corresponding to that signal.

3 When an address type is set, 1 is set as the initial value in the PMC path number (Nos. 24901 to 24920) corresponding to that signal, and 0 is set as the initial value in the address number (Nos. 12841 to 12860) and the bit number (Nos. 12881 to 12900).
[Example]
If parameter No. 12801 is set to 2, the parameters are initialized as follows:
No. 24901=1 PMC path number
No. 12841=0 Address number
No. 12881=00000000 Bit number
If, however, the PMC path number (Nos. 24901 to 24920) corresponding to that signal is set, the PMC path number (Nos. 24901 to 24920) will not be initialized.

4 If an attempt is made to set a value that cannot be set, a warning, "DATA IS OUT OF RANGE" appears; retry setting a value.

12841	Operation history signal selection address number (No. 01)
to	to
12860	Operation history signal selection address number (No. 20)

[Input type] Parameter input
[Data type] Word
[Valid data range] For an explanation of the address ranges of the G, F, X, and Y signals, refer to the PMC Programming Manual (B-64513EN).

These parameters set operation history signal selection address numbers Nos. 1 to 20.
Nos. 1 to 20 correspond to Nos. 1 to 20 on the operation history signal selection screen.
These parameters are paired with other parameters as given below.

No.	PMC path number	Address type	Address number	Bit number
01	No. 24901	No. 12801	No. 12841	No. 12881
02	No. 24902	No. 12802	No. 12842	No. 12882
03	No. 24903	No. 12803	No. 12843	No. 12883
…		…	…	…
20	No. 24920	No. 12820	No. 12860	No. 12900

NOTE
1. Operation history signals that can be selected and deselected with parameters are for the first 20 of 60 sets.
2. When an address number is set, 0 is set as the initial value in the bit number (Nos. 12881 to 12900) corresponding to that signal.
3. If an attempt is made to set a value that cannot be set or if the address type (Nos. 12801 to 12820) corresponding to that signal is 0, a warning, "DATA IS OUT OF RANGE" appears; retry setting a value.

	#7	#6	#5	#4	#3	#2	#1	#0
12881	RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0
to	to							
12900	RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0

[Input type] Parameter input
[Data type] Bit

RB7 - RB0 History of the respective operation history signal selection bits Nos. 1 to 20 (RB7 to RB0) corresponding to the operation history signal selection addresses set in parameters Nos. 12801 to 12860 is:
0 : Not retained. (History of the bit is not recorded.)
1 : Retained. (History of the bit is recorded.)

These parameters are paired with other parameters as given below.

No.	PMC path number	Address type	Address number	Bit number
01	No. 24901	No. 12801	No. 12841	No. 12881
02	No. 24902	No. 12802	No. 12842	No. 12882
03	No. 24903	No. 12803	No. 12843	No. 12883
…		…	…	…
20	No. 24920	No. 12820	No. 12860	No. 12900

NOTE
1. Operation history signals that can be selected and deselected with parameters are for the first 20 of 60 sets.

NOTE

2 If the value of the address type (Nos. 12801 to 12820) corresponding to that signal is 0, a warning, "DATA IS OUT OF RANGE" appears; retry setting a value.

12990	G code modal group (first one) to be recorded as history data when an alarm or an external operator message is issued
to	to
12999	G code modal group (tenth one) to be recorded as history data when an alarm or an external operator message is issued

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to maximum G code group number

Set a G code modal group number to be recorded as alarm history, message history and operation history data when an alarm or an external operator message is issued.

NOTE

If the parameter sets a value out of the valid data range, the state of each G code group is recorded.

	#7	#6	#5	#4	#3	#2	#1	#0
13000								TMD0

[Input type] Parameter input
[Data type] Bit path

#0 TMD0 In the lathe/machining center G code system switching function, if an M code for switching to the turning mode or the milling mode is specified in a program command, the code and strobe signals are:
0: Not output.
1: Output.

13020	M code number for switching to the turning mode (turning mode switching M code)
13021	M code number for switching to the milling mode (milling mode switching M code)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999

For the lathe/machining center G code system switching function, these parameters set the M codes for switching to the turning mode and the milling mode in a program command. M00, M01, M02, M30, M98, and M99 cannot be set. They will be invalid even if they are set. Do not use the M codes used in other functions. The same number cannot be set for the turning mode switching M code (parameter No. 13020) and the milling mode switching M code (parameter No. 13021). The mode switching M codes are not buffered.

	#7	#6	#5	#4	#3	#2	#1	#0
13101						15M	TPB	

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#1 TPB Baud rate used with the external touch panel
0: 19200 bps is always used.
1: The baud rate with the baud rate number set in parameter No. 0123 for channel 2 is used.

As mentioned in the description of bit 3 (TPA) of parameter No. 3119, when TPA is set to 0, the baud rate is always set to 19200 bps.
To allow the baud rate to be changed, set bit 1 (TPB) of parameter No. 13101 to 1.
This allows the baud rate number set in parameter No. 0123 for channel 2 to be used.

> **NOTE**
> Baud rates that can be set may vary depending on the ETP used.

#2 15M On a 15” display unit, the simultaneous multi-path display program check screen:
0: Does not display modal information.
1: Displays modal information.

	#7	#6	#5	#4	#3	#2	#1	#0
13102	EDT	BGI	BGD					TAD

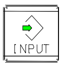
[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

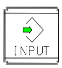
#0 TAD When the axis is not displayed by the bit 0 (NDPx) of parameter or parameter No.3130,
0: The set axis is displayed as blanks.
1: The axis is closed up and displayed.

#5 BGD When the background edit option is set, background editing on the CNC program edit screen is:
0: Enabled.
1: Disabled.

When MANUAL GUIDE *i* is used, set this parameter to 1 to disable background editing on the CNC program edit screen.

#6 BGI When the cursor is placed at a program, and the 

key is pressed on the program list screen:
0: Background editing starts.
1: Background editing does not start.

If this parameter is set to 0, pressing the 

key on the program list screen automatically changes the screen display to the background edit screen, allowing editing of a selected program. If the parameter is set to 1, the screen display does not change, and background editing does not start.

#7 EDT During memory operation, program editing is:
0: Enabled.
1: Disabled.

> **NOTE**
> 1 When 0 is set, during memory operation, you can stop the program by a single block stop or feed hold, select the EDIT mode, and edit the program.
> When the main program is running:
> - The same edit functions as used for ordinary editing can be used.
>
> When a subprogram is running:
> - Only the word-unit edit function can be used.
> - Any program called from DNC or MDI operation cannot be edited.
> - Only the subprogram can be edited.
>
> 2 Before restarting memory operation, take extreme caution to return the cursor to the position before stopping the program. If you want to execute the program from other than the cursor position when stopped, be sure to reset the machine before executing the program.

	#7	#6	#5	#4	#3	#2	#1	#0
13112	NTD	NTA				SPI	SVI	IDW

[Input type] Parameter input
[Data type] Bit path

#0 IDW Editing on the servo or spindle information screen is:
0: Prohibited.
1: Not prohibited.

#1 SVI The servo information screen is:
0: Displayed.
1: Not displayed.

#2 SPI The spindle information screen is:
0: Displayed.
1: Not displayed.

#6 NTA On the 3-dimensional machining manual feed screen, a table-based pulse amount is:
0: Displayed.
1: Not displayed.

#7 NTD On the 3-dimensional machining manual feed screen, a tool axis based pulse amount is:
0: Displayed.
1: Not displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
13113				MDS	CFD			CLR

[Input type] Parameter input
[Data type] Bit path

#0 CLR Upon reset, the display of a travel distance by 3-dimensional machining manual feed is:
0: Not cleared.
1: Cleared.

#3 CFD As feedrate F, the 3-dimensional machining manual feed screen displays:
0: Composite feedrate at the linear axis/rotation axis control point.
1: Feedrate at the tool tip.

#4 MDS If a reset is made during execution of a block including the S code:
0: Modal information (S code) in an executing block is displayed.
1: Modal information (S code) in a previous block is displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
13114					E15		P19	P15

[Input type] Parameter input
[Data type] Bit

#0 P15
#1 P19 The screen display mode used with the CNC screen display function is selected according to the following table.

P19	P15	Screen display mode
0	0	10.4” mode
0	1	15” mode
1	0	19” mode

#3 E19 If the display mode used with the CNC screen display function is the 15" mode:
0: Regular 15" designs are used in display.
1: 19" expansion designs are used in display.

> **NOTE**
> This parameter is valid when the CNC screen display function is used for the stand-alone type 30*i*/31*i*/32*i* (with personal computer function with Windows XP).

	#7	#6	#5	#4	#3	#2	#1	#0
13115	P10	KBC	SI2	SI1	IAU	ITB	IAT	ICT

[Input type] Parameter input
[Data type] Bit

#0 ICT For MDI key input, the CTRL key is:
0: Enabled.
1: Disabled.

#1 IAT For MDI key input, the ALT key is:
0: Enabled.
1: Disabled.

#2 ITB For MDI key input, the TAB key is:
0: Enabled.
1: Disabled.

#3 IAU For MDI key input, the AUX key is:
0: Enabled.
1: Disabled.

#4 SI1 Soft key input of the characters shown below is:
0: Disabled.
1: Enabled.
< > ¥ % $! ~ : " '

#5 SI2 Soft key input of the characters shown below and switching between the uppercase and lowercase input modes by a soft key are:
0: Disabled.
1: Enabled.
( ) ? * & @ _

#6 KBC With the standard ONGP-MDI unit, in the lowercase input mode, "[" and "]" are:
0: Not converted to "<" and ">", respectively.
1: Converted to "<" and ">", respectively.

When value of this parameter is set, the value will be available after the power is turned off.

#7 P10 With the 30*i*/31*i*/32*i* (with personal computer function with Windows XP) with a 15" display unit, when the CNC screen display function is used, the mode for displaying the screen is:
0: The 15" mode.
1: The 10.4" mode.

	#7	#6	#5	#4	#3	#2	#1	#0
13117	SQP	SQB	PMP	INT				

[Input type] Parameter input
[Data type] Bit path

#4 INT During a program restart, the interference check on cutter/tool nose radius compensation is:
0: Enabled.
1: Disabled.

#5 PMP To the MDI program that is output due to a program restart, the memory protection signals KEY1 and KEY3 are:
0: Not effective.
1: Effective.

> **NOTE**
> When 0 is set in bit 7 (KEY) of parameter No. 3290, KEY3 is used to protect the MDI program. When 1 is set in the parameter, KEY1 is used.

#6 SQB A program restart with a block number specification is:
0: Enabled.
1: Disabled.

#7 SQP A program restart with the P type is:
0: Enabled.
1: Disabled.

13131	Group number for simultaneous display of multiple paths

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 10

This parameter sets a group for simultaneous display on one screen in a multi-path system.
The paths set to belong to the same group are displayed on one screen.
If the values for all paths are set to 0, the simultaneous multi-path display function is disabled.

> **NOTE**
> When specifying groups, specify group numbers not less than 1 successively.
> On 8.4” and 10.4” display units, up to three paths can be specified for simultaneous display.
> On a 15” and 19” display units, up to four paths can be specified for simultaneous display.

13132	Simultaneous multi-path display order number

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of paths included in a simultaneous multi-path display group

This parameter sets the display order of a path defined to belong to a simultaneous multi-path display group.
Set the order, using numbers ranging from 1 to the number of paths included in the simultaneous multi-path display group.

[Example] Setting of simultaneous display group numbers and simultaneous display order numbers

Number of paths of CNC	Path	Display group number	Intra-group display order number	Screen display (Numbers represent displayed path numbers.)
One path	Path 1	1	1	1
Three path	Path 1	1	1	1 | 2 | 3
	Path 2	1	2	
	Path 3	1	3	
	Path 1	1	1	1 ⇨ 2 ⇨ 3
	Path 2	2	1	
	Path 3	3	1	
	Path 1	1	2	2 | 1 ⇨ 3
	Path 2	1	1	
	Path 3	2	1	

> **NOTE**
> Specify successive order numbers not less than 1 for the paths defined to belong to a group.

13140	First character in spindle load meter display
13141	Second character in spindle load meter display

[Input type] Setting input
[Data type] Byte spindle
[Valid data range] These parameters set character codes to set the name of each spindle that appears in spindle load meter display. Any character string consisting of numeric characters, alphabetical characters, katakana characters, and symbols with a maximum length of two characters can be displayed as a spindle name.
If 0 is set, the following is displayed:

1st spindle	S1
2nd spindle	S2
3rd spindle	S3
4th spindle	S4

13151	SERIAL NUMBER

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 9999
SERIAL NUMBER is the number for the files output to a memory card by external output command DPRNT/BPRNT. 1 is added to SERIAL NUMBER when POPEN is executed. SERIAL NUMBER becomes 0 if it exceeds 9999.

> **NOTE**
> Please do not change the value of parameter No. 13151 because it is automatically updated.

4.124 PARAMETERS OF TOOL MANAGEMENT FUNCTIONS (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
13200	NFD	NAM	T0O	TP2	ETE	TRT	THN	TCF

[Input type] Parameter input
[Data type] Bit path

#0 TCF When a T code is specified with the tool management function:
0: A cartridge number and pot number found by the NC are output.
1: The specified T code is output without modification.

#1 THN When NX.T and HD.T are displayed with the tool management function:
0: The tool type numbers at the first spindle position and the first standby position are displayed.
1: The values specified from the PMC window are displayed.

#2 TRT As the remaining lifetime value for outputting the tool life arrival notice signal:
0: The remaining lifetime of the last tool is used.
1: The sum of the remaining lifetimes of the tools with the same type number is used.

> **NOTE**
> This parameter is valid when bit 3 (ETE) of parameter No. 13200 is set to 0 (arrival notice for each type number).

#3 ETE The tool life arrival notice signal is output:
0: For each tool type.
1: For each tool.

#4 TP2 The output format of cartridge management data is:
0: New registration format (G10L76P1 format).
1: Modification format (G10L76P2 format).

#5 T0O When T0 is specified:
0: A tool search is made assuming that the tool type number is 0.
1: The cartridge number and pot number are assumed to be 0.

#6 NAM When a T code is specified, but a valid tool with a remaining lifetime cannot be found:
0: The alarm PS5317, "LIVES OF ALL TOOLS EXPIRED" is issued.
1: The alarm is not issued. Instead, the tool with the maximum tool management number is selected from the tools of the specified tool type, and Life expiration signal TMFNFD<F315.6> is set to “1”.

#7 NFD When a T code is specified, but a valid tool with a remaining lifetime cannot be found in the cartridge:
0: The spindle position and standby position are also searched.
1: The spindle position and standby position are not searched.

	#7	#6	#5	#4	#3	#2	#1	#0
13201		TDS		TFT	TME	TDB	TDN	TDC

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

#0 TDC The function of customizing the tool management data screen of the tool management function is:
0: Disabled.
1: Enabled.

#1 TDN On the tool management function screen, the character string for indicating the tool life status can contain:
0: Up to 6 characters.
1: Up to 12 characters.

#2 TDB The tool management function displays tool information in the:
0: Conventional mode.
1: 1/0 mode.

#3 TME In the tool management function, multi-edge tools are:
0: Not supported.
1: Supported.

#4 TFT On the tool management data screen, data extraction for a specified item is:
0: Disabled.
1: Enabled.

#6 TDS A tool data search using a tool type number is:
0: Not performed.
1: Performed.

	#7	#6	#5	#4	#3	#2	#1	#0
13202	DOM	DOT		DO2	DOB	DOY	DCR	

[Input type] Parameter input
[Data type] Bit

#1 DCR On the tool management function screen, tool nose radius compensation data is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or compound system.

#2 DOY On the tool management function screen, Y-axis offset data is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or compound system.

#3 DOB On the tool management function screen, B-axis offset data is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or compound system.

#4 DO2 On the tool management function screen, the second geometry tool offset data is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or compound system.

#6 DOT On the tool management function screen, the tool offset data (X, Z) of the T series is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or compound system.

#7 DOM On the tool management function screen, the tool offset data of the M series is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the machining center system or compound system.

	#7	#6	#5	#4	#3	#2	#1	#0
13203	TCN	SWC	NTS	TSI	NM4	NM3	NM2	NM1

[Input type] Parameter input
[Data type] Bit path

#0 NM1 The first cartridge is:
0: Searched.
1: Not searched.

#1 NM2 The second cartridge is:
0: Searched.
1: Not searched.

#2 NM3 The third cartridge is:
0: Searched.
1: Not searched.

#3 NM4 The fourth cartridge is:
0: Searched.
1: Not searched.

#4 TSI When multi-edge tools are supported by the tool management function, tools are searched as follows:
0: A tool is selected by remaining tool life. (Conventional search)
1: In selection, priority is given to a tool located at the spindle position or standby position.

#5 NTS When multi-edge tools are supported by the tool management function, if the life of an edge that belong to an edge group has expired, the edge group is:
0: Not excluded from the target tools to be searched during tool search operation.
1: Excluded from the target tools to be searched during tool search operation.

#6 SWC The tools with the same tool type number are searched for:
0: Tool with the shortest lifetime.
1: Tool with the small customization data number.
In this case, a customization data number is to be set in parameter No. 13260.

#7 TCN Tool life count operation is triggered by:
0: M06/restart M code. (A T code alone does not start counting.)
1: T code. (Count operation is not started by M06.)

	#7	#6	#5	#4	#3	#2	#1	#0
13204						DTA	ATA	TDL

[Input type] Parameter input
[Data type] Bit

#0 TDL The protection function for tool management data using a key is:
0: Disabled.
1: Enabled.

#1 ATA The tool attachment signal, magazine number signal, and pot number signal are:
0: Used. (Auto attachment)
1: Not used. (Manual attachment)

#2 DTA The tool detachment signal, magazine number signal, and pot number signal are:
0: Used. (Auto detachment)
1: Not used. (Manual detachment)

	#7	#6	#5	#4	#3	#2	#1	#0
13206				OVI			SSM	

[Input type] Parameter input
[Data type] Bit

#1 SSM As a chapter selection soft key of the tool management function, a soft key for changing the screen display to the MANUAL GUIDE i screen is:
0: Not displayed.
1: Displayed.

#4 OVI When tool management data is output, it includes:
0: No offset value.
1: Offset values.

	#7	#6	#5	#4	#3	#2	#1	#0
13210	FNS							

[Input type] Parameter input
[Data type] Bit

#7 FNS Acquisition of unused multi-edge group numbers and tool offset numbers and their display on the tool management screen are:
0: Not performed.
1: Performed.

NOTE
When this parameter is set, the power must be turned off before operation is continued.

13220	Number of valid tools in tool management data

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 64 (Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of valid tools in tool management data.

13221	M code for tool life count restart

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 65535

When 0 is set in this parameter, this parameter is ignored.

When an M code for tool life count restart is specified, the counting of the life of the tool attached at the spindle position is started. When the type for counting the number of use times is selected, the target of life counting is switched to the tool attached at the spindle position, and the life count is incremented by 1.

When the type for counting time is selected, the target of life counting is switched to the tool attached at the spindle position but no other operations are performed. If the tool attached at the spindle position is not a tool under tool life management, no operation is performed.

The M code set in parameter No. 6811 waits for FIN. However, the M code set in this parameter does not wait for FIN.

The M code set in parameter No. 13221 must not be specified in a block where another auxiliary function is specified.

The M code set in parameter No. 13221 does not wait for FIN. So, do not use the M code for other purposes.

> **NOTE**
> The use of this parameter varies depending on whether it is used by the tool management function or tool life management function.

13222	Number of data items in the first cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 64 (Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of data items used with the first cartridge.

13223	Start pot number of the first cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 9999

This parameter sets the start pot number to be used with the first cartridge. Pot numbers starting with the value set in this parameter and sequentially incremented by 1 are assigned to all data items.

13227	Number of data items in the second cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 64(Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of data items used with the second cartridge.

13228	Start pot number of the second cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 9999

This parameter sets the start pot number to be used with the second cartridge. Pot numbers starting with the value set in this parameter and sequentially incremented by 1 are assigned to all data items.

13232	Number of data items in the third cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 64(Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of data items used with the third cartridge.

13233	Start pot number of the third cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 9999

This parameter sets the start pot number to be used with the third cartridge. Pot numbers starting with the value set in this parameter and sequentially incremented by 1 are assigned to all data items.

13237	Number of data items in the fourth cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 64(Extended to 240 or 1000 by the addition of an option)
This parameter sets the number of data items used with the fourth cartridge.

13238	Start pot number of the fourth cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 9999
This parameter sets the start pot number to be used with the fourth cartridge. Pot numbers starting with the value set in this parameter and sequentially incremented by 1 are assigned to all data items.

	#7	#6	#5	#4	#3	#2	#1	#0
13240					MT4	MT3	MT2	MT1

> **NOTE**
> When at least one of these parameters is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit

#0 MT1 The first cartridge is of the:
0: Chain type.
1: Matrix type.
When this parameter is set to 1, parameter No. 13222 is invalid.

#1 MT2 The second cartridge is of the:
0: Chain type.
1: Matrix type.
When this parameter is set to 1, parameter No. 13227 is invalid.

#2 MT3 The third cartridge is of the:
0: Chain type.
1: Matrix type.
When this parameter is set to 1, parameter No. 13232 is invalid.

#3 MT4 The fourth cartridge is of the:
0: Chain type.
1: Matrix type.
When this parameter is set to 1, parameter No. 13237 is invalid.

13241	Number of rows of the first cartridge (when the cartridge is of the matrix type)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the first cartridge is of the matrix type (bit 0 (MT1) of parameter No. 13240 is set to 1), set the number of rows in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13241) × (setting of parameter No. 13242) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the first cartridge is invalid.

13242	Number of columns of the first cartridge (when the cartridge is of the matrix type)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the first cartridge is of the matrix type (bit 0 (MT1) of parameter No. 13240 is set to 1), set the number of columns in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13241) × (setting of parameter No. 13242) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the first cartridge is invalid.

13243	Number of rows of the second cartridge (when the cartridge is of the matrix type)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the second cartridge is of the matrix type (bit 1 (MT2) of parameter No. 13240 is set to 1), set the number of rows in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13243) × (setting of parameter No. 13244) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the second cartridge is invalid.

13244	Number of columns of the second cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the second cartridge is of the matrix type (bit 1 (MT2) of parameter No. 13240 is set to 1), set the number of columns in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13243) × (setting of parameter No. 13244) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the second cartridge is invalid.

13245	Number of rows of the third cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the third cartridge is of the matrix type (bit 2 (MT3) of parameter No. 13240 is set to 1), set the number of rows in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13245) × (setting of parameter No. 13246) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the third cartridge is invalid.

13246	Number of columns of the third cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the third cartridge is of the matrix type (bit 2 (MT3) of parameter No. 13240 is set to 1), set the number of columns in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13245) × (setting of parameter No. 13246) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the third cartridge is invalid.

13247	Number of rows of the fourth cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the fourth cartridge is of the matrix type (bit 3 (MT4) of parameter No. 13240 is set to 1), set the number of rows in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13247) × (setting of parameter No. 13248) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the fourth cartridge is invalid.

13248	Number of columns of the fourth cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the fourth cartridge is of the matrix type (bit 3 (MT4) of parameter No. 13240 is set to 1), set the number of columns in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13247) × (setting of parameter No. 13248) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the fourth cartridge is invalid.

13250	Number of valid spindles

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 4
This parameter sets the number of spindle positions usable with the tool management function.

13251	Number of valid standby positions

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 4

This parameter sets the number of standby positions usable with the tool management function.

13252	M code for specifying a particular tool

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 65535

This parameter sets not a tool type number but an M code for directly specifying the T code of a particular tool.

13260	Customization data number to be searched for

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 40

When bit 6 (SWC) of parameter No. 13203 is set to 1, this parameter sets a customization data number to be searched for.
The valid data range is 1 to 4 when the option for customization data extension is not selected. When the option for customization data extension (5 to 20) is selected, the valid data range is 1 to 20. When the option for customization data extension (5 to 40) is selected, the valid data range is 1 to 40.
When bit 6 (SWC) of parameter No. 13203 is set to 0, or a value not within the valid data range is set, the search function based on customization data is disabled, and the tool with the shortest lifetime is searched for.

13265	Number for selecting a spindle position offset number

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 9999

This parameters sets an H/D code for selecting an offset number registered in the data of the tool attached at the spindle position.
When 0 is set, an ordinary used code such as H99/D99 is used. When a value other than 0 is set, H99/D99 no longer has a particular meaning. So, when H99/D99 is specified in this case, the specification of offset number 99 is assumed.
With the T series, address D only is used to specify a tool number and offset number, so that a restriction is imposed on the number of digits. So, the valid data range of this parameter varies according the number of digits of an offset number.
When the number of digits of an offset number is 1: to 9
When the number of digits of an offset number is 2: to 99
When the number of digits of an offset number is 3: to 999

> **NOTE**
> The use of this parameter varies depending on whether it is used by the tool management function or tool life management function.

4.125 PARAMETERS OF TOOL LIFE MANAGEMENT (2 OF 2)

13221	M code for tool life count restart

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 255 (not including 01, 02, 30, 98, and 99)

When 0 is set, this parameter is ignored.
For the operation of an M code for tool life count restart, see the description of parameter No. 6811.
This parameter is used when an M code for tool life count restart exceeds 127.
Set parameter No. 6811 to 0, and set the value of an M code in this parameter.

> **NOTE**
> The use of this parameter varies depending on whether it is used by the tool management function or tool life management function.

13265	H code for using the tool length offset in tool life management

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 9999

Usually, when H99 is specified, tool length offset is enabled by the H code of the tool being used. By setting any H code in this parameter, the H code instead of H99 can be used. If 0 is specified, H99 is assumed.
A value ranging from 0 to 9999 can be set.

> **NOTE**
> The use of this parameter varies depending on whether it is used by the tool management function or tool life management function.

13266	D code for enabling cutter compensation in tool life management

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 9999

Usually in tool life management, specifying D99 allows the D code of the tool being used to enable cutter compensation. By setting any D code in this parameter, the D code instead of D99 can be used. If 0 is set, D99 is assumed.

4.126 PARAMETERS OF HYPOTHETICAL LINEAR AXIS CONTROL

13280	Axis number of the hypothetical axis for the real axis in the hypothetical plane

[Input type] Parameter input
[Data type] Byte axis

[Valid data range] 0 to Number of controlled axes

> **NOTE**
> When this parameter is changed, the power must be turned off.

Set the relationship between the hypothetical axis and the real axis in the hypothetical plane.
The following is an example in which X,Y axes are the hypothetical axes, C is the real rotary axis in the hypothetical plane and V is the real linear axis in the hypothetical plane.

Axis No.	Axis Name	Hypothetical axis number (No.13280)	
1	X	0	Hypothetical axis
2	Y	0	Hypothetical axis
3	Z	0	Real axis out of hypothetical plane
4	C	1	Real rotary axis in hypothetical plane
5	V	2	Real linear axis in hypothetical plane

13281	Distance between the rotation center of real rotary axis in the hypothetical plane and the center of the tool (L)

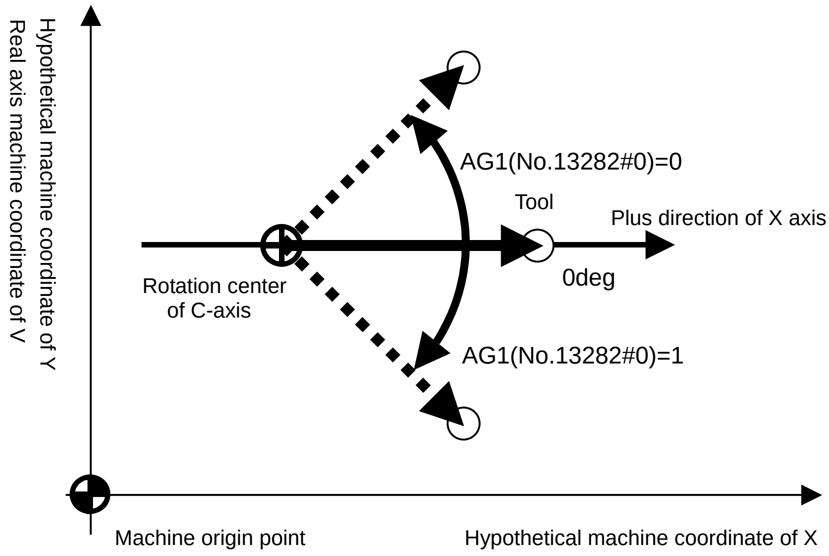
[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit] Depend on the increment system of the reference axis
[Valid data range] Positive 9 digit of minimum unit of data (Refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter is set the distance between the rotation center of real rotary axis in the hypothetical plane and the center of the tool.

	#7	#6	#5	#4	#3	#2	#1	#0
13282	HLC				CFD	OTC	AG2	AG1

[Input type] Parameter input
[Data type] Bit path

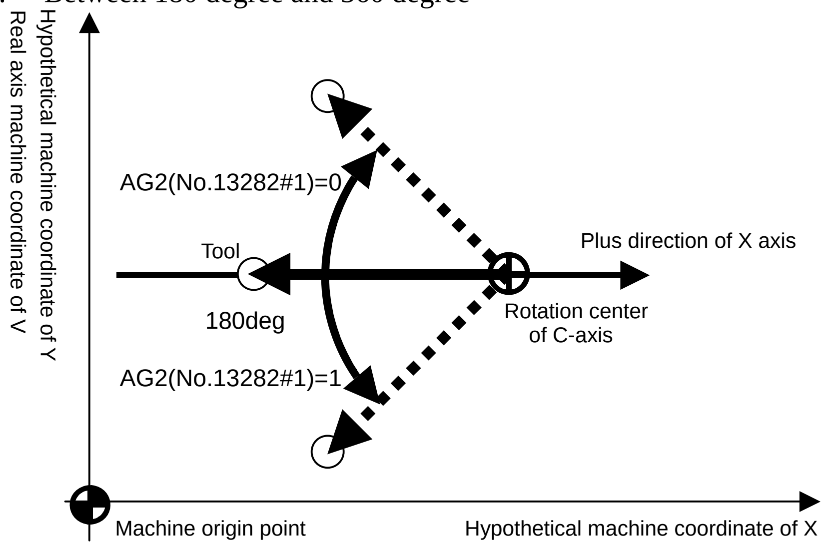
> **NOTE**
> When this parameter is changed, the power must be turned off.

#0 AG1 In case that the angle between the X axis plus direction and the vector from the center of the real rotary axis in the hypothetical plane (C) to the tool is 0 degree at starting the hypothetical axis command mode, the movement of the real rotary axis (C) is
0: Between 0 degree and 180 degree
1: Between 180 degree and 360 degree



#1 AG2 In case that the angle between the X axis plus direction and the vector from the center of the real rotary axis in the hypothetical plane (C) to the tool is 180 degree at starting the hypothetical axis command mode, the movement of the real rotary axis (C) is

0: Between 0 degree and 180 degree
1: Between 180 degree and 360 degree



#2 OTC During the real axis command mode, stored stroke limit check for hypothetical axis is

0: Used
1: Not used

#3 CFD During the hypothetical axis command mode, feedrate control for clamping the real axis feedrate under the maximum feedrate is

0: Used
1: Not used

#7 HLC The hypothetical liner axis function is

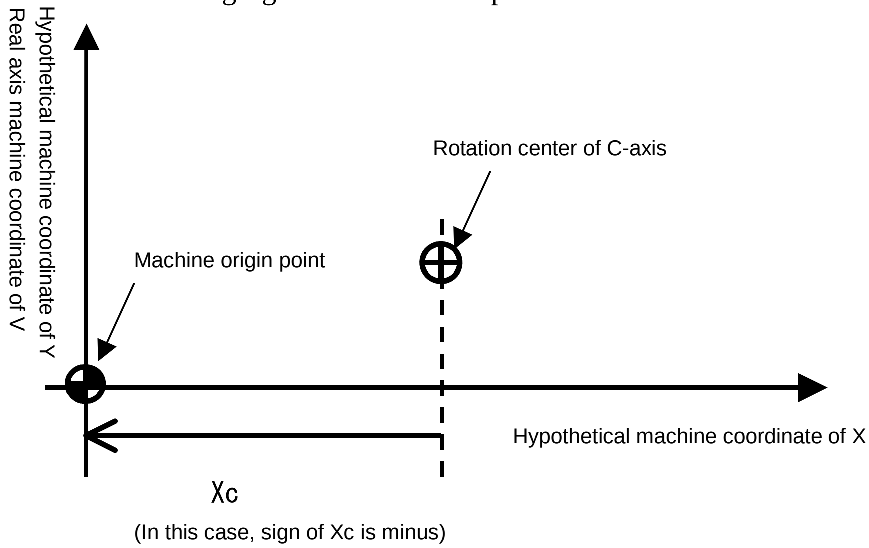
0: Disable.
1: Enable.

13283	**Distance and direction from the rotation center of the real rotary axis (C) to the machine origin point of hypothetical axis (X) (Xc)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (Refer to the standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

> **NOTE**
> When this parameter is changed, the power must be turned off.

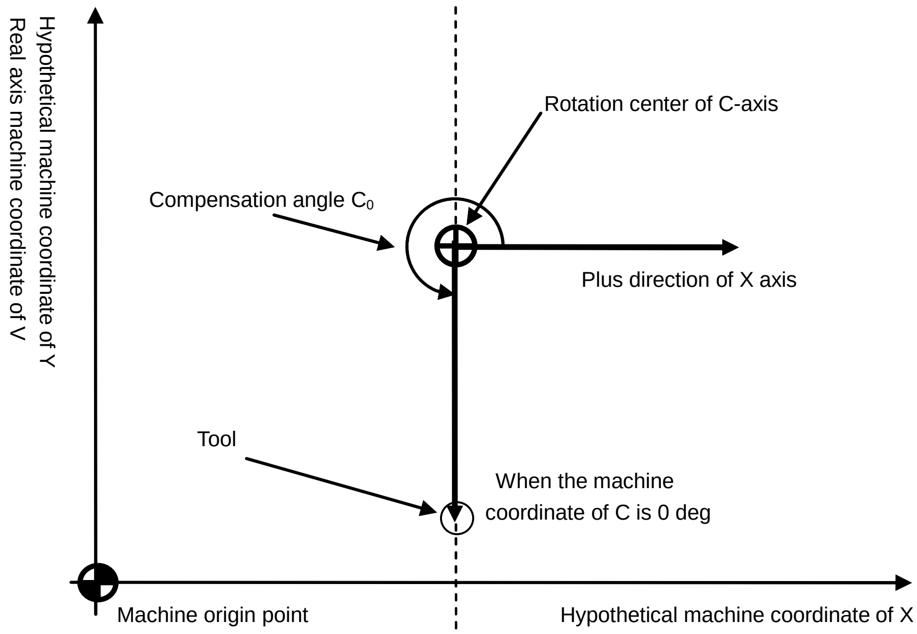
Set the distance and the direction from the rotation center of real rotary axis C to the machine origin point of hypothetical axis X.
Xc in the following figure is set into this parameter.



13284	**Compensation angle for real rotary axis (C_0)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] degree
[Minimum unit] Depend on the increment system of the applied axis
[Valid data range] 0.0 to +360.0

This parameter is set the angle between the vector of the plus direction of hypothetical axis X and the vector connecting from the center of the real rotary axis (C) to the tool when the machine coordinate value of the real rotary axis C is 0 degree in CCW (Counter Clock Wise) direction.
C_0 in the following figure is set into this parameter.



4.127 PARAMETERS OF STRAIGHTNESS COMPENSATION (2 OF 2)

13301	Straightness compensation: Compensation point number a of moving axis 4
to	to
13304	Straightness compensation: Compensation point number d of moving axis 4

13311	Straightness compensation: Compensation point number a of moving axis 5
to	to
13314	Straightness compensation: Compensation point number b of moving axis 5

13321	Straightness compensation: Compensation point number a of moving axis 6
to	to
13324	Straightness compensation: Compensation point number d of moving axis 6

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 1535

These parameters set compensation point numbers in stored pitch error compensation.
Set four compensation points for each moving axis.

13351	Compensation value corresponding to compensation point number a of moving axis 4
to	to
13354	Compensation value corresponding to compensation point number d of moving axis 4

13361	Compensation value corresponding to compensation point number a of moving axis 5
to	to
13364	Compensation value corresponding to compensation point number d of moving axis 5

13371	Compensation value corresponding to compensation point number a of moving axis 6
to	to
13374	Compensation value corresponding to compensation point number d of moving axis 6

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

These parameters set a compensation value for each moving axis compensation point.

13381	Number of a straightness compensation point located at the most negative position of moving axis 1
13382	Number of a straightness compensation point located at the most negative position of moving axis 2
13383	Number of a straightness compensation point located at the most negative position of moving axis 3
13384	Number of a straightness compensation point located at the most negative position of moving axis 4
13385	Number of a straightness compensation point located at the most negative position of moving axis 5
13386	Number of a straightness compensation point located at the most negative position of moving axis 6

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 6000 to 6767

These parameters set the number of a straightness compensation point located at the most negative position for each moving axis.

If a parameter setting exceeds the valid data range, an alarm is issued, and compensation cannot be performed.

13391	Compensation magnification for moving axis 1 in straightness compensation
13392	Compensation magnification for moving axis 2 in straightness compensation
13393	Compensation magnification for moving axis 3 in straightness compensation
13394	Compensation magnification for moving axis 4 in straightness compensation
13395	Compensation magnification for moving axis 5 in straightness compensation
13396	Compensation magnification for moving axis 6 in straightness compensation

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path

[Valid data range] 0 to 100

These parameters set the straightness compensation magnification for each moving axis. When 1 is set as the straightness compensation magnification, the unit of compensation data equals the detection unit. When 0 is set, straightness compensation is not performed.

4.128 PARAMETERS OF FLEXIBLE SYNCHRONOUS CONTROL (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
13420					DID	DIC	DIB	DIA

[Input type] Parameter input
[Data type] Bit path

#0 DIA The movement direction of the automatic phase synchronization of group A is:
0: + direction.
1: - direction.

#1 DIB The movement direction of the automatic phase synchronization of group B is:
0: + direction.
1: - direction.

#2 DIC The movement direction of the automatic phase synchronization of group C is:
0: + direction.
1: - direction.

#3 DID The movement direction of the automatic phase synchronization of group D is:
0: + direction.
1: - direction.

	#7	#6	#5	#4	#3	#2	#1	#0
13421					FSV	FRF	FCN	FRS

[Input type] Parameter input
[Data type] Bit path

NOTE
Set these parameters for the first path only. It will be effective to all paths.

#0 FRS In a program containing an M code for turning the flexible synchronous mode on/off, a program restart is:
0: Disabled.
1: Enabled.

#1 FCN In the emergency stop/servo off state, Inter-Path flexible synchronous control is:
0: Canceled.
1: Not canceled.

#2 FRF If G27/G28/G29/G30/G30.1/G53 is specified during flexible synchronous control, alarm PS0010, “IMPROPER G-CODE” is:
0: Issued.
1: Is not issued. Commands to the master axis are possible.

Even if, however, parameter bit FRF is set to 1, and G28 is specified for the master axis in the state in which the reference position of the master axis subject to flexible synchronous control is not established, or if G27/G28/G29/G30/G30.1/G53 is specified for the slave axis, alarm PS5381, “INVALID COMMAND IN FSC MODE” is issued.

> **NOTE**
> If the option for inter-path flexible synchronous control is specified, even if 0 is set in the parameter bit FRF, the operation will be the same as that if 1 is set.

#3 FSV When the axis related to synchronization is servo off satate while flexible synchronous control or inter-path flexible synchronous control, an automatic operation is:
0: Stopped.
1: Stopped if the axis related to synchronization moves.

> **NOTE**
> In inter-path flexible synchronous control, this parameter becomes effective when parameter FCN (No.13421#1) is set to 1.

13425	**Acceleration/deceleration time constant of the slave axis when synchronization is started/canceled (group A)**
13426	**Acceleration/deceleration time constant of the slave axis when synchronization is started/canceled (group B)**
13427	**Acceleration/deceleration time constant of the slave axis when synchronization is started/canceled (group C)**
13428	**Acceleration/deceleration time constant of the slave axis when synchronization is started/canceled (group D)**

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 4000

These parameters set the acceleration/deceleration time constants of the slave axis subject to automatic phase synchronization for flexible synchronous control.
The acceleration when synchronization is started/canceled will be as follows:
Acceleration = parameter No. 1420 / parameters Nos. 13425 to 13428

13429	**Automatic phase synchronization rate for the slave axis (group A)**
13430	**Automatic phase synchronization rate for the slave axis (group B)**
13431	**Automatic phase synchronization rate for the slave axis (group C)**
13432	**Automatic phase synchronization rate for the slave axis (group D)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, deg/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

These parameters set the automatic phase synchronization rates for the slave axis subject to automatic phase synchronization.
These rates are superimposed on the rate synchronized to the master axis.

If the setting of one of the parameters is 0, the automatic phase synchronization rate for the corresponding group will be 6 (mm/min).

13433	Machine coordinates of the master axis used as the reference for phase synchronization (group A)
13434	Machine coordinates of the master axis used as the reference for phase synchronization (group B)
13435	Machine coordinates of the master axis used as the reference for phase synchronization (group C)
13436	Machine coordinates of the master axis used as the reference for phase synchronization (group D)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, deg (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the machine coordinates of the master axis used as the reference for phase synchronization. If the setting of this parameter is 0, the origin position (coordinates: 0) of the machine coordinate system of the master axis will be the reference position for automatic phase synchronization.

13437	Threshold value for automatic phase synchronization error detection signal output (group A)
13438	Threshold value for automatic phase synchronization error detection signal output (group B)
13439	Threshold value for automatic phase synchronization error detection signal output (group C)
13440	Threshold value for automatic phase synchronization error detection signal output (group D)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, deg (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.000 to +999999.999)
If a difference between the master and slave axes after execution of automatic phase synchronization for flexible synchronization control exceeds the setting, the automatic phase synchronization error detection signals, PHERA, PHERB, PHERC, and PHERD become “1”.
For the inter-path flexible synchronous control, the parameter applies only to slave-axis paths.

4.129 PARAMETERS OF PROGRAMS (4 OF 4)

	#7	#6	#5	#4	#3	#2	#1	#0
13450				MFC				

[Input type] Parameter input
[Data type] Bit path

#4 MFC When the cutting is executed without specifying a feedrate (F) after the modal G code of group 05 was changed by G93(inverse time feed) / G94(feed per minute) / G95(feed per revolution) command,

0: The feedrate (F) is inherited as a modal.

1: Alarm PS0011, “FEED ZERO (COMMAND)” is issued.

> **NOTE**
> 1 In G93 mode, if the axis command and the feedrate (F) command are not in the same block, alarm PS1202, "NO F COMMAND AT G93" is issued regardless of the setting of this parameter.
> 2 If this parameter bit is set to 1, and if the G code of group 05 is cleared due to a reset, by setting bit 6 (CLR) of parameter No. 3402 to 1 and bit 5 (C05) of parameter No. 3406 to 0, so that the modal G code is switched, the feedrate (F) will be cleared even if bit 7 (CFH) of parameter No. 3409 is set to 1.
> 3 If this parameter bit is 1, and bit 7 (FC0) of parameter No. 1404 is set to 1, alarm PS0011 is not issued and the block is executed with a feedrate of 0 even if the feed selection command is used to switch the modal code of group 05 and the axis command is executed in cutting feed mode without specifying a feedrate (F). In G93 mode, alarm PS1202 is issued regardless of the setting of the parameter bit FC0.
> 4 If this parameter bit is 1, alarm PS0011 or PS1202 is not used even if the feed selection command is used to switch the modal code of group 05 and the axis command is executed in cutting feed mode without specifying a feedrate (F), provided that the travel distance is 0.
> 5 If this parameter bit is 1, alarms PS0011 and PS1202 are issued if the feed selection command is used to switch the modal code of group 05 and the axis command is executed in cutting feed mode without specifying a feedrate (F), even if cutting feedrate (parameter No. 1411) during automatic operation is set. (This is true of the M series.)

	#7	#6	#5	#4	#3	#2	#1	#0
13451							ATW	

[Input type] Parameter input
[Data type] Bit path

#1 ATW When I, J, and K are all set to 0 in a block that specifies a feature coordinate system setup command (G68.2), which is a tilted working plane indexing command:

0: An alarm PS5457, “G68.2 FORMAT ERROR” is issued.

1: A feature coordinate system with a tilted plane angle of 0 degrees is assumed for operation.

4.130 PARAMETERS OF MANUAL LINER/CIRCULAR INTERPOLATION

13541	The head address of the R signal used by the input data in the manual linear/circular interpolation

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 59999

The head address of the internal relay(R signal) of PMC used by the input data in the manual linear/circular interpolation is set. In input data, the data area in 20 bytes from the address which is set to this parameter is needed.

> **NOTE**
> 1 When this parameter is set, the power must be turned off before operation is continued.
> 2 This parameter is valid when bit 3 (MRI) of parameter No.7106 is set to 1.

13542	Head address of the R signal used by the output data in the manual linear/circular interpolation

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 9999

The head address of the internal relay(R signal) of PMC used by the output data in the manual linear/circular interpolation is set. In output data, the data area in 10 bytes from the address which is set to this parameter is needed.

> **NOTE**
> 1 When this parameter is set, the power must be turned off before operation is continued.
> 2 This parameter is valid when bit 4 (MRO) of parameter No.7106 is set to 1.
> 3 About setting parameters Nos. 13541 and 13542
> (1) Set the value which becomes the multiple of four. (0, 4, 8, …)
> (2) The address of output data and input data must not be duplicated.
> (3) When the multi-path system is used, set the value which does not duplicate the data address used in other path systems.
> (4) The range in R address is different depending on PMC used and the memory. Confirm the specification of PMC, and set the value within the range which can be used.
> When the settings other than the above-mentioned ((1) to (4)) were done, the alarm PW5390, “R-ADDRESS SETTING IS ILLEGAL” is issued.

4.131 PARAMETERS OF CANNED CYCLES FOR DRILLING M CODE OUTPUT IMPROVEMENT

13543	M code for C-axis unclamping in canned cycles for drilling (1st set)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the M code for C-axis unclamping in canned cycles for drilling (first set).

> **NOTE**
> This parameter is valid when bit 4 (CME) of parameter No. 5161 is set to 1.

13544	M code for C-axis clamping in canned cycles for drilling (2nd set)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the M code for C-axis clamping in canned cycles for drilling (second set).

> **NOTE**
> This parameter is valid when bit 4 (CME) of parameter No. 5161 is set to 1.

13545	M code for C-axis unclamping in canned cycles for drilling (2nd set)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the M code for C-axis unclamping in canned cycles for drilling (second set).

> **NOTE**
> This parameter is valid when bit 4 (CME) of parameter No. 5161 is set to 1.

4.132 PARAMETERS OF THE MACHINING CONDITION SELECTION FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
13600	MSA							MCR

[Input type] Parameter input
[Data type] Bit path

#0 MCR When an allowable acceleration rate adjustment is made with the machining condition selection function or machining quality level adjustment function (machining parameter adjustment screen, precision level selection screen), parameter No. 1735 for the deceleration function based on acceleration in circular interpolation is:
0: Modified.
1: Not modified.

#7 MSA When the machining condition selection function or machining quality level adjustment function is used, the acceleration rate change time (bell-shaped) (LV1, LV10) is:
0: Set using parameter Nos. 13612 and 13613.
1: Set using parameter Nos. 13662 and 13663.

	#7	#6	#5	#4	#3	#2	#1	#0
13601								MPR

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#0 MPR The machining parameter adjustment screen is:
0: Displayed.
1: Not displayed.
Even if 1 is set in this parameter bit, the precision level selection screen for the machining condition selecting function and the precision level selection screens (machining quality level selection screen and the machining level selection screen) for the machining quality level adjustment function are displayed.

13610	Acceleration rate for acceleration/deceleration before look-ahead interpolation in AI contour control (precision level 1)
13611	Acceleration rate for acceleration/deceleration before look-ahead interpolation in AI contour control (precision level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)
Each of these parameters sets an acceleration rate for acceleration/ deceleration before interpolation in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13612	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 1)
13613	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Byte path
[Unit of data] msec
[Valid data range] 0 to 127

Each of these parameters sets an acceleration rate change time (bell-shaped) in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13614	Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration (precision level 1)
13615	Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration (precision level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

Each of these parameters sets an allowable acceleration rate change amount per 1 ms for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration during AI contour control.

Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13616	Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration in successive linear interpolation operations (precision level 1)
13617	Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration in successive linear interpolation operations (precision level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

Each of these parameters sets an allowable acceleration rate change amount per 1 ms for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration in successive linear interpolation operations during AI contour control.

Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

NOTE

1. For an axis with 0 set in this parameter, parameter No. 13614 and No. 13615 (allowable acceleration rate change amount in speed control based on acceleration rate change under control on the rate of change of acceleration) are valid.
2. For an axis with 0 set in parameter No. 13614 and No. 13615 (allowable acceleration rate change amount in speed control based on acceleration rate change under control on the rate of change of acceleration), speed control based on acceleration rate change is disabled, so that the specification of this parameter has no effect.

13618	Rate of change time of the rate of change of acceleration in smooth bell-shaped acceleration/deceleration before interpolation when AI contour control is used (precision level 1)

13619	Rate of change time of the rate of change of acceleration in smooth bell-shaped acceleration/deceleration before interpolation when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 50

Each of these parameters sets the rate (percentage) of the change time of the rate of change of acceleration to the change time of acceleration rate change in smooth bell-shaped acceleration/deceleration before look-ahead interpolation during AI contour control.

Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

> **NOTE**
> When 0 or a value not within the valid data range is set in this parameter, smooth bell-shaped acceleration/deceleration before look-ahead interpolation is not performed.

13620	Allowable acceleration rate when AI contour control is used (precision level 1)

13621	Allowable acceleration rate when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)

(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

Each of these parameters sets an allowable acceleration rate in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13622	Time constant for acceleration/deceleration after interpolation when AI contour control is used (precision level 1)

13623	Time constant for acceleration/deceleration after interpolation when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 1 to 512

Each of these parameters sets a time constant for acceleration/ deceleration after interpolation when AI contour control is used. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13624	Corner speed difference when AI contour control is used (precision level 1)

13625	Corner speed difference when AI contour control is used (precision level 10)

[Input type] Parameter input

[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Each of these parameters sets an allowable speed difference for speed determination based on corner speed difference in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13626	**Maximum cutting speed when AI contour control is used (precision level 1)**
13627	**Maximum cutting speed when AI contour control is used (precision level 10)**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)
Each of these parameters sets a maximum cutting speed in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13628	**Parameter number corresponding to arbitrary item 1 when AI contour control is used**
13629	**Parameter number corresponding to arbitrary item 2 when AI contour control is used**

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 65535
These parameters set the parameter numbers corresponding to arbitrary items 1 and 2.

NOTE
The parameter numbers corresponding to the following cannot be specified:
- Bit parameters
- Spindle parameters Nos. 4000 to 4799
- Parameters of real number type
- Parameters that require power-off (for which the alarm PW0000, “POWER MUST BE OFF” is issued)
- Nonexistent parameters

13630	**Value with emphasis on speed (precision level 1) of the parameter corresponding to arbitrary item 1 when AI contour control is used**
13631	**Value with emphasis on speed (precision level 1) of the parameter corresponding to arbitrary item 2 when AI contour control is used**

13632	Value with emphasis on speed (precision level 10) of the parameter corresponding to arbitrary item 1 when AI contour control is used

13633	Value with emphasis on speed (precision level 10) of the parameter corresponding to arbitrary item 2 when AI contour control is used

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Depend on the type of parameter for an arbitrary item
[Valid data range] Depend on the type of parameter for an arbitrary item

Each of these parameters sets a value with emphasis placed on speed or precision for a parameter.

13634	Precision level currently selected when AI contour control is used

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 10

This parameter sets the level currently selected.

13662	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 1), range extended

13663	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 10), range extended

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 200

Each of these parameters sets an acceleration rate change time (bell-shaped) in AI contour control. Set a value (precision 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

4.133 PARAMETERS OF PARAMETER CHECK SUM FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
13730	CSR							CKS

[Input type] Parameter input
[Data type] Bit

#0 CKS A power-on, a parameter check sum check is:
0: Not performed.
1: Performed.

#7 CSR Alarm No. 5340 (parameter check sum error) is cleared with:
0: 

+ 

keys.
1: 

key.

13731	Number to be excluded from the NC parameter check sum, 01

13732	Number to be excluded from the NC parameter check sum, 02

13733	**Number to be excluded from the NC parameter check sum, 03**
13734	**Number to be excluded from the NC parameter check sum, 04**
13735	**Number to be excluded from the NC parameter check sum, 05**
13736	**Number to be excluded from the NC parameter check sum, 06**
13737	**Number to be excluded from the NC parameter check sum, 07**
13738	**Number to be excluded from the NC parameter check sum, 08**
13739	**Number to be excluded from the NC parameter check sum, 09**
13740	**Number to be excluded from the NC parameter check sum, 10**
13741	**Number to be excluded from the NC parameter check sum, 11**
13742	**Number to be excluded from the NC parameter check sum, 12**
13743	**Number to be excluded from the NC parameter check sum, 13**
13744	**Number to be excluded from the NC parameter check sum, 14**
13745	**Number to be excluded from the NC parameter check sum, 15**
13746	**Number to be excluded from the NC parameter check sum, 16**
13747	**Number to be excluded from the NC parameter check sum, 17**
13748	**Number to be excluded from the NC parameter check sum, 18**
13749	**Number to be excluded from the NC parameter check sum, 19**
13750	**Number to be excluded from the NC parameter check sum, 20**

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] mm, inch, degree (machine unit)
[Valid data range] 0 to maximum parameter number

These parameters set the numbers of the parameters to be excluded from the check sum in the parameter check sum function.

13751	**Start number of the range to be excluded from the NC parameter check sum, 01**
13752	**Start number of the range to be excluded from the NC parameter check sum, 02**
13753	**Start number of the range to be excluded from the NC parameter check sum, 03**
13754	**Start number of the range to be excluded from the NC parameter check sum, 04**
13755	**Start number of the range to be excluded from the NC parameter check sum, 05**
13756	**Start number of the range to be excluded from the NC parameter check sum, 06**
13757	**Start number of the range to be excluded from the NC parameter check sum, 07**
13758	**Start number of the range to be excluded from the NC parameter check sum, 08**
13759	**Start number of the range to be excluded from the NC parameter check sum, 09**
13760	**Start number of the range to be excluded from the NC parameter check sum, 10**
13761	**Start number of the range to be excluded from the NC parameter check sum, 11**

13762	Start number of the range to be excluded from the NC parameter check sum, 12
13763	Start number of the range to be excluded from the NC parameter check sum, 13
13764	Start number of the range to be excluded from the NC parameter check sum, 14
13765	Start number of the range to be excluded from the NC parameter check sum, 15
13766	Start number of the range to be excluded from the NC parameter check sum, 16
13767	Start number of the range to be excluded from the NC parameter check sum, 17
13768	Start number of the range to be excluded from the NC parameter check sum, 18
13769	Start number of the range to be excluded from the NC parameter check sum, 19
13770	Start number of the range to be excluded from the NC parameter check sum, 20

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] mm, inch, degree (machine unit)
[Valid data range] 0 to maximum parameter number

These parameters specify the range of parameters to be excluded from the check sum in the parameter check sum function. The parameters ranging from the start number to the end number are excluded from the check sum.

NOTE
1 The parameters with the start and end numbers are also excluded.
2 In a combination of start and end numbers, if the start number is greater than the end number (start number > end number), the combination is invalid.
3 If the start and end numbers are the same (start number = end number), the single parameter with that number is excluded.

4.134 PARAMETERS OF DUAL CHECK SAFETY (2 OF 2)

13810	
13811	
13821	
to	to
13829	
13831	
to	to
13838	
13840	
to	to
13843	
13880	
to	to
13911	

13920	
to	to
13951	

13960	
to	to
13991	

These parameters are related to Dual Check Safety.
See Dual Check Safety CONNECTION MANUAL (B-64483EN-2) for details.

4.135 PARAMETERS OF SAFETY FUNCTION BY FL-net

13850	
to	to
13874	

13876	
to	to
13879	

These parameters are related to safety function by FL-net.
For details, refer to the FL-net Board CONNECTION MANUAL (B-64163EN).

4.136 PARAMETERS OF AXIS CONTROL/INCREMENT SYSTEM (3 OF 3)

	#7	#6	#5	#4	#3	#2	#1	#0
14000						IRF	INA	

[Input type] Parameter input
[Data type] Bit axis

#1 INA If an inch-metric switch command is executed at a position other than the reference position,
0: It is executed as usual.
1: Alarm PS5362, “CONVERT INCH/MM AT REF-POS” is issued.

#2 IRF An inch-metric switch command (G20, G21) at the reference position is:
0: Disabled.
1: Enabled.

When this function is enabled for an axis, if an attempt to switch between the inch and metric unit is made although the tool is not at the reference position on that axis, an alarm PS5362 is issued, and switching between the inch and metric unit is canceled.
Be sure to move the tool to the reference position by, for example, specifying G28 before switching between the inch and metric unit.

4.137 PARAMETERS OF LINEAR SCALE WITH ABSOLUTE ADDRESS REFERENCE POSITION

14010	Maximum allowable travel distance when the reference position is established for a linear scale with an absolute address reference position

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets the maximum allowable travel distance at the FL rate when the reference position is established for a linear scale with an absolute address reference position. When the travel distance exceeds the setting of this parameter, the alarm DS0017, “SERIAL DCL:REF-POS ESTABLISH ERR” is issued. When this parameter is set to 0, the maximum allowable travel distance is not checked.

NOTE
1 To establish the reference position with axis synchronous control, set the parameter for both master and slave axes.
2 In angular axis control, the setting of this parameter is invalid to the orthogonal axis where the reference position on the angular axis is being established.

4.138 PARAMETERS OF PIVOT AXIS CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
14250					RGE			

[Input type] Parameter input
[Data type] Bit path

#3 RGE The division of the gain multiplier of the pivot axis is:
0: Performed at up to 10 points.
For the pivot axis, set parameters Nos. 14270 to 14279 (angle) and parameters Nos. 14280 to 14289 (gain multiplier for the angle).
1: Expanded at up to (10 × number of controlled axes).
The method of changing parameters Nos. 14270 to 14279 (angle) and parameters Nos. 14280 to 14289 (gain multiplier for the angle) is changed, and the number of division points varies with the number of controlled axes.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

When the bit 3 (RGE) of parameter No. 14250 is set to 0

14270	Angle 1 (θ - data for G diagrams)
14271	Angle 2 (θ - data for G diagrams)
14272	Angle 3 (θ - data for G diagrams)
14273	Angle 4 (θ - data for G diagrams)
14274	Angle 5 (θ - data for G diagrams)
14275	Angle 6 (θ - data for G diagrams)
14276	Angle 7 (θ - data for G diagrams)
14277	Angle 8 (θ - data for G diagrams)
14278	Angle 9 (θ - data for G diagrams)
14279	Angle 10 (θ - data for G diagrams)

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
When the increment system is IS-B, 0.0 to +360.
Set these parameters for the pivot axis.

14280	Setting for the gain multiplier of angle 1 (θ - gain for G diagrams)
14281	Setting for the gain multiplier of angle 2 (θ - gain for G diagrams)
14282	Setting for the gain multiplier of angle 3 (θ - gain for G diagrams)
14283	Setting for the gain multiplier of angle 4 (θ - gain for G diagrams)
14284	Setting for the gain multiplier of angle 5 (θ - gain for G diagrams)
14285	Setting for the gain multiplier of angle 6 (θ - gain for G diagrams)
14286	Setting for the gain multiplier of angle 7 (θ - gain for G diagrams)
14287	Setting for the gain multiplier of angle 8 (θ - gain for G diagrams)
14288	Setting for the gain multiplier of angle 9 (θ - gain for G diagrams)
14289	Setting for the gain multiplier of angle 10 (θ - gain for G diagrams)

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] ×1/512
[Min. unit of data] -32768(×-63) to 32767(×64.9)
Set these parameters for the pivot axis.
The gain multiplier is calculated using the setting of a parameter, as follows:

$$\text{Gain multiplier} = \frac{\text{Setting of parameter}}{512} + 1$$

Thus, the gain multipliers for the settings below are as given below.

Setting	-32768	-1536	-1024	512	1024	1536	32767
Gain multiplier	-63	-2	-1	2	3	4	64.9

When the bit 3 (RGE) of parameter No. 14250 is set to 0

14270	Angle (θ - gain for G diagrams)
to	to
14279	Angle (θ - gain for G diagrams)

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] -1, 0, or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, -1.0, 0.0 to +360.)
[Example] Set angles as follows:
1st axis: Angles 1.0 to 10.0
2nd axis: Angles 11.0 to 20.0

3rd axis: Angles 21.0 to 30.0
to
8th axis: Angles 71.0 to 75.0

Parameter	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
14270	1.0	11.0	21.0	31.0	41.0	51.0	61.0	71.0
14271	2.0	12.0	22.0	32.0	42.0	52.0	62.0	72.0
14272	3.0	13.0	23.0	33.0	43.0	53.0	63.0	73.0
14273	4.0	14.0	24.0	34.0	44.0	54.0	64.0	74.0
14274	5.0	15.0	25.0	35.0	45.0	55.0	65.0	75.0
14275	6.0	16.0	26.0	36.0	46.0	56.0	66.0	-1.0
14276	7.0	17.0	27.0	37.0	47.0	57.0	67.0	—
14277	8.0	18.0	28.0	38.0	48.0	58.0	68.0	—
14278	9.0	19.0	29.0	39.0	49.0	59.0	69.0	—
14279	10.0	20.0	30.0	40.0	50.0	60.0	70.0	—

Set -1.0 in the parameter for "maximum number of items used + 1", where items refer to angles.
The table gives values if angles 1.0 to 75.0 are set in 1-degree steps.
If there are multiple pivot axes, the settings are used universally to all the pivot axes.

14280	Setting for the gain multiplier of angle (θ - gain for G diagrams)
to	to
14289	Setting for the gain multiplier of angle (θ - gain for G diagrams)

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] ×1/512
[Min. unit of data] -32768(×-63) to 32767(×64.9)
The gain multiplier is calculated using the setting of a parameter, as follows:

$$\text{Gain multiplier} = \frac{\text{Setting of parameter}}{512} + 1$$

Thus, the gain multipliers for the settings below are as given below.

Setting	-32768	-1536	-1024	512	1024	1536	32767
Gain multiplier	-63	-2	-1	2	3	4	64.9

[Example] Set the settings for the gain multipliers for angles (parameters Nos. 14270 to 14279) as follows:
1st axis: Setting for the gain multiplier for angles 1.0 to 10.0
2nd axis: Setting for the gain multiplier for angles 11.0 to 20.0
3rd axis: Setting for the gain multiplier for angles 21.0 to 30.0
to
8th axis: Setting for the gain multiplier for angles 71.0 to 75.0

Parameter	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
14280	614	1382	1843	2150	2150	2048	1945	1782
14281	691	1428	1894	2151	2140	2038	1928	1763
14282	768	1474	1920	2152	2130	2027	1912	1743

Parameter	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
14283	845	1520	1945	2153	2119	2017	1896	1724
14284	922	1566	1971	2154	2109	2007	1880	1704
14285	999	1612	1997	2155	2099	1996	1864	−
14286	1076	1659	2022	2154	2089	1986	1847	−
14287	1153	1705	2048	2153	2078	1976	1831	−
14288	1230	1751	2073	2152	2068	1966	1815	−
14289	1307	1797	2099	2151	2058	1955	1798	−

In this example, the 12th angle is set for the second axis of parameter No. 14271, and the setting for the gain multiplier for the angle is set for the second axis of parameter No. 14281.

NOTE
1 When bit 3 (RGE) of parameter No. 14250 is set to 1, the number of angles and the number of settings for the gain multipliers for the angles vary depending on the number of controlled axes.
[Example]
For eight axes, up to 80 items can be set, and for four axes, up to 40 items can be set.
2 If there are multiple pivot axes, the settings are used universally to all the pivot axes.

4.139 PARAMETERS OF FSSB (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
14476			SSC					

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit

#5 SSC One connector of the separate detector interface unit is:
0: Not shared among two or more axes.
1: Shared among two or more axes.

NOTE
When making two U axes synchronize with one spindle in two U axis control pairs, set this parameter to “1”.

4.140 PARAMETERS OF SERVO GUIDE Mate

Parameter Nos. 14500 to 14637 shown below hold initial values and values set by screen operations in SERVO GUIDE Mate.
These parameters are set by the CNC. So, never input values from the parameter screen.

	#7	#6	#5	#4	#3	#2	#1	#0
14500								

[Input type] Parameter input
[Data type] Bit

14501 to **14637**	

[Input type] Parameter input
[Data type] Byte / 2-word / Real

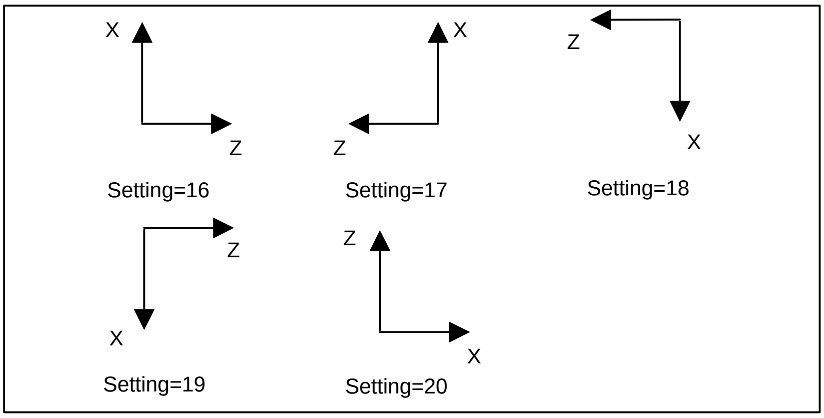
4.141 PARAMETERS OF GRAPHIC DISPLAY (3 OF 5)

14706	**Directions of the axes of the machine**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 16 to 20

When the dynamic graphic display function is used, the directions of the axes of the machine (the orientations of the basic three axes of the workpiece coordinate system for the main spindle) are selected from the following and set in the parameter:

Setting 16: Right-handed coordinate system Right = +Z, up = +X
Setting 17: Right-handed coordinate system Right = -Z, up = +X
Setting 18: Right-handed coordinate system Right = -Z, up = -X
Setting 19: Right-handed coordinate system Right = +Z, up = -X
Setting 20: Right-handed coordinate system Right = +X, up = +Z



14713	**Unit of magnification by which enlargement and reduction is performed with the dynamic graphic display function**

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 255

This parameter sets the unit of magnification by which enlargement and reduction is performed with the dynamic graphic display function.
Unit of magnification = 64 / setting
If 0 is set, 64 is assumed.

14714	Unit of horizontal movement when a movement is made with the dynamic graphic display function

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 255

This parameter sets the unit of horizontal movement (in dots) applied when a movement is made with the dynamic graphic display function.
If 0 is set, 64 is assumed.

14715	Unit of vertical movement when a movement is made with the dynamic graphic display function

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 255

This parameter sets the unit of vertical movement (in dots) applied when a movement is made with the dynamic graphic display function.
If 0 is set, 35 is assumed.

14716	Unit of rotation angle when rotation is performed with the dynamic graphic display function

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 255

This parameter sets the unit (in degrees) of a rotation angle by which the drawing coordinate system is rotated with the dynamic graphic display function.
If 0 is set, 10 is assumed.

14717	Axis number of the rotation axis to be drawn with the dynamic graphic display function

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

This parameter sets the axis number of the rotation axis to be drawn with the dynamic graphic display function.

NOTE
1. This parameter regards as objects of drawing the rotation axes to operate when the following interpolation command is executed.
   - Polar coordinate interpolation
2. Do not change the setting of this parameter while drawing is in progress.
3. Rotation axes other than those rotation axes (such as the C-axis) whose center of rotation is on the Z-axis of the three basic axes cannot be objects of drawing.

4.142 PARAMETERS OF EMBEDDED ETHERNET

	#7	#6	#5	#4	#3	#2	#1	#0
14880		DHC	DNS	UNM			PCH	ETH

[Input type] Parameter input
[Data type] Bit

#0 ETH The embedded Ethernet function (a built-in port or PCMCIA LAN card) is:
0: Used.
1: Not used.

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#1 PCH At the start of communication of the FTP file transfer function for built-in port, checking for the presence of the server using PING is:
0: Performed.
1: Not performed.

> **NOTE**
> Usually, set 0.
> If 1 is set not to check the presence of the server by using PING, it may take several tens of seconds to recognize an error when the server is not present in the network.
> For mainly security reasons, a personal computer may be set so that it does not respond to the PING command. To communicate with such a personal computer, set 1.

#4 UNM With a built-in port, the CNC Unsolicited Messaging function is:
0: Not used.
1: Used.

> **NOTE**
> Re-setting this parameter requires turning the power off and on again or restarting the embedded Ethernet interface.

#5 DNS With a built-in port, the DNS client function is:
0: Not used.
1: Used.

> **NOTE**
> Re-setting this parameter requires turning the power off and on again or restarting the embedded Ethernet interface.

#6 DHC With a built-in port, the DHCP client function is:
0: Not used.
1: Used.

> **NOTE**
> Re-setting this parameter requires turning the power off and on again or restarting the embedded Ethernet interface.

	#7	#6	#5	#4	#3	#2	#1	#0
14882				UNS				

[Input type] Parameter input
[Data type] Bit

#4 UNS In the CNC Unsolicited Messaging function of a built-in port, when the end of the function is requested by other than the CNC Unsolicited Messaging server currently connected:

0: The request for the end of the function is rejected.
1: The request for the end of the function is accepted.

14890	Selects the host computer 1 OS.
14891	Selects the host computer 2 OS.
14892	Selects the host computer 3 OS.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 2

0: Windows95/98/Me/2000/XP/Vista/7.
1: UNIX, VMS.
2: Linux.

NOTE
Some FTP server software products do not depend on the OS. So, even when the above parameters are set, it is sometimes impossible to display a list of files properly.

14896	Selection of embedded Ethernet in stand-alone type Series 30*i*, 31*i*, 32*i* (with personal computer function with Windows CE)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 3

When the stand-alone type Series 30*i*, 31*i*, 32*i* (with personal computer function with Windows CE) is used, this parameter sets the embedded Ethernet that can be used.

No. 14896	Built-in port	PCMCIA LAN card
0	Port in the CNC	Memory card slot on a side of the display unit
1	Port in the CNC	Memory card slot in the CNC
2	Port in the rear of the display unit	Memory card slot on a side of the display unit
3	Port in the rear of the display unit	Memory card slot in the CNC

4.143 PARAMETERS OF ROTATION AREA INTERFERENCE CHECK (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
14900	IC4	IC3	IC2	IC1	IRB	IRA	IB2	IB1

NOTE
When at least one of these parameters is set, the power must be turned off before operation is continued.

[Input type] Parameter input

[Data type] Bit

#0 IB1 Movement direction of group B (the first axis)

0: The direction of movement along the first axis of the group-B movement plane is the same as the direction of movement along the first axis on the group-A movement plane.

1: The direction of movement along the first axis of the group-B movement plane is opposite to the direction of movement along the first axis on the group-A movement plane.

#1 IB2 Movement direction of group B (the second axis)

0: The direction of movement along the second axis of the group-B movement plane is the same as the direction of movement along the second axis on the group-A movement plane.

1: The direction of movement along the second axis of the group-B movement plane is opposite to the direction of movement along the second axis of the group-A movement plane.

#2 IRA Rotation direction of the rotation axis on which group A is rotated

0: The direction of a rotation from the positive side of the first axis of the plane to the positive side of the second axis is assumed to be the positive direction of the rotation axis on which group A is rotated.

1: The direction of a rotation from the positive side of the first axis of the plane to the positive side of the second axis is assumed to be the negative direction of the rotation axis on which group A is rotated.

#3 IRB Rotation direction of the rotation axis on which group B is rotated

0: The direction of a rotation from the positive side of the first axis of the plane to the positive side of the second axis is assumed to be the positive direction of the rotation axis on which group B is rotated.

1: The direction of a rotation from the positive side of the first axis of the plane to the positive side of the second axis is assumed to be the negative direction of the rotation axis on which group B is rotated.

#4-7 IC1-IC4 Processing time required to make the interference check

The processing time is a multiple of 8. If the calculated value of the processing time is smaller than 8, the processing time is assumed to be 8 msec.

Setting	IC4	IC3	IC2	IC1
16	0	0	0	0
4(8)	0	0	0	1
8	0	0	1	0
16	0	1	0	0
24	0	1	1	0
32	1	0	0	0
40	1	0	1	0
48	1	1	0	0

	#7	#6	#5	#4	#3	#2	#1	#0
14901	**NB4**	**NB3**	**NB2**	**NB1**	**NA4**	**NA3**	**NA2**	**NA1**

[Input type] Parameter input
[Data type] Bit

#0 NA1 Rectangle 1 in the group A which rotates according to the movement of rotary axes is specified.

#1 NA2 Rectangle 2 in the group A which rotates according to the movement of rotary axes is specified.

#2 NA3 Rectangle 3 in the group A which rotates according to the movement of rotary axes is specified.

#3 NA4 Rectangle 4 in the group A which rotates according to the movement of rotary axes is specified.

0: Rectangle rotates according to the rotation on rotary axis of the group A.

1: Rectangle does not rotate according to the rotation on rotary axis of the group A.

#4 NB1 Rectangle 1 in the group B which rotates according to the movement of rotary axes is specified.

#5 NB2 Rectangle 2 in the group B which rotates according to the movement of rotary axes is specified.

#6 NB3 Rectangle 3 in the group B which rotates according to the movement of rotary axes is specified.

#7 NB4 Rectangle 4 in the group B which rotates according to the movement of rotary axes is specified.

0: Rectangle rotates according to the rotation on rotary axis of the group B.

1: Rectangle does not rotate according to the rotation on rotary axis of the group B

	#7	#6	#5	#4	#3	#2	#1	#0
14902			IRD	IRC	IDA2	IDA1	ICA2	ICA1

[Input type] Parameter input
[Data type] Bit

#0 ICA1 Movement direction of group C (the first axis)

0: The direction of movement along the first axis of the group-C movement plane is the same as the direction of movement along the first axis on the group-A movement plane.

1: The direction of movement along the first axis of the group-C movement plane is opposite to the direction of movement along the first axis on the group-A movement plane.

#1 ICA2 Movement direction of group C (the second axis)

0: The direction of movement along the second axis of the group-C movement plane is the same as the direction of movement along the second axis on the group-A movement plane.

1: The direction of movement along the second axis of the group-C movement plane is opposite to the direction of movement along the second axis of the group-A movement plane.

#2 IDA1 Movement direction of group D (the first axis)

0: The direction of movement along the first axis of the group-D movement plane is the same as the direction of movement along the first axis on the group-A movement plane.

1: The direction of movement along the first axis of the group-D movement plane is opposite to the direction of movement along the first axis on the group-A movement plane.

#3 IDA2 Movement direction of group D (the second axis)

0: The direction of movement along the second axis of the group-D movement plane is the same as the direction of movement along the second axis on the group-A movement plane.

1: The direction of movement along the second axis of the group-D movement plane is opposite to the direction of movement along the second axis of the group-A movement plane.

#4 IRC Rotation direction of the rotation axis on which group C is rotated

0: The direction of a rotation from the positive side of the first axis of the plane to the positive side of the second axis is assumed to be the positive direction of the rotation axis on which group C is rotated.

1: The direction of a rotation from the positive side of the first axis of the plane to the positive side of the second axis is assumed to be the negative direction of the rotation axis on which group C is rotated.

#5 IRD Rotation direction of the rotation axis on which group D is rotated

0: The direction of a rotation from the positive side of the first axis of the plane to the positive side of the second axis is assumed to be the positive direction of the rotation axis on which group D is rotated.

1: The direction of a rotation from the positive side of the first axis of the plane to the positive side of the second axis is assumed to be the negative direction of the rotation axis on which group D is rotated.

	#7	#6	#5	#4	#3	#2	#1	#0
14903	ND4	ND3	ND2	ND1	NC4	NC3	NC2	NC1

[Input type] Parameter input
[Data type] Bit

#0 NC1 Rectangle 1 in the group C which rotates according to the movement of rotary axes is specified.

#1 NC2 Rectangle 2 in the group C which rotates according to the movement of rotary axes is specified.

#2 NC3 Rectangle 3 in the group C which rotates according to the movement of rotary axes is specified.

#3 NC4 Rectangle 4 in the group C which rotates according to the movement of rotary axes is specified.

0: Rectangle rotates according to the rotation on rotary axis of the group C.

1: Rectangle does not rotate according to the rotation on rotary axis of the group C.

#4 ND1 Rectangle 1 in the group D which rotates according to the movement of rotary axes is specified.

#5 ND2 Rectangle 2 in the group D which rotates according to the movement of rotary axes is specified.

#6 ND3 Rectangle 3 in the group D which rotates according to the movement of rotary axes is specified.

#7 ND4 Rectangle 4 in the group D which rotates according to the movement of rotary axes is specified.

0: Rectangle rotates according to the rotation on rotary axis of the group D.

1: Rectangle does not rotate according to the rotation on rotary axis of the group D

14910	Axis number of the first axis of the plane on which group A is moved

[Input type] Parameter input

[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)
Setting value

1 to 32	: controlled axes on own path
101 to 132	: controlled axes on path1
201 to 232	: controlled axes on path2
:	
901 to 932	: controlled axes on path9
1001 to 1032	: controlled axes on path10

This parameter sets the axis number of the first axis of the group-A movement plane.
Set the first axis of the basic plane
This parameter should set the value.
[Example] When an interference check is made on the Z-X plane, the first axis is the Z-axis.

> **NOTE**
> This parameter is necessary for defining the rectangle other than A group, and this parameter is necessary also for defining a rectangular rotation center position other than A group.
> Therefore, please choose the number which can surely be set.

14911	Axis number of the second axis of the plane on which group A is moved

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)
Setting value

1 to 32	: controlled axes on own path
101 to 132	: controlled axes on path1
201 to 232	: controlled axes on path2
:	
901 to 932	: controlled axes on path9
1001 to 1032	: controlled axes on path10

This parameter sets the axis number of the second axis of the group-A movement plane.
Set the second axis of the basic plane.
This parameter should set the value.
[Example] When an interference check is made on the Z-X plane, the second axis is the X-axis.

> **NOTE**
> This parameter is necessary for defining the rectangle other than A group, and this parameter is necessary also for defining a rectangular rotation center position other than A group.
> Therefore, please choose the number which can surely be set.

14912	Axis number of the rotary axis on which group A is rotated

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)

Setting value

1 to 32	: controlled axes on own path
101 to 132	: controlled axes on path1
201 to 232	: controlled axes on path2
:	
901 to 932	: controlled axes on path9
1001 to 1032	: controlled axes on path10

This parameter sets the axis number of a rotation axis used for rotating group-A.
If there is no relevant rotary axis, set 0.

> **NOTE**
> All the controlled axes which belong to group-A must be assigned to be the same path.

14913	Axis number of the first axis of the plane on which group B is moved

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)
Setting value

1 to 32	: controlled axes on own path
101 to 132	: controlled axes on path1
201 to 232	: controlled axes on path2
:	
901 to 932	: controlled axes on path9
1001 to 1032	: controlled axes on path10

This parameter sets the axis number of the first axis of the group-B movement plane.
Set the axis number of the axis parallel to the first axis of the group-A movement plane.
If there is no relevant movement axis, set 0.

14914	Axis number of the second axis of the plane on which group B is moved

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)
Setting value

1 to 32	: controlled axes on own path
101 to 132	: controlled axes on path1
201 to 232	: controlled axes on path2
:	
901 to 932	: controlled axes on path9
1001 to 1032	: controlled axes on path10

This parameter sets the axis number of the second axis of the group-B movement plane.
Set the axis number of the axis parallel to the second axis of the group-A movement plane.
If there is no relevant movement axis, set 0.

14915	Axis number of the rotary axis on which group B is rotated

[Input type] Parameter input

[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)
Setting value
1 to 32 : controlled axes on own path
101 to 132 : controlled axes on path1
201 to 232 : controlled axes on path2
:
901 to 932 : controlled axes on path9
1001 to 1032 : controlled axes on path10

This parameter sets the axis number of a rotation axis used for rotating group-B.
If there is no relevant rotary axis, set 0.

NOTE
All the controlled axes which belong to group-B must be assigned to be the same path.

14916	Axis number of the first axis of the plane on which group C is moved

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)
Setting value
1 to 32 : controlled axes on own path
101 to 132 : controlled axes on path1
201 to 232 : controlled axes on path2
:
901 to 932 : controlled axes on path9
1001 to 1032 : controlled axes on path10

This parameter sets the axis number of the first axis of the group-C movement plane.
Set the axis number of the axis parallel to the first axis of the group-A movement plane.
If there is no relevant movement axis, set 0.

14917	Axis number of the second axis of the plane on which group C is moved

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)
Setting value
1 to 32 : controlled axes on own path
101 to 132 : controlled axes on path1
201 to 232 : controlled axes on path2
:
901 to 932 : controlled axes on path9
1001 to 1032 : controlled axes on path10

This parameter sets the axis number of the second axis of the group-C movement plane.
Set the axis number of the axis parallel to the second axis of the group-A movement plane.
If there is no relevant movement axis, set 0.

14918	Axis number of the rotary axis on which group C is rotated

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to the number of controlled axes
or m×100+n (m:1 to the path number, n:1 to the number of controlled axes)
Setting value
1 to 32 : controlled axes on own path
101 to 132 : controlled axes on path1
201 to 232 : controlled axes on path2
:
901 to 932 : controlled axes on path9
1001 to 1032 : controlled axes on path10

This parameter sets the axis number of a rotation axis used for rotating group-C.
If there is no relevant rotary axis, set 0.

NOTE
All the controlled axes which belong to group-C must be assigned to be the same path.

14920	Maximum point of rectangle 1 of group A in the first axis
14921	Minimum point of rectangle 1 of group A in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 1 of group A in the first axis.
When a rotation axis is present (parameter No. 14912), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-A movement axes with the rotation axis set at the reference angular displacement (parameter No. 14938).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14922	Maximum point of rectangle 1 of group A in the second axis
14923	Minimum point of rectangle 1 of group A in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 1 of group A in the second axis.
When a rotation axis is present (parameter No. 14912), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-A movement axes with the rotation axis set at the reference angular displacement (parameter No. 14938).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14924	Maximum point of rectangle 2 of group A in the first axis
14925	Minimum point of rectangle 2 of group A in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 2 of group A in the first axis.
When a rotation axis is present (parameter No. 14912), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-A movement axes with the rotation axis set at the reference angular displacement (parameter No. 14938).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14926	Maximum point of rectangle 2 of group A in the second axis
14927	Minimum point of rectangle 2 of group A in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 2 of group A in the second axis.
When a rotation axis is present (parameter No. 14912), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-A movement axes with the rotation axis set at the reference angular displacement (parameter No. 14938).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14928	Maximum point of rectangle 3 of group A in the first axis
14929	Minimum point of rectangle 3 of group A in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 3 of group A in the first axis.
When a rotation axis is present (parameter No. 14912), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-A movement axes with the rotation axis set at the reference angular displacement (parameter No. 14938).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14930	Maximum point of rectangle 3 of group A in the second axis
14931	Minimum point of rectangle 3 of group A in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 3 of group A in the second axis.
When a rotation axis is present (parameter No. 14912), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-A movement axes with the rotation axis set at the reference angular displacement (parameter No. 14938).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14932	Maximum point of rectangle 4 of group A in the first axis
14933	Minimum point of rectangle 4 of group A in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 4 of group A in the first axis.
When a rotation axis is present (parameter No. 14912), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-A movement axes with the rotation axis set at the reference angular displacement (parameter No. 14938).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14934	Maximum point of rectangle 4 of group A in the second axis
14935	Minimum point of rectangle 4 of group A in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 4 of group A in the second axis.
When a rotation axis is present (parameter No. 14912), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-A movement axes with the rotation axis set at the reference angular displacement (parameter No. 14938).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14936	Rotation center in the first axis when group-A is rotated
14937	Rotation center in the second axis when group-A is rotated

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the rotation center when group A is rotated.
Set the distances from the machine zero point after reference position return has been performed for group-A movement axes.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no rotation axis, set 0.

14938	Reference angular displacement of the rotation axis of group A

[Input type] Parameter input
[Data type] Real
[Unit of data] degree(machine unit)

[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the coordinate value (reference angular displacement) of the rotation axis when rectangle areas of group A are set for the interference check function.
If there is no relevant rotation axis, set 0.

14940	Maximum point of rectangle 1 of group B in the first axis
14941	Minimum point of rectangle 1 of group B in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 1 of group B in the first axis.
When a rotation axis is present (parameter No. 14915), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-B movement axes with the rotation axis set at the reference angular displacement (parameter No. 14958).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14942	Maximum point of rectangle 1 of group B in the second axis
14943	Minimum point of rectangle 1 of group B in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 1 of group B in the second axis.
When a rotation axis is present (parameter No. 14915), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-B movement axes with the rotation axis set at the reference angular displacement (parameter No. 14958).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14944	Maximum point of rectangle 2 of group B in the first axis
14945	Minimum point of rectangle 2 of group B in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)

[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 2 of group B in the first axis.
When a rotation axis is present (parameter No. 14915), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-B movement axes with the rotation axis set at the reference angular displacement (parameter No. 14958).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14946	**Maximum point of rectangle 2 of group B in the second axis**
14947	**Minimum point of rectangle 2 of group B in the second axis**

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 2 of group B in the second axis.
When a rotation axis is present (parameter No. 14915), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-B movement axes with the rotation axis set at the reference angular displacement (parameter No. 14958).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14948	**Maximum point of rectangle 3 of group B in the first axis**
14949	**Minimum point of rectangle 3 of group B in the first axis**

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 3 of group B in the first axis.
When a rotation axis is present (parameter No. 14915), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-B movement axes with the rotation axis set at the reference angular displacement (parameter No. 14958).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14950	Maximum point of rectangle 3 of group B in the second axis
14951	Minimum point of rectangle 3 of group B in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 3 of group B in the second axis.
When a rotation axis is present (parameter No. 14915), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-B movement axes with the rotation axis set at the reference angular displacement (parameter No. 14958).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14952	Maximum point of rectangle 4 of group B in the first axis
14953	Minimum point of rectangle 4 of group B in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 4 of group B in the first axis.
When a rotation axis is present (parameter No. 14915), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-B movement axes with the rotation axis set at the reference angular displacement (parameter No. 14958).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14954	Maximum point of rectangle 4 of group B in the second axis
14955	Minimum point of rectangle 4 of group B in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the maximum point and minimum point of rectangle area 4 of group B in the second axis.
When a rotation axis is present (parameter No. 14915), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-B movement axes with the rotation axis set at the reference angular displacement (parameter No. 14958).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14956	Rotation center in the first axis when group-B is rotated
14957	Rotation center in the second axis when group-B is rotated

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the rotation center when group B is rotated.
Set the distances from the machine zero point after reference position return has been performed for group-B movement axes.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no rotation axis, set 0.

14958	Reference angular displacement of the rotation axis of group B

[Input type] Parameter input
[Data type] Real
[Unit of data] degree(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the coordinate value (reference angular displacement) of the rotation axis when rectangle areas of group B are set for the interference check function.
If there is no relevant rotation axis, set 0.

14960	Maximum point of rectangle 1 of group C in the first axis
14961	Minimum point of rectangle 1 of group C in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 1 of group C in the first axis.

When a rotation axis is present (parameter No. 14918), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-C movement axes with the rotation axis set at the reference angular displacement (parameter No. 14978).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14962	Maximum point of rectangle 1 of group C in the second axis
14963	Minimum point of rectangle 1 of group C in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 1 of group C in the second axis.
When a rotation axis is present (parameter No. 14918), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-C movement axes with the rotation axis set at the reference angular displacement (parameter No. 14978).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14964	Maximum point of rectangle 2 of group C in the first axis
14965	Minimum point of rectangle 2 of group C in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 2 of group C in the first axis.
When a rotation axis is present (parameter No. 14918), set the distances from the machine zero point to the maximum and minimum points after the reference position return has been performed for the group-C movement axes with the rotation axis set at the reference angular displacement (parameter No. 14978).
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14966	Maximum point of rectangle 2 of group C in the second axis
14967	Minimum point of rectangle 2 of group C in the second axis

[Input type] Parameter input

[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 2 of group C in the second axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

14968	Maximum point of rectangle 3 of group C in the first axis
14969	Minimum point of rectangle 3 of group C in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 3 of group C in the first axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

14970	Maximum point of rectangle 3 of group C in the second axis
14971	Minimum point of rectangle 3 of group C in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 3 of group C in the second axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

14972	Maximum point of rectangle 4 of group C in the first axis
14973	Minimum point of rectangle 4 of group C in the first axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)

[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 4 of group C in the first axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

14974	Maximum point of rectangle 4 of group C in the second axis
14975	Minimum point of rectangle 4 of group C in the second axis

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the maximum point and minimum point of rectangle area 4 of group C in the second axis.
The set plane is specified with group-A movement axes 1 and 2. Set the distances from the machine zero point to the maximum and minimum points.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
If there is no relevant rectangle area, set 0.

14976	Rotation center in the first axis when group-C is rotated
14977	Rotation center in the second axis when group-C is rotated

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)
These parameters set the rotation center when group C is rotated.
Set the distances from the machine zero point after reference position return has been performed for group-C movement axes.
Be sure to set a radius value regardless of whether the axis command is a diameter- or radius-programmed command.
The set plane is specified with group-A movement axes 1 and 2.
If there is no relevant rectangle area, set 0.

14978	Reference angular displacement of the rotation axis of group C

[Input type] Parameter input
[Data type] Real
[Unit of data] degree(machine unit)
[Min. unit of data] Depend on the increment system of the reference axis in the first path
[Valid data range] 9 digit of minimum unit of data(refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the coordinate value (reference angular displacement) of the rotation axis when rectangle areas of group C are set for the interference check function.
If there is no relevant rotation axis, set 0.

4.144 PARAMETERS OF PERIODICAL SECONDARY PITCH COMPENSATION

14985	Number of the periodical secondary pitch compensation position at the extremely negative position for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1535

The compensation position set in this parameter is used as the reference point for periodical secondary pitch error compensation. This reference point is used as the compensation position at the reference position.
The compensation at the reference point must be 0.

14986	Number of the periodical secondary pitch compensation position at the extremely positive position for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1535

This parameter sets the periodical secondary pitch compensation position at the extremely positive position for each axis.

14987	Interval between periodical secondary pitch compensation positions for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, deg (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 to interval between stored pitch error compensation positions (parameter No. 3624)

This parameter sets the interval between periodical secondary pitch compensation positions for each axis.

14988	Magnification for periodical secondary pitch error compensation for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Integer axis
[Valid data range] 0 to 100

This parameter sets the magnification for periodical secondary pitch error compensation for each axis.
If the magnification is set to 1, the same unit as the detection unit is used for the compensation data.

	#7	#6	#5	#4	#3	#2	#1	#0
14995							RVSx	RCVx

[Input type] Parameter input
[Data type] Bit axis

#0 RCVx In Reverse motion function for restart, “Return to Interruption point” operation of each axis is:
0: Not available.
1: Available.
Set this parameter when Reverse motion function for restart is applied to the axis.

#1 RVSx In Reverse motion function for restart, “Reverse motion of Program” operation of each axis is:
0: Not available.
1: Available.
Set this parameter when Reverse motion function for restart is applied to the axis. When RVSx is 0, the axis moves as the machine lock axis in reverse motion. (While the coordinate value updates, the axis does not move actually in reverse motion.)(When a machine lock is being applied to an axis, “L” appears on the left side of the axis address of the axis on the coordinate position display screen.)

	#7	#6	#5	#4	#3	#2	#1	#0
14996							RST	RRP

[Input type] Parameter input
[Data type] Bit path

#0 RRP In Reverse motion function for restart, while reverse motion is operating, spindle rotation speed setting (parameter No.14997) is:
0: Not used.
1: Used.
If parameter RRP is set to 0, spindle rotation speed during reverse motion becomes the speed of when “Search for Interruption block” is completed (spindle rotation speed in the block where program was interrupted).
If parameter RRP is set to 1, spindle rotation speed during reverse motion becomes the speed set in parameter No.14997.

#1 RST In Reverse motion function for restart, when parameter RRP is set to 1,

0: Spindle rotation speed setting (parameter No.14997) is effective after “Return to Interruption point” operation is completed.

1: Spindle rotation speed setting (parameter No.14997) is effective from “Return to Interruption point” operation starting.

When RST is set to 1, “Return to Interruption point” operation starts after SAR signal is set to “1” if the bit 0 (SAR) of parameter No.3708 is set to 1 (spindle speed arrival signal SAR <Gn029.4> is used).

NOTE

A tool and a workpiece, etc. might interfere with each other by the axes falling by the gravity when machining is interrupted by an operation of an emergency stop or a power failure. In this case, when a spindle axis rotates before completing “Return to Interruption point”, a tool and a workpiece, etc. might be damaged. Therefore, it is recommended that parameter RST is setting to 0 for this case.

14997	Spindle rotation speed during reverse motion operating

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

In Reverse motion function for restart, spindle rotation speed during “Reverse motion of Program” operating is set.
This set value is effective when the parameter RRP (No.14996#0) is set to 1.

14998	Feedrate for Return to Interruption point

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +999000.0)

In Reverse motion function for restart, feedrate for “Return to Interruption point” is set.

Settings for rapid traverse rate is used for the deceleration / acceleration type and the time constant.
Override for rapid traverse is effective for this speed setting. When F0 speed is selected as the override for rapid traverse, an override 0% for rapid traverse is applied.

NOTE

When this parameter is set to 0, parameter No.1420 for rapid traverse rate is used as “Return to Interruption point” speed.

4.145 PARAMETERS OF MANUAL HANDLE RETRACE (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
18000							RTW	

[Input type] Parameter input
[Data type] Bit

#1 RTW At the start of a re-forward movement operation of the manual handle retrace function in a multi-path system,
0: The re-forward movement operation is performed immediately on each path.
1: Those paths for which reverse movement is prohibited are synchronized at the stop position.

	#7	#6	#5	#4	#3	#2	#1	#0
18050	OTW							

[Input type] Parameter input
[Data type] Bit path

#7 OTW If an axis move command is executed with PMC axis control during automatic operation, and the NC block under execution is stopped by a feed hold when the axis moving due to PMC axis control is completed, the amount of movement due to PMC axis control in that block is:
0: Not reflected in the NC coordinate system.
1: Reflected in the NC coordinate system.

18060	M code that prohibits backward movement

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 999

When an M code that prohibits backward movement is specified during backward movement, backward movement of blocks before the M code is prohibited. In this case, backward movement prohibition signal MRVSP<Fn091.2> is output.

The M code that prohibits backward movement is not output to the PMC as an M code. As the M code that prohibits backward movement, set an M code that is not used by auxiliary functions and macros.

18065	M code 1 that prohibits backward movement and is output as an M code
18066	M code 2 that prohibits backward movement and is output as an M code

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 999

When an M code that prohibits backward movement is specified during backward movement, backward movement of blocks before the M code is prohibited. In this case, backward movement prohibition signal MRVSP<Fn091.2> is output.

Such M codes that prohibits backward movement are output to the PMC as M codes. As the M codes that prohibit backward movement, set M codes that are not used by auxiliary functions and macros.

4.146 PARAMETERS OF AI CONTOUR CONTROL (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
19500	FCC	FNW						

[Input type] Parameter input
[Data type] Bit path

#6 FNW When the feedrate is determined according to the feedrate difference and acceleration in AI contour control:
0: The maximum feedrate at which the allowable feedrate difference and acceleration for each axis are not exceeded is used.
1: A feedrate is determined to satisfy the condition that the allowable feedrate difference and allowable acceleration rate of each axis are not exceeded, and also to ensure that a constant deceleration rate is applied to the same figure regardless of the direction of movement.

#7 FCC When there is an axis that requires one or more seconds for acceleration in acceleration/deceleration before look-ahead interpolation:
0: Emphasis is placed on precision, so that the specified feedrate may not be reached.
1: Emphasis is placed on speed, so that the specified feedrate is produced.
When this parameter is set to 1, the precision of curved interpolation such as circular interpolation and NURBS interpolation may decrease.

	#7	#6	#5	#4	#3	#2	#1	#0
19501			FRP					

[Input type] Parameter input
[Data type] Bit path

#5 FRP Linear rapid traverse is:
0: Acceleration/deceleration after interpolation
1: Acceleration/deceleration before interpolation
Set a maximum allowable acceleration rate for each axis in parameter No. 1671.
When using bell-shaped acceleration/deceleration before interpolation, set an acceleration rate change time in parameter No. 1672.

When this parameter is set to 1, acceleration/deceleration before interpolation is also applied to rapid traverse if all conditions below are satisfied. At this time, acceleration/deceleration after interpolation is not applied.
- Bit 1 (LRP) of parameter No. 1401 is set to 1: Linear interpolation type positioning
- A value other than 0 is set in parameter No. 1671 for an axis.
- The AI contour control mode is set.

If all of these conditions are not satisfied, acceleration/deceleration after interpolation is applied.

	#7	#6	#5	#4	#3	#2	#1	#0
19503				ZOL				HPF

[Input type] Parameter input
[Data type] Bit path

#0 HPF When a feedrate is determined based on acceleration in AI contour control, smooth feedrate control is:
0: Not used.
1: Used.

#4 ZOL The deceleration function based on cutting load in AI contour control (deceleration based on Z-axis fall angle) is:
0: Enabled for all commands.
1: Enabled for linear interpolation commands only.

	#7	#6	#5	#4	#3	#2	#1	#0
19515							ZG2	

[Input type] Parameter input
[Data type] Bit path

#1 ZG2 When the deceleration function based on cutting load in AI contour control (deceleration based on Z-axis fall angle) is used:
0: Stepwise override values are applied.
1: Inclined override values are applied.
This parameter is valid only when bit 4 (ZAG) of parameter No. 8451 is set to 1.
When this parameter is set to 1, be sure to set parameter Nos. 19516, 8456, 8457, and 8458.

19516	Override for area 1 in deceleration based on cutting load in AI contour control

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 100
This parameter sets an override value for area 1 when the deceleration function based on cutting load in AI contour control is used.
This parameter is valid only when bit 1 (ZG2) of parameter No. 19515 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
19517							HNG	SNG

[Input type] Parameter input
[Data type] Bit path

#0 SNG When smooth speed control is effective, by block length of the linear interpolation, smooth speed control and speed control with change of acceleration on each axis;
0: Are not invalidated.
1: Are invalidated.
When smooth speed control is effective, smooth speed control and speed control with change of acceleration on each axis are invalidated in the block longer than the block length set to parameter No. 19518 if this parameter is set to 1.

#1 HNG By block length of the linear interpolation, speed control with acceleration on each axis and speed control with change of acceleration on each axis;
0: Are not invalidated.
1: Are invalidated.
Speed control with acceleration on each axis and speed control with change of acceleration on each axis are invalidated in the block longer than the block length set to parameter No. 19518 if this parameter is set to 1.

19518	Block length in speed control with acceleration or smooth speed control and speed control with change of acceleration are invalidated

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the block length to invalidate speed control with acceleration on each axis or smooth speed control and speed control with change of acceleration on each axis by block length of the linear interpolation.

This parameter is effective when bit 1 (HNG) of parameter No. 19517 is set to 1 or bit 0 (SNG) of parameter No. 19517 is set to 1 if smooth speed control is effective.

Speed control with acceleration on each axis of smooth speed control and speed control with change of acceleration on each axis are invalidated in the block longer than the block length set to this parameter.

If 0.0 is set, the specification of 10.0 is assumed.

4.147 PARAMETERS OF CYLINDRICAL INTERPOLATION

	#7	#6	#5	#4	#3	#2	#1	#0
19530		CYS	CYA					

[Input type] Parameter input
[Data type] Bit path

#5 CYA Specifies whether to perform cylindrical interpolation cutting point compensation in the cylindrical interpolation command (G07.1).
0: Perform.
1: Do not perform.

#6 CYS Specifies whether when the cylindrical interpolation cutting point compensation function is used, cutting point compensation is performed between blocks or together with a block movement if the cutting point compensation value is less than the setting of parameter No. 19534.
0: Performed between blocks.
1: Performed together with a block movement if the cutting point compensation value is less than the setting of parameter No. 19534.

19531	Tool offset axis number for the XY plane
19532	Tool offset axis number for the ZX plane
19533	Tool offset axis number for the YZ plane

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

Specify a tool offset axis that intersects the cylindrical rotation axis at right angles.

19534	Limit for changing cylindrical interpolation cutting point compensation in a single block

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 1 to 999999999

The following operation is performed, depending on the setting of parameter No. 19530:

(1) Bit 6 (CYS) of parameter No. 19530 is set to 0
If the amount of cylindrical interpolation cutting point compensation is smaller than the value set in this parameter, cylindrical interpolation cutting point compensation is not performed. Instead, this ignored amount of cylindrical interpolation cutting point compensation is added to the next amount of cylindrical interpolation cutting point compensation to determine whether to perform cylindrical interpolation cutting point compensation.

(2) Bit 6 (CYS) of parameter No. 19530 is set to 1
If the amount of cylindrical interpolation cutting point compensation is smaller than the value set in this parameter, cylindrical interpolation cutting point compensation is performed together with the movement of the specified block.

> **NOTE**
> Set this parameter as follows:
> Setting < (setting for a rotation axis in parameter No. 1430) $\times$ 4/3
> where 4/3 is a constant for internal processing.

19535	Limit of travel distance moved with the cylindrical interpolation cutting point compensation in the previous block unchanged.

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 1 to 999999999

The following operation is performed, depending on the type of interpolation:

(1) For linear interpolation
If the travel distance in a specified block is smaller than the value set in this parameter, machining is performed without changing the cylindrical interpolation cutting point compensation in the previous block.

(2) For circular interpolation
If the diameter of a specified arc is smaller than the value set in this parameter, machining is performed without changing the cylindrical interpolation cutting point compensation in the previous block. Cylindrical interpolation cutting point compensation is not performed according to a circular movement.

4.148 PARAMETERS OF OPTIMAL TORQUE ACCELERATION/DECELERATION

	#7	#6	#5	#4	#3	#2	#1	#0
19540								FAP

[Input type] Parameter input
[Data type] Bit path

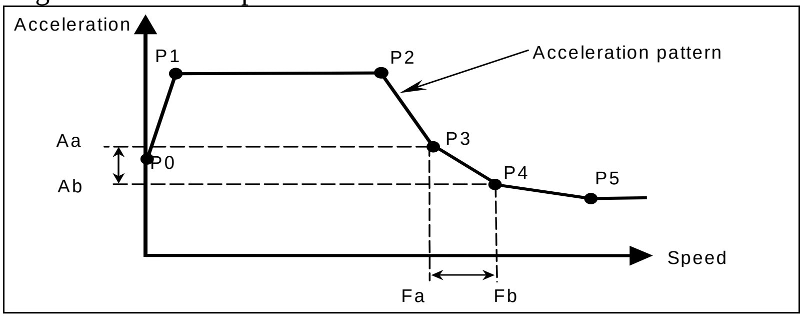
#0 FAP Optimal torque acceleration/deceleration is:

0: Disabled.

1: Enabled.

When the linear positioning parameters, namely bit 1 (LRP) of parameter No. 1401 and bit 0 (FAP) of parameter No. 19540, are set to 1, and a value other than 0 is set in reference acceleration parameter No. 1671 for an axis, the acceleration/deceleration for rapid traverse becomes optimal torque acceleration/deceleration in the mode for acceleration/deceleration before look-ahead interpolation (or the AI contour control mode). Optimal torque acceleration/ deceleration is controlled according to parameter-set restricted acceleration curve data.

Setting an acceleration pattern



Set the speed at each of the acceleration setting points (P0 to P5) in a corresponding parameter, then in parameters for each axis, set acceleration rates applicable in the following four cases at these speeds: when a movement in the positive direction is accelerated, when a movement in the positive direction is decelerated, when a movement in the negative direction is accelerated, and when a movement in the negative direction is decelerated.

The line connecting the acceleration setting points is the acceleration pattern.

The acceleration rate for each axis is calculated. For example, between speeds Fa to Fb in the above figure, the acceleration rates corresponding to these speeds, Aa to Ab, are used for calculation.

The tangent acceleration is controlled so that it does not exceed the calculated acceleration rate for each axis.

> ⚠ **CAUTION**
>
> When an acceleration pattern is set, setting a high acceleration rate immediately after a speed of 0 can cause an impact on the machine, so it is not desirable. Therefore, **be sure to apply a relatively low acceleration rate at a speed of 0** as shown in the above figure.

19541	Optimal torque acceleration/deceleration (speed at P1)
19542	Optimal torque acceleration/deceleration (speed at P2)
19543	Optimal torque acceleration/deceleration (speed at P3)
19544	Optimal torque acceleration/deceleration (speed at P4)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] 0.01%
[Valid data range] 0 to 10000

The speeds at acceleration setting points P1 to P4 are to be set with speed parameters Nos. 19541 to 19544 as ratios to the rapid traverse speed (parameter No. 1420). The speed at P0 is 0, and the speed at P5 is the rapid traverse rate specified with parameter No. 1420. Any acceleration setting point for which the speed parameter (one of Nos. 19541 to 19544) is set to 0 will be skipped.

19545	**Optimal torque acceleration/deceleration (acceleration at P0 during movement in + direction and acceleration)**

19546	**Optimal torque acceleration/deceleration (acceleration at P1 during movement in + direction and acceleration)**

19547	**Optimal torque acceleration/deceleration (acceleration at P2 during movement in + direction and acceleration)**

19548	**Optimal torque acceleration/deceleration (acceleration at P3 during movement in + direction and acceleration)**

19549	**Optimal torque acceleration/deceleration (acceleration at P4 during movement in + direction and acceleration)**

19550	**Optimal torque acceleration/deceleration (acceleration at P5 during movement in + direction and acceleration)**

19551	**Optimal torque acceleration/deceleration (acceleration at P0 during movement in - direction and acceleration)**

19552	**Optimal torque acceleration/deceleration (acceleration at P1 during movement in - direction and acceleration)**

19553	**Optimal torque acceleration/deceleration (acceleration at P2 during movement in - direction and acceleration)**

19554	**Optimal torque acceleration/deceleration (acceleration at P3 during movement in - direction and acceleration)**

19555	**Optimal torque acceleration/deceleration (acceleration at P4 during movement in - direction and acceleration)**

19556	**Optimal torque acceleration/deceleration (acceleration at P5 during movement in - direction and acceleration)**

19557	**Optimal torque acceleration/deceleration (acceleration at P0 during movement in + direction and deceleration)**

19558	**Optimal torque acceleration/deceleration (acceleration at P1 during movement in + direction and deceleration)**

19559	**Optimal torque acceleration/deceleration (acceleration at P2 during movement in + direction and deceleration)**

19560	**Optimal torque acceleration/deceleration (acceleration at P3 during movement in + direction and deceleration)**

19561	**Optimal torque acceleration/deceleration (acceleration at P4 during movement in + direction and deceleration)**

19562	**Optimal torque acceleration/deceleration (acceleration at P5 during movement in + direction and deceleration)**

19563	**Optimal torque acceleration/deceleration (acceleration at P0 during movement in - direction and deceleration)**

19564	**Optimal torque acceleration/deceleration (acceleration at P1 during movement in - direction and deceleration)**

19565	Optimal torque acceleration/deceleration (acceleration at P2 during movement in - direction and deceleration)

19566	Optimal torque acceleration/deceleration (acceleration at P3 during movement in - direction and deceleration)

19567	Optimal torque acceleration/deceleration (acceleration at P4 during movement in - direction and deceleration)

19568	Optimal torque acceleration/deceleration (acceleration at P5 during movement in - direction and deceleration)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] 0.01%
[Valid data range] 0 to 32767

For each travel direction and each acceleration/deceleration operation, set the allowable acceleration rate at each of the acceleration setting points (P0 to P5). As an allowable acceleration rate, set a ratio to the value set in the reference acceleration parameter No. 1671. When 0 is set, the specification of 100% is assumed.

4.149 PARAMETERS OF NANO SMOOTHING

19581	Tolerance smoothing for nano smoothing

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets a tolerance value for a program created using miniature line segments in nano smoothing.

When 0 is set in this parameter, a minimum amount of travel in the increment system is regarded as a tolerance value.

19582	Minimum amount of travel of a block that makes a decision based on an angular difference between blocks for nano smoothing

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the minimum amount of travel of a block that makes a decision based on an angular difference between blocks for nano smoothing. A block that specifies an amount of travel less than the value set in this parameter makes no decision based on an angular difference.

When 0 is set in this parameter, a decision based on an angular difference is made with all blocks.

A value greater than the value set in parameter No. 8490 for making a decision based on the minimum travel distance of a block must be set.

19587	Tolerance of rotary axes for nano smoothing 2

[Input type] Setting input
[Data type] Real axis
[Unit of data] degree (input unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 - +999999.999)

This parameter sets the tolerance of rotation axes in a program created using small line segments in nano smoothing 2. This parameter is valid only for the rotation axes specified in nano smoothing 2.

When 0 is set in this parameter, a minimum amount of travel in the increment system is regarded as a tolerance value.

19588	Maximum travel distance on rotary axis of a block where nano smoothing 2 is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 - +999999.999)

This parameter sets a travel distance (block length) used to determine whether to apply nano smoothing 2.

If the line specified in a block is longer than the value set in the parameter, nano smoothing 2 is not applied to that block.

The travel distance means the length of the displacement segment in the plane coordinate system composed of two rotation axes.

19589	Minimum travel distance on rotary axis of a block where nano smoothing 2 is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 - +999999.999)

This parameter sets a travel distance (block length) used to determine whether to apply nano smoothing 2.

If the line specified in a block is shorter than the value set in this parameter, nano smoothing 2 is not applied to that block.

The travel distance means the length of the displacement segment in the plane coordinate system composed of two rotation axes.

19590	Maximum angular difference on rotary axis between blocks where nano smoothing 2 is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to 180

This parameter sets the angular difference used to determine whether to apply nano smoothing 2.
At a point having a difference in angle greater than this setting, nano smoothing 2 is turned off.
The angular difference means the angle between the displacement segments in the plane coordinate system composed of two rotation axes.

19591	Minimum travel distance on rotary axis of a block that makes a decision based on an angular difference on rotary axis between blocks where nano smoothing 2 is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 - +999999.999)
This parameter sets the minimum amount of travel of a block that makes a decision based on an angular difference between blocks for nano smoothing 2.
A block that specifies an amount of travel less than the value set in this parameter makes no decision based on an angular difference.
When 0 is set in this parameter, a decision based on an angular difference is made with all blocks.
A value greater than the value set in parameter No. 19589 for making a decision based on the minimum travel distance of a block must be set.
The angular difference means the angle between the displacement segments in the plane coordinate system composed of two rotation axes. The travel distance means the length of the displacement segment in the plane coordinate system composed of two rotation axes.

4.150 PARAMETERS OF TOOL COMPENSATION (3 OF 3)

	#7	#6	#5	#4	#3	#2	#1	#0
19602			D3D					

[Input type] Parameter input
[Data type] Bit path

#5 D3D Specifies whether to display the distance to go in the program coordinate system or workpiece coordinate system during the 3-dimensional coordinate system conversion or the tilted working plane indexing.
0: Display the distance to go in the program coordinate system.
1: Display the distance to go in the workpiece coordinate system.

	#7	#6	#5	#4	#3	#2	#1	#0
19604								TPC

[Input type] Setting input
[Data type] Bit path

#0 TPC In the case that there is no address P at the start of tool center point control or cutting point command (G43.4/G43.5/G43.8/G43.9), tool posture control
0: Does not work.
1: Works.

	#7	#6	#5	#4	#3	#2	#1	#0
19605	TIT		NIC					NSC

[Input type] Parameter input
[Data type] Bit path

#0 NSC For the machine type that has no rotation axis for rotating the tool (when parameter No. 19680 is set to 12 to specify the table rotation type), control point shifting in the tilted working plane indexing is:
0: Enabled.
Set bit 4 (SPR) and bit 5 (SVC) of parameter No. 19665.
1: Disabled.

#5 NIC When the compensation plane is changed in 3-dimensional cutter compensation, the interference check is:
0: Performed.
1: Not performed.

#7 TIT If, in a tool rotary type machine (parameter No. 19680 = 2), tool center point control and inverse time feed or feed per revolution are used together,
0: Inverse time feed or feed per revolution is applied during tool center point control.
1: It operates as tool length compensation in tool axis direction.

NOTE
For the composite and table rotary types, inverse time feed or feed per revolution is applied during tool center point control regardless of this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
19607	NAG	NAA	CAV			CCC	SPG	
	NAG	NAA	CAV		WCD	CCC	SPG	

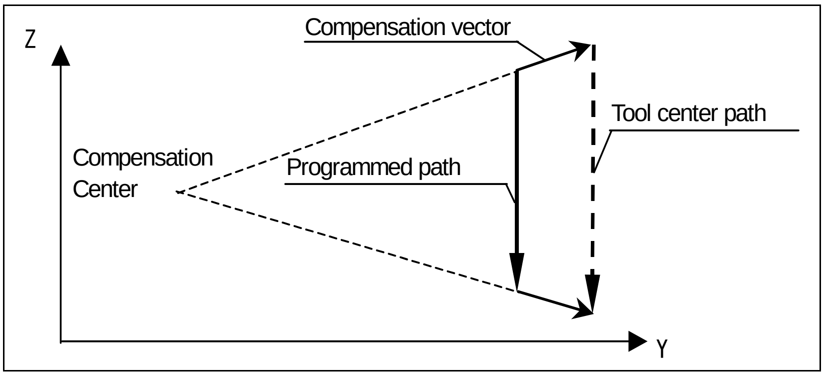
[Input type] Parameter input
[Data type] Bit path

#1 SPG To apply 3-dimensional tool compensation to a machine having a table rotation axis, as the G code to be specified:
0: G41.2/G42.2 is used regardless of the machine type.
1: G41.4/G42.4 is used for a table rotation type machine; G41.5/G42.5 for a mixed type machine.

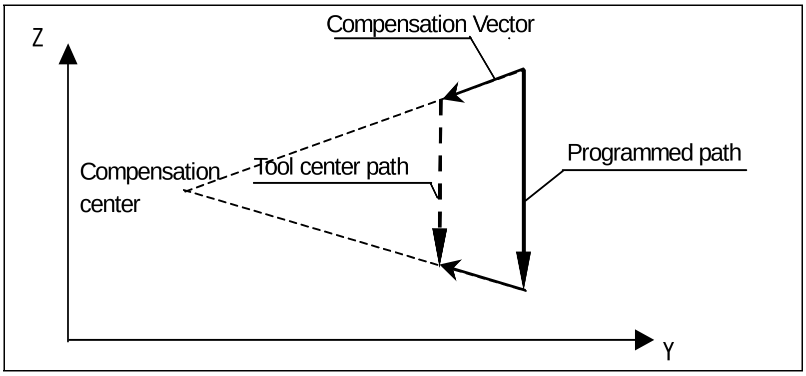
#2 CCC In the cutter compensation/tool nose radius compensation mode, the outer corner connection method is based on:
0: Linear connection type.
1: Circular connection type.

#3 WCD This parameter specify a direction of compensation vector by a sign of offset value in grinding-wheel wear compensation

		Offset vale by D code	
		Minus	**Plus**
Bit 3 (WCD) of parameter No. 19607	**0**	Direction from compensation center to command end position.	Direction from command end position to compensation center
	1	Direction from command end position to compensation center	Direction from compensation center to command end position.



Direction from compensation center to command end position



Direction from command end position to compensation center

#5 CAV When an interference check finds that interference (overcutting) occurred:

0: Machining stops with the alarm PS0041, "INTERFERENCE IN CUTTER COMPENSATION".
(Interference check alarm function)

1: Machining is continued by changing the tool path to prevent interference (overcutting) from occurring. (Interference check avoidance function)

For the interference check method, see the descriptions of bits 1 (CNC) and 3 (CNV) of parameter No. 5008.

#6 NAA When the interference check avoidance function considers that an avoidance operation is dangerous or that a further interference to the interference avoidance vector occurs:

0: An alarm is issued.
When an avoidance operation is considered to be dangerous, the alarm PS5447 is issued.
When a further interference to the interference avoidance vector is considered to occur, the alarm PS5448 is issued.

1: No alarm is issued, and the avoidance operation is continued.

> ⚠ **CAUTION**
> When this parameter is set to 1, the path may be shifted largely. Therefore, set this parameter to 0 unless special reasons are present.

#7 NAG If the gap vector length is 0 when the interference check avoidance function for cutter compensation/tool nose radius compensation is used:

0: Avoidance operation is performed.

1: Avoidance operation is not performed.

	#7	#6	#5	#4	#3	#2	#1	#0
19608	HEL	MIR	PRI			DET	NI5	

[Input type] Parameter input
[Data type] Bit path

#1 NI5 The interference check in 3-dimensional cutter compensation is performed by:
0: Projecting a look-ahead command position onto a plane perpendicular to the tool axis direction of a block for which compensation is planned.
1: Projecting a look-ahead command position onto a plane that is always perpendicular to the tool axis direction. When a table rotation axis is present, checking is made in the table coordinate system.

> **NOTE**
> When 3-dimensional cutter compensation is used, set this parameter to 1 unless special reasons are present.

#2 DET When the programming coordinate system is fastened to the table in tool center point control or 3-dimensional tool compensation, the relative position and absolute position of a specified path are:
0: Displayed in the programming coordinate system (fastened to the table).
1: Displayed in the workpiece coordinate system (not fastened to the table).

#5 PRI Among multiple end point candidates that exist when a movement is made on a rotation axis by a command such as I, J, and K when a slanted surface machining command is specified under tool center point control (type 2) or 3-dimensional tool compensation (type 2):
0: A combination in which the master (first rotation axis) makes a smaller angular movement is selected for a machine of tool rotation type or table rotation type. A combination in which the table (second rotation axis) makes a smaller angular movement is selected for a machine of composite type.
1: A combination in which the slave (second rotation axis) makes a smaller angular movement is selected for a machine of tool rotation type or table rotation type. A combination in which the tool (first rotation axis) makes a smaller angular movement is selected for a machine of composite type.

#6 MIR When programmable mirror image is applied to a linear axis in tool center point control (type 2) or 3-dimensional tool compensation (type 2), mirror image is:
0: Not applied to a specified I, J, or K command
1: Applied to a specified I, J, or K command.

#7 HEL When the tool is tilted toward the forward move direction by a Q command in tool center point control (type 2), a helical interpolation block:
0: Tilts the tool in the direction of the tangent to the arc (at the block end point).
1: Tilts the tool toward the forward move direction involving the helical axis (at the block end point).

	#7	#6	#5	#4	#3	#2	#1	#0
19609							CCT	

[Input type] Parameter input
[Data type] Bit path

#1 CCT The cancellation of the G codes in group 08 is:
0: Specified by G49.
1: Able to be specified by G49.1 as well.
If G49 is specified when cancellation using G49.1 is set, the G codes of group 08 are canceled.

19625	Number of blocks to be read in the cutter compensation/tool nose radius compensation mode

[Input type] Setting input
[Data type] Byte path
[Valid data range] 3 to 8
This parameter sets the number of blocks to be read in the cutter compensation/tool nose radius compensation mode. When a value less than 3 is set, the specification of 3 is assumed. When a value greater than 8 is set, the specification of 8 is assumed. As a greater number of blocks are read, an overcutting (interference) forecast can be made with a command farther ahead. However, the number of blocks read and analyzed increases, so that a longer block processing time becomes necessary.

Even if the setting of this parameter is modified in the MDI mode by stopping in the cutter compensation/tool nose radius compensation mode, the setting does not become valid immediately. Before the new setting of this parameter can become valid, the cutter compensation/tool noise radius compensation mode must be canceled, then the mode must be entered again.

19630	Limit used to determine a block to make no movement during calculation of the intersection with the tool side face offset (G41.2, G42.2)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
When the tool side face offset intersection is calculated, if the difference in coordinate value between two points in the compensation plane is smaller than the value set in this parameter, the block is regarded as making no movement. In this case, a look-ahead operation for one further block is performed before the intersection vector is calculated. Normally, set a value around 0.01 mm.

19631	Variation for determining an angle when the leading-edge offset function is performed

[Input type] Parameter input
[Data type] Real axis
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
In the leading-edge offset function is performed, this parameter sets the range of variations applicable when the included angle of the tool direction vector (VT) and the advancing direction vector (VM) is determined to be 0°, 180°, or 90°.
For example, let the included angle between VT and VM be θ ($0 \le \theta \le 180$) and the angle set in this parameter be Δθ. θ is then determined as follows:

If $0 \le \theta \le \Delta\theta$ $\theta = 0°$
$(180-\Delta\theta) \le \theta \le 180$ $\theta = 180°$

$(90-\Delta\theta) \leq \theta \leq (90+\Delta\theta)$ $\theta = 90°$

Normally, set a value around 1.0.

19632	Distance from a programmed point (pivot point) to tool center point position (cutting point)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the distance from a programmed point to the actual cutting point to perform vector calculation for 3-dimensional cutter compensation at the tool center point.

When this parameter is set to 0, the tool center point is not supported by the 3-dimensional cutter compensation function.

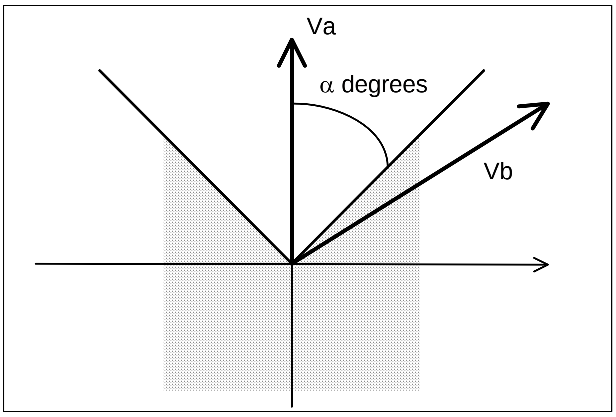
NOTE
This parameter can be rewritten only before the 3-dimensional cutter compensation mode is entered.

19635	Angle used as a criterion for the interference check in 3-dimensional cutter compensation

[Input type] Setting input
[Data type] Real axis
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

In 3-dimensional cutter compensation, if the difference in angle between two tool direction vectors is equal to or greater than the setting of this parameter, the tool direction is determined to have been changed.
When 0 is set, 45 degrees is assumed.

Let two tool direction vectors be Va and Vb. Then, if the difference in angle is α degrees or greater as shown in the figure below, the tool direction vector is determined to have changed.



19636	Angle used to determine whether to execute the interference check/avoidance function of 3-dimensional tool compensation machining

[Input type] Setting input

[Data type] Real path
[Unit of data] deg
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

The interference check/avoidance function of 3-dimensional tool compensation machining is executed when the angle difference between the tool direction vectors for the target two points is less than the setting.

This parameter is valid when bit 1 (NI5) of parameter No. 19608 is set to 1. When the setting is 0, the angle is assumed to be 10.0 degrees.

	#7	#6	#5	#4	#3	#2	#1	#0
19640						RS3	RS2	RS1
						RS3	RS2	RS1

[Input type] Parameter input
[Data type] Bit path

 # 0 RS1
 # 1 RS2
 # 2 RS3 The tool nose rotation axis and the swivel head axis is set by the setting of the rotation axis selected by bit 0 to 2 of the parameter No.19640.

Setting of 1st rotation axis :parameter No.19681, 19682
Setting of 2nd rotation axis :parameter No.19686, 19687
Setting of 3rd rotation axis :parameter No.19691, 19692

RS3	RS2	RS1	Tool nose rotation axis	Swivel head axis
0	0	0	1st axis	2nd axis
0	0	1	1st axis	3rd axis
0	1	0	2nd axis	1st axis
0	1	1	2nd axis	3rd axis
1	0	0	3rd axis	1st axis
1	0	1	3rd axis	2nd axis
1	1	0		
1	1	1		

When (#2,#1,#0) = (1,1,0) or (1,1,1), the meaning of these parameters is the same as setting (0,0,0).(The tool nose rotation axis is the 1st rotation axis and the swivel head axis is the 2nd rotation axis.)

NOTE
The parameters No. 19691, 19692 that set the 3rd rotation axis are effective only in the Tool offset conversion function. In other 5-axis functions, these parameters are not effective.

	#7	#6	#5	#4	#3	#2	#1	#0
19641						INW	SRD	TRD
						INW	SRD	TRD

[Input type] Parameter input
[Data type] Bit path

 # 0 TRD Reference angle of the tool nose rotation axis is
0: 0 degree.
1: 180 degree.

 # 1 SRD Direction of rotation of the swivel head axis is
0: Counterclockwise.
1: Clockwise.

 # 2 INW Amount of wear is
0: Taken into account in the offset calculate.
1: Not taken into account in the offset calculate.

19642	Reference angle of the swivel head axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] degree
[Valid data range] 0.0 to 360.0
Set the reference angle of the swivel head axis at tool measure position.

4.151 PARAMETERS OF 5-AXIS MACHINING FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
19650							RAP	RAM

[Input type] Parameter input
[Data type] Bit axis

#0 RAM For a tool axis direction tool length compensation function, rotation axes are:
0: Not used.
1: Used.
Select and set two rotation axes.

#1 RAP Rotation axes used for the tool axis direction tool length compensation function are:
0: Ordinary rotation axes.
1: Parameter axes.
When 0 is set, absolute coordinates are used as the coordinates of rotation axes in tool axis direction tool length compensation. When 1 is set, the value set in parameter No. 19658 is used as the coordinates of the rotation axes.
When there is no rotation axis or only one rotation axis in the controlled axes, set 1 in bits 0 (RAM) and 1 (RAP) of parameter No. 19650 for the linear axes to which non-existent rotation axes belong and set an angular displacement in parameter No. 19658.

[Example 1] There are linear axes X, Y, and Z, and rotation axes A, B, and C which rotate about the X-, Y-, and Z-axes, respectively. The tool axis direction is controlled with the rotation axes A and C.

	Bit 0 (RAM) of parameter No. 19650
X	0
Y	0
Z	0
A	1
B	0
C	1

[Example 2] The controlled axes include only the linear axes X, Y, and Z. By using the tool attachment, the tool axis is tilted in the same tool axis direction as when the A- and C-axes are rotated.

	Bit 0 (RAM) of parameter No. 19650	Bit 1 (RAP) of parameter No. 19650	Angular displacement of rotation axis (parameter No. 19658)
X	1	1	45.0
Y	0	0	0.0
Z	1	1	30.0

19655	Axis number of the linear axis to which a rotation axis belongs

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to Number to controlled axes

Set this parameter to use the tool axis direction tool length compensation function.
When a rotation axis rotates about a linear axis, the linear axis is referred to as an axis to which the rotation axis belongs, and is set using this parameter. For a rotation axis that belongs to no linear axis or for a linear axis, set 0.

[Example] Axis configuration: X, Y, Z, C, and A
Linear axes: X, Y, and Z
Rotation axes: A (rotating about the X-axis) and C (rotating about the Z-axis)
In the above case, set the following:

Axis number	Axis name	Setting
1	X	0
2	Z	0
3	Y	0
4	C	2
5	A	1

19656	Tool axis direction

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 3

Enter the tool axis direction when the two rotation axes are set at 0 degrees.

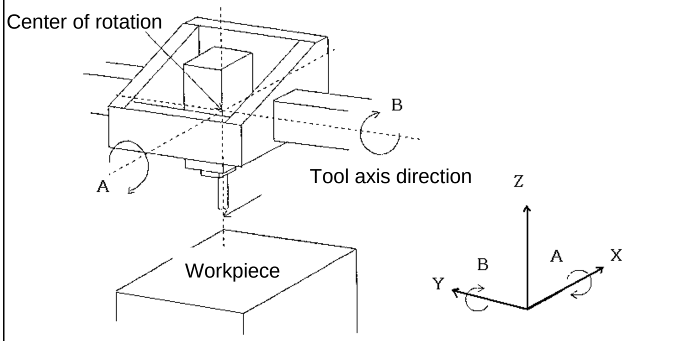
Data	Tool axis direction
1	X-axis
2	Y-axis
3	Z-axis

19657	Master rotation axis number

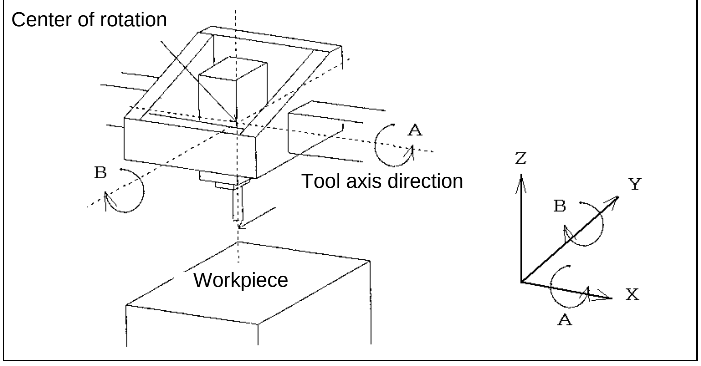
[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number to controlled axes

When a machine does not have the rotation axis that rotates about the tool axis, this parameter sets the axis number of a rotation axis used as the master axis. For a machine not using the master-axis configuration, set 0.
When the tool axis direction is controlled by two rotation axes, neither of which rotates about the tool axis, one of the rotation axes is mounted on the other rotation axis as shown in the figure below. In this case, the rotation axis on which the other rotation axis is mounted is called the master axis.

A- and B-axes (The tool axis is the Z-axis and the B-axis is the master.)



A- and B-axes (The tool axis is the Z-axis and the A-axis is the master.)



Example of setting parameters that determine the machine configuration
Tool axis direction: Z-axis
Axis configuration: W, X, Y, Z, A, and B
Rotation axes: A-axis (rotating about the X-axis) and B-axis (rotating about the Y-axis)
Master axis: A-axis

Parameter number	Data					
No. 19655	X	Y	Z	W	A	B
	0	0	0	0	1	2
No. 19656	3					
No. 19657	5					

19658	Angular displacement of a rotation axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the coordinate of a rotation axis, among the rotation axes determining the tool axis direction, which is not controlled by the CNC for the tool axis direction tool length compensation function. Whether this parameter is valid or invalid is determined by the setting of bit 1 (RAP) of parameter No. 19650.

19659	Offset value for the angular displacement of a rotation axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg
[Min. unit of data] Depend on the increment system of the applied axis

[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
An offset can be applied to the angular displacement for the tool axis direction tool length compensation function to compensate for the move direction.

19660	Origin offset value of a rotation axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets an angular displacement shifted from the origin for a rotation axis for the tool axis direction tool length compensation function.

19661	Rotation center compensation vector in tool axis direction tool length compensation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the vector from the first rotation axis center to the second rotation axis center for the tool axis direction tool length compensation function.

19662	Spindle center compensation vector in tool axis direction tool length compensation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the compensation vector for the spindle center for the tool axis direction tool length compensation function.

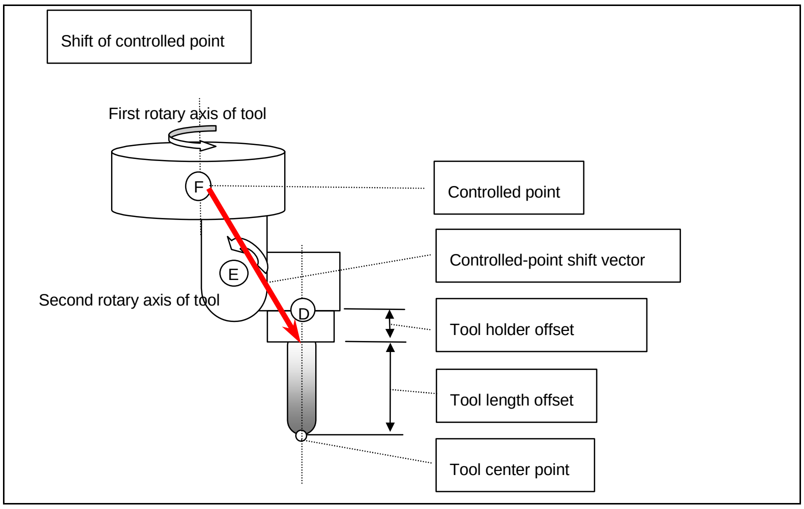
	#7	#6	#5	#4	#3	#2	#1	#0
19665	ETH		SVC	SPR				

[Input type] Parameter input
[Data type] Bit path

#4 SPR The controlled point is shifted by:
0: Automatic calculation.
1: Using parameter No. 19667.

Bit 5 (SVC) of parameter No. 19665	Bit 4 (SPR) of parameter No. 19665	Shift of controlled point
0	-	Shift is not performed as not done conventionally.

Bit 5 (SVC) of parameter No. 19665	Bit 4 (SPR) of parameter No. 19665	Shift of controlled point
1	0	The controlled point is shifted according to the result of the following automatic calculation: - (Intersection offset vector between the tool axis and the first rotation axis of the tool + intersection offset vector between the second and first rotation axes of the tool + tool holder offset (parameter No. 19666)) (See the figure below.)
1	1	The controlled point is shifted. As the shift vector, the vector set in parameter No. 19667 is used.



[Controlled-point shift vector when automatically calculated]

#5 SVC The controlled point is:
0: Not shifted.
1: Shifted.
The method of shifting is specified by bit 4 (SPR) of parameter No. 19665.

NOTE
When the machine has no rotation axis for rotating the tool (when parameter No. 19680 is set to 12 to specify the table rotation type), the controlled point is not shifted regardless of the setting of this parameter.

#7 ETH The tool holder offset function in tool length compensation is:
0: Disabled.
1: Enabled.

19666	Tool holder offset value

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set an offset value (tool holder offset value) specific to the machine from the control point to the tool attachment position in tool length compensation (after specification of G53.1 in the tilted working plane indexing mode), tool length compensation in tool axis direction, 3-dimensional manual feed, or tool center point control. In tool length compensation (not in the tilted working plane indexing mode), however, tool holder offset can be enabled or disabled with bit 7 (ETH) of parameter No. 19665.

NOTE
Set a radius value.

19667	Controlled-point shift vector

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the shift vector for the controlled point. This value becomes valid when bit 5 (SVC) of parameter No. 19665 is set to 1, and bit 4 (SPR) of parameter No. 19665 is set to 1.

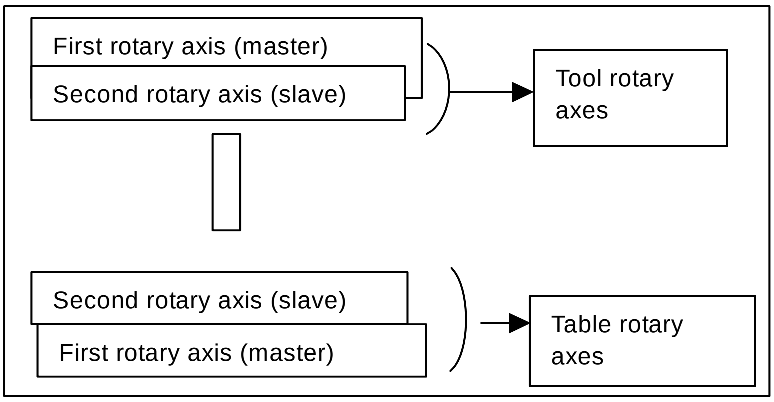
NOTE
Set a radius value.

19680	Mechanical unit type

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 21

Specify the type of the mechanical unit.

Parameter No. 19680	Mechanical unit type	Controlled rotation axis	Master and slave
0		Mechanism having no rotation axis	
2	Tool rotation type	Two rotation axes of the tool	The first rotation axis is the master, and the second rotation axis is the slave.
12	Table rotation type	Two rotation axes of the table	The first rotation axis is the master, and the second rotation axis is the slave.
21	Mixed type	One rotation axis of the tool + one rotation axis of the table	The first rotation axis is the tool rotation axis, and the second rotation axis is the table rotation axis.



> **NOTE**
> A hypothetical axis is also counted as a controlled rotary axis.
> <Hypothetical axis>
> In some cases, it is convenient to use an imaginary rotary axis whose angle is fixed to a certain value. For example, suppose that a tool is mounted in a tilted manner through an attachment. In such a case, the rotary axis considered hypothetically is a hypothetical axis. Bits 0 (IA1) and 1 (IA2) of parameter No. 19696 determine whether each rotary axis is an ordinary rotary axis or a hypothetical axis.

19681	Controlled-axis number for the first rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the controlled-axis number for the first rotation axis.
For a hypothetical axis (when bit 0 (IA1) of parameter No. 19696 is 1), set 0.

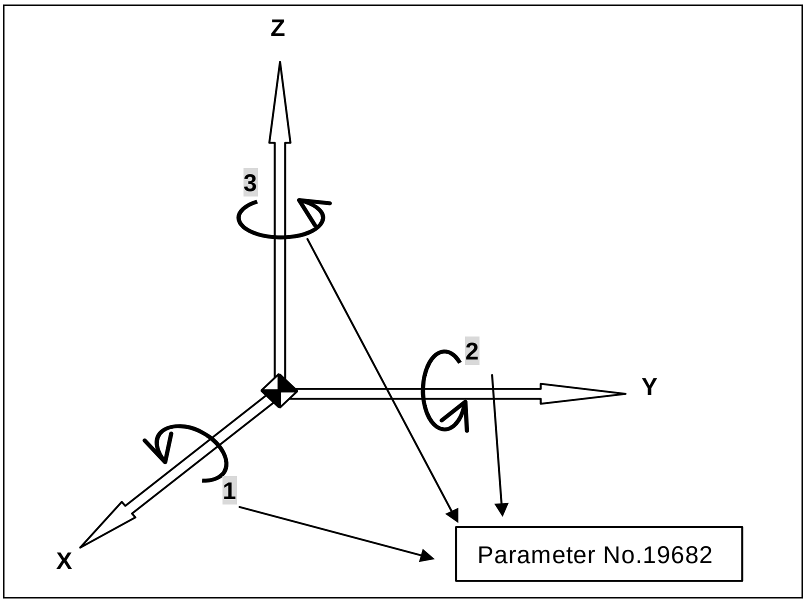
[Example] Assuming that the axis configuration in path 1 is X,Y,Z,B,C and the axis configuration in path 2 is X,Z,C,Y,B, set the parameter to 5 in path 1 and to 3 in path 2 if C is the first rotation axis in each path.

19682	Axis direction of the first rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 6

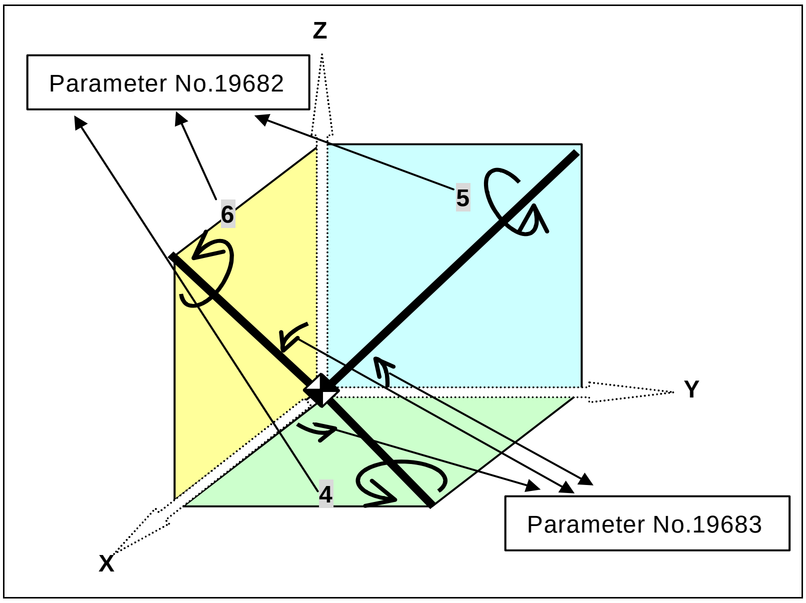
Specify the axis direction of the first rotation axis.
1: On X-axis
2: On Y-axis
3: On Z-axis
4: On an axis tilted a certain angle from the X-axis from the positive X-axis to positive Y-axis
5: On an axis tilted a certain angle from the Y-axis from the positive Y-axis to positive Z-axis
6: On an axis tilted a certain angle from the Z-axis from the positive Z-axis to positive X-axis

(A value 4 to 6 is to be set when the inclined rotation axis control function is used.)



19683	Inclination angle when the first rotation axis is an inclined axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] The increment system of the reference axis is to be followed.
[Valid data range] Nine digits of the least input increment (see standard parameter setting table (A).)
(-999999.999 to +999999.999 for IS-B)
When a value 1 to 3 is set in parameter No. 19682, set 0 degrees.
When a value 4 to 6 is set in parameter No. 19682, specify the inclination angle.



19684	Rotation direction of the first rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1
Set the direction in which the first rotation axis rotates as a mechanical motion when a positive move command is issued.

0: Clockwise direction as viewed from the negative to positive direction of the axis specified in parameter No. 19682 (right-hand thread rotation)
1: Counterclockwise direction as viewed from the negative to positive direction of the axis specified in parameter No. 19682 (left-hand thread rotation)

Normally, 0 is set for a tool rotation axis, and 1 is set for a table rotation axis.

19685	Rotation angle when the first rotation axis is a hypothetical axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
When the first rotation axis is a hypothetical axis (bit 0 (IA1) of parameter No. 19696 is 1), set the rotation angle.

19686	Controlled-axis number for the second rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes
Set the controlled-axis number for the second rotation axis.
For a hypothetical axis (bit 1 (IA2) of parameter No. 19696 is 1), set 0.
[Example] Assuming that the axis configuration in path 1 is X,Y,Z,B,C and the axis configuration in path 2 is X,Z,C,Y,B, set the parameter to 4 in path 1 and to 5 in path 2 if B is the second rotation axis in each path.

19687	Axis direction of the second rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 6
Specify the axis direction of the second rotation axis.
1: On X-axis
2: On Y-axis
3: On Z-axis
4: On an axis tilted a certain angle from the X-axis from the positive X-axis to positive Y-axis
5: On an axis tilted a certain angle from the Y-axis from the positive Y-axis to positive Z-axis
6: On an axis tilted a certain angle from the Z-axis from the positive Z-axis to positive X-axis

(A value 4 to 6 is to be set when the inclined rotation axis control function is used.)
When the second rotation axis is the slave axis, the direction when the master axis is at 0 degrees must be set.

19688	Inclination angle when the second rotation axis is inclined

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

If parameter No. 19687 is set to a value 1 to 3, set 0 degrees.
If parameter No. 19687 is set to a value 4 to 6, set the inclination angle.

19689	Rotation direction of the second rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1

Set the direction in which the second rotation axis rotates as a mechanical motion when a positive move command is issued.

0: Clockwise direction as viewed from the negative to positive direction of the axis specified in parameter No. 19687 (right-hand thread rotation)
1: Counterclockwise direction as viewed from the negative to positive direction of the axis specified in parameter No. 19687 (left-hand thread rotation)

Normally, 0 is set for a tool rotation axis, and 1 is set for a table rotation axis.

19690	Rotation angle when the second rotation axis is a hypothetical axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

When the second rotation axis is a hypothetical axis (bit 1 (IA2) of parameter No. 19696 is 1), set the rotation angle.

19691	Controlled-axis number for the third rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the controlled-axis number for the third rotation axis.

[Example] Assuming that the axis configuration in path 1 is X,Y,Z,A,B,C and the axis configuration in path 2 is X,A,Z,C,Y,B, set the parameter to 6 in path 1 and to 4 in path 2 if C is the third rotation axis in each path.

NOTE
This parameter is effective only in the Tool offset conversion function. In other 5-axis functions, this parameter is not effective.

19692	Axis direction of the third rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 6

Specify the axis direction of the third rotation axis.

1: On X-axis
2: On Y-axis
3: On Z-axis
4: On X-axis tilted a certain angle from the positive direction of X-axis to the positive direction of Y-axis
5: On Y-axis tilted a certain angle from the positive direction of Y-axis to the positive direction of Z-axis

6: On Z-axis tilted a certain angle from the positive direction of Z-axis to the positive direction of X-axis

(Values 4 to 6 are to be set when the inclined rotation axis control function is used.)
When the third rotation axis is the slave axis, the direction when the master axis is at 0 degrees must be set.

> **NOTE**
> This parameter is effective only in the Tool offset conversion function. In other 5-axis functions, this parameter is not effective.

	#7	#6	#5	#4	#3	#2	#1	#0
19696		RFC	WKP		NPC		IA2	IA1

[Input type] Parameter input
[Data type] Bit path

#0 IA1 0: The first rotation axis is an ordinary rotation axis.
1: The first rotation axis is a hypothetical axis.
If IA1 is 1, set 0 as the controlled-axis number for the first rotation axis (parameter No. 19681).
Also, set parameter Nos. 19682 to 19685 on the assumption that there is a rotation axis.

#1 IA2 0: The second rotation axis is an ordinary rotation axis.
1: The second rotation axis is a hypothetical axis.
If IA2 is 1, set 0 as the controlled-axis number for the second rotation axis (parameter No. 19686).
Also, set parameter Nos. 19687 to 19690 on the assumption that there is a rotation axis.

#3 NPC In tool posture control for tool center point control (type 2), when the change of tool posture at the block end is not done with the parameters Nos. 19738 and 19739, even if the tool posture passes the singular posture,
0: Program is executed without the change of tool posture.
1: The alarm PS5421, “ILLEGAL COMMAND IN G43.4/G43.5” occurs.

#5 WKP For a 5-axis machine having a table rotation axis, as the programming coordinate system for tool center point control or 3-dimensional tool compensation machining:
0: The table coordinate system (coordinate system fixed on the rotary table) is used.
1: The workpiece coordinate system is used.

> **NOTE**
> For 3-dimensional tool compensation machining, the setting of this parameter is used only when bit 4 (TBP) of parameter No. 19746 is set to 1.

#6 RFC In tool center point control, when a command that does not move the tool center point with respect to the workpiece is issued, the feedrate of the rotation axis is:
0: The maximum cutting feedrate (parameter No. 1432).
1: A specified feedrate.

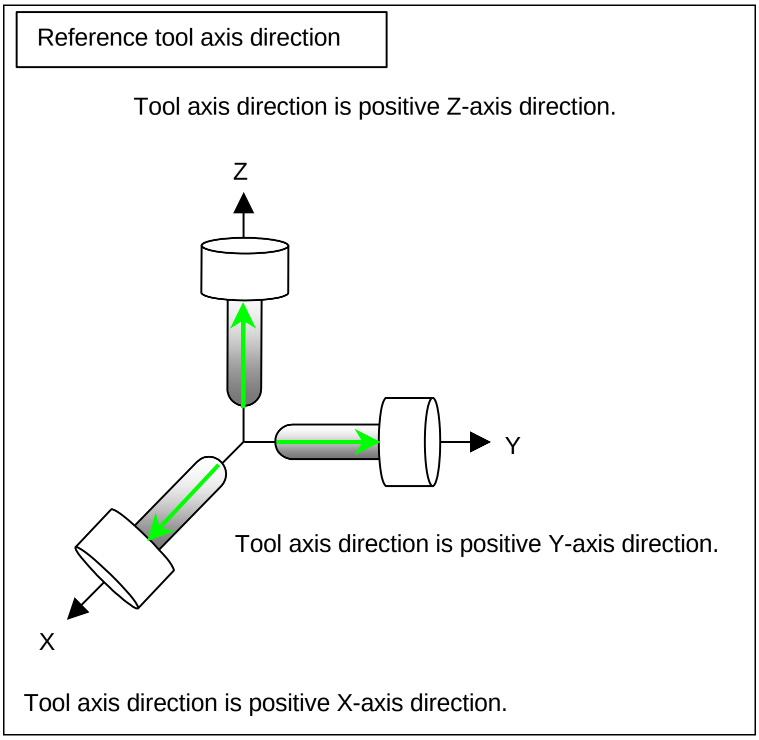
19697	Reference tool axis direction

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 3

Set the tool axis direction in the machine coordinate system when the rotation axes for controlling the tool are all at 0 degrees. Also, set the tool axis direction in the machine coordinate system in a mechanism in which only the rotation axes for controlling the table are present (there is no rotation axis for controlling the tool).

1: Positive X-axis direction
2: Positive Y-axis direction
3: Positive Z-axis direction

When the reference tool axis direction is neither the X-, Y-, nor Z-axis direction, set the reference direction in this parameter, then set appropriate angles as the reference angle RA and reference angle RB (parameter Nos. 19698 and 19699).



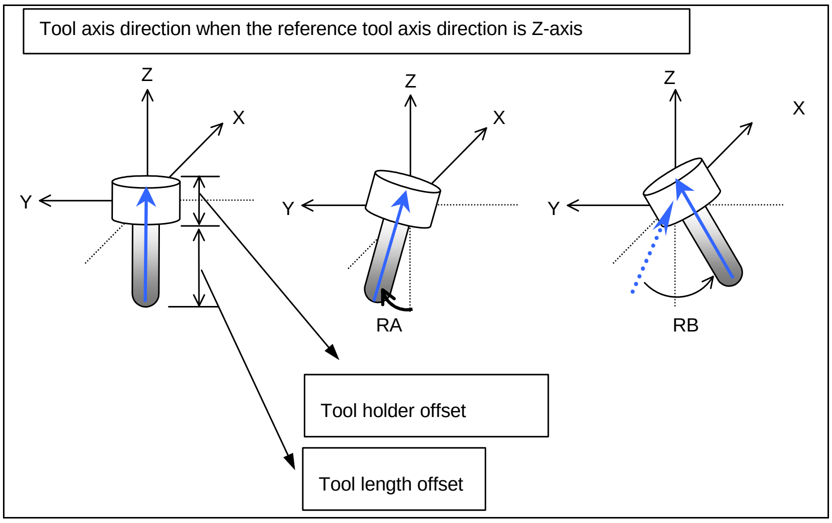
19698	Angle when the reference tool axis direction is tilted (reference angle RA)
19699	Angle when the reference tool axis direction is tilted (reference angle RB)

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

When the reference tool axis direction (parameter No. 19697) is set to 1, the tool axis is tilted the RA degrees on the Z-axis from the positive X-axis direction to positive Y-axis direction, then the tool axis is tilted the RB degrees on the X-axis from the positive Y-axis direction to positive Z-axis direction.

When the reference tool axis direction (parameter No. 19697) is set to 2, the tool axis is tilted the RA degrees on the X-axis from the positive Y-axis direction to positive Z-axis direction, then the tool axis is tilted the RB degrees on the Y-axis from the positive Z-axis direction to positive X-axis direction.

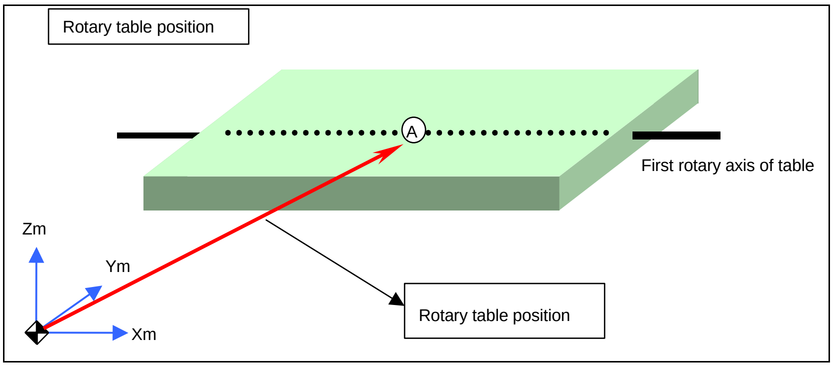
When the reference tool axis direction (parameter No. 19697) is set to 3, the tool axis is tilted the RA degrees on the Y-axis from the positive Z-axis direction to positive X-axis direction, then the tool axis is tilted the RB degrees on the Z-axis from the positive X-axis direction to positive Y-axis direction.



19700	Rotary table position (X-axis of the basic three axes)
19701	Rotary table position (Y-axis of the basic three axes)
19702	Rotary table position (Z-axis of the basic three axes)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set these parameters when parameter No. 19680 is set to 12 or 21. The vector from the origin of the machine coordinate system to point A on the first rotation axis of the table is set as the rotary table position in the machine coordinate system.



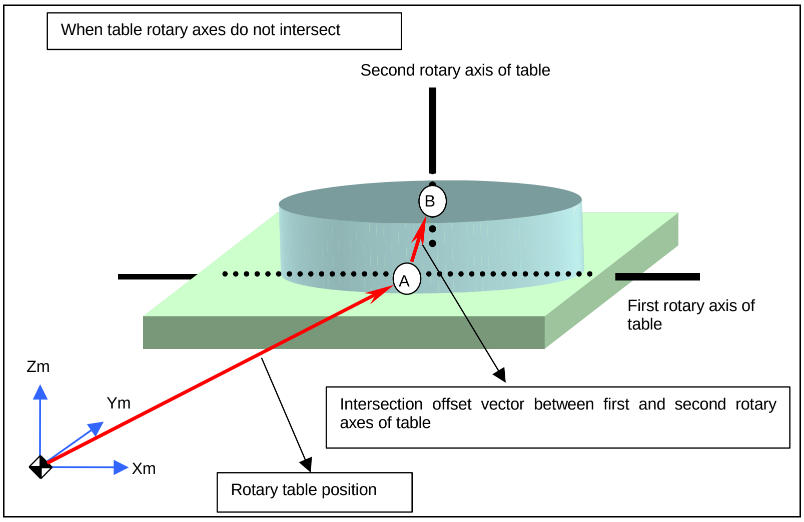
NOTE

As point A, set a position that is easy to measure on the first rotary axis of the table.
Set a radius value.
If the rotary table is moved along the X-, Y-, or Z-axis or all of these axes, set the position of the rotary table when the machine coordinates of the X-, Y-, and Z-axes are all set to 0.

19703	**Intersection offset vector between the first and second rotation axes of the table (X-axis of the basic three axes)**
19704	**Intersection offset vector between the first and second rotation axes of the table (Y-axis of the basic three axes)**
19705	**Intersection offset vector between the first and second rotation axes of the table (Z-axis of the basic three axes)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set these parameters when the first rotation axis and second rotation axis of the table do not intersect. These parameters are valid when parameter No. 19680 is set to 12. When the rotation axes for controlling the table are all at 0 degrees, the vector from point A to point B on the second rotation axis of the table is set as the intersection offset vector in the machine coordinate system.



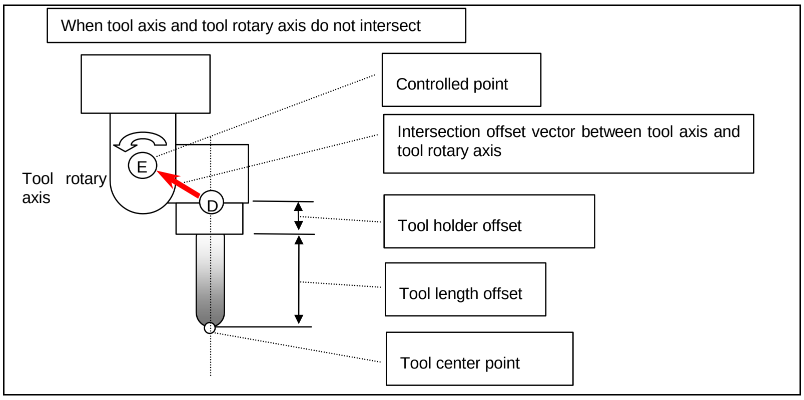
> **NOTE**
> As point B, set a position that is easy to measure on the second rotary axis of the table.
> Set a radius value.

19709	**Intersection offset vector between the tool axis and tool rotation axis (X-axis of the basic three axes)**
19710	**Intersection offset vector between the tool axis and tool rotation axis (Y-axis of the basic three axes)**
19711	**Intersection offset vector between the tool axis and tool rotation axis (Z-axis of the basic three axes)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set these parameters when the tool axis and tool rotation axis do not intersect.
These parameters are valid when parameter No. 19680 is set to 2 or 21.

If parameter No. 19680 is 21, set the vector from point D on the tool axis to point E determined on the tool rotation axis as the intersection offset vector in the machine coordinate system when the rotation axes for controlling the tool are all at 0 degrees.
If parameter No. 19680 is 2, set the vector from point D on the tool axis to point E determined on the second rotation axis of the tool as the intersection offset vector in the machine coordinate system when the rotation axes for controlling the tool are all at 0 degrees.



> **NOTE**
> Point D is determined by adding the tool length offset and tool holder offset (parameter No. 19666) to the tool tip. As point E, set a position that is easy to measure.
> Set a radius value.

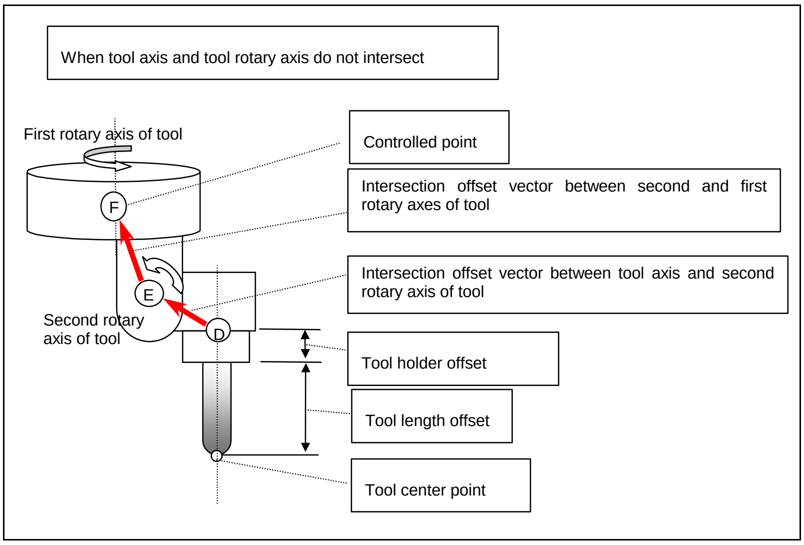
19712	**Intersection offset vector between the second and first rotation axes of the tool (X-axis of the basic three axes)**

19713	**Intersection offset vector between the second and first rotation axes of the tool (Y-axis of the basic three axes)**

19714	**Intersection offset vector between the second and first rotation axes of the tool (Z-axis of the basic three axes)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set these parameters when the rotation axes of the tool do not intersect.
These parameters are valid when parameter No. 19680 is set to 2.
Set the vector from point E on the second rotation axis of the tool to point F on the first rotation axis of the tool as the intersection offset vector in the machine coordinate system when the rotation axes for controlling the tool are all at 0 degrees.



> **NOTE**
> As point F, set a position that is easy to measure.
> Set a radius value.

19738	Angle to check if Tool posture is near Singular posture or not

[Input type] Parameter input
[Data type] Real path
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

In the case of tool posture control for tool center point control (type 2), when the difference(angle) between a tool posture and the singular posture is less than this parameter, the tool posture is regarded as ‘near the singular posture’. Then, the tool posture at the block end is changed so that the tool posture passes the singular posture during the block.

If this parameter is 0.0, the tool posture at the block end is not changed.

19739	Angle to decide that the tool posture at block end is not changed

[Input type] Parameter input
[Data type] Real path
[Unit of data] degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table(A))
(When the increment system is IS-B, -999999.999 to +999999.999)

When an appropriate value is set in parameter No. 19738 in tool posture control for tool center point control (type 2), a tool posture near the singular point may occur during the execution of a block. If this happens, change the tool posture at the end point so that the singular posture is passed within the block. With respect to the angle of the rotation axis nearer to the workpiece before and after the tool posture is changed (the rotation axis is the master axis when the tool turns, the slave axis when the table turns, or the table rotation axis when the rotation is of the mixed type), however, the tool posture must not be changed if both the difference between the angle after the change and (angle before the change + 180 degrees) and the difference between the angle after the change and (angle before the change – 180 degrees) are equal to or greater than the value set in the parameter.

19741	Upper limit of the movement range of the first rotation axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the upper limit of the movement range of the first rotation axis in tool center point control (type 2), 3-dimensional cutter compensation (type 2), or tool axis direction control of the tilted working plane indexing (G53.1). When the movement range of the first rotation axis is not specified or the first rotation axis is the roll-over axis, this parameter and parameter No. 19742 must both be set to 0.

19742	Lower limit of the movement range of the first rotation axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the lower limit of the movement range of the first rotation axis in tool center point control (type 2), 3-dimensional cutter compensation (type 2), or tool axis direction control of the tilted working plane indexing (G53.1). When the movement range of the first rotation axis is not specified or the first rotation axis is the roll-over axis, this parameter and parameter No. 19741 must both be set to 0.

19743	Upper limit of the movement range of the second rotation axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the upper limit of the movement range of the second rotation axis in tool center point control (type 2), 3-dimensional cutter compensation (type 2), or tool axis direction control of the tilted working plane indexing (G53.1). When the movement range of the second rotation axis is not specified or the second rotation axis is the roll-over axis, this parameter and parameter No. 19744 must both be set to 0.

19744	Lower limit of the movement range of the second rotation axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the lower limit of the movement range of the second rotation axis in tool center point control (type 2), 3-dimensional cutter compensation (type 2), or tool axis direction control of the tilted working plane indexing (G53.1). When the movement range of the second rotation axis is not specified or the second rotation axis is the roll-over axis, this parameter and parameter No. 19743 must both be set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
19746		CRS		TBP	LOZ	LOD	PTD	

[Input type] Parameter input
[Data type] Bit path

#1 PTD When 3-dimensional cutter compensation is performed for a table rotation type machine, the direction of the tool is:
0: Specified by parameter Nos. 19697, 19698, and 19699.
1: Specified as a direction perpendicular to the plane specified by G17, G18, or G19.

#2 LOD As the tool length for 3-dimensional machining manual feed:
0: The value of parameter No. 12318 is used.
1: The tool length currently used for tool length compensation is used.

#3 LOZ When bit 2 (LOD) of parameter No. 19746 is set to 1 and tool length compensation is not applied, as the tool length for 3-dimensional machining manual feed:
0: The value of parameter No. 12318 is used.
1: 0 is used.

#4 TBP For a 5-axis machine having a table rotation axis, as the programming coordinate system for 3-dimensional tool compensation machining:
0: The workpiece coordinate system is used.
1: The setting of bit 5 (WKP) of parameter No. 19696 is used.

#6 CRS In tool center point control, when the deviation from the path during movement at the specified cutting feedrate or rapid traverse rate is determined to exceed the limit:
0: The feedrate or rapid traverse rate is not decreased.
1: The feedrate or rapid traverse rate is controlled so that the limit of the deviation from the path set in the parameter for the cutting feed or rapid traverse is not exceeded.

When this parameter is set to 1:
In the rapid traverse mode, the rapid traverse rate is decreased so that the deviation from the path does not exceed the limit specified in parameter No. 19751.
In the cutting feed mode, the cutting feedrate is decreased so that the deviation from the path does not exceed the limit specified in parameter No. 19752.

19751	Limit of the deviation from the path (for rapid traverse)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)

[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the limit of the deviation from the path in the rapid traverse mode in tool center point control.
If the tool moves at the specified rate, the deviation from the path may exceed the value specified in this parameter. In this case, the rate is decreased so that the tool moves along the path.
This parameter is valid when bit 6 (CRS) of parameter No. 19746 is set to 1.
When 0 is set, the least input increment is assumed to be the limit of the deviation from the path.
If a negative value is set, the rapid traverse rate is not decreased.

> **NOTE**
> The error generated after the rate is decreased may be smaller than the value set in this parameter depending on the calculation error.

19752	Limit of the deviation from the path (for cutting feed)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the limit of the deviation from the path in the cutting feed mode in tool center point control.
If the tool moves at the specified rate, the deviation from the path may exceed the value specified in this parameter. In this case, the rate is decreased so that the tool moves along the path.
This parameter is valid when bit 6 (CRS) of parameter No. 19746 is set to 1.
When 0 is set, the least input increment is assumed to be the limit of the deviation from the path.
If a negative value is set, the cutting feedrate is not decreased.

> **NOTE**
> The error generated after the rate is decreased may be smaller than the value set in this parameter depending on the calculation error.

	#7	#6	#5	#4	#3	#2	#1	#0
19754	SPM		INZ	TCR	TAR			

[Input type] Parameter input
[Data type] Bit axis

#3 TAR In the deceleration function using acceleration in AI contour control, permissible acceleration parameter No. 19762 and lower limit speed parameter No. 19760 for rapid traverse in tool center point control are:
0: Disabled.
1: Enabled.

#4 TCR In speed determination using the speed difference at a corner in AI contour control, permissible speed difference parameter No. 19761 for rapid traverse in tool center point control is:
0: Disabled.
1: Enabled.

#5 INZ If, in tool center point control and 3-dimensional cutter compensation, a table coordinate system command is issued,
0: In the state in which each function is started, the workpiece coordinate system is fixed to the rotary table, and becomes a table coordinate system.
1: Regardless of the table rotation axis position when each function is started, the workpiece table is fixed to the rotary table, with the table rotation axis position being 0, and becomes a table coordinate system.

> **NOTE**
> In case workpiece setting error compensation or tilted working plane indexing is active, the parameter INZ is assumed to be 1 even if it is 0.

#7 SPM The rotation axis position used as the reference when the parameters related to the functions below, parameters Nos. 19681 to 19714, are set is:
0: Absolute coordinates.
1: Machine coordinates

This parameter is effective to the functions below.
- Tool center point control
- Smooth TCP
- Tool posture control
- 3-dimensional tool compensation
- Cutting point command
- Workpiece setting error compensation
- Tilted working plane indexing
- Tilted working plane indexing with guidance

19760	Lower limit speed for the deceleration function using the acceleration in AI contour control (for rapid traverse in tool center point control)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
The deceleration function using the acceleration in AI contour control automatically calculates an optimum speed according to the geometry.
Depending on the geometry, the calculated speed may be very low.
In such cases, to prevent the feedrate from becoming too low, in rapid traverse in tool center point control, this parameter can be used to set the lower limit speed for deceleration.
For this parameter to take effect, bit 3 (TAR) of parameter No. 19754 must be set to 1. If bit 3 (TAR) of parameter No. 19754 is set to 0, parameter No. 1738 becomes effective.
Note that for linear interpolation, parameter No. 1738 becomes effective, while for circular interpolation, parameter No. 1732 becomes effective.

19761	Permissible speed difference in speed determination using the speed difference at a corner (for rapid traverse in tool center point control)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

If, in rapid traverse during tool center point control, speed determination using the speed difference at a corner is used, and the changes in the speed component on each axis exceeds the setting of this parameter at a block joint, a feedrate that does not exceed the setting is determined, and deceleration is performed using acceleration/deceleration before interpolation. This can reduce the shock to the machine at a corner.

For this parameter to take effect, bit 4 (TCR) of parameter No. 19754 must be set to 1. If bit 4 (TCR) of parameter No. 19754 is set to 0, parameter No. 1783 becomes effective.

When bit 4 (TCR) of parameter No. 19754 is set to 1, for any axes for which 0 is set for this parameter, speed determination using the speed difference at a corner is disabled in rapid traverse during tool center point control.

19762	Permissible acceleration for each axis in the deceleration function using the acceleration in AI contour control (for rapid traverse in tool center point control)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Min. unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(For a millimeter machine, 0.0 to +100000.0, for an inch machine, 0.0 to +10000.0)

This parameter sets the permissible value of the acceleration that will occur due to changes in the direction of movement along the linear axis in rapid traverse during tool center point control.

For this parameter to take effect, bit 3 (TAR) of parameter No. 19754 must be set to 1. If bit 3 (TAR) of parameter No. 19754 is set to 0, parameter No. 1737 becomes effective.

When bit 3 (TAR) of parameter No. 19754 is set to 1, for any axes for which 0 is set for this parameter, the deceleration function using the acceleration is disabled in rapid traverse during tool center point control.

Note that for linear interpolation, parameter No. 1737 becomes effective, while for circular interpolation, parameter No. 1735 becomes effective.

4.152 PARAMETERS OF FSSB (2 OF 2)

24000	ATR value corresponding to slave 01 on first FSSB line
24001	ATR value corresponding to slave 02 on first FSSB line
to	to
24031	ATR value corresponding to slave 32 on first FSSB line

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word

[Valid data range] 1001 to 1046, 2001 to 2016, 3001 to 3004, 1000

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each of slave 1 to slave 32 on first FSSB line (first optical connector).

The slave is a generic term for servo amplifiers, spindle amplifiers and separate detector interface units connected via an FSSB optical cable to the CNC. Numbers 1 to 32 are assigned to slaves, with younger numbers sequentially assigned to slaves closer to the CNC.

A 2-axis amplifier consists of two slaves, and a 3-axis amplifier consists of three slaves. In each of these parameters, set a value as described below, depending on whether the slave is an amplifier, separate detector interface unit, or nonexistent.

- When the slave is a servo amplifier:
  Set the axis number of a servo amplifier to allocate (value set with parameter No. 1023) plus 1000.
- When the slave is a spindle amplifier:
  Set the spindle number of a spindle to allocate (value set with parameter No. 3717) plus 2000.
- When the slave is a separate detector interface unit:
  Set 3001, 3002, 3003, and 3004, respectively, for the first (one connected nearest to the CNC), second, third, and fourth separate detector interface units.
- When the slave is nonexistent:
  Set 1000.

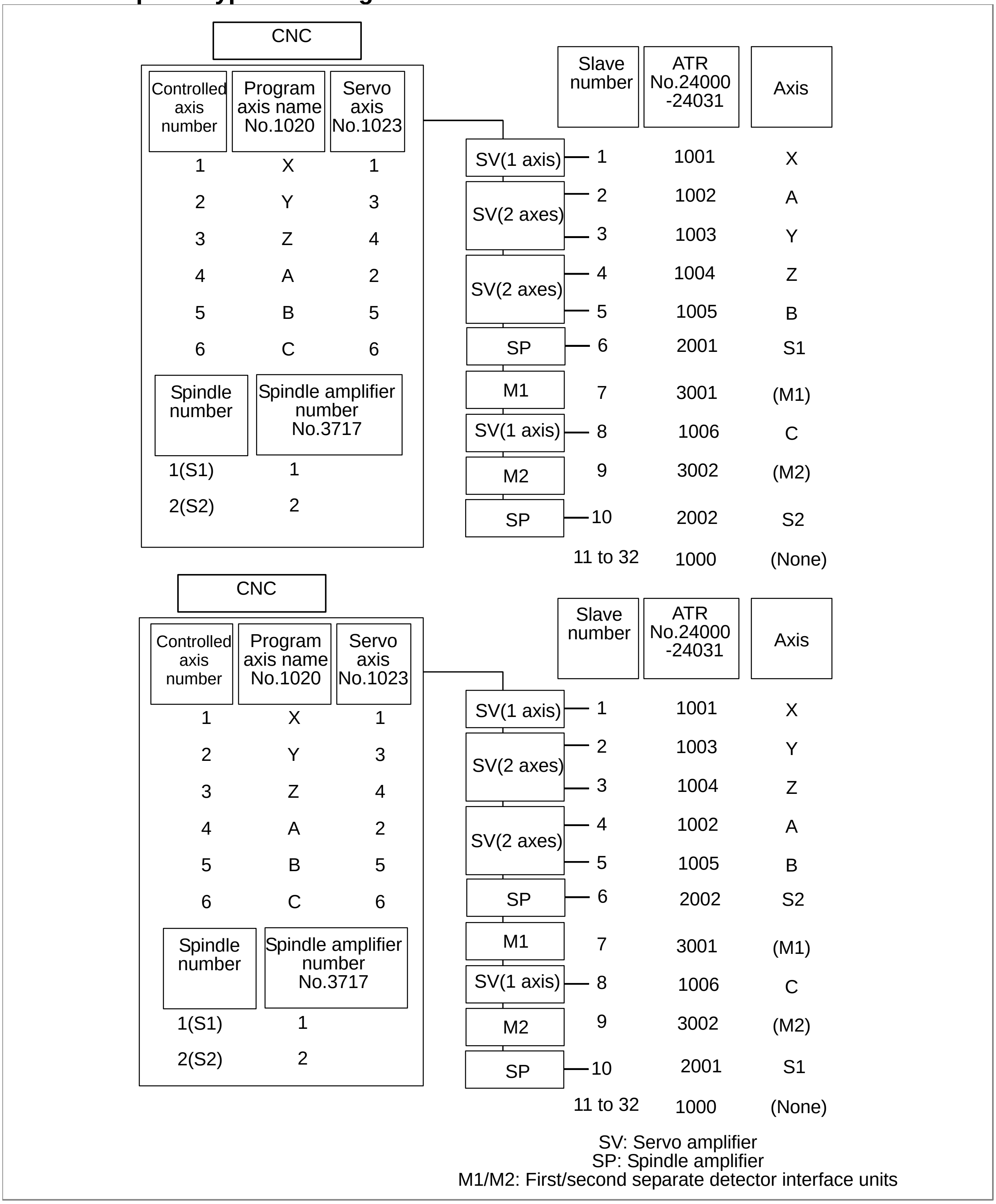
NOTE

1 When the electronic gear box (EGB) function is used
Although an amplifier is not actually required for an EGB dummy axis, set this parameter with assuming that a dummy amplifier is connected. To put it another way, specify this parameter with a value set in the EGB dummy axis parameter (No. 1023) plus 1000, instead of "1000", as an address translation table value for one of non-existent slaves.

2 When the FSSB is set to the automatic setting mode (when the bit 0 (FMD) of parameter No. 1902 is set to 0), parameter Nos. 24000 to 24031 are automatically set as data is input on the FSSB setting screen. When the manual setting 2 mode is set (when the bit 0 (FMD) of parameter No. 1902 is set to 1), be sure to directly set values in parameter Nos. 24000 to 24031.

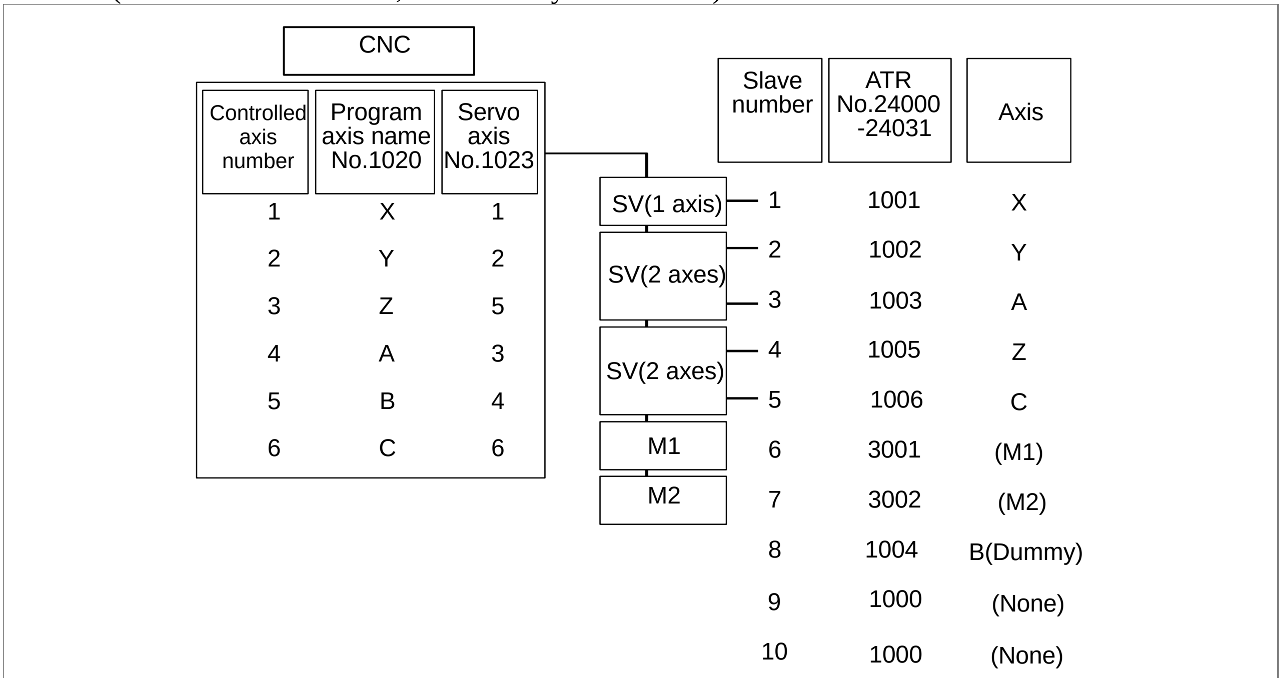
Example of axis configuration and parameter settings

- Example 1 Typical setting



- Example 2 Setting with a dummy axis in use

Example of axis configuration and parameter settings when the electronic gear box (EGB) function is used
(EGB slave axis: A-axis, EGB dummy axis: B-axis)



SV: Servo amplifier
M1/M2: First/second separate detector interface units

24032	**ATR value corresponding to slave 01 on second FSSB line**
24033	**ATR value corresponding to slave 02 on second FSSB line**
to	**to**
24063	**ATR value corresponding to slave 32 on second FSSB line**

NOTE
When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1001 to 1046, 2001 to 2016, 3005 to 3008, 1000

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each of slave 1 to slave 32 on second FSSB line (second optical connector). Set these parameters only when a servo axis control card with two optical connectors (FSSB lines) is used.

To specify these parameters, follow the same procedure as for the first FSSB line (parameters Nos. 24000 to 24031). Note, however, that the valid data range varies depending on the separate detector interface unit used.

- When the slave is a separate detector interface unit:
  Set 3005, 3006, 3007, and 3008, respectively, for the first (one connected nearest to the CNC), second, third, and fourth separate detector interface units.

24064	**ATR value corresponding to slave 01 on third FSSB line**
24065	**ATR value corresponding to slave 02 on third FSSB line**
to	**to**
24095	**ATR value corresponding to slave 32 on third FSSB line**

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1049 to 1078, 2001 to 2016, 3009 to 3012, 1000

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each of slave 1 to slave 32 on third FSSB line. Set these parameters only when an additional axis board is used.

To specify these parameters, follow the same procedure as for the first FSSB line (parameters Nos. 24000 to 24031). Note, however, that the valid data range varies.

- When the slave is a separate detector interface unit:
  Set 3009, 3010, 3011, and 3012, respectively, for the first (one connected nearest to the CNC), second, third, and fourth separate detector interface units.

24096	**Connector number for the first or ninth separate detector interface unit**
24097	**Connector number for the second or tenth separate detector interface unit**
24098	**Connector number for the third or eleventh separate detector interface unit**
24099	**Connector number for the fourth or twelfth separate detector interface unit**
24100	**Connector number for the fifth separate detector interface unit**
24101	**Connector number for the sixth separate detector interface unit**
24102	**Connector number for the seventh separate detector interface unit**
24103	**Connector number for the eighth separate detector interface unit**

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 8

Set a connector number for the connector to which a separate detector interface unit is attached if the separate detector interface unit is to be used. The following table lists the necessary settings. Be sure to specify 0 for connectors not in use.

Correspondence between connectors and connector numbers	
Connector	**Connector number**
JF101	1
JF102	2
JF103	3

Correspondence between connectors and connector numbers	
Connector	**Connector number**
JF104	4
JF105	5
JF106	6
JF107	7
JF108	8

(Setting example)

Controlled axis	Connector to which each separate detector interface unit is attached				Parameter setting			
	1st connector	2nd connector	5th connector	6th connector	No. 24096	No. 24097	No. 24100	No. 24101
X1	JF101	—	—	—	1	0	0	0
Y1	—	JF102	—	—	0	2	0	0
Z1	—	—	JF102	—	0	0	2	0
X2	—	JF101	—	—	0	1	0	0
Y2	—	—	—	JF101	0	0	0	1
Z2	—	—	—	—	0	0	0	0
A1	—	—	JF101	—	0	0	1	0
B1	—	—	—	JF102	0	0	0	2
C1	—	JF104	—	—	0	4	0	0
A2	JF102	—	—	—	2	0	0	0
B2	—	JF103	—	—	0	3	0	0
C2	—	—	—	JF103	0	0	0	3

NOTE

1. Specify these parameters when separate detector interface units are used.
2. Parameters Nos. 24096 to 24103 are specified automatically when data is entered on the FSSB setting screen if the FSSB setting mode in use is the automatic setting mode (bit 0 (FMD) of parameter No. 1902 = "0"). If the manual setting 2 mode (bit 0 (FMD) of parameter No. 1902) = "1"), specify the parameters directly.

24104	ATR value corresponding to connector 1 on the first separate detector interface unit

24105	ATR value corresponding to connector 2 on the first separate detector interface unit
to	to
24111	ATR value corresponding to connector 8 on the first separate detector interface unit

24112	ATR value corresponding to connector 1 on the second separate detector interface unit
to	to
24119	ATR value corresponding to connector 8 on the second separate detector interface unit

24120	ATR value corresponding to connector 1 on the third separate detector interface unit
to	to
24127	ATR value corresponding to connector 8 on the third separate detector interface unit

24128	ATR value corresponding to connector 1 on the fourth separate detector interface unit
to	to
24135	ATR value corresponding to connector 8 on the fourth separate detector interface unit

24136	ATR value corresponding to connector 1 on the fifth separate detector interface unit
to	to
24143	ATR value corresponding to connector 8 on the fifth separate detector interface unit

24144	ATR value corresponding to connector 1 on the sixth separate detector interface unit
to	to
24151	ATR value corresponding to connector 8 on the sixth separate detector interface unit

24152	ATR value corresponding to connector 1 on the seventh separate detector interface unit
to	to
24159	ATR value corresponding to connector 8 on the seventh separate detector interface unit

24160	ATR value corresponding to connector 1 on the eighth separate detector interface unit
to	to
24167	ATR value corresponding to connector 8 on the eighth separate detector interface unit

NOTE

When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1000 to 1046

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each connector on a separate detector interface unit.
The first to fourth separate detector interface units are connected to first FSSB line, and the fifth and eighth separate detector interface units are connected to second FSSB line.
Specify each parameter with a value set in parameter No. 1023 (axis connected to a separate detector interface unit connector) plus 1000.
If a connector attached to a separate detector interface unit is not in use, set 1000 for the connector.

NOTE

1 Specify these parameters if one separate detector interface unit connector is shared among two or more axes. They need not be specified if one connector is used by one axis.
2 Using these parameters requires setting bit 5 (SSC) of parameter No. 14476 to 1.

24168	ATR value corresponding to connector 1 on the ninth separate detector interface unit

24169	ATR value corresponding to connector 2 on the ninth separate detector interface unit
to	to
24175	ATR value corresponding to connector 8 on the ninth separate detector interface unit

24176	ATR value corresponding to connector 1 on the tenth separate detector interface unit
to	to
24183	ATR value corresponding to connector 8 on the tenth separate detector interface unit

24184	ATR value corresponding to connector 1 on the eleventh separate detector interface unit
to	to
24191	ATR value corresponding to connector 8 on the eleventh separate detector interface unit

24192	ATR value corresponding to connector 1 on the twelfth separate detector interface unit
to	to
24199	ATR value corresponding to connector 8 on the twelfth separate detector interface unit

> **NOTE**
> When these parameters are set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1049 to 1078, 1000

Set an address translation table value (ATR value) for each separate detector interface unit connector on the third FSSB line. These parameters must be specified when the separate detector interface units are used with an additional axis board.
The ninth to twelfth separate detector interface units are connected to third FSSB line.
Specify each parameter with a value set in parameter No. 1023 (axis connected to a separate detector interface unit connector) plus 1000.
If a connector attached to a separate detector interface unit is not in use, set 1000 for the connector.

> **NOTE**
> 1 Specify these parameters if one separate detector interface unit connector is shared among two or more axes. They need not be specified if one connector is used by one axis.
> 2 Using these parameters requires setting bit 5 (SSC) of parameter No. 14476 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
24203								FHR

> **NOTE**
> When the parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit

#0 FHR FSSB high-speed rigid tapping is:
0: Disabled.
1: Enabled.

> **NOTE**
> In addition, it is necessary to set parameter No.24204.

24204	The index number of spindle axis that synchronizes to each servo axis

> **NOTE**
> When the parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis

[Valid data range] 0 to the maximum number of spindles

In FSSB high-speed rigid tapping, set the index number of spindle axis that synchronizes to servo axis.

> **NOTE**
> 1 When the parameter FHR (Bit 0 of No.24203) is 1, this parameter is enabled.
> 2 Four or less index numbers of spindle axis can be set with the system. If five or more index numbers of spindle axis are set, the alarm (PW0037) "SV/SP COMBINATION ERROR" is issued.

4.153 PARAMETERS OF GRAPHIC DISPLAY (4 OF 5)

24300	Time for One-touch menu to be closed (before switching screen)

[Input type] Parameter input
[Data type] Byte
[Unit of data] sec
[Valid data range] 0 to 127

The One-touch menu is automatically closed when the One-touch menu is not operated during the time set by this parameter before switching the screen with the One-touch menu.

24301	Time for One-touch menu to be closed (after switching screen)

[Input type] Parameter input
[Data type] Byte
[Unit of data] sec
[Valid data range] -1 to 127

The One-touch menu is automatically closed when the One-touch menu is not operated during the time set by this parameter after switching the screen with the One-touch menu.
If -1 is set, the one-touch menu closes at once after switching the screen.

Ex1)

In case that until switching the screen from One-touch menu is open, automatic close is invalid.
One-touch menu is closed automatically 5 second later after switching the screen.
No.24300 = 0, No.24301 = 5

Ex2)

In case that when One-touch menu is closed automatically with no operation of One-touch menu 10 second from open.
One-touch menu is closed automatically just after switching the screen.
No.24300 = 10, No.24301 = -1

> **NOTE**
> 1 If 0 is set to parameter No.24300 and No.24301, One-touch menu is not closed automatically.
> 2 When the One-touch menu switched to the screen being displayed now is pressed, parameter No.24301 is applied though the screen doesn't switch.

24302	Delay time from trigger signal to storing operation history for the machine state monitoring function

[Input type] Parameter input
[Data type] Byte
[Data range] -1 to 32767

This parameter sets delay time from turning on trigger signal to beginning preservation of the operation history in the machine state monitoring function.

Parameter No.24302	Delay Time from trigger signal to storing operation history
-1	0 msec
0	160 msec
1 to 32767	Parameter No.24302 × 16 msec

	#7	#6	#5	#4	#3	#2	#1	#0
24303							EEP	ELV

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 ELV Divisions of Eco levels are
0: 4 levels.
1: 8 levels.

> **NOTE**
> This parameter requires the option of Energy saving level selecting function.
> If this parameter is changed, adjust the parameters Nos. 11397 and 11398 again.
> If the current Eco level gets invalid because of change in this parameter, the current Eco level is set to Eco level 0.

#1 EEP An Eco level is
0: Not specified in each path.
The Eco level is common for all paths.
1: Specified in each path.

> ⚠ **CAUTION**
> Machine or work can be damaged by out-of-synchronization when Eco levels of spindles in synchronization control mode differ from each other. This is because this function differs the time constant for acceleration/deceleration in spindle synchronization mode.
> Set “0” without fail when using spindle synchronization control between paths.

> **NOTE**
> This parameter requires the option of Energy saving level selecting function.
> When this parameter is set to “0” from “1”, the current Eco level is set to the Eco level of path 1 before changing this parameter.

24305	Range of tool offset change

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (offset unit)
[Min. unit of data] The increment system of a tool offset value is followed.
[Valid data range] The settings of bits 3 to 0 (OFE, OFD, OFC, and OFA) of parameter No. 5042 are followed.

For metric input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0 to 9999.99mm
0	0	0	0	0 to 9999.999mm
0	0	1	0	0 to 9999.9999mm
0	1	0	0	0 to 9999.99999mm
1	0	0	0	0 to 999.999999mm

For inch input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0 to 999.999inch
0	0	0	0	0 to 999.9999inch
0	0	1	0	0 to 999.99999inch
0	1	0	0	0 to 999.999999inch
1	0	0	0	0 to 99.9999999inch

Specify the valid range of tool offset changes.
The lower limit of specifiable offset value is given as the preset offset value subtracted by this parameter. On the same way, the upper limit is given as the present offset value added by this parameter.
If present offset value is equal to 100.000 with this parameter equal to 2.000, for example, value of 98.000 - 102.000 can be input.
When value of smaller than or equal to 0.000 is specified in this parameter, input range is not limited.

	#7	#6	#5	#4	#3	#2	#1	#0
24306					LVD			

[Input type] Parameter input
[Data type] Bit

#3 LVD In the macro screen, display/setting of the variable is:
0: Conventional specification.
1: FS16*i* compatible specification.

> **NOTE**
> Please don’t change this parameter while executing the program.

	#7	#6	#5	#4	#3	#2	#1	#0
24308								MMP

[Input type] Parameter input

[Data type] Bit

#0 MMP The program displayed on the program screen in HNDL, INC, JOG or REF mode is:
0: A program which is the last displayed in MEM or RMT mode.
1: A program which is the last displayed in MEM mode.

	#7	#6	#5	#4	#3	#2	#1	#0
24309								DSC

[Input type] Parameter input
[Data type] Bit

#0 DSC When the text data (program, parameter and offset etc.) which includes semicolon code (;) are input to the CNC:
0: Only the semicolon code(;) is not input.
1: The character string between semicolon(;) and EOB(LF)/CR/EOR(%) is not input as comments.

NOTE
1 Because these comments are not input, it is not possible to display, edit and output on the CNC.
2 The function is invalid in the input of EIA code.
3 The function is invalid in the binary data (such as Fine torque sensing data and Learning control data) and Maintenance information data.
4 Do not describe the comments in the line before the program code start (% at the file head).
5 The character string after semicolon in control out(), angle bracket<> or square bracket[] is not handled as comment.
6 The function is invalid when the data PUT/MPUT of Ethernet.

	#7	#6	#5	#4	#3	#2	#1	#0
24310								WOC

[Input type] Parameter input
[Data type] Bit

#0 WOC While the additional workpiece coordinate system is selecting and the parameter ABH (No.11308#6)=1, changing the workpiece origin offset value, external workpiece origin offset or the workpiece coordinate system shift value is reflect to the display of absolute coordinate value when:
0: The program start or reset.
1: The offset is changed.

NOTE
This parameter is effective at parameter ABH(No.11308#6)=1.

	#7	#6	#5	#4	#3	#2	#1	#0
24311	TPP							

[Input type] Parameter input
[Data type] Bit

#7 TPP When 8.4-inch display unit or vitual MDI key function is used, the current position on program screen of TEACH IN mode is:
0: Not displayed.
1: Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
24312	NDY							

[Input type] Parameter input
[Data type] Bit path

#7 NDY On the screen of tool offset for milling and turning, Y-axis offset is:
0: Displayed.
1: Not displayed.

24316	Protection of data folder in data server (PSW)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 999999999

This parameter sets a password for protecting data folder in data server. When a value other than zero is set in this parameter and this value differs from the keyword set in parameter No.24317, data folder in data server is not displayed on Program list screen. The folder is also not displayed in a file list in data server, which is reffered from PCs via FTP connection.
Unless the same value as the password (No.24316) is set in the keyword (No.24317), this password cannot be changed.

NOTE
1 The state where password ≠ 0 and password ≠ keyword is referred to as the locked state. When an attempt is made to modify the password by MDI input operation in this state, the warning message "WRITE PROTECTED" is displayed to indicate that the password cannot be modified. When an attempt is made to modify the password with G10 (programmable parameter input), alarm PS0231, “ILLEGAL FORMAT IN G10 L52” is issued.
2 When the value of the password is not 0, the parameter screen does not display the password. Care must be taken in setting a password.

24317	Protection key for data folder in data server (Key)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 999999999

When the same value as the password (No. 24316) is set in this parameter, the locked state is released and the user can change the password.

NOTE
The value set in this parameter is not displayed. When the power is turned off, this parameter is set to 0.

24901	Operation history signal selection PMC path number (No. 01)
to	to
24920	Operation history signal selection PMC path number (No. 20)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 3

These parameters set operation history signal selection PMC path numbers Nos. 1 to 20.
The correspondence between PMC path numbers and settings is as given in the table below.

PMC path number	Parameter value
Not selected.	0
1st PMC	1
2nd PMC	2
3rd PMC	3

Nos. 1 to 20 correspond to Nos. 1 to 20 on the operation history signal selection screen.
These parameters are paired with other parameters as given below.

No.	PMC path number	Address type	Address number	Bit number
01	No. 24901	No. 12801	No. 12841	No. 12881
02	No. 24902	No. 12802	No. 12842	No. 12882
03	No. 24903	No. 12803	No. 12843	No. 12883
…		…	…	…
20	No. 24920	No. 12820	No. 12860	No. 12900

NOTE

1 Operation history signals that can be selected and deselected with parameters are for the first 20 of 60 sets. If an operation history signal is specified from the operation history signal selection screen, the PMC path number is fixed at the first PMC.

2 To deselect a signal, set 0.
At this time, 0 is set as the initial value in the address type (Nos. 12801 to 12820), the address number (Nos. 12841 to 12860), and the bit number (Nos. 12881 to 12900) corresponding to that signal.

3 When a PMC path number is set, 1 is set as the initial value in the address type (Nos. 12801 to 12820) corresponding to that signal, and 0 is set as the initial value in the address number (Nos. 12841 to 12860) and the bit number (Nos. 12881 to 12900).
[Example]
If parameter No. 24901 is set to 1, the parameters are initialized as follows:
No. 12801=1 Address type
No. 12841=0 Address number
No. 12881=00000000 Bit number
If, however, the address type (Nos. 12801 to 12820) corresponding to that signal is set, the address type (Nos. 12801 to 12820), the address number (Nos. 12841 to 12860), and the bit number (Nos. 12881 to 12900) will not be initialized.

4 If an attempt is made to set a value that cannot be set, a warning, "DATA IS OUT OF RANGE" appears; retry setting a value.

4.154 LATHE/MACHINING CENTER G CODE SYSTEM SWITCHING FUNCTION(2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
25570								TMM

[Input type] Parameter input
[Data type] Bit path

#0 TMM The modal relevant parameter is
0: Refer to the existing parameter.
1: Refer to the lathe/machining center G code system switching function.

	#7	#6	#5	#4	#3	#2	#1	#0
25571	D08	D07	D06	D05	D04	D03	D02	D01
25572	D16	D15	D14	D13	D12	D11	D10	D09
25573	D24	D23	D22	D21	D20	D19	D18	D17
25574	D32	D31	D30	D29	D28	D27	D26	D25

[Input type] Parameter input
[Data type] Bit path

D01 to D32 Set a group of G codes to be displayed on the program check screen.
The table below indicates the correspondence between bits and G code groups.
The setting of a bit has the following meaning:
0: Displays the G code group corresponding to a bit.
1: Does not display the G code group corresponding to a bit.

Parameter	G code group
D01	01
D02	02
D03	03
:	:
D32	32

	#7	#6	#5	#4	#3	#2	#1	#0
25575								
						G19	G18	

[Input type] Parameter input
[Data type] Bit path

#1 G18 Plane selected when power is turned on or when the control is cleared
0: G17 mode (plane XY)
1: G18 mode (plane ZX)

#2 G19 Plane selected when power is turned on or when the control is cleared
0: The setting of bit 1 (G18) of parameter No. 25575 is followed.
1: G19 mode (plane YZ)
When this bit is set to 1, set bit 1 (G18) of parameter No. 25575 to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
25576							**DWL**	

[Input type] Parameter input
[Data type] Bit path

#1 DWL The dwell time (G04) is:
0: Always dwell per second.
1: Dwell per second in the feed per minute mode (G94), or dwell per rotation in the feed per rotation mode (G95).

	#7	#6	#5	#4	#3	#2	#1	#0
25577	**C07**	**C06**	**C05**	**C04**	**C03**	**C02**	**C01**	

	#7	#6	#5	#4	#3	#2	#1	#0
25578	**C15**	**C14**	**C13**	**C12**	**C11**	**C10**	**C09**	**C08**

	#7	#6	#5	#4	#3	#2	#1	#0
25579	**C23**	**C22**		**C20**	**C19**	**C18**	**C17**	**C16**

	#7	#6	#5	#4	#3	#2	#1	#0
25580	**CFH**	**C30**	**C29**	**C28**	**C27**	**C26**	**C25**	**C24**

[Input type] Parameter input
[Data type] Bit

C01 to C30 If bit 6 (CLR) of parameter No. 3402 is set to 1, set a group of G codes to be placed in the cleared state when the CNC is reset by the 

key of the MDI unit, the external reset signal, the reset and rewind signal, or the emergency stop signal.
The table below indicates the correspondence between bits and G code groups
The setting of a bit has the following meaning:
0: Places the G code group in the cleared state.
1: Does not place G code group in the cleared state.

Parameter	G code group
C01	01
C02	02
C03	03
:	:
C30	30

#7 CFH When bit 6 (CLR) of parameter No. 3402 is 1, the 

key on the MDI unit, the external reset signal, the reset and rewind signal, or emergency stop will,
0: Clear F codes, H codes (for the M series), D codes (for the M series), and T codes (for the T series).
1: Not clear F codes, H codes (for the M series), D codes (for the M series), and T codes (for the T series).

	#7	#6	#5	#4	#3	#2	#1	#0
25581								**TPS**

[Input type] Parameter input
[Data type] Bit path

#0 TPS When a plane is selected on the lathe system in the power-on state or cleared state:
0: G18 mode (Z-X plane) is selected.
1: Bits 1 (G18) and 2 (G19) of parameter No. 25575 are followed.

	#7	#6	#5	#4	#3	#2	#1	#0
25582	D40	D39	D38	D37	D36	D35	D34	D33

	#7	#6	#5	#4	#3	#2	#1	#0
25583	D48	D47	D46	D45	D44	D43	D42	D41

	#7	#6	#5	#4	#3	#2	#1	#0
25584	D56	D55	D54	D53	D52	D51	D50	D49

[Input type] Parameter input
[Data type] Bit path

D33 to D49 These bits set the G code groups to be displayed on the program check screen.
The correspondence between the bits and G code groups is as given in the table below.
The settings of each bit have the meanings below.
0: The G code group corresponding to the bit is displayed.
1: The G code group corresponding to the bit is not displayed.

Parameter	G code group
D33	33
D34	34
D35	35
:	:
D56	56

25585	G code modal group (first one) to be recorded as history data when an alarm is issued
~	to
25594	G code modal group (tenth one) to be recorded as history data when an alarm is issued

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to maximum G code group number
Set a G code modal group number to be recorded as alarm history and operation history data when an alarm is issued.

> **NOTE**
> If the parameter sets a value out of the valid data range, nth records the state of n group. (For instance, 01 group is recorded if the 1st parameter is out of range and 02 group is recorded if the 2nd parameter is out of range.)

25595	Axis display order for current position display screens

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 32
Set the order in which axes are displayed on current position display screens.

> **NOTE**
> When this parameter is all 0, the display of the axis is displayed according to the parameter No. 3130.

4.155 PARAMETERS OF HIGH PRECISION OSCILLATION FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
25650								SSO

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

#0 SSO High precision oscillation function is
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
25651					HST	SGS	FFS	OST

[Input type] Parameter input
[Data type] Bit path

#0 OST During oscillation motion, if G80 command or reset is specified,
0: Oscillation axis moves to point R and stops. (Standard specification)
1: Oscillation axis decelerates and stops.

#1 FFS When oscillation motion is started by G81.1 command,
0: Oscillation motion is begun, after the oscillation axis passes point R and the center point between upper and lower dead points are passed. (Standard specification)
1: Movements to point R and to the center point between upper and lower dead points is omitted, and oscillation motion can be immediately started.

If this parameter is set to 1, the first dead point is as follows.

State before G81.1 command	The first dead point
First command of oscillation motion after the power is turned on or in the state of reset.	Lower dead point
In the state that command of cancel was specified on the way to lower dead point at last oscillation motion.	
In the state that command of cancel was specified on the way to upper dead point at last oscillation motion.	Upper dead point

> **NOTE**
> If this parameter is effective, parameter OST(No,25651#0) need be set to 1.

#2 SGS If oscillation motion is canceled by oscillation start signal CHPST <Gn051.6>,
- 0: Oscillation axis moves to point R and stops. (Standard specification)
- 1: Oscillation axis decelerates and stops.

If the oscillation axis decelerates and stops by oscillation start signal CHPST, use each axis workpiece coordinate system preset signal WPRST1-WPRST8<Gn358> together.
Refer to the following manual for details of the setting method and so on.
"FANUC Series 30*i*/31*i*/32*i*-MODEL B CONNECTION MANUAL (FUNCTION)" (B-64483EN-1) "Each Axis Workpiece Coordinate System Preset Signal"

> **NOTE**
> If this parameter is effective, parameter OST(No,25651#0) need be set to 1.

#3 HST During oscillation motion, if oscillation hold signal *CHLD <Gn051.7> is set to"0" from "1",
- 0: Oscillation axis moves to point R and suspends. (Standard specification)
- 1: Oscillation axis decelerates and suspends.

> **NOTE**
> If this parameter is effective, parameter OST and SGS (No.25651#0 and #2) need be set to 1.

25652	Maximum allowable acceleration rate of oscillation motion

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, deg/sec^2 (machine unit)
[Valid data range] Refer to standard parameter setting table (D).

Set a maximum allowable acceleration rate for oscillation axis during oscillation motion (with sine curve feedrate).

If a value greater than maximum value is set, the value is clamped to maximum value.
If 0 is set, maximum value is assumed to be set.

25653	Acceleration rate of starting or cancellation oscillation motion

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec^2, inch/sec^2, deg/sec^2 (machine unit)
[Valid data range] Refer to standard parameter setting table (D).

It is the acceleration rate of starting motion (from point R to center point between upper and lower dead points) or cancel motion.
Moreover, when override is changed during oscillation motion, the acceleration/ deceleration is set by this parameter.
If a value greater than maximum value is set, the value is clamped to maximum value.
If 0 is set, maximum value is assumed to be set.

	#7	#6	#5	#4	#3	#2	#1	#0
25655	ABS							

[Input type] Parameter input
[Data type] Bit path

#7 ABS In chopping function, the real position data is displayed at
0: Machine coordinates.
1: Absolute coordinates.

> **NOTE**
> The real position data are displayed on the real data screen (It is enabled when parameter CHD (No.8360#4) is set to 1).

4.156 PARAMETERS OF SPINDLE UNIT COMPENSATION AND NUTATING ROTARY HEAD TOOL LENGTH COMPENSATION

	#7	#6	#5	#4	#3	#2	#1	#0
25860	SU3	SU2			NCV	SCV		

[Input type] Parameter input
[Data type] Bit path

#2 SCV At power-on, a spindle unit compensation vector is:
0: Not calculated.
1: Calculated.

> **NOTE**
> This parameter is effective in the case of either of the following settings:
> - Bit 6 (CLR) of parameter No. 3402 = 0
> - Bit 6 (CLR) of parameter No. 3402 = 1 and bit 3 (C27) of parameter No. 3409 = 1

#3 NCV At power-on, an nutating rotary head tool length compensation vector is:
0: Not calculated.
1: Calculated.

> **NOTE**
> This parameter is effective in the case of either of the following settings:
> - Bit 6 (CLR) of parameter No. 3402 = 0
> - Bit 6 (CLR) of parameter No. 3402 = 1, bit 0 (C08) of parameter No. 3407 = 1, and bit 7 (CFH) of parameter No. 3409 = 1

#6 SU2 In absolute coordinate display and in relative position display, the spindle unit compensation vector is:
0: Included.
1: Not included.

#7 SU3 On the spindle unit compensation/nutating rotary head tool length compensation screens, parameter input is:
0: Prohibited.
1: Permitted.

25861	**Rotation axis for performing spindle unit compensation/tool length compensation (1st set)**
25862	**Linear axis 1 for performing spindle unit compensation/tool length compensation (1st set)**
25863	**Linear axis 2 for performing spindle unit compensation/tool length compensation (1st set)**
25864	**Linear axis 3 for performing spindle unit compensation/tool length compensation (1st set)**
25866	**Rotation axis for performing spindle unit compensation/tool length compensation (2nd set)**
25867	**Linear axis 1 for performing spindle unit compensation/tool length compensation (2nd set)**
25868	**Linear axis 2 for performing spindle unit compensation/tool length compensation (2nd set)**
25869	**Linear axis 3 for performing spindle unit compensation/tool length compensation (2nd set)**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

These parameters set the rotation axes and linear axes for performing spindle unit compensation/nutating rotary head tool length compensation.

25865	**Inclination of the rotation axis for performing spindle unit compensation/tool length compensation (1st set)**
25870	**Inclination of the rotation axis for performing spindle unit compensation/tool length compensation (2nd set)**

[Input type] Parameter input
[Data type] Real path
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] -360.0 to 360.0

These parameters set the inclinations of the rotation axes for performing spindle unit compensation/nutating rotary head tool length compensation.

25871	**Component on linear axis 1 of the V_2 vector for performing spindle unit compensation**
25872	**Component on linear axis 2 of the V_2 vector for performing spindle unit compensation**
25873	**Component on linear axis 3 of the V_2 vector for performing spindle unit compensation**
25874	**Component on linear axis 1 of the V_1 vector for performing spindle unit compensation**
25875	**Component on linear axis 2 of the V_1 vector for performing spindle unit compensation**
25876	**Component on linear axis 3 of the V_1 vector for performing spindle unit compensation**
25877	**Component on linear axis 1 of the V_0 vector for performing spindle unit compensation**
25878	**Component on linear axis 2 of the V_0 vector for performing spindle unit compensation**
25879	**Component on linear axis 3 of the V_0 vector for performing spindle unit compensation**

[Input type] Parameter input
[Data type] Real path
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the V_2, V_1, and V_0 vectors for performing spindle unit compensation.

25880	Reference angle of the rotation axis for performing spindle unit compensation (1st set)
25881	Reference angle of the rotation axis for performing spindle unit compensation (2nd set)
25882	Compensation amount of the rotation axis for performing spindle unit compensation (1st set)
25883	Compensation amount of the rotation axis for performing spindle unit compensation (2nd set)

[Input type] Parameter input
[Data type] Real path
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] -360.0 to 360.0

These parameters set the reference angles and compensation amount for performing spindle unit compensation.

25884	Reference angle of the rotation axis for performing nutating rotary head tool length compensation (1st set)
25885	Reference angle of the rotation axis for performing nutating rotary head tool length compensation (2nd set)

[Input type] Parameter input
[Data type] Real path
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] -360.0 to 360.0

These parameters set the reference angles for the rotation axes for performing nutating rotary head tool length compensation.

25886	Reference angle (R_A) of the tool axis on the plane of linear axes 2-3
25887	Reference angle (R_B) of the tool axis on the plane of linear axes 3-1

[Input type] Parameter input
[Data type] Real path
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] -360.0 to 360.0

These parameters set the direction of the rotation axis for performing nutating rotary head tool length compensation, using two angles R_A and R_B.

25888	Compensation amount of the tilt angle of the rotation axis

[Input type] Parameter input
[Data type] Real path
[Min. unit of data] Depend on the increment system of the reference axis
[Valid data range] -360.0 to 360.0

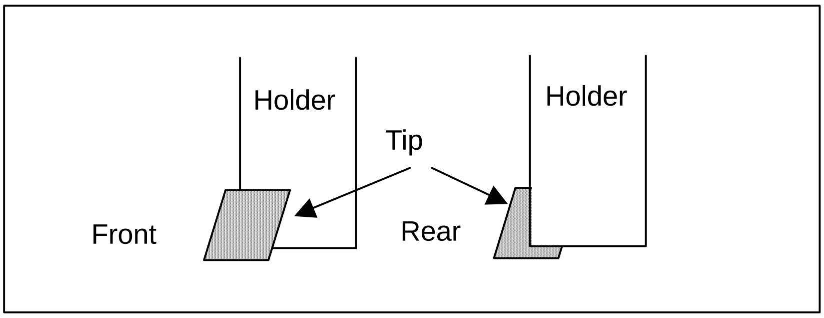
This parameter sets the compensation amount of the tilt angle of the rotation axis when the spindle unit is of NUTATOR TYPE.

4.157 PARAMETERS OF GRAPHIC DISPLAY (5 OF 5)

	#7	#6	#5	#4	#3	#2	#1	#0
27350								GTP

[Input type] Parameter input
[Data type] Bit

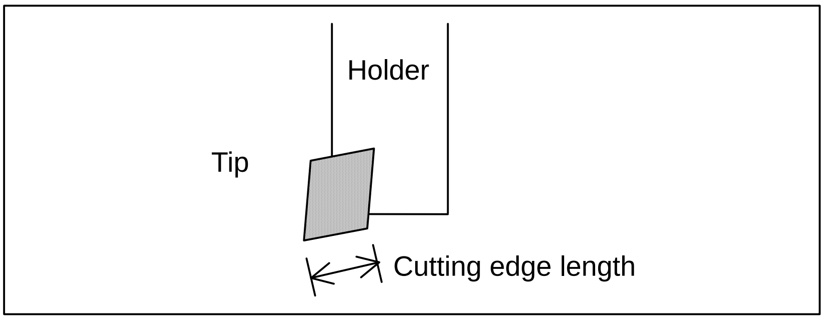
#0 GTP When a general-purpose tool is drawn in animated simulation, the tip is:
0: Positioned on the front.
1: Positioned on the rear.



27351	Cutting edge length applied when a general-purpose tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the cutting edge length applied when a general-purpose tool is drawn in animated simulation.

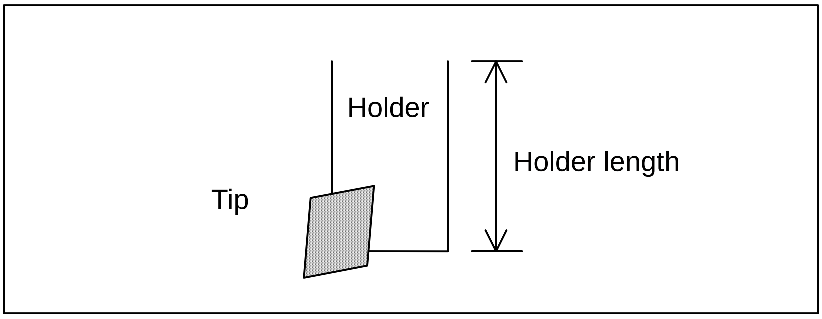


When 0 is set, 12 mm for metric input or 0.4724 inch for inch input is assumed.

27352	Holder length applied when a general-purpose tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder length applied when a general-purpose tool is drawn in animated simulation.

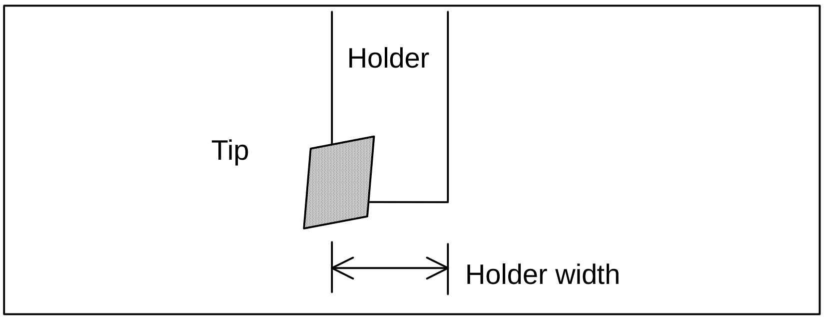


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27353	Holder width applied when a general-purpose tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder width applied when a general-purpose tool is drawn in animated simulation.

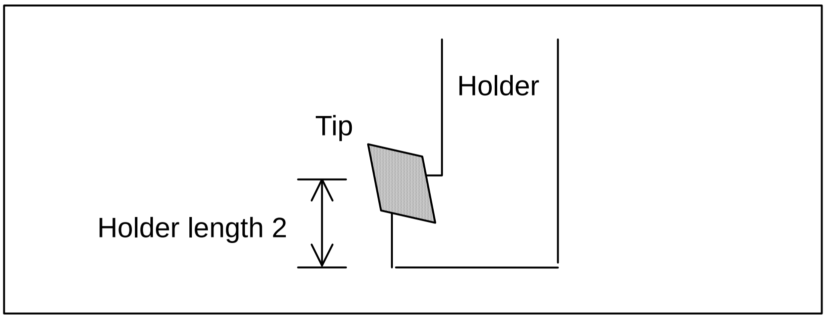


When 0 is set, 14 mm for metric input or 0.5512 inch for inch input is assumed.

27354	Holder length 2 applied when a general-purpose tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

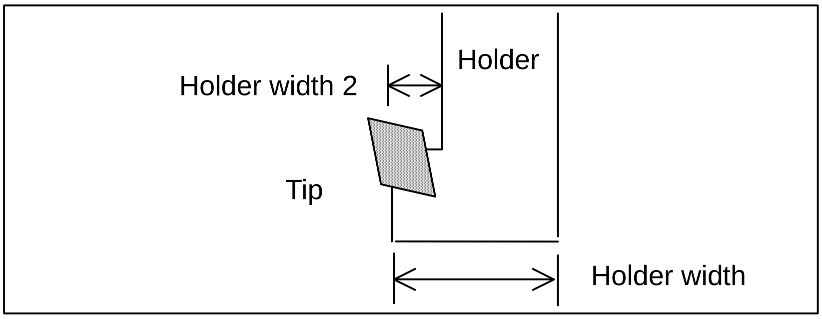
This parameter sets the holder length 2 applied when a general-purpose tool is drawn in animated simulation.



27355	Holder width 2 applied when a general-purpose tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

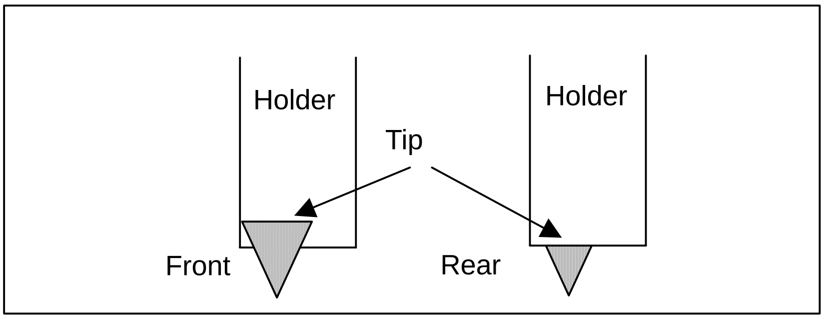
This parameter sets the holder width 2 applied when a general-purpose tool is drawn in animated simulation.



	#7	#6	#5	#4	#3	#2	#1	#0
27356								TTP

[Input type] Parameter input
[Data type] Bit

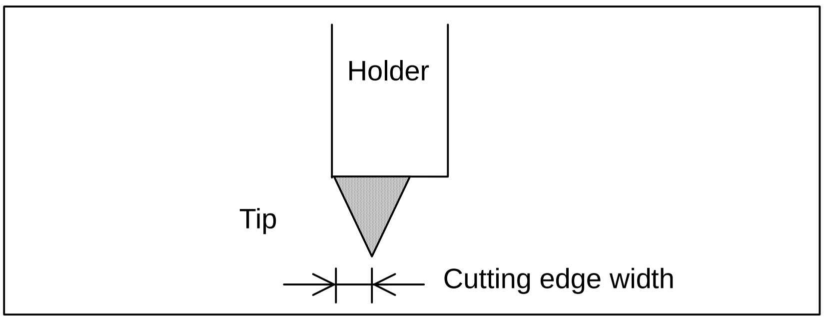
#0 TTP When a threading tool is drawn in animated simulation, the tip is:
0: Positioned on the front.
1: Positioned on the rear.



27357	Cutting edge width applied when a threading tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the cutting edge width applied when a threading tool is drawn in animated simulation.



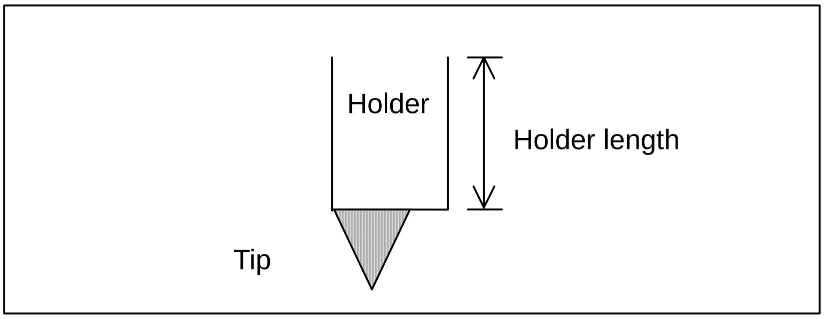
When 0 is set, 3 mm for metric input or 0.11811 inch for inch input is assumed.

27358	Holder length applied when a threading tool is drawn in animated simulation

[Input type] Parameter input

[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder length applied when a threading tool is drawn in animated simulation.

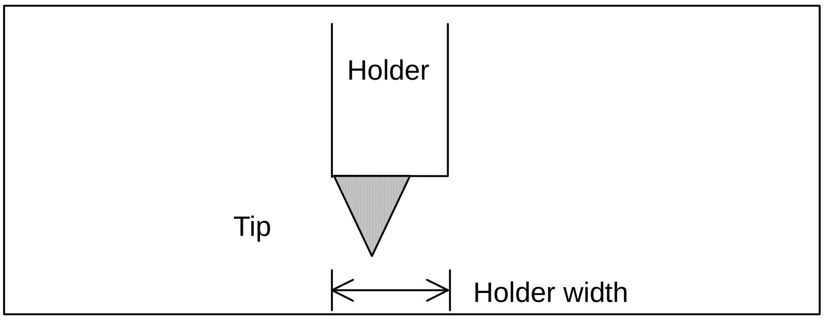


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27359	Holder width applied when a threading tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder width applied when a threading tool is drawn in animated simulation.

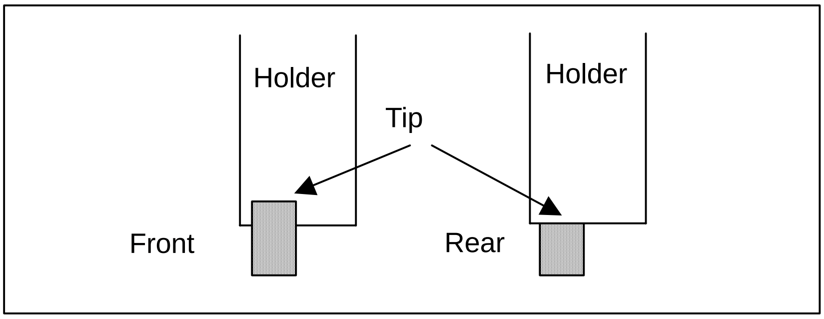


When 0 is set, 14 mm for metric input or 0.5512 inch for inch input is assumed.

	#7	#6	#5	#4	#3	#2	#1	#0
27360								GVP

[Input type] Parameter input
[Data type] Bit

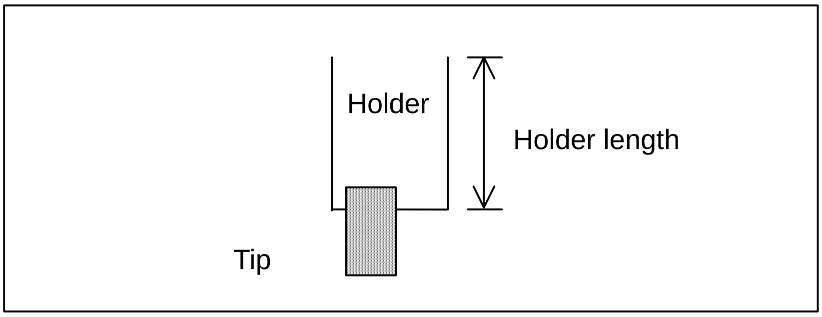
#0 GVP When a groove cutting tool is drawn in animated simulation, the tip is:
0: Positioned on the front.
1: Positioned on the rear.



27361	Holder length applied when a groove cutting tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder length applied when a groove cutting tool is drawn in animated simulation.

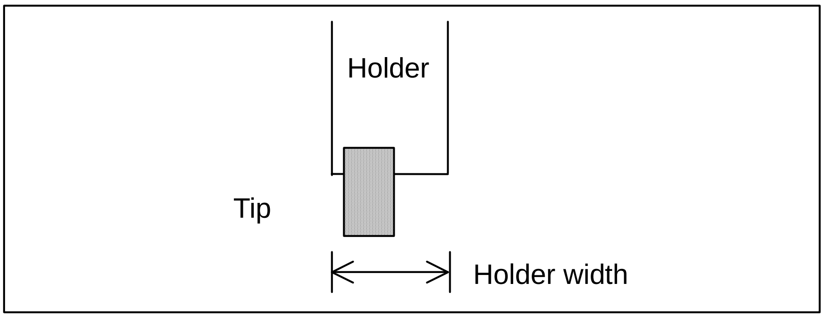


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27362	Holder width applied when a groove cutting tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder width applied when a groove cutting tool is drawn in animated simulation.

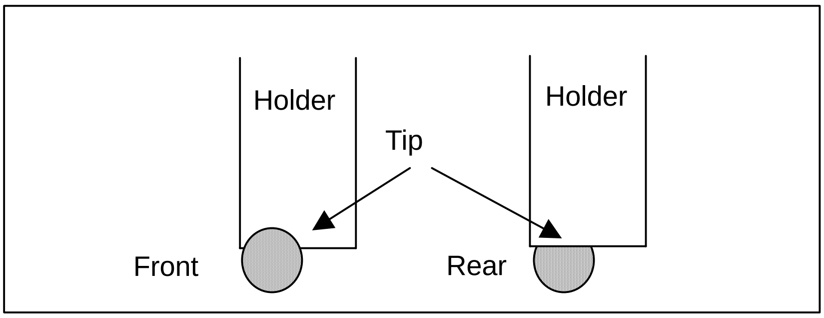


When 0 is set, 14 mm for metric input or 0.5512 inch for inch input is assumed.

	#7	#6	#5	#4	#3	#2	#1	#0
27363								BTP

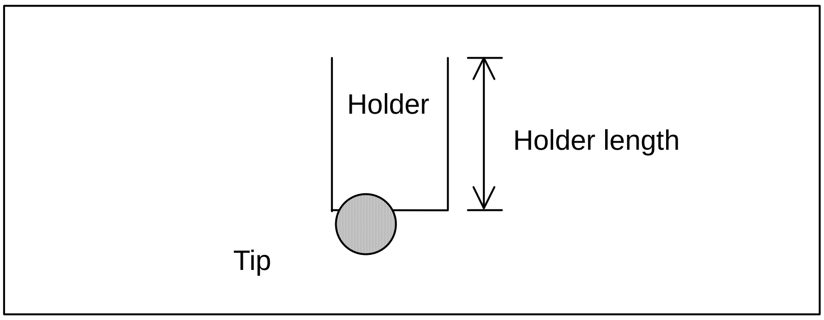
[Input type] Parameter input
[Data type] Bit

#0 BTP When a round-nose tool is drawn in animated simulation, the tip is:
0: Positioned on the front.
1: Positioned on the rear.



27364	Holder length applied when a round-nose tool is drawn in animated simulation

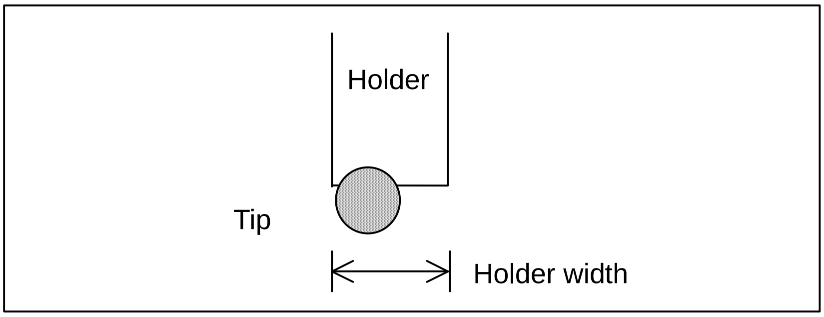
[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger
This parameter sets the holder length applied when a round-nose tool is drawn in animated simulation.



When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27365	Holder width applied when a round-nose tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger
This parameter sets the holder width applied when a round-nose tool is drawn in animated simulation.

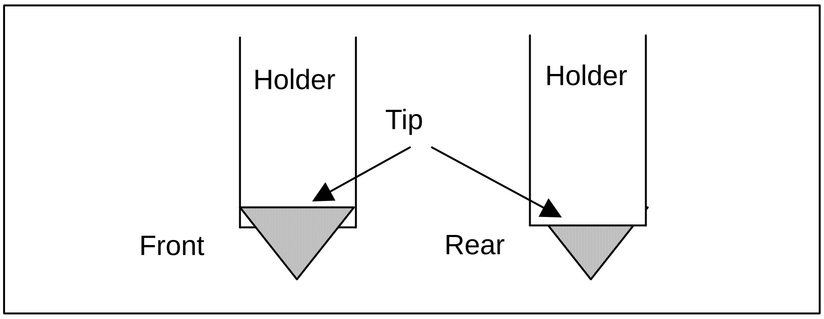


When 0 is set, 14 mm for metric input or 0.5512 inch for inch input is assumed.

	#7	#6	#5	#4	#3	#2	#1	#0
27366								**STP**

[Input type] Parameter input
[Data type] Bit

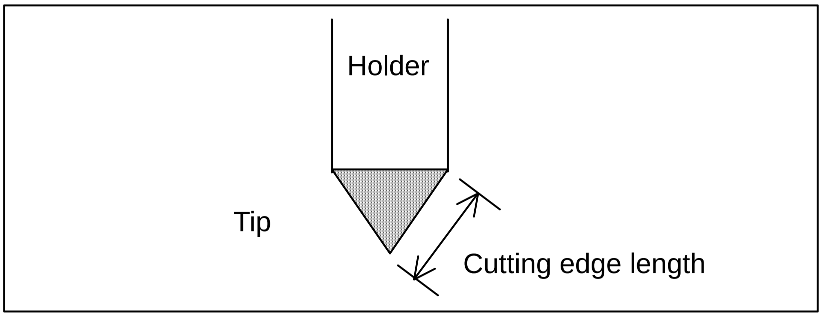
#0 STP When a point nose straight tool is drawn in animated simulation, the tip is:
0: Positioned on the front.
1: Positioned on the rear.



27367	**Cutting edge length applied when a point nose straight tool is drawn in animated simulation**

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the cutting edge length applied when a point nose straight tool is drawn in animated simulation.

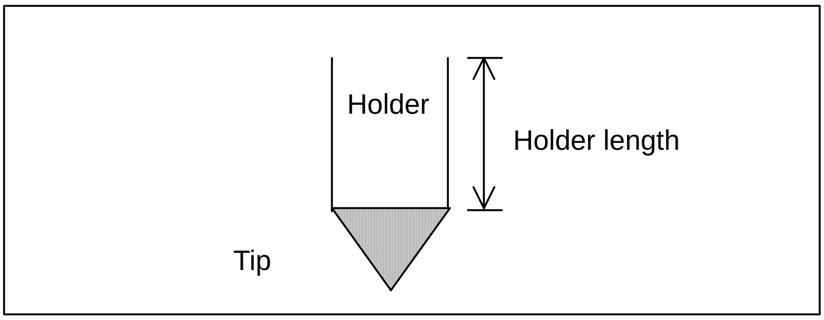


When 0 is set, 12 mm for metric input or 0.4724 inch for inch input is assumed.

27368	Holder length applied when a point nose straight tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder length applied when a point nose straight tool is drawn in animated simulation.

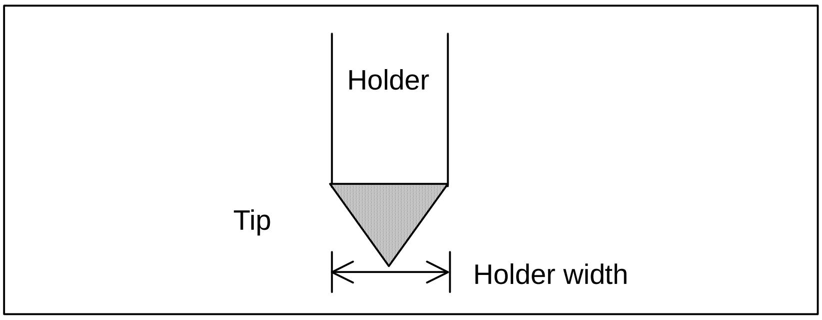


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27369	Holder width applied when a point nose straight tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder width applied when a point nose straight tool is drawn in animated simulation.

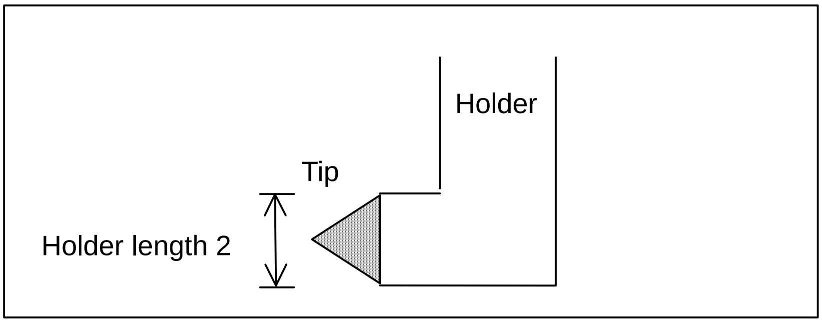


When 0 is set, 14 mm for metric input or 0.5512 inch for inch input is assumed.

27370	Holder length 2 applied when a point nose straight tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

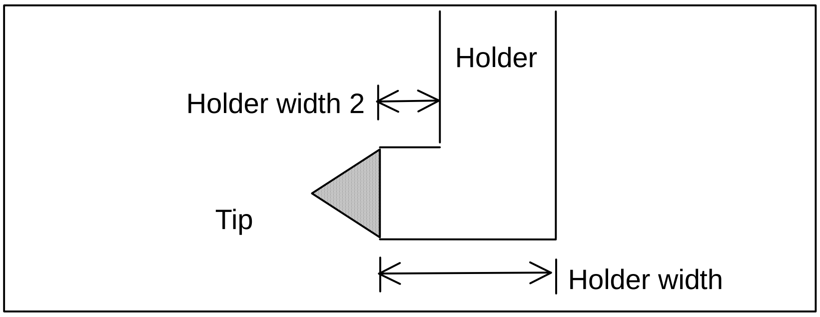
This parameter sets the holder length 2 applied when a point nose straight tool is drawn in animated simulation.



27371	Holder width 2 applied when a point nose straight tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

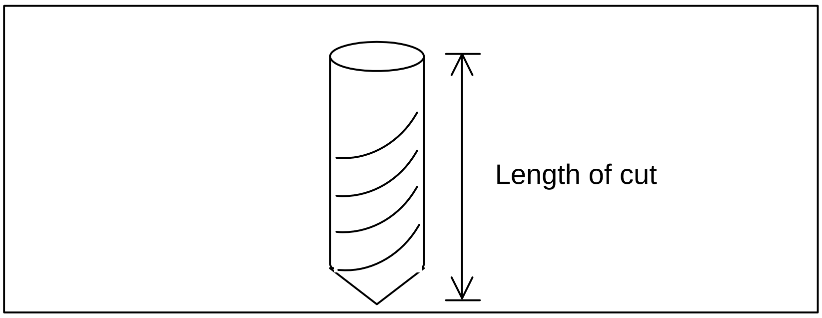
This parameter sets the holder width 2 applied when a point nose straight tool is drawn in animated simulation.



27372	Length of cut applied when a drill tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the length of cut applied when a drill tool is drawn in animated simulation.



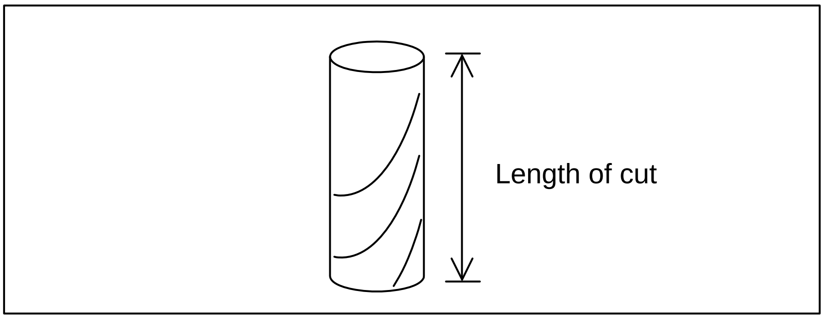
When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27373	Length of cut applied when a flat end milling cutter is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word

[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the length of cut applied when a flat end milling cutter is drawn in animated simulation.

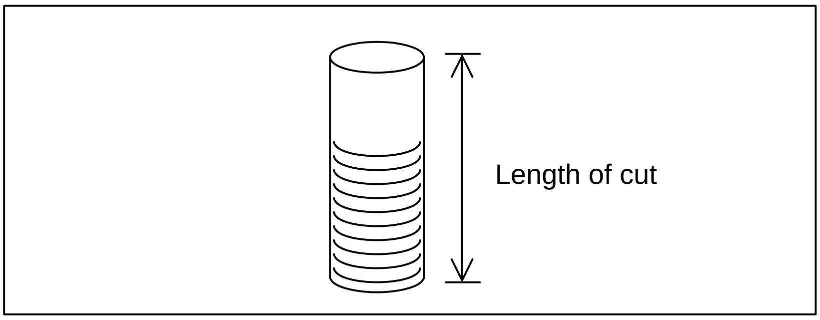


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27374	Length of cut applied when a tapping tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the length of cut applied when a tapping tool is drawn in animated simulation.

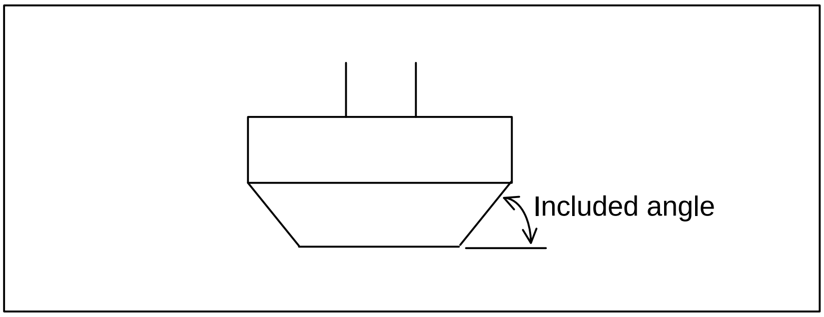


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27375	Included angle applied when a chamfering tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] degree
[Valid data range] 0 to 90

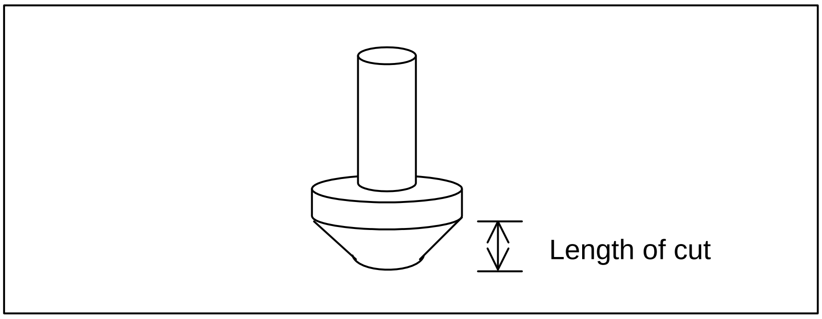
This parameter sets the included angle applied when a a chamfering tool is drawn in animated simulation.



27376	Length of cut applied when a chamfering tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the length of cut applied when a chamfering tool is drawn in animated simulation.

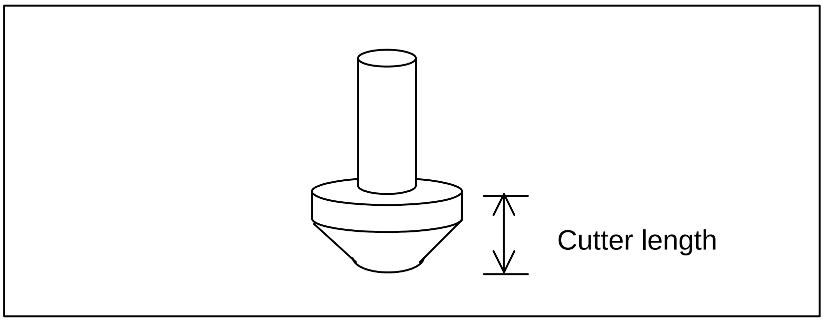


When 0 is set, 26 mm for metric input or 1.0236 inch for inch input is assumed.

27377	Cutter length applied when a chamfering tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the cutter length applied when a chamfering tool is drawn in animated simulation.

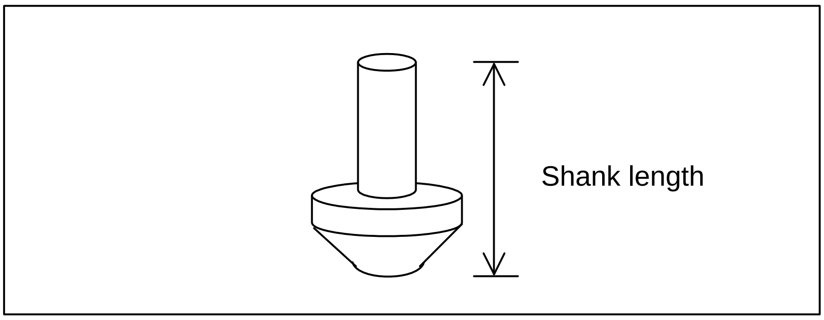


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27378	Shank length applied when a chamfering tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the shank length applied when a chamfering tool is drawn in animated simulation.

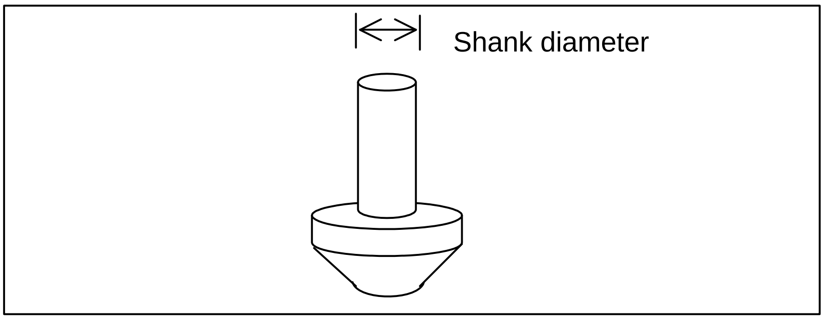


When 0 is set, 130 mm for metric input or 5.1181 inch for inch input is assumed.

27379	Shank diameter applied when a chamfering tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the shank diameter applied when a chamfering tool is drawn in animated simulation.

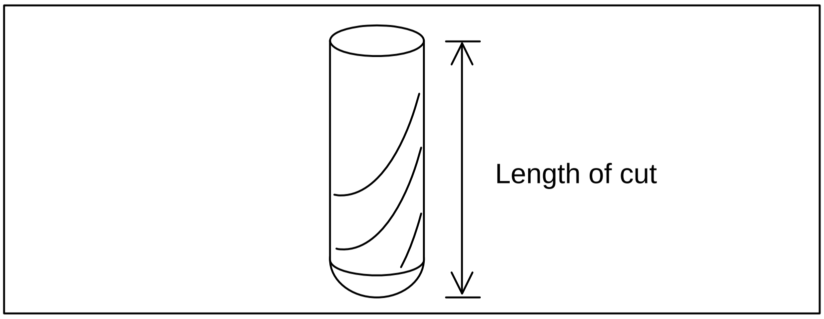


When 0 is set, 32 mm for metric input or 1.2598 inch for inch input is assumed.

27380	Length of cut applied when a ball end mill is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the length of cut applied when a ball end mill is drawn in animated simulation.

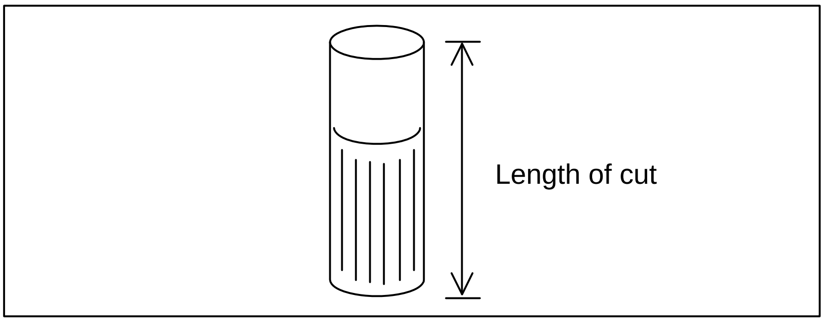


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27381	Length of cut applied when a reamer is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the length of cut applied when a reamer is drawn in animated simulation.

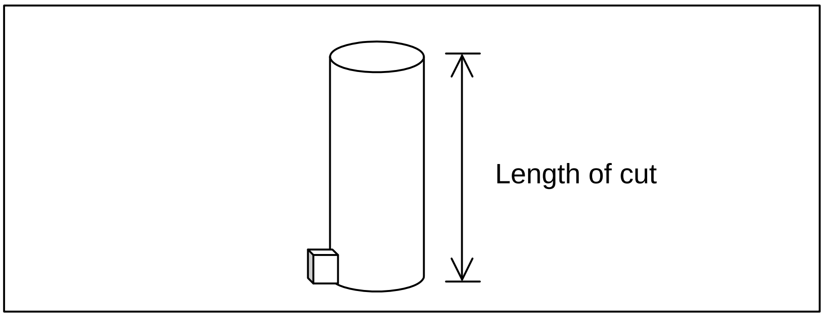


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27382	Length of cut applied when a boring tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the length of cut applied when a boring tool is drawn in animated simulation.

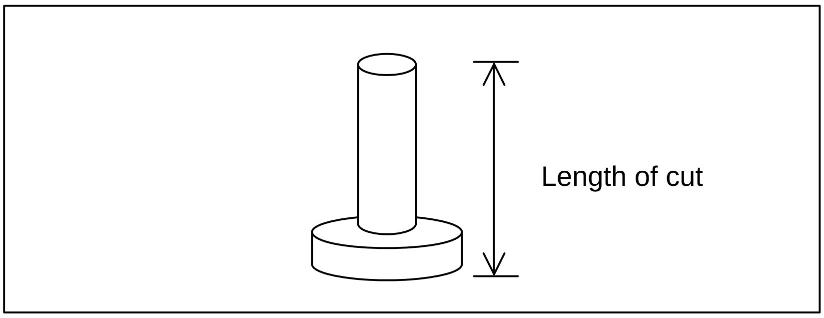


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27383	Length of cut applied when a face milling cutter is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the length of cut applied when a face milling cutter is drawn in animated simulation.

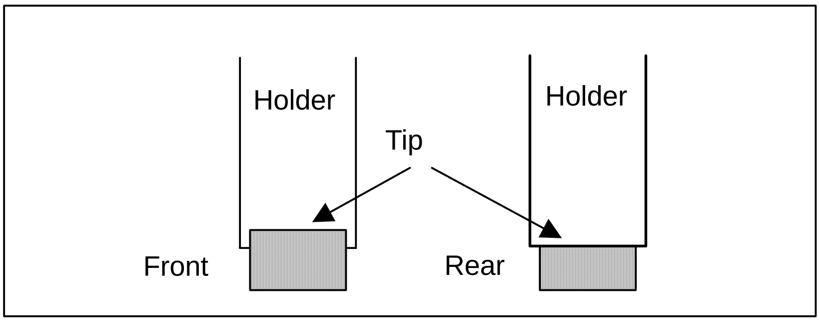


When 0 is set, 63 mm for metric input or 2.4803 inch for inch input is assumed.

	#7	#6	#5	#4	#3	#2	#1	#0
27384								VRP

[Input type] Parameter input
[Data type] Bit

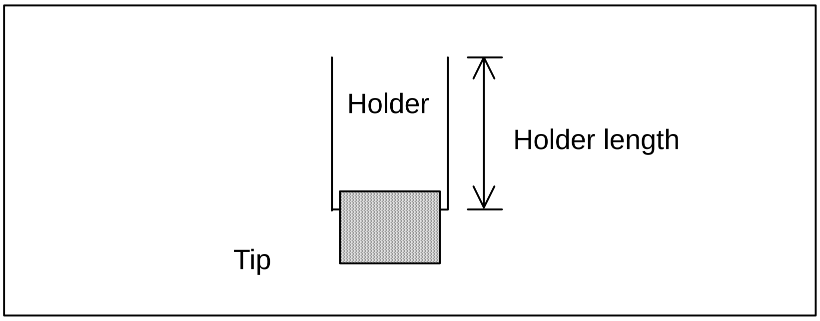
#0 VRP When a multifunction tool is drawn in animated simulation, the tip is:
0: Positioned on the front.
1: Positioned on the rear.



27385	Holder length applied when a multifunction tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder length applied when a multifunction tool is drawn in animated simulation.

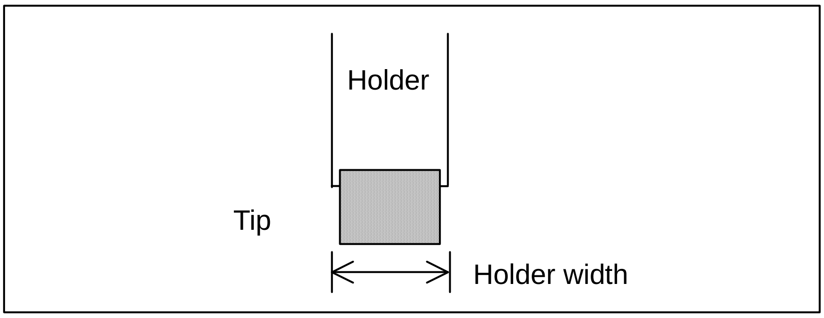


When 0 is set, 50 mm for metric input or 1.9685 inch for inch input is assumed.

27386	Holder width applied when a multifunction tool is drawn in animated simulation

[Input type] Parameter input
[Data type] 2-word
[Unit of data] 0.001mm (metric input), 0.0001inch (inch input)
[Valid data range] 0 or larger

This parameter sets the holder width applied when a multifunction tool is drawn in animated simulation.



When 0 is set, 14 mm for metric input or 0.5512 inch for inch input is assumed.

APPENDIX

A CHARACTER CODE LIST

Character	Code	Comment	Character	Code	Comment
A	065		6	054	
B	066		7	055	
C	067		8	056	
D	068		9	057	
E	069			032	Space
F	070		!	033	Exclamation mark
G	071		”	034	Quotation marks
H	072		#	035	Sharp
I	073		$	036	Dollar mark
J	074		%	037	Percent
K	075		&	038	Ampersand
L	076		’	039	Apostrophe
M	077		(	040	Left parenthesis
N	078		)	041	Right parenthesis
O	079		*	042	Asterisk
P	080		+	043	Positive sign
Q	081		,	044	Comma
R	082		-	045	Negative sign
S	083		.	046	Period
T	084		/	047	Slash
U	085		:	058	Colon
V	086		;	059	Semicolon
W	087		<	060	Left angle bracket
X	088		=	061	Equal sign
Y	089		>	062	Right angle bracket
Z	090		?	063	Question mark
0	048		@	064	Commercial at mark
1	049		[	091	Left square bracket
2	050		¥	092	Yen mark
3	051		]	093	Right square bracket
4	052		^	094	
5	053		_	095	Underline

INDEX

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REVISION RECORD

Edition	Date	Contents
04	Sep., 2012	• Addition of following items - Lathe/machining center G code system switching function(1 of 2) - Parameters of hypothetical linear axis control - Lathe/machining center G code system switching function(2 of 2) • Correction of errors
03	Aug., 2011	• Addition of following items - Input type - Parameters of arbitrary speed threading - Parameters of high precision oscillation function • Correction of errors
02	Oct., 2010	• Addition of following items - Parameters of Ethernet/FL-net functions - Parameter of machine configuration selecting function - Parameters of high-speed smooth TCP (1 of 2) - Parameter of three-dimensional rotary error compensation - Parameters of high-speed smooth TCP (2 of 2) - Parameters of safety function by FL-net • Correction of errors
01	Jun., 2010	