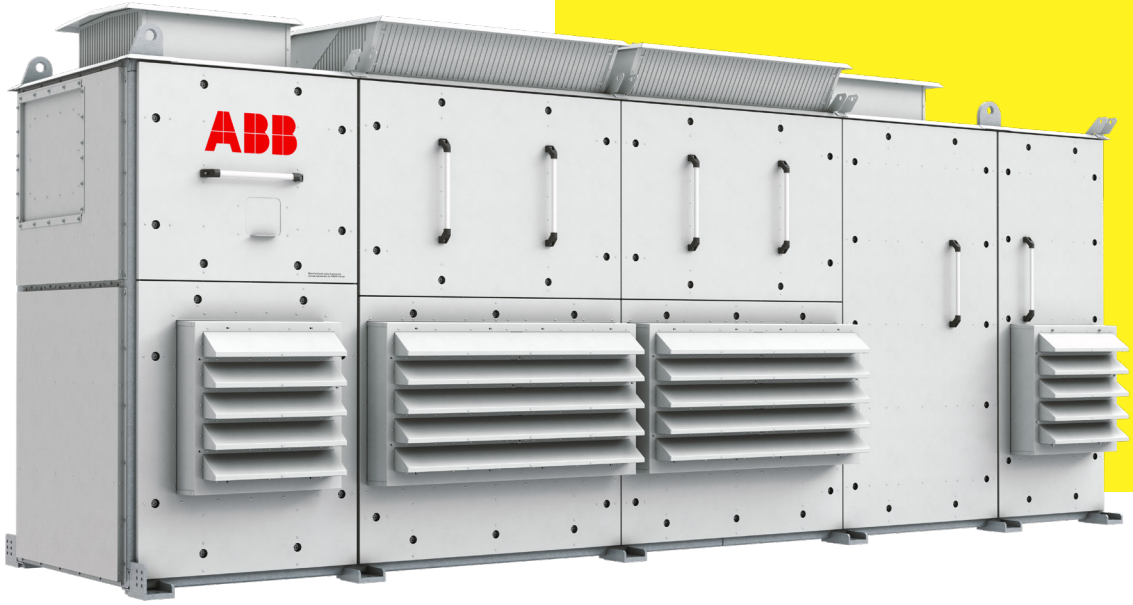
FIMER



Central inverter PVS980-58

Firmware manual

From 4348 to 5000 kVA

Related documents

Hardware manuals and guides

PVS980-58 (4348 to 5000 kVA) central inverters hardware manual *3AXD50000342181*

PVS980-58 (4348 to 5000 kVA) central inverters commissioning and maintenance manual *3AXD50000342198*

Firmware manuals and guides

PVS980 central inverters firmware manual *3AXD10001146386*

Option manuals and guides

ACS-AP-x Assistant control panels user's manual *3AUA0000085685*

Start-up and maintenance PC tool Drive composer user's manual *3AUA0000094606*

FENA-01/-11/-21 Ethernet adapter module user's manual *3AUA0000093568*

FSCA-01 RS-485 adapter module user's manual *3AUA0000109533*

NETA-21 Remote monitoring tool user's manual *3AUA0000096939*

Cybersecurity for ABB drives technical manual *3AXD10000492137*

Firmware manual

PVS980-58 central inverter
(from 4348 to 5000kVA)

3AXD10001146386 Rev A
EN
EFFECTIVE: 2020-05-08

Table of contents

4. Parameters

1

Introduction

This chapter describes the contents of the manual. It also contains information on the applicability of the manual, safety instructions, target audience, related documents, terms and abbreviations.

Safety instructions

Obey all of the safety instructions delivered with the inverter.

- Read the complete safety instructions before you install, commission, or use the inverter.
- Refer to the hardware manual and commissioning and maintenance manual for the inverter for detailed safety instructions.
- Read the software function specific warnings and notes before changing the default settings of the function. These warnings and notes are presented together with the parameter descriptions wherever appropriate.
- Read the task-specific safety instructions before you start the task. These safety instructions are presented together with the procedure wherever appropriate.
- Refer to the list of related documents on the inner front cover.

Applicability

This manual is applicable to inverters with control program version 1.71 or later (refer to parameter *107.05 Firmware ver*).

Target audience

This manual is intended for people who commission, adjust the parameters of, or operate, monitor or troubleshoot FIMER central inverters.

The reader is expected to know the standard electrical wiring practices, electronic components, and electrical schematic symbols.

Contents of the manual

The manual includes the following chapters.

- *Introduction* (this chapter).
- *Control panel* (on page *11*) gives instructions for using the control panel.
- *Program features* (on page *13*) describes the firmware features of the inveter
- *Parameters* (on page *55*) describes the parameters of the control program.
- *Troubleshooting* (on page *153*) lists all alarm and fault messages with possible causes and corrective actions.
- *Communication interfaces* (on page *179*) describes the menu structure of the inverter user interface.
- *Tools* (on page *189*) describes the PC tools that can be used with the inverter.

Related documents

Refer to the inside of the front cover.

Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is the sole responsibility of the customer to provide and continuously ensure a secure connection between the product and customer network or any other network (as the case may be). The customer shall establish and maintain any appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs and so on) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. FIMER and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Terms and abbreviations

Term/Abbreviation	Explanation
AC500	ABB programmable logic controller (PLC) series
ACS-AP-I	Control panel type
BAMU	Auxiliary measuring unit
BCU	Control unit
BU	Branching unit
CPU	Central processing unit
CS	Control section
DC input	Connection point from solar array to inverter. One input consists of one positive and one negative terminal.
DDCS	Distributed drives communication system. A protocol used in optical fiber communication inside and between drives and inverters.
Drive Composer	PC tool for operating, controlling, and monitoring inverters
FENA	Optional Ethernet adapter module for EtherNet/IP, Modbus TCP and PROFINET IO protocols.
FSCA	Optional Modbus RTU adapter module
IGBT	Insulated gate bipolar transistor.
Inverter	A cabinet-built device containing all inverter modules together with their control electronics, and I/O and auxiliary components. The inverter module converts the DC voltage to AC voltage. Its operation is controlled by switching the IGBTs.
I/O, IO	Input/Output
LCL	Passive line filter
MCB	Main circuit breaker
MGND	Solar array functional grounding unit
MIRU	Solar array insulation resistance measuring unit
MPPT	Maximum power point tracking. Inverter firmware function that automatically operates the photovoltaic generator at its maximum power point.
PLC	Programmable logic controller
PV	Photovoltaic
SCADA	Supervisory control and data acquisition
Solar array	Group of parallel-connected solar strings
Solar generator	The total of all solar strings of a solar power supply system, which are electrically interconnected

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Control panel

Refer to *ACX-AP-x assistant control panels user's manual* (*3AUA0000085685* [English]).

3

Program features

This chapter describes the program features of the firmware. For each feature there is a list of related parameters, faults and alarms, if applicable.

Product overview

The PVS980-58 is a central inverter that converts, adjusts and conveys power that is generated by a solar generator to the electrical power system.

See the descriptions of features listed in *List of program features*:

Tabel 1: List of program features

Operational description

Inverter operation uses the following machine states.

Standby – inverter is not enabled.

Initialize – inverter initializes the internal systems and performs self-tests.

Disconnected – inverter waits for permission to connect to the grid.

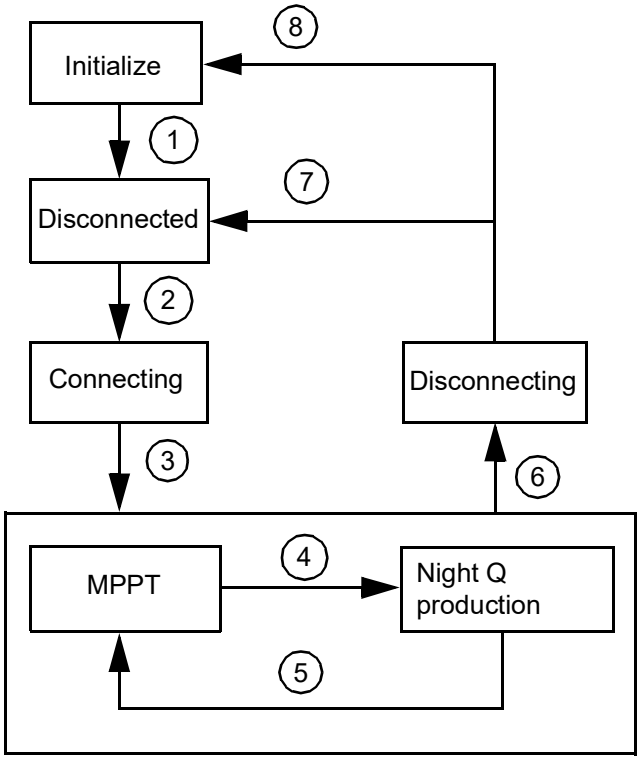
Connecting – inverter performs DC voltage and grid stability tests.

MPPT – is the normal operational state during power generation.

Standby or Night Q production – When the DC power level from panels is low, the inverter is in this state depending on the night mode settings (parameter *213.51 Night Q production*).

Disconnecting – disconnects from the grid.

Initialize – If inverter is not enabled or if fault occurs, inverter enters this state and waits to be reset.



Transition number	Triggering condition
1	Inverter is enabled and initialized successfully, and not faulted.
2	Grid is stable and AC breakers are closed.
3	All power modules are ready for operation.
4	Reactive power compensation is enabled and PV power is less than the pre-defined limit.
5	Reactive power compensation is disabled.
6	Inverter is faulted or shut down is requested or grid is not stable or PV power is less than the predefined limit.
7	Inverter is enabled and not faulted.
8	Inverter is disabled or faulted.

Figure 1. Operational states

Inverter start/stop

Inverter operation

The parameter *189.01 Inverter operation* can be used to shut down the inverter in a controlled way and to disable autonomous operation. In addition to shut down, inverter operation also sets the main state machine to the initial state and also affects grid monitoring delays. Grid monitoring delays are restarted after enabling the operation.

Note: Software update is possible only if inverter operation is disabled.

Start/stop switch

Start/stop switch on the inverter control section is one condition for starting the inverter. The switch must stay on to allow operation and if it is turned off, the inverter performs a controlled shut down.

Transfer trip

The Transfer trip function allows to remotely shut down the inverter as fast as possible. The parameter *189.04 SCADA transfer trip* can be written by, e.g., SCADA systems. In addition, the IO signal can be used to signal the inverter to shut down. The input that is the source for the transfer trip signal can be selected with parameter *189.03 IO transfer trip source* signal.

When transfer trip is triggered an event can be generated. The generated event depends on the action selected by parameter *189.05 Transfer trip event*.

Shut down

The inverter can be signaled to shut down in a controlled way using an IO signal. The parameter *189.06 IO shutdown source* can be used to select which input is the source for the shutdown signal. In addition, parameter *189.07 SCADA shutdown* can be used to signal the inverter to shut down.

When shut down is requested, an event can be generated. The generated event depends on the action selected by parameter *189.08 Shutdown event*.

Settings

Parameter group:*189 Inverter control*

Control interfaces

Control panel

The inverter can be monitored and controlled locally from a single ACS-AP-I assistant control panel.

Fieldbus

The inverter can be connected to several automation systems through fieldbus interfaces. For information on how to control/monitor the inverter through an external control system, see *Communication interfaces* on page *179*.

Settings

Parameter groups: *150 FBA* and *154 FBA B settings*.

Grid code settings

Preset grid codes

The inverter has preset grid code settings for numerous countries. The installation grid is set with parameter *135.01 Grid code*.

Note: The inverter will not operate without a valid grid code setting.

When a grid code is selected, all the necessary parameter settings are set to match the grid requirements. The grid code settings affect parameters in the following groups: *125 FRT support curve*, *126 FRT tripping curve*, *130 Limits* and *135 Grid monitoring*. The parameters include, e.g., tripping limits for under- and overvoltage and under- and overfrequency, initial connection delays, a variety of reconnection delays, anti-islanding settings, fault ride-through settings, power limitation settings, and MPPT recovery settings. Usually the grid code is not changed during the lifetime of the inverter.

If you need to change the grid code, note that changing the parameter *135.01 Grid code* always overrides manual changes performed on the above-mentioned parameter groups.

The ready-made parameter settings that are installed by the selected grid code can be modified according to the local requirements after the grid code is set. See more details in the section *Customizing grid code settings*.

Customizing grid code settings

To change the grid code-related parameter settings (parameters in groups *125 FRT support curve*, *126 FRT tripping curve*, *130 Limits* and *135 Grid monitoring*), follow this procedure:

Disable the inverter

1. Enter the **Parameter** menu.
2. Select *189.01 Inverter operation* and press **Edit**.
3. Change the value from **Enabled** to **Disabled** and press **Save**. After a short period, the inverter stops running and it is possible to change the parameter values.

Customize settings

1. Enter the parameter list: **Menu** → **Parameters** → **Complete list**.
2. Check that you have set a grid code with parameter *135.01 Grid code*.
3. Make required changes to the parameters in groups: *125 FRT support curve*, *126 FRT tripping curve*, *130 Limits* and *135 Grid monitoring*.

Enable the inverter and save the parameter changes to permanent memory

1. Select *189.01 Inverter operation* to **Enable**.
2. Save parameter values by setting the parameter *196.07 Param save*.

Settings

Parameters: *135.01 Grid code*, *189.01 Inverter operation*

Grid monitoring

The inverter monitors grid conditions with internal measurements. The measured frequency and voltages are compared against the limits set in parameter group *135 Grid monitoring*. If the measured values do not stay within the limit for a certain minimum period of time, the inverter declares the grid as unstable and disconnects from the grid and inhibits grid connection.

There are two types of grid monitoring limits: normal limit and connection limit.

Normal limit – is always active and can declare the grid unstable at anytime.

Connection limit – is active when the inverter is not connected to the grid. Typically connection limit is stricter than normal limit.

All grid monitoring limits can be enabled independently. Grid monitoring and fault ride-through are parallel features. They can both be enabled or disabled separately.

Notes:
- All grid monitoring settings are reset when the grid code is changed.
- Depending on the installation grid, an external third party-certified grid monitoring relay may be needed.

Nominal values

Note: Consider the fault ride-through settings when defining grid monitoring limits.

The inverter monitors the line-to-line voltages. The settings for grid monitoring can be set in relation to nominal values. The inverter nominal line-to-line voltage on the low voltage side of the MV transformer can be set with parameters. Contact your local FIMER support for more information.

Connection delays

Typically, it is required that the grid must be stable for a time period before connection to the grid is allowed. For this purpose there is a set of delays.

- *135.10 Initial connection delay* must expire before the first grid connection attempt can be made after a power-up.
- *135.11 Reconnection delay* defines the delay that must expire after a disconnection before the following reconnection can be made.
- *135.13 Quick reconnection delay* is used if the grid is unstable for less than the time defined in parameter *135.12 Quick disturbance limit*. Thus a short unstable grid allows a faster reconnection. If parameter *135.12* is set to **0**, quick reconnection is not used.

Settings

Parameters: *135.10...135.13*

Connection limits

The grid monitoring function of the inverter includes a connection condition check that is active when the inverter is attempting to connect to the grid. Typically, grid connection limits are more stringent than grid disconnection limits. Connection limits may also be referred to as "cut-in" conditions. There are connection limits for underfrequency, overfrequency, overvoltage, and undervoltage. Each phase/main voltage is independently monitored. The connection limits can be disabled, enabled only for the first connection, or enabled also for reconnections.

Settings

Parameters: *135.20*...*135.27*

● Voltage monitoring

There are four limits for undervoltage monitoring and four limits for overvoltage monitoring. Each limit has an enable parameter, a limit parameter, and a time parameter.

When the limit is enabled and the measured value exceeds the limit for the duration of the time parameter, the grid is declared as unstable. All limit checks are logically connected in parallel. Each phase/main voltage is independently monitored.

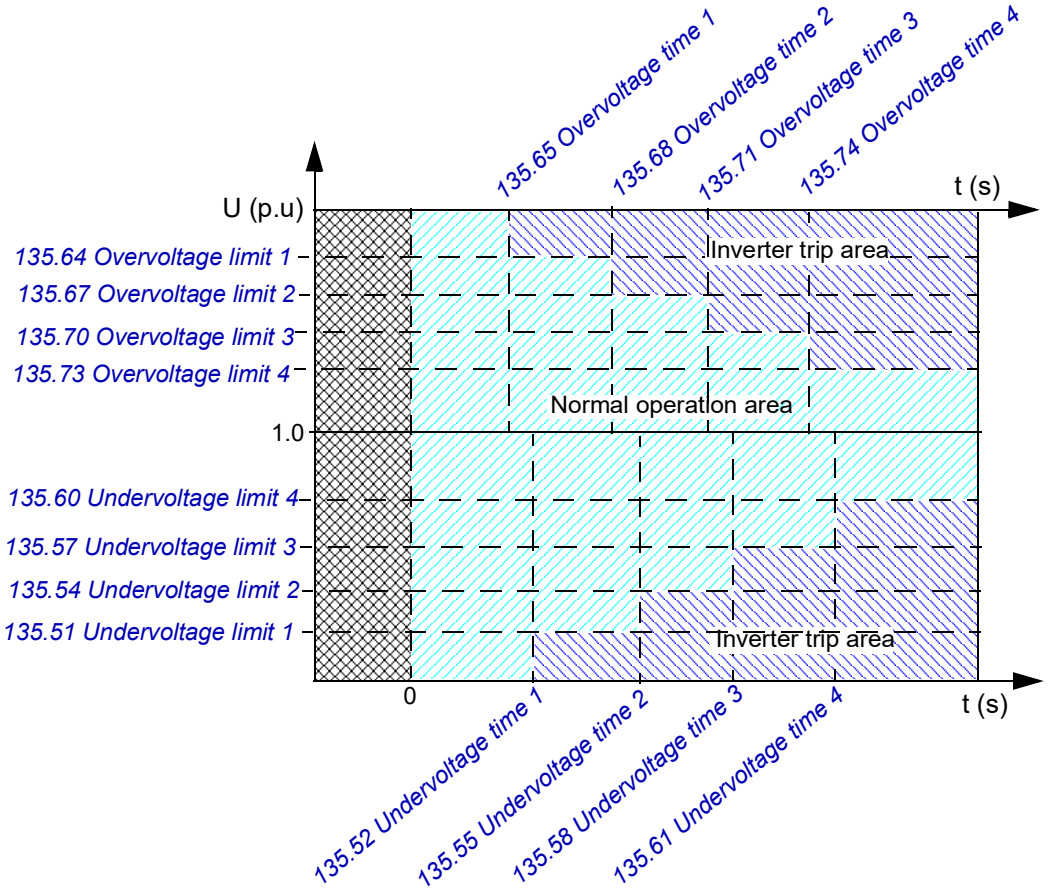


Figure 2. Voltage monitoring timing diagram

Settings

Parameters: *135.50 Undervoltage enable 1*...*135.74 Overvoltage time 4*

● Sliding overvoltage

Sliding overvoltage implements monitoring for a slowly rising AC voltage. A ten minute average value is calculated and compared against the limit. Each phase/main voltage is independently monitored. The duration for the tolerated overvoltage situation can be set with parameter *135.77 Sliding overvoltage time*.

Settings

Parameters: *135.75 Sliding overvoltage enable*,*135.76 Sliding overvoltage limit*,*135.77 Sliding overvoltage time*

Frequency monitoring

There are six limits for underfrequency and four limits for overfrequency monitoring. All limits have an enable parameter, limit parameter, and time parameter. When limit is enabled and measured value exceeds the limit for a duration of the time parameter, the grid is declared as unstable. All limit checks are logically connected in parallel.

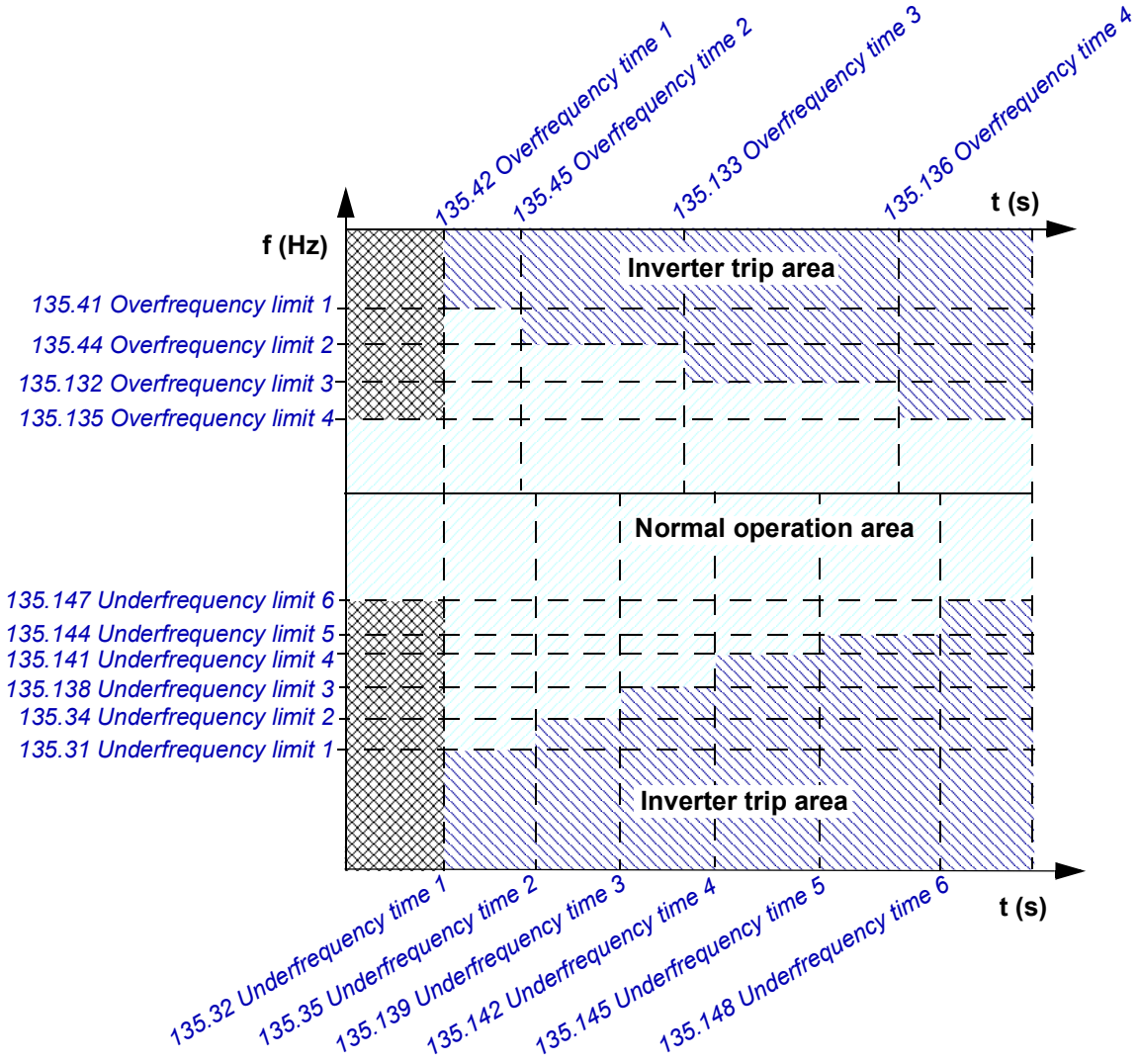


Figure 3. Frequency monitoring timing diagram

Settings

Parameters:*135.30 Underfrequency enable 1*...*135.45 Overfrequency time 2* and *135.131 Overfrequency enable 3*...*135.148 Underfrequency time 4*

Combinatory limit

Combinatory limit monitors grid voltage and frequency simultaneously. There are limits for the positive sequence and the negative sequence of grid voltage, and limits for underfrequency and overfrequency.

The grid is declared as unstable, if

- the negative sequence voltage and the frequency are outside their limits, or
- the positive sequence voltage and the frequency are outside their limits.

If either of the conditions is true for the time defined by parameter *135.81 Combinatory trip time*, the grid is declared as unstable and the inverter disconnects from the grid.

Settings

Parameters:*135.80 Combinatory trip*,*135.81 Combinatory trip time*,*135.84 Comb pos seq voltage limit*, *135.85 Comb neg seq voltage limit*,*135.86 Comb underfrequency limit*, *135.87 Comb overfrequency limit*

Rate of change of frequency

The grid frequency rate of change (RoCoF) has enable and limit parameters. If it is enabled and the limits are exceeded, the inverter disconnects from the grid.

Settings

Parameters:*135.110 Rate of change of freq enable*,*135.111 Rate of change of freq limit*

Anti-islanding

The inverter Anti-islanding function prevents an island situation in an electrical grid. An island in a grid is a situation in which a generator powers part of the grid even though the power from the utility grid is cut off. Islanding can be dangerous to people working on the grid and not realizing that the circuit is still powered. For that reason, distributed power generators such as solar inverters can be required to detect an island situation and immediately stop feeding power to the grid.

In a typical case when a part of the grid is islanded, the voltage and/or frequency of the islanded part changes rapidly, and thus the island can be detected using voltage and/or frequency limits. However, the worst-case scenario of an island situation is when the load of the islanded grid part matches the energy production and this is when the limit based voltage and/or frequency island detection method may fail. To also detect the worst-case balanced load island situation, the active frequency shift based method can be used in the inverter. The active method forces the voltage and/or frequency to rapidly change even in the balanced load island situation. The island detection voltage and/or frequency limits will then be exceeded causing the inverter to stop energy production.

The detection limits of the function can be configured using parameters which are preset so that relevant grid-dependent requirements are fulfilled.

The Anti-islanding function can be enabled or disabled with parameter*135.100 Anti-islanding*.

The inverter also supports an external transfer trip signal through SCADA or I/O.

Settings

Parameters*:135.100...135.108*

External grid monitoring relay

Depending on the installation, an external third party-certified grid monitoring relay may be used. If an external relay is used, loose limits for grid monitoring should be set. The recommended setting for the overvoltage monitoring limit is 130%. The limit for undervoltage monitoring should be set as less than the external relay setting.

The inverter can use external grid monitoring through the parameter *135.16 External trip* that can be written, e.g., by fieldbus. If this parameter has a value of **1**, external grid monitoring indicates an unstable grid.

Settings

Parameter:*135.16 External trip*

Fault ride-through tripping curve

The fault ride-through (FRT) tripping curve function is an extra undervoltage and overvoltage tripping function. The function programs a curve where the inverter disconnects from the grid. The grid codes define the inverter behavior during a grid fault. Typically, they specify the following:

- how long a dip can last for
- how long a swell can last for
- how to behave with symmetrical voltage dips and peaks
- how to behave with asymmetrical voltage dips and peaks.

There are two different cases of FRT function:

- Low-voltage ride-through (LVRT), see page *21* and
- High-voltage ride-through (HVRT), see page *22*.

The FRT function can be enabled with parameter *126.01 FRT enable.*

Low-voltage ride-through (LVRT) tripping curve

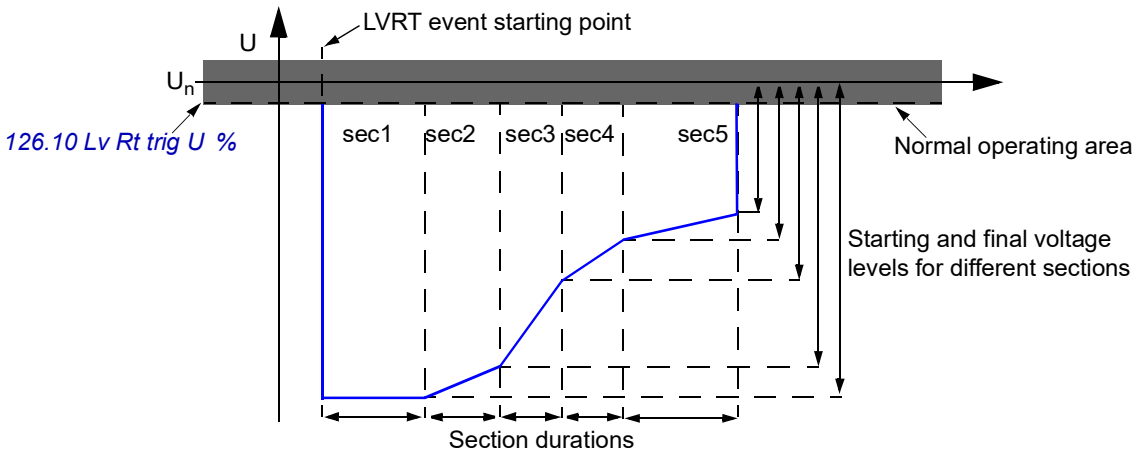


Figure 4. Low-voltage ride-through (LVRT) tripping curve

If the grid voltage drops below the low-voltage ride-through triggering level defined by parameter *126.10 Lv Rt trig U %*, the inverter indicates a grid warning. If the grid transient lasts longer than the voltage dependent time defined by parameters *126.12 Lv Rt sec 1 time*...*126.28 Lv Rt ext U %,* the inverter trips. Otherwise the inverter operates normally without interruptions after the LVRT event has ended.

After the LVRT event, the MPPT of the inverter starts generating power according to the voltage level present. A fast recovery function can be enabled with parameter *178.03 Fast recovery*. This enables a rapid recovery of the DC link voltage from the open circuit voltage to the voltage that was present before the LVRT. The ramp for the function can be set with parameter *178.41 Recovery ramp*. These parameters are set by the grid code.

The LVRT tripping curve is defined using five temporal sections. Each section is parametrically defined by duration, starting, and final voltage level. These parameters exist in the parameter group *126 FRT tripping curve*. The *Low-voltage ride-through (LVRT) tripping curve* shows an example of the LVRT tripping curve. When the voltage remains above the line defined by the five sections, the inverter stays connected to the grid; otherwise the inverter stops operation.

The voltage comparisons are defined using parameters *126.02 Lv Rt symm sig...126.03 Lv Rt asymm sig*. The asymmetric limit can be set with parameter *126.06 Asymm/symm limit*.

Note: Consider the grid monitoring settings when defining LVRT settings.

Settings

See parameter groups: *126 FRT tripping curve*, *178 MPPT settings*

High-voltage ride-through (HVRT) tripping curve

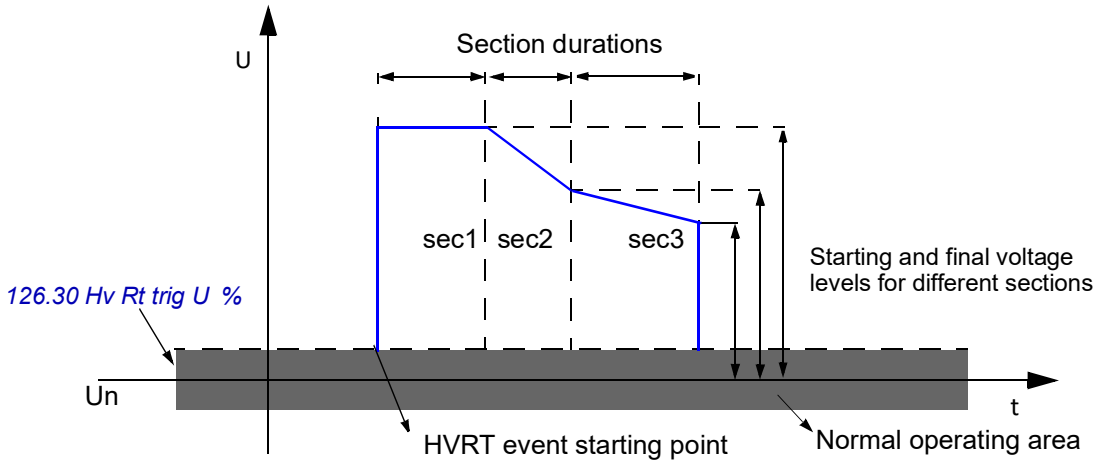


Figure 5. High-voltage ride-through (HVRT) tripping curve

If the grid voltage rises above the high-voltage ride-through (HVRT) triggering level defined by parameter *126.30 Hv Rt trig U %*, the inverter indicates a grid warning. If the grid transient lasts longer than the voltage dependent time defined by parameters *126.32 Hv Rt sec 1 time...126.42 Hv Rt S3 end U %,* the inverter trips. Otherwise the inverter operates normally without interruptions after the HVRT event has ended.

The HVRT tripping curve is defined using three temporal sections. Each section is parametrically defined by duration, starting, and final voltage level (See group *126 FRT tripping curve*). The *High-voltage ride-through (HVRT) tripping curve* shows an example of the HVRT tripping curve. When the voltage remains below the line defined by the three sections, the inverter stays connected to the grid; otherwise the inverter stops operation.

The voltage comparisons are defined using parameters *126.04 Hv Rt symm sig* and *126.05 Hv Rt asymm sig*. The asymmetric limit can be set with parameter *126.06 Asymm/symm limit*.

Settings

See parameter group:*126 FRT tripping curve*

Grid support

Grid support allows injecting capacitive or inductive current to the grid. This function supports grid voltage during voltage peak or dip. Typically, the amount of reactive current depends on the grid voltage level. Different grid codes demand different grid support functionalities and are defined by parameter settings. The grid support reactive power reference overrides the normal reactive power reference.

Note: The parameter settings are preset according to the grid code.

Triggering grid support

Grid support activates when the voltage drops below the low trigger level *125.04 Lv Gs trig U %* or rises above the high trigger level *125.18 Hv Gs trig U %*. The actual voltage that is compared against the trigger level can be selected separately for symmetric and asymmetric faults with parameters *125.02 Gs Lv symm sig* and *125.03 Gs Lv asymm sig*, respectively. The asymmetric limit is set with parameter *126.06 Asymm/symm limit* as a ratio of negative and positive sequence grid voltages.

Trigger voltages are relative to a reference voltage and are set to either nominal voltage or to a pre-fault 60 second average voltage. The reference voltage is selected using parameter *125.51 Gs reference voltage*. If the selection is Nominal voltage, then the selected actual voltage is compared against the nominal value. However, a typical no-fault voltage can vary from one connection point to another. This can be taken into account by setting the reference voltage to a 60 s average. The average voltage is selected with parameter *125.52 Gs average voltage* and this value is then used as a reference voltage. In practice this means that if the pre-fault voltage is 110% and the trigger is set to 90%, grid support is triggered at 110 - (100 - 90) = 100% of nominal voltage, where the difference is between nominal voltage and trigger voltage. See timing diagrams of grid support modes in *Figure 6.Grid support current curve - K factor mode* and *Figure 7.Grid support current - curve points mode*.

During a grid fault, the injected reactive current comprises of a base part, I_{base}, and an additional grid support part, I_{delta}. The base part can either be zero or equal to a pre-dip value that is calculated as a 60 second average of the actual reactive current. The base part can be configured with parameter *125.50 Gs base current*. Grid support current I_{delta} depends on the difference between the above-mentioned reference voltage and the selected actual voltage.

In *Grid support current curve - K factor mode*, the reference voltage is shown as a dotted vertical line. The actual voltage is compared against this reference line. The mapping of voltage difference depends on the selected support mode.

- Grid support is active as long as the selected voltage stays outside the dead band, or the voltage returns within the dead band for less than the time defined by parameter *125.36 Gs after dip time*.
- Grid support is deactivated when the voltage returns within the dead band for the time defined by parameter *125.36 Gs after dip time*.

The total current during a grid fault can be limited with parameter *125.37 Frt Imax %*. There are also ramp times for active current and reactive current that are used during grid fault. For example, the parameter *125.28 Frt Ireact ref ramp up* defines how fast reactive current is ramped up when voltage drops.

Support modes

Grid support mode is selected using parameter *125.01 Grid support*. It defines how the measured voltage value is converted into a reactive current reference. Four conversion modes can be defined/selected.

Disabled – FRT grid support is not active. Instead, the inverter follows the reactive power settings defined by parameter group*124 Reactive power reference*.

No support – I_{delta} is set to zero and base current I_{base} is defined by parameter *125.50 Gs base current*. In this case, the same base current value is used throughout the entire FRT event.

K- factor – The amount of grid support is defined with the starting point P1 and the grid support gains as described in *Grid support current curve - K factor mode*. There are separate gains for low voltage and high voltage ride-through grid support. These are set in *125.05 Lv Gs K-factor* and *125.19 Hv Gs K-factor*. Point P1 is defined with voltage and current settings using parameters *125.06 Lv Gs P1 volt %*,*125.07 Lv Gs P1 cur %*, *125.20 Hv Gs P1 volt %* and *125.21 Hv Gs P1 cur %*. Note that point P1 can be different

for low voltage and high voltage grid support. With P1, an offset can be added to the grid support current.

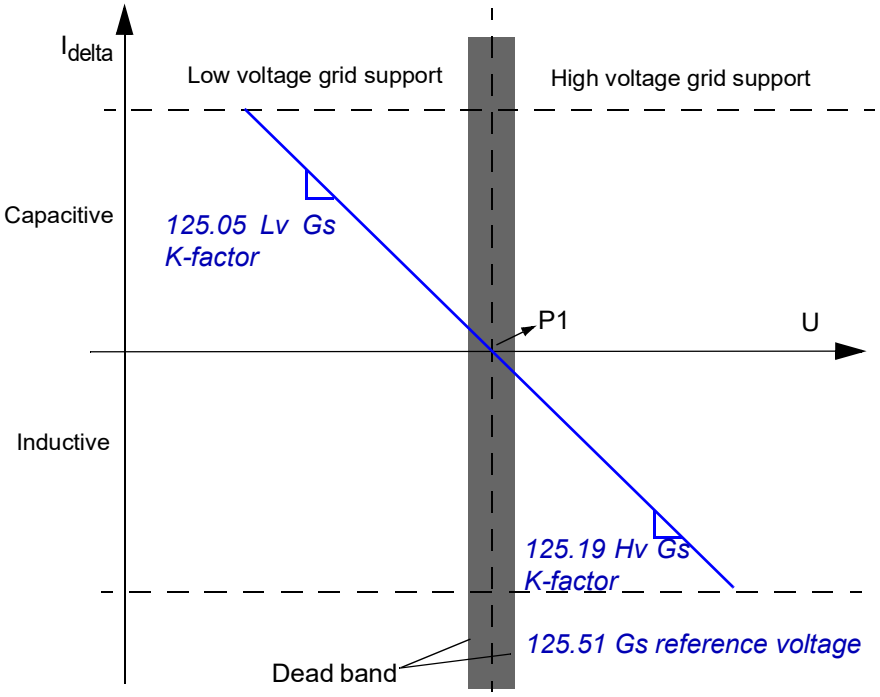


Figure 6. Grid support current curve - K factor mode

Curve points – This mode can be used when a piecewise linear grid support current is needed. See *Grid support current - curve points mode*. The mode uses five points on the low voltage side and three points on the high voltage side to map the voltage to grid support current references. The areas between the points are interpolated.

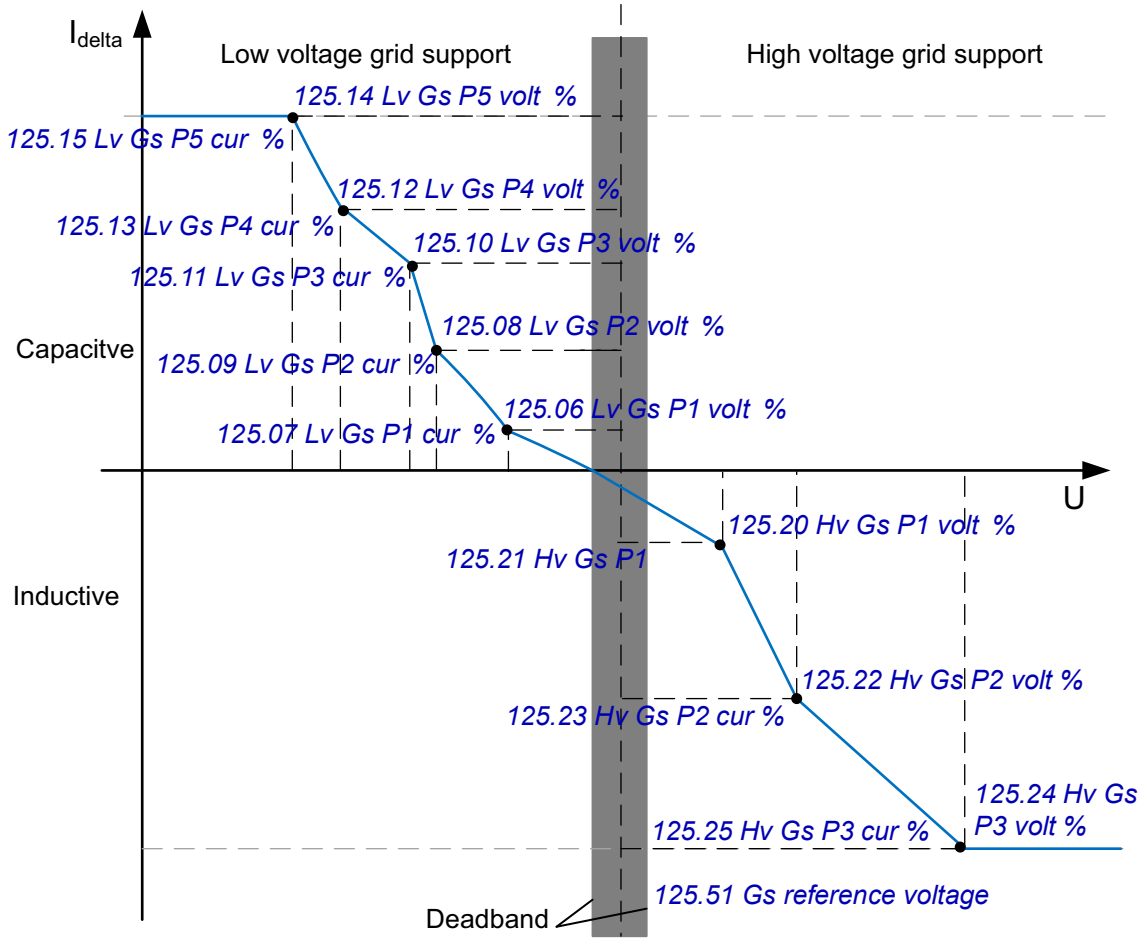


Figure 7. Grid support current - curve points mode

Reactive power control

The inverter is capable of generating reactive power to the grid.

- With a positive reactive power reference, the inverter injects reactive power to the grid. This is also called as capacitive reactive power or over-excited operation.
- With a negative reactive power reference, the inverter absorbs reactive power from the grid. This is also called inductive reactive power or under-excited operation.

A reference value for reactive power can be given through the control unit or fieldbus interface. The inverter also supports reactive power generation according to the defined curves such as Q(U), Q(P), and cosφ (P).

A reference type for the reactive power can be selected from several different types (see parameter *124.06 Q power ref type*). A reference value must also be entered in parameter *124.01 User Qref* according to the selected reference format. The possible input reference types are:

- Reactive current reference in Amperes
- Reactive current reference in percent of the nominal current
- Reactive power reference in kVAr
- Reactive power reference in percent of the nominal power
- Reactive power reference angle in degrees
- Reactive power reference in CosPhi
- Voltage reference for the AC voltage control in Volts
- Voltage reference for the AC voltage control in percent.

Parameter*124.01* can be adjusted to two decimals. For accurate control, example in CosPhi control mode, the value can be scaled with parameter*124.04 Q ref scale*. Example, if Qref value 9.75 is scaled at 0.10, then the result is 0.975 internally.

Note: When the inverter is not enabled, change the scaling to minimize the possibility of wrong Qref inputs.

Ramping is used for reactive current. The ramps can be set with parameters *124.14 Ireact ref ramp up* and *124.15 Ireact ref ramp down*. The main tasks of the reactive current ramping are:

- Reactive current reference limitation
- Reactive current reference ramping
- Ramp bypass in case of AC voltage control.

In addition to constant set points for reactive power, pre-defined curves can be used. If only the curve is used as a reactive power reference, it can be set with parameter*124.06 Q power ref type =* Q(x) regulation curve. The curve type can be selected with parameter*124.30 Q(x) curve*. See examples of different curve types in the sections *Q(U) control curve* (page *28*), *Q(P) control curve* (page *29*), and *cos phi (P) control curve* (page *29*). The curve is defined with six points that map the input signal to the output signal. The lock-in and lock-out conditions define when the selected curve is active.

The normal Q-ref can be used parallel to the Q(x) regulation curve, with parameter *124.29 Combined operation of Qref and Q(x) curve* is enabled. When dual mode is enabled, the normal Q-ref is used until the Q(x) regulation curve is activated by the lock-in condition and in Q(U) curve with the Q(U) activation level.

The reactive power control curve activates when the lock-in condition set by parameter *124.31 Lock-in level* is exceeded and deactivates when lock-out condition set by parameter*124.32 Lock-out level* is deceeded. In *Q(U) control curve*, the conditions are percent of active power. In other curves the conditions are percent of nominal voltage. The lock-in condition can be set so that the curves are always active (set to zero (power > 0 or voltage > 0)).

Q(U) control curve

In Q(U) control curve mode, reactive power generated by the inverter depends on the grid voltage as described in the example *Q(U) control curve*. Active power in percent is used as a lock-in and lock-out conditions.

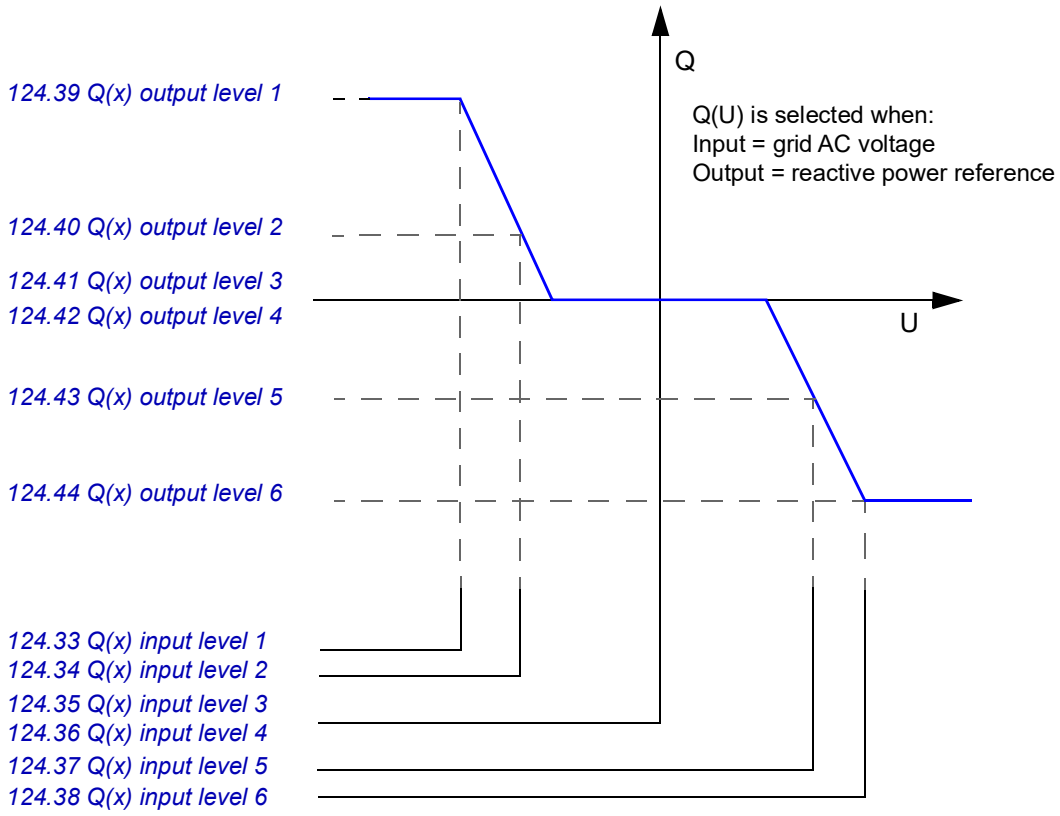


Figure 8. Q(U) control curve

The delay time for activating the Q(U) regulation curve can be set in parameter*124.45 Q(U) activation delay*. The lower limit for nominal voltage activation can be set with parameter*124.46 Q(U) activation level low*. When grid voltage falls below this limit, the curve is active. The upper limit for nominal voltage activation can be set with parameter *124.47 Q(U) activation level high*. When grid voltage goes beyond this limit, the curve is active.

Q(P) control curve

In Q(P) control curve mode, the reactive power generated by the inverter depends on the active power as described in the example *Q(P) control curve*. Grid voltage in percent is used as a lock-in and lock-out conditions.

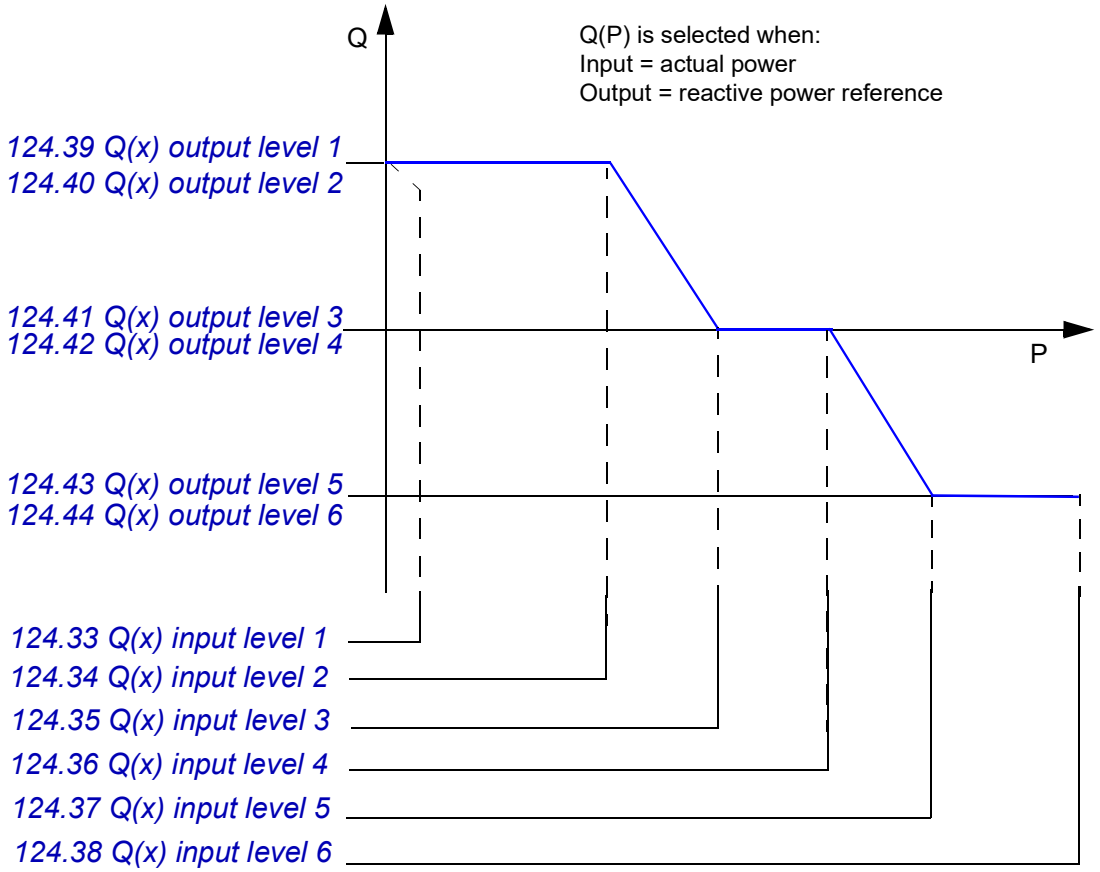


Figure 9. Q(P) control curve

cos phi (P) control curve

In cos phi (P) control curve mode, the reactive power generated by the inverter depends on the active power. Grid voltage is used as a lock-in condition. When setting this curve, crossing cos phi level one must be defined using two different points for the same point.

For example, input level 2 = 0,5; output level 2 = 1,0 and input level 3 = 0,5; output level 3 = -1,0.

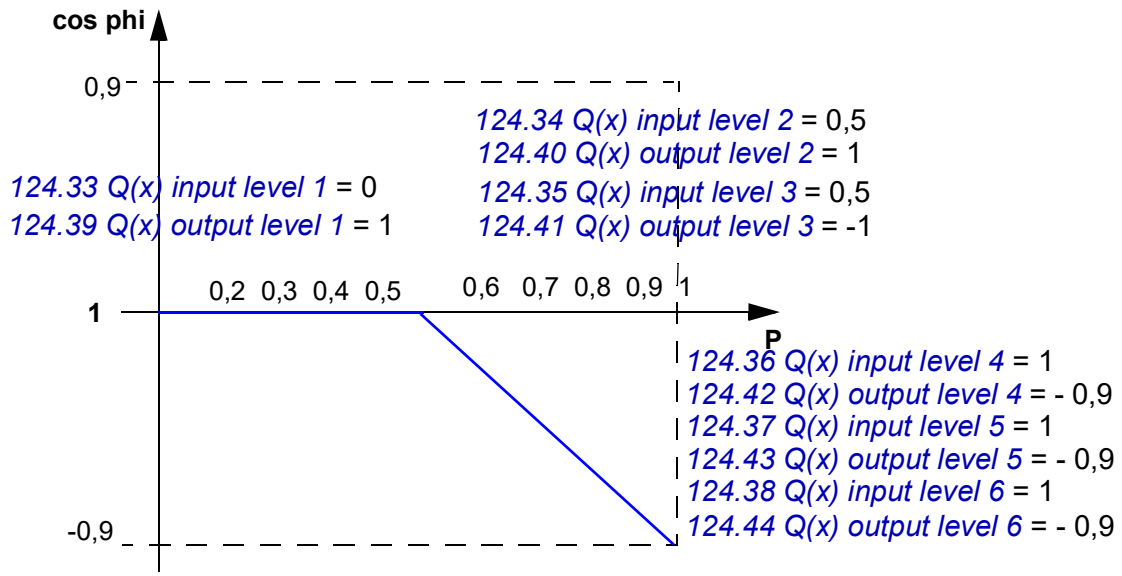


Figure 10. cos phi (P) control curve

● cos phi (U) control curve

In cos phi (U) control curve mode, the reactive power generated by the inverter depends on the grid voltage, as described in the example *Q(U) control curve*. The power reference type is set in parameter*124.06 Q power ref type* = Q(x) regulation curve and parameter*124.30 Q(x) curve* = CosPhi(U).

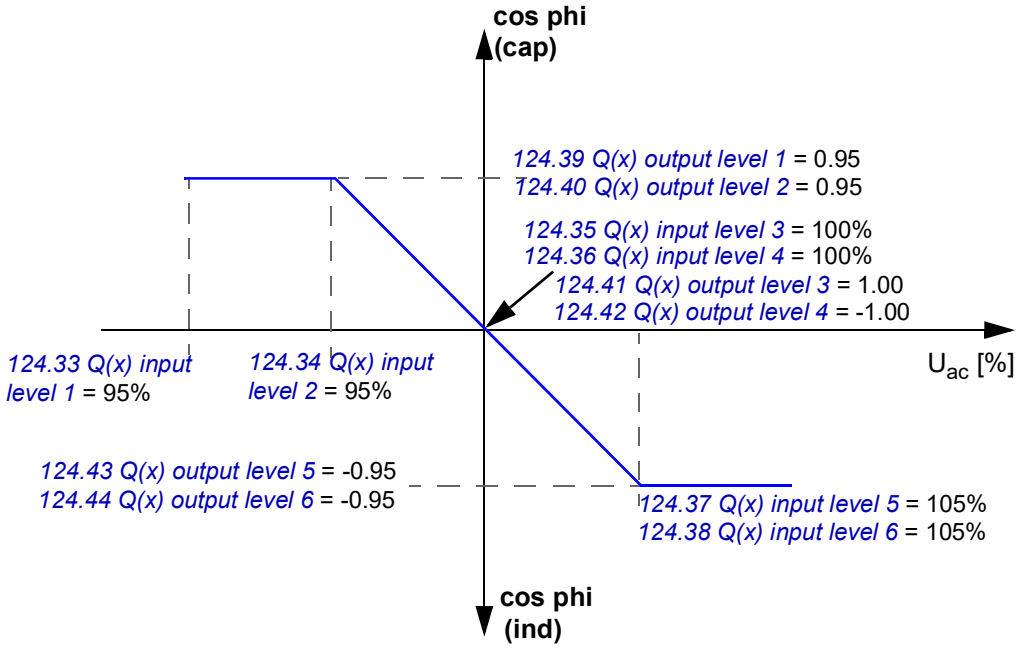


Figure 11. cos phi (U) control curve

The delay time for activating the cos phi (U) regulation curve can be set in parameter *124.45 Q(U) activation delay* = 100 ms. The minimum and maximum activation levels can be set with parameters*124.46 Q(U) activation level low* = 99% and*124.47 Q(U) activation level high* = 101%. Note that cos phi 1 and -1 are the same.

Power prioritization

Prioritization of the active and reactive power can be set with parameter*130.101Priority*.

Note: The inverter can generate reactive power according to the given reference if the current limit of the inverter is not exceeded. If the inverter is already feeding the maximum allowed current to the grid, the parameter*130.101 Priority* defines whether active or reactive power is limited.

Settings

Parameters: *124.01 User Qref*, *124.06 Q power ref type*, *124.14 Ireact ref ramp up*, *124.15 Ireact ref ramp down*, *124.30 Q(x) curve*, *124.31 Lock-in level*, *124.32 Lock-out level*, *124.33 Q(x) input level 1*...*124.44 Q(x) output level 6*, and*130.101 Priority*.

Night Q production

During normal inverter operation, the inverter enters sleep mode when the sun goes down since there is no active power available from the solar panels. This ends both active and reactive power production. However, reactive power production during the night may be of use to the solar plant by eliminating the need for extra reactive power compensation at sites where it would otherwise be required.

The night reactive power (Night Q) production function is deactivated by default. It can be activated or forced on using parameter *213.51 Night Q production*. The operation of night Q production is as follows:

- When the inverter enters Sleep mode, the reactive power reference is checked. If the absolute value of the reactive power reference is larger than the value in parameter *213.52 Night Q low power*, the inverter disconnects from the DC side, but not from the AC side, and continues to generate reactive power. If the mode is forced on, it stays connected to the AC grid even if the absolute value of the reactive power reference is smaller than the value in parameter *213.52 Night Q low power*. The shut down procedure without the effect of reactive power is shown in *Night Q production curve*. The figure shows the inverter shut down operation and night Q transition operation when the active power is below the minimum power limit for the delay time defined by parameter *213.17 Disconnection delay for sleep-mode*.

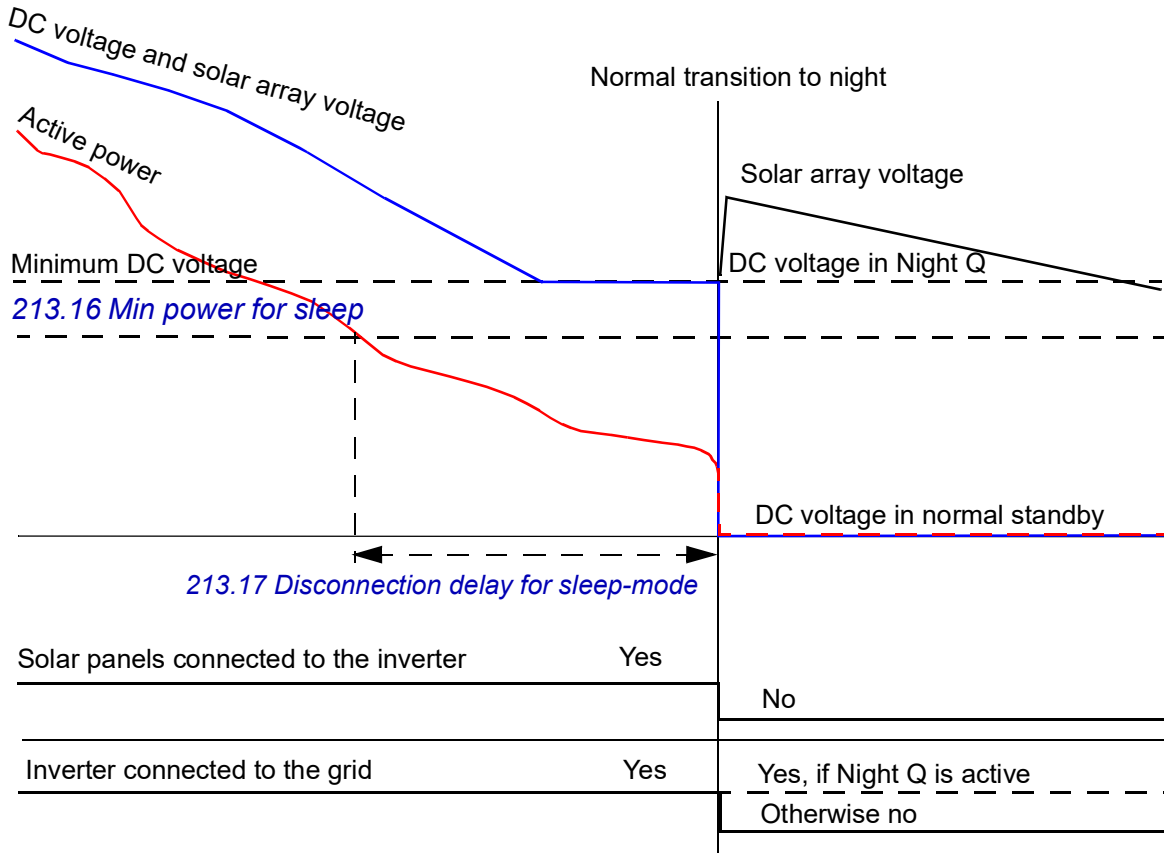


Figure 12. Night Q production curve

- If the absolute value of the reactive power reference decreases *213.52 Night Q low power* for a duration of *213.53 Night Q delay*, the inverter disconnects from the AC side and proceeds to normal Sleep mode.
- A separate reactive power reference can be set for Night Q production with parameter *213.54 Night Q reference*. If this reference differs from 0 kvar, it is used. If the reference is 0 kvar, the normal reactive power reference is used.
- If during the night, the absolute value of the reactive power reference increases more than *213.52 Night Q low power*, the inverter connects to the AC grid and starts producing reactive power.
- In the morning, the inverter transfers smoothly from Night Q mode to power generation mode, when the panels produce enough power for the panel DC voltage to rise above the required limit. See *Night Q mode to power generation mode transition curve*.

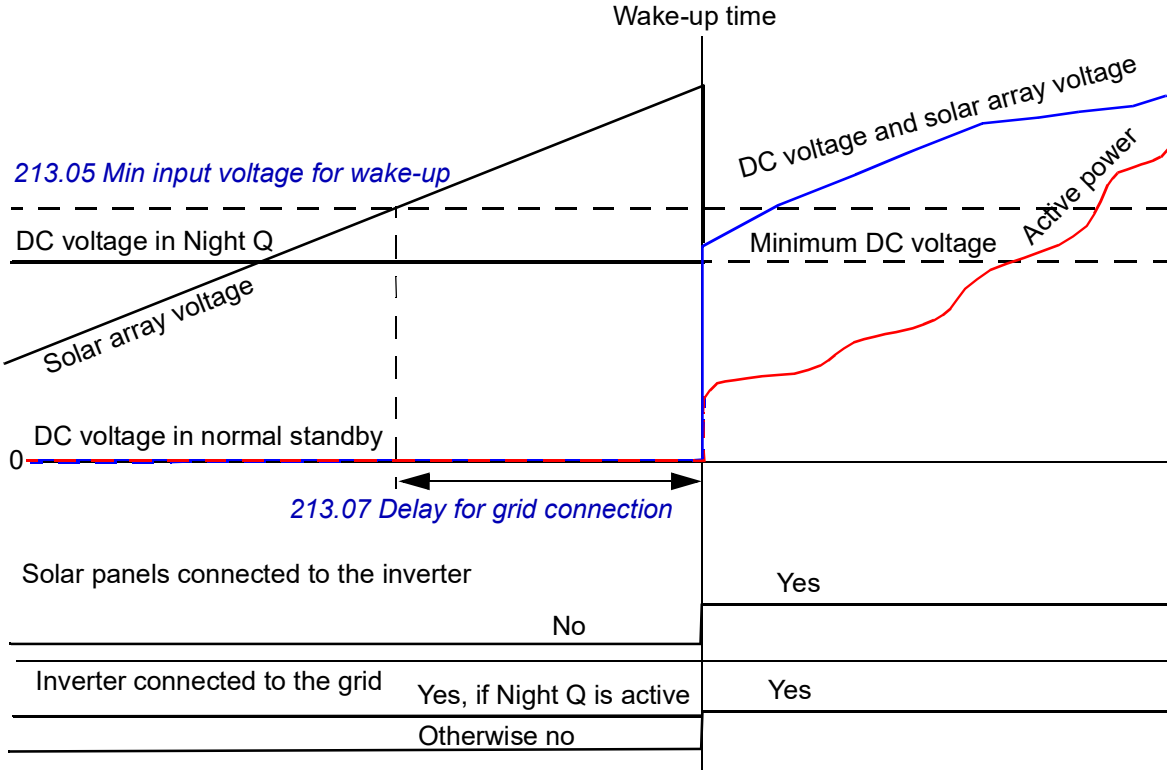


Figure 13. Night Q mode to power generation mode transition curve

Settings

Parameters: *213.51*...*213.54*

Active power limitations

External active power limit

Inverter output power can be limited by defining the maximum output power value using parameter *130.75 External power limit*. The external power limit has ramps defined using parameters *130.98 External limit ramp up* and *130.99 External limit ramp down*.

Flat-top limit

External power limit is designed for temporary power limitation. Flat-top limit permanently limits active power capacity of the inverter to a value lower than nominal. Normally the inverter has a semi-circular power capacity as the inverter can produce as much active power as it can produce reactive power. However, with the flat-top limit, this capacity can be cut by reducing the amount of active power. Note that in the end flat-top is only one constant active power limit.

Limitation after grid connection and after grid fault

Active power can be limited after a grid connection and after a grid fault. The limitation type can be selected using parameter *130.70 Startup power ramp type*. The limitation can be set as active always, active only after a grid fault, or never active. There are different ramp rates for grid connections and re-connections after grid faults. A limitation ramp starts from 0%. A ramp is defined as a percent of nominal power per minute.

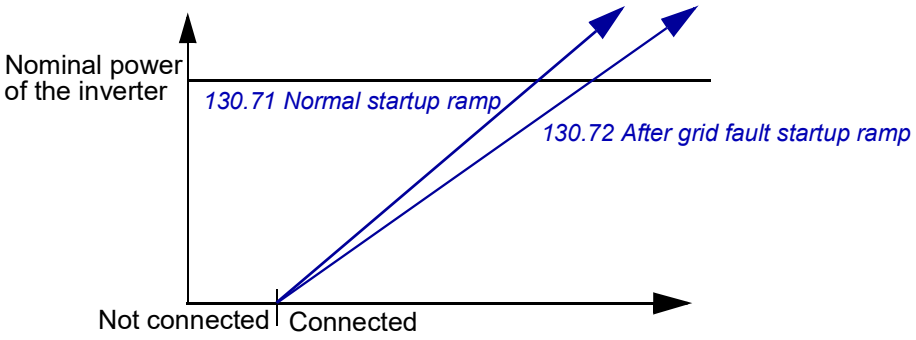


Figure 14. After grid connection and after grid fault limitation curve

Limitation based on grid voltage

Active power limitation as a function of grid voltage can be used to reduce grid voltage rise. The characteristics of this function can be set through parameter *130.76 P(U) limiter*. The limiter can be configured as Disabled, Constant limit, or Droop limit.

Constant P(U) limitation

When average grid voltage exceeds the value in parameter *130.77 P(U) trigger level*, the power limit is ramped down to *130.79 P(U) limit level*. The value in parameter *130.80 P(U) limit ramp* is used for ramping the power limit down.

Later, when the average grid voltage falls below *130.78 P(U) release level*, the power limit is released and power is ramped up by *130.81 P(U) release ramp*. The red line in *Constant P(U) limitation* shows the active power limit.

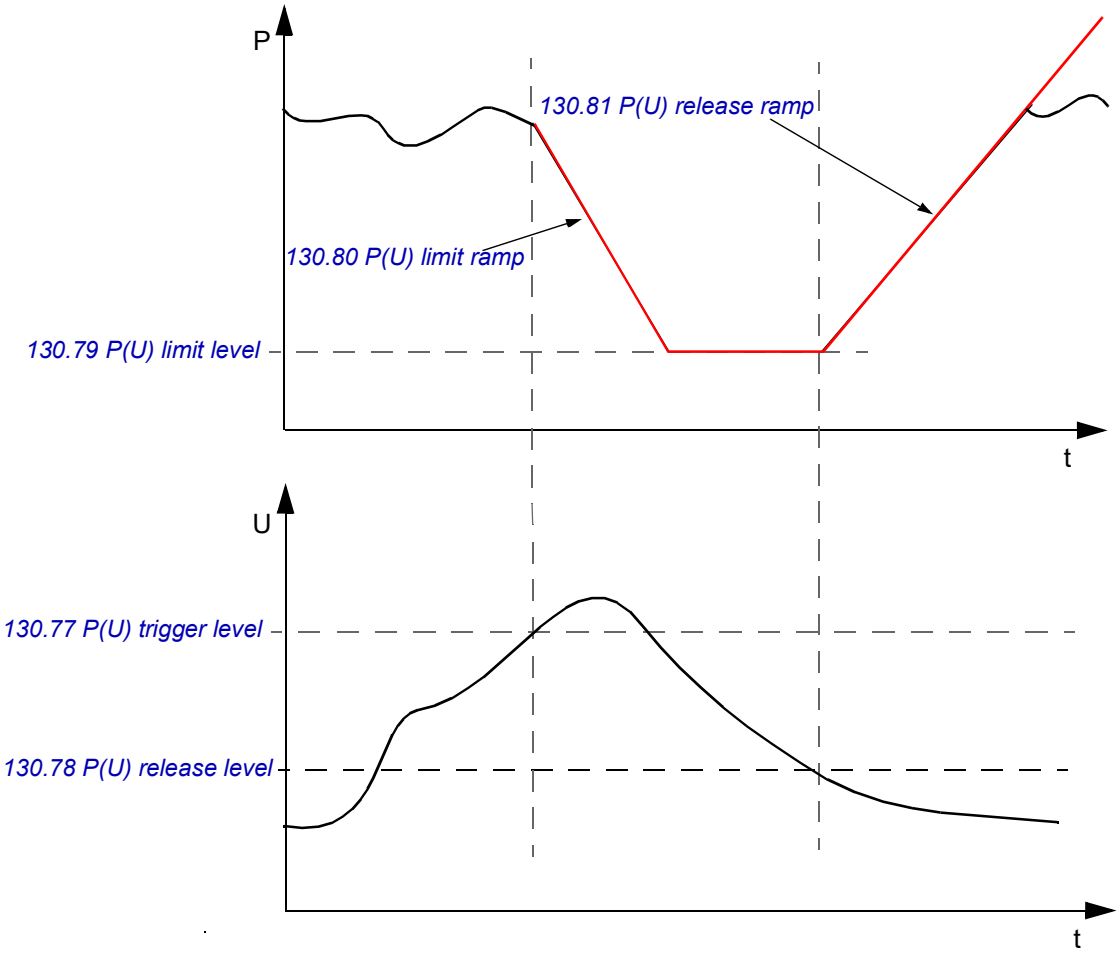


Figure 15. Constant P(U) limitation

Droop P(U) limitation curve

When average grid voltage exceeds the value in parameter *130.77 P(U) trigger level*, droop limitation is activated. The power limitation gradient is calculated based on the grid voltage and values in parameters *130.77 P(U) trigger level*, *130.79 P(U) limit level*, and *130.82 P(U) end level*.

Limitation is in effect until the voltage drops below the value defined in parameter *130.78 P(U) release level*. When the average grid voltage falls below the value in parameter *130.78*, the power limit is released and power is ramped up using parameter *130.81 P(U) release ramp*. The delay time before releasing the power limit can be set with parameter *130.85 P(U) release time*.

The average grid voltage is filtered with a time constant defined in parameter *130.83 P(U) filtering time constant*. Parameter *130.84 P(U) reference power* selects the power level used as the power limitation curve start point, either nominal power or the power at the time of exceeding the trigger level.

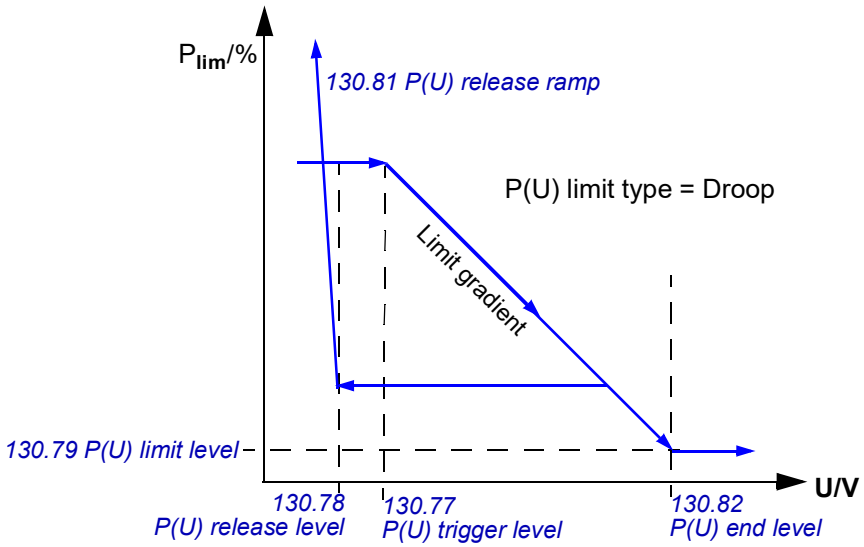


Figure 16. Droop P(U) limitation curve

Limitation based on grid frequency

Power limitation based on grid frequency can be set to operate in either incremental P(f) or free-running P(f) mode. The P(f) limitation type can be selected with parameter *130.62 P(f) limit type*.

Incremental P(f) limitation curve

The frequency that starts power limitation is defined by parameter *130.63 P(f) corner frequency*. When this frequency is surpassed, the current power value is saved and the power limit is calculated in relation to this power level. The limit stays in effect until the frequency drops below the value defined by parameter *130.65 P(f) release frequency*.

After the time defined in parameter *130.66 P(f) release time* has expired, the power limit is ramped up with the parameter *130.67 P(f) release ramp* in relation to nominal power.

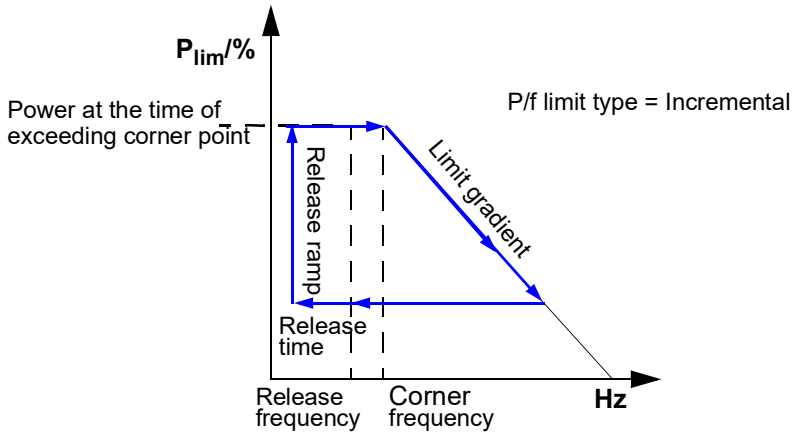


Figure 17. Incremental P(f) limitation curve

Free running P(f) limitation curve

When the value in parameter *130.63 P(f) corner frequency* is surpassed, the current power level is saved and the power limit is calculated in relation to this power level. The limit is set to change freely according to the frequency above the corner frequency. When the frequency drops below the value specified by parameter *130.63*, the power limit is ramped up using parameter *130.67 P(f) release ramp* in relation to the power reference type specified by *130.68 P(f) release ramp ref*.

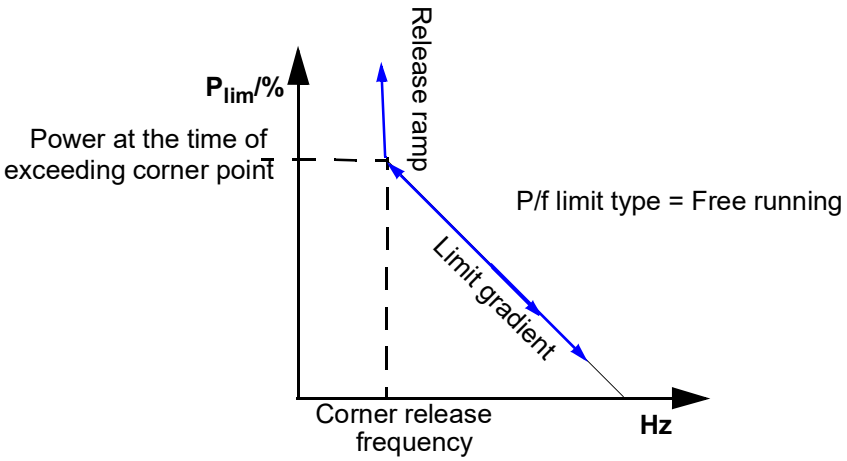


Figure 18. Free running P(f) limitation curve

Power gradient

The power gradient functionality limits the rise rate of active power to a predefined value. This can help to stabilize the grid as power is not changed too rapidly. The power gradient functionality can be enabled with parameter *130.92 Active power ramping* and the rise rate can be set with parameter *130.93 Active power ramp*. If the power change is small, the

rise rate limit follows the actual power closely. When active power starts to increase rapidly, the limit is activated until actual power stabilizes.

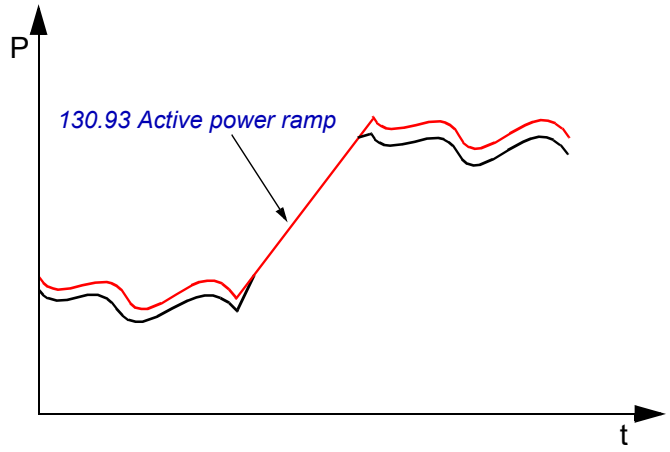


Figure 19. Power gradient: Active power ramp curve

For controlled stopping, a shut down ramp can be implemented with which power is reduced slowly to zero after which the grid contactors are opened. The ramp can be defined with parameter *130.94 Shut down ramp*. The internal limit follows the actual power and after the inverter operation is deactivated, the power limit ramps to zero. This does not affect grid disconnection time in case of faults or grid disturbance.

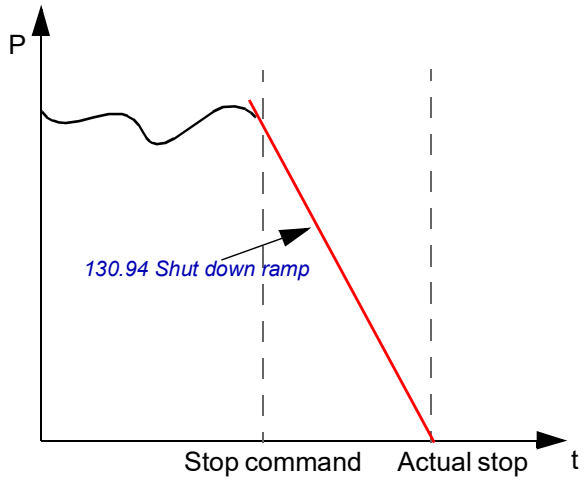


Figure 20. Power gradient: Shut down ramp curve

Settings

See parameters: *130.62*...*130.76*, *130.92*...*130.94*, *130.98* and *130.99*

DC input monitor

DC input monitor supervises DC input voltage and DC input current.

- The DC input voltage is the voltage measured on the panel side of the DC contactor. DC input voltage and power can be monitored with parameters *208.01 Input voltage* and *208.03 Input power*.
- The measured DC input current is used for detecting DC input overcurrent and reverse DC input currents. The power module input currents can be monitored with parameter *208.04 Input current*.

See also, *DC input specific current monitoring (available with G417 option)* on page *40*.

DC input voltage monitor

The function monitors that the voltage on the DC input side is larger than the minimum limit and smaller than the maximum limit when the inverter starts to operate. The DC input voltage monitor also checks the polarity of the DC input voltage. If a large negative voltage is detected in the input a warning is displayed to indicate an improper connection of the DC cables.

Settings

213.05 Min input voltage for wake-up

213.08 Min input voltage for first start

DC input specific current monitoring (available with G417 option)

With the G417 option, each DC input current is measured. This information is used to detect DC input overcurrent, reverse DC input current, current deviations between DC inputs, and to detect blown DC input fuses. The monitored DC inputs are configured with parameters *174.01*, *174.02*, 174.03 and 174.04. DC input currents can be monitored from *174.51*...*174.82* DC input 1…48 currents.

Settings

174.01 Connected DC inputs 1-12

174.02 Connected DC inputs 13-24

174.51 DC input 1 current...*174.82 DC input 24 current*

Overcurrent detection

The Overcurrent detection function can be enabled through parameter *174.05 Overcurrent detection*. Detection can trigger either a delayed fault or an instantaneous fault depending on the current level and delay. The instant overcurrent trip limit is set to *174.06 Overcurrent instant limit*. A smaller current limit with a delay can be inserted to *174.07 Overcurrent delayed limit* and time limit to *174.08 Overcurrent time delay*.

Settings

174.05 Overcurrent detection

174.06 Overcurrent instant limit

174.07 Overcurrent delayed limit

174.08 Overcurrent time delay

Reverse current detection

The Reverse input current detection function can be enabled with parameter *174.09 Reverse current detection*. If reverse current is detected, a fault is activated after the delay. The limit value is set to *174.10 Delayed Reverse current limit* and the delay to *174.11 Reverse current time delay*.

Settings

174.09 Reverse current detection

174.10 Delayed Reverse current limit

174.11 Reverse current time delay

Current deviation detection

A faulty DC input, e.g., due to a high amount of shadowing or obstacles can be detected if the current in one DC input deviates significantly from other DC inputs. The current deviation function is enabled by default and the action is Warning. The action can be changed with parameter *174.14 Current deviation action*. If the DC input currents deviate more than the current configuration limits, then the *174.14 Current deviation action* is activated after a delay defined in parameter *174.15 Current deviation delay*. The configuration limits contain additional parameters. See the following description.

The inverter can be configured to use either a relative or absolute comparison between DC input currents by setting parameter *174.16 Comparison mode* to the desired manner. The value that the individual currents are compared against is the reference value depending

on which type is selected by parameter *174.17 Reference type*. The reference value can be selected to be either the maximum or the mean value of the connected DC inputs.

Global reference – selects the method for calculating reference current: from the input section specific currents or from all inputs currents (global).

- If all inputs have equal number of panels and are installed in a similar way, global reference can be used.
- If there are installation differences between the inputs, local reference should be used because the input currents are comparable only inside the input section.

Relative comparison mode – individual DC input currents are compared against the reference value in percent. The limit is defined by parameter *174.19 Relative current limit*. If a DC input current is more or less than the reference value an action is triggered after the delay. Additionally, the reference value must be more than what is defined in parameter *174.21 Relative threshold* to avoid nuisance trips at low currents.

Absolute mode – individual DC input currents are compared against the reference value in amperes. If the difference is greater than the value found in parameter *174.20 Absolute current limit* in amperes an action is triggered after the delay.

Settings

174.15 Current deviation action

174.16 Comparison mode

174.17 Reference type

174.18 Global reference

174.19 Relative current limit

174.20 Absolute current limit

174.21 Relative threshold

Blown fuse detection

The Fuse monitor action can be enabled through parameter *174.22 Fuse monitor action*. The default action is Warning.

A blown fuse can be detected if the DC input current is less than the value found in parameter *174.23 Blown fuse detection limit* and the mean DC input current is over *174.24 Blown fuse active boundary*.

Note: It is also possible to check the DC fuse status with option G420: DC input fuse blown indicator (one common output signal per power section, not with 0F291).

Settings

174.22 Fuse monitor action

174.23 Blown fuse detection limit

174.24 Blown fuse active boundary

Temperature control

Temperature measurements

The inverter measures several system temperatures for temperature control and other diagnostic purposes.

The ambient temperature is measured from the main air channel intake and can be read from parameter *211.01 Ambient temperature*.

The temperature of the control section cabinet can be read from parameter *211.02 Control board temperature*.

The temperature of the AC and DC sections can be read from parameters *211.03 AC section air temperature* and *211.04 DC section air temperature*.

The temperature of each power section can be read from parameters *211.05 Power sections 1 and 3 air temperature* and *211.06 Power sections 2 and 4 air temperature*.

The temperature of IGBT modules for each power section is measured. The highest IGBT module temperature of each power section can be read from parameters:

- *211.08 Highest IGBT M1 temperature*
- *211.09 Highest IGBT M2 temperature*
- *211.10 Highest IGBT M3 temperature*
- *211.11 Highest IGBT M4 temperature*

An overtemperature warning is shown when temperature(s) exceed the set warning levels. An overtemperature fault is detected when temperature(s) exceed the set fault levels, stopping the inverter operation. Note that the warning and fault levels are fixed and cannot be edited.

Settings

See parameter group *211 Temperature monitoring*

Temperature based grid current limitation

The grid current can be limited due to a high ambient temperature or high internal inverter temperatures. If the grid current is limited by the temperature based current limitation, a status bit is set in the limitation status parameter *130.04 Limit word 4*. Also, a corresponding status bit is set in parameter *130.06 Limit word 6* defining the temperature measurement that is the source of the limitation.

Settings

130.04 Limit word 4, bit3

130.06 Limit word 6, bit0...4

Temperature based active power limitation

The inverter may limit the active power to limit the input DC current from the PV arrays. The limit for the DC current is dependent on the measured temperatures. If the active power is limited by the temperature based limitation, a status bit is set in the limitation status parameter *130.01 Limit word 1*. Also, a corresponding status bit is set in parameter *130.05 Limit word 5* defining the temperature measurement that is the source of the limitation. If the DC input current measurement option is available and enabled, also the power section of which input DC current is limited is shown in parameter *130.05 Limit word 5*.

Settings

130.01 Limit word 1, bit14

130.05 Limit word 5, bit0...8

Temperature based operation inhibits

Inverter operation is inhibited if the ambient temperature exceeds the set maximum operational ambient temperature or is below the minimum operational ambient temperature. A corresponding status bit is set in parameter *173.05 Internal inverter inhibitors 1*, when an inhibit is active. An inhibit bit is automatically removed when the ambient temperature returns within operational limits.

If the power section(s) AC and/or DC cabinet temperature(s) is below the set minimum operational power section temperature, grid connection is inhibited. A status bit is set in parameter *173.05* when an inhibit is active. An inhibit bit is automatically removed when the temperature(s) returns above the operational limit.

Settings

173.05 Internal inverter inhibitors 1, bit4...6

If the power section(s) AC and/or DC cabinet temperature(s) is below the set minimum operational power section temperature, grid connection is inhibited. A status bit is set in parameter *173.05* when an inhibit is active. An inhibit bit is automatically removed when the temperature(s) returns above the operational limit.

Grounding and insulation resistance monitoring

●Insulation resistance

According to standard IEC62109-2, the insulation resistance of the PV panel array should be measured before grid connection. The standard does not state that insulation resistance shall be measured while the inverter is running. In addition to IEC62109-2 standard, local country grid codes might put forward additional requirements on insulation measurements. For additional safety, FIMER recommends that insulation resistance is regularly measured using an earth fault measuring device.

● Insulation measurement unit

Insulation resistance measurement is an automatic feature of the inverter. The feature is preconfigured to prevent the starting of inverter when insulation resistance is low and notifies the event. Note that low insulation resistance might also be caused by environmental factors, such as, high humidity.

WARNING!
The devices used to monitor insulation resistance are not personnel safety devices and not fire protection devices against leakage current.

The MIRU unit of the inverter measures the insulation resistance. The MIRU unit is enabled/disabled with parameter *210.25 Insulation resistance measurement*. Note that if grounding feature of the inverter is enabled, then insulation resistance measurement is also automatically enabled regardless of the setting in parameter *210.25*.

Note: Parameter *210.25* is visible only with R&D access. See *Access levels* (page *54*).

When insulation resistance measurement is activated for the first time, wait until a valid measurement result is received, at least five minutes. If a valid measurement result is not received within 60 minutes, MIRU is determined to be faulty and a warning message is displayed.

The insulation measuring unit can be used to measure any earth fault in the system and thus prevent any further damages caused by earth faults. Note that obtaining a valid measurement value can take a long time. For example, measuring a direct zero (earth fault from the AC side) might take up to five minutes. Measuring a real insulation impedance value in kilo ohms, can take up to 10 minutes.

Event setting

If a low insulation resistance measurement is configured to trigger a warning or a fault then it also inhibits grid connection; otherwise it trips the inverter if it is connected to the grid and generating active power. An automatic recovery can be implemented using the warning event as a fail action. When insulation resistance increases above the limit defined in parameter *210.28 Insulation resistance limit*, the warning event is removed and the inverter connects to grid. If a fault was triggered, it must be reset before grid connection.

Self-test for grid connection

If grounding is not enabled, the MIRU unit can be configured to run a self-test every day prior to grid connection. Self-test can be enabled through parameter *210.33 MIRU self-test*. An input voltage level can be set with parameter *210.34 Self-test voltage* that must be exceeded before the test is run in the morning. The inverter will not connect to the grid

unless the self-test is passed. If the test does not pass the inverter keeps running the self-test.

Grounding

As default, the MGND-01 board is configured for DC- grounding but this can be changed during commissioning of the inverter. Option code F282 selects DC+ grounding instead of DC- grounding. Option code F314 selects Floating DC (no grounding).

For details of the MGND-01 board, refer to the hardware manual.

Software control for grounding is identical regardless of grounding types. The following descriptions and parameters are valid for all types of grounding.

Grounding modes

The grounding mode can be selected through parameter *210.01 Grounding mode*.

Mode	Description
Off	Grounding feature and grounding unit are disabled.
Forced	Forced activation of grounding without first checking the insulation resistance. If, during forced grounding, high ground current (through the grounding resistor) or high grounding voltage (across the series-connected grounding resistor and fuse) is measured by the internal measurement circuitry, then the MGND-01 unit will enter the “Failed forcing state” and at the same time will remove the grounding action and triggers a warning or a fault. The MGND-01 unit will remain in the Failed forcing state until the mode is changed to Off or the fault is reset. If the MGND-01 unit is configured to only trigger a warning then the grounding mode must be changed to Off to restore normal operation of the MGND-01 unit. Note: Forced mode is intended for tests only.
Automatic	Automatic or autonomous mode. In this mode, grounding is automatically enabled and the behaviour is defined with parameters *210.03*...*210.09*.

Grounding at low insulation resistance

If the insulation resistance reading is low due to, for example, high ambient moisture, grounding can still be activated with parameter *210.04 Ignore insulation resistance*.

Note: Grounding is automatically removed if the MGND-01 unit discovers high grounding currents or voltages.

Ungrounded operation

When insulation resistance is sufficiently high and the solar panel array is allowed to operate without grounding, ungrounded operation can be enabled with parameter *210.05 Ungrounded operation*.

Grounding events

Whenever the grounding unit detects an abnormal condition, such as high grounding currents, high grounding voltages or sudden change in the resistive grounding current, the inverter triggers a warning or a fault. The action of how the inverter should react can be selected with parameters:

- *210.12 Grounding circuit voltage fail action*
- *210.16 Grounding current fault action*
- *210.18 Sudden change current fault action*

Note: The action in parameter *210.18* can also be set to value "No", which disables the sudden change in grounding current feature.

Sudden change in grounding current

When the grounding feature is enabled, the MGND-01 unit constantly measures the current flowing through the grounding circuit and obtains the rms current value and the pure resistive current of that value. The resistive current (i.e. residual current) value is monitored for sudden changes and if certain limits (defined by standards) are exceeded, the inverter triggers a warning or a fault.

Grounding unit

The optional grounding unit MGND-01 enables solar panel array DC+ or DC- grounding. MGND-01 is equipped with grounding current measurement circuits and a fuse for protecting the measurement circuitry in case of excessive grounding currents.

Settings

See parameter group: *210 Grounding supervision*

Status information

Typically, the inverter operates autonomously by starting and stopping until internal operating conditions are satisfied. The inverter can be remotely controlled to connect or disconnect from the grid. When a request for re-connection to the grid is sent, several internal conditions are checked before connection can take place. The operating states and operational status of the inverter can be seen through the variables in parameter group *173 Inverter status*.

State machines

The inverter software has several state machines that control its operation. The most relevant state machines can be seen through parameters *173.02 Inverter main state* and *173.03 MPPT unit state*.

- The first state parameter describes higher level operation such as, if the inverter is connecting to or disconnecting from the grid.
- The second state parameter describes the status of the MPPT unit. It indicates, for instance, if the power module is charged, running, or stopped.

Status words

The inverter indicates its main state in parameter *173.01 Main status word* by collecting the high level inverter information into this location. See the status word bit definitions in the parameter list on page *102*.

The inverter can be controlled to stop externally. The states from these commands are collected into parameter *173.04 Start command SW*. For instance, if the inverter is requested to stop remotely by SCADA. If all defined bits are set in parameter *173.04*, then the inverter may start if internal operating conditions are fulfilled.

The inverter has several internal check conditions that may prevent it from starting. The state of these conditions can be seen from parameters *173.05 Internal inverter inhibitors 1* and *173.07 Internal inverter inhibitors 3*. If a bit is set in these parameters then the inverter will not start until the condition has stopped.

Parameter *173.05 Internal inverter inhibitors 1* – indicates inverter level information such as if the grid or configuration status is sufficient for the inverter to start and run.

Parameter *173.07 Internal inverter inhibitors 3* – indicates MPPT unit level status such as if the power module is ready or if input voltage is within the start limit.

Note: Some of the conditions that inhibit the inverter from starting are temporally constrained meaning the condition is fulfilled only after the time delay is passed. For some of these conditions there are timers that can help debug issues.

Settings

Parameters *173.20*...*173.30*.

Power production status

The status of power production can be monitored from parameter *173.11 Output power status*. This parameter determines the usage limit of the total available input power. Additionally, the parameter shows if the input voltage is limited or if the inverter is in test mode. The MPP tracking status indicates that the inverter is producing maximum available power.

Disconnection status

When the inverter is disconnected from the grid, parameter *173.12 Disconnect trigger* shows the status and reason for disconnection. After the inverter is reconnected, the parameter *173.12* is reset to the Connected status.

Settings

Parameters *173.12 Disconnect trigger*

Customer I/O

MV station monitoring and control

Medium voltage station monitoring and control feature can be configured to protect the transformer and to control the medium voltage switchgear. The software features to IOs can be configured with parameters in group *177 MV Station*. See descriptions in the following sections: *Digital inputs*, *Analog inputs* and *Digital output*.

For details of I/O connections, refer to the hardware and commissioning and maintenance manuals.

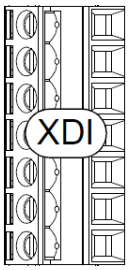
Digital inputs

There are eight configurable protective digital input features for medium voltage transformer and for medium voltage switchgear:

- Transformer temperature alarm
- Transformer temperature fault
- Transformer over pressure
- Transformer low oil level
- Transformer vacuum failure
- Transformer gas discharge fault
- Breaker opening
- Phase loss detection.

Any of these features can be configured to use any of the customer interface digital inputs of the inverter. For actual connections of digital inputs, refer to the hardware manual.

Each configured digital input feature has the following set of parameters:

Parameter type	Selection list	X61 terminal
Source	Off [0]	
	On [1]	
	Digital input X61.1 [2]	
	Digital input X61.2 [3]	
	Digital input X61.3 [4]	
	Digital input X61.4 [5]	
	Digital input X61.5 [6]	
	Digital input X61.6 [7]	
	Digital input X61.7 [8]	
	Spare DI8...DI12 [9...13]	Not supported in this release.
Input action	No action [0]	
	Delayed warning [1]	
	Warning and delayed fault [2]	
	Delayed fault [3]	
	Fault and delayed MV breaker opening [4]	
Action delay	Delayed action defined in the above action parameters	
Limit	Current limit. This limit defines the maximum output current for the inverter when the input is active.	
Logic	Active low [0]	
	Active high [1]	

Tabel 2: Customer interface digital inputs configuration

To activate a certain MV station protection feature, select the correct source and settings. For example, if the MV transformer overpressure signal is connected to the digital input X61.x connector, configure the following parameters:

Parameter type	Instruction
Source	Set parameter *177.26 MV overpressure source* = Digital input X61.3 [4]
Input action	Set required action in parameter*177.27 Transformer overpressure action*
Action delay	Set a delay for the operation of the feature with parameter*177.28 Transformer overpressure delay*
Logic	Set parameter *177.30 Transformer overpressure failure logic* to active low or high
Limit	In case of an event at a certain limit, the inverter can be set to reduce the grid current. Set this limit with parameter *177.29 Transformer overpressure current limit*. If this limitation is not needed, set the limit more than the maximum current.

Tabel 3: Example of customer interface digital inputs configuration

Note: If the feature is configured to trigger a fault, inverter will stop feeding current.

Settings

177.11 MV temperature alarm source... *177.50 MV phase loss detection failure logic*

Analog inputs

There are two configurable analog input features for the medium voltage transformer:

- Oil temperature
- Coil temperature.

These software features can be configured to the two analog inputs (4…20 mA) of the inverter (Analog input -X61.9 - 10 and Analog input X61.11 - 12).

For actual connections of analog inputs, refer to the hardware manual.

The inverter software reads the current signal from the selected input and scales it linearly to the temperature. Scaling can be selected independently for each measurement with two parameters, temperature at 4 mA and temperature at 20 mA. A linear curve fits in between the two points.

The inverter can be set to trigger events and limit the output current if the measured temperature rises above a defined level. Warning and fault levels can also be set independently for each measurement/feature. The inverter output current limit can be mapped by three points as shown in *Inverter output current limitation curve*.

The inverter output current limitation curve is based on the temperature.

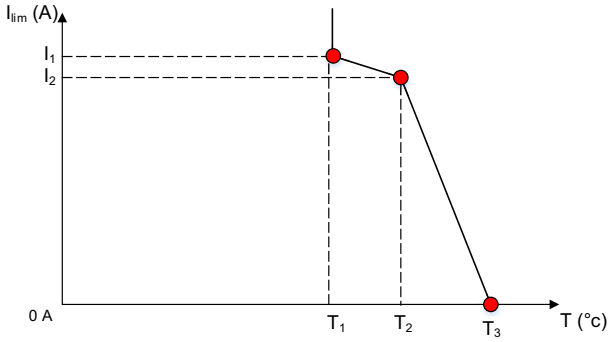


Figure 21. Inverter output current limitation curve

Both the analog inputs software feature has the following set of parameters:

Parameter type	Selection list	X61 terminal
Source	Zero [0]	
	Analog input X61.9 - 10	
	Analog input X61.11 - 12	
	Spare AI3...AI5	Not supported in this release
Temperature	Shows the measured temperature	
Temperature at 4 mA	Temperature sensor configuration. A linear scaling is assumed to be between the two current values.	
Temperature at 20 mA		
Temperature warning limit	Temperature limits that trigger events	
Temperature fault limit		
Current limit temperature 1 - 3	See T_1 - T_3 in *Inverter output current limitation curve*.	
Current limit current 1 - 2	See I_1 - I_2 in *Inverter output current limitation curve*.	

Tabel 4: Customer interface analog inputs configuration

For example, if MV transformer oil temperature signal, which uses a Nokeval HTB230 0/200 current sensor is connected to the Analog input X61.11 - 12 connector, configure the following parameters:

Parameter type	Instruction
Source	Set parameter *177.63 Transformer temperature 2 source* = Analog input X61.11 - 12 [2]
Temperature at 4 mA	Set parameter *177.65 Transformer temperature 2 at 4 mA current* = 0°
Temperature at 20 mA	Configure current limitations of the temperature and the warnings and faults.
Rest of the parameters	Set parameter *177.30 Transformer overpressure failure logic* to active low or high.

Tabel 5: Example of customer interface analog inputs configuration

Settings

177.51 Transformer temperature 1 source...*177.73 Transformer temperature 2, current limit current 2*

Digital output

The only digital output for the MV station is the MV switchgear breaker opening signal. This signal is controlled by different features of the MV transformer or by user control. The MV breaker opening signal can be routed from the software to the physical IO by setting the parameter *176.12 PCC CPU RO 1 sourceUser RO1 source* = MV breaker status [4].

For actual connections of digital output, see the Hardware manual.

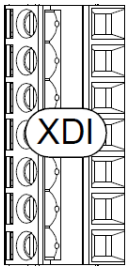
Customer external faults

There are three user input sources that can be configured to trigger external faults for the customer-related features using digital inputs:

- External fault 1 source
- External fault 2 source
- External fault 3 source

Any of these faults can be configured to use any of the customer-related external faults. For details of I/O connections, refer to the hardware and commissioning and maintenance manuals.

Each configured external fault has the following set of parameters:

Parameter type	Selection list	X61 terminal
Source	Off [0]	
	On [1]	
	Digital input X61.1 [2]	
	Digital input X61.2 [3]	
	Digital input X61.3 [4]	
	Digital input X61.4 [5]	
	Digital input X61.5 [6]	
	Digital input X61.6 [7]	
	Digital input X61.7 [8]	
	Spare DI8 [9]...DI12 [13]	Not supported in this release.
Action	No action [0]	
	Delayed warning [1]	
	Warning and delayed fault [2]	
	Delayed fault [3]	
Action delay	Delay time to trigger the defined fault action.	
Failure logic	Active low [0]	
	Active high [1]	

Tabel 6: Customer external faults configuration

To configure a customer fault signal, select the correct source and settings. For example, if a customer fault signal is connected to the Digital input X61.x connector, configure the following parameters:

Action type	Set parameter...
Source for external fault 1 signal	*176.21 External fault 1 source* = Digital input X61.3 [4]
Active type in the event of external fault 1	*176.22 External fault 1 action* = Delayed fault [3]
Delay time to trigger the fault 1 action	*176.23 External fault 1 action delay* = 1 s
Fault 1 failure logic	*176.24 External fault 1 failure logic* = Active High

Tabel 7: Example of customer external faults configuration

Settings

176.21 External fault 1 source...*176.34 External fault 3 failure logic*

User lock

For better cybersecurity, it is highly recommended that you set a master pass code to prevent, for example, the changing of parameter values and/or the loading of firmware and other files.

WARNING! FIMER will not be liable for damages or losses caused by the failure to activate the user lock using a new pass code. Refer to*Cybersecurity disclaimer* on page *8*.

To activate the user lock for the first time, follow the steps below:

1. Enter the default pass code, 10000000, into parameter *196.02 Passcode*. This will make parameters *196.100…196.102* visible.
2. Enter a new pass code into parameter *196.100 Change user pass code*. Always use eight digits; if using Drive composer, finish with **Enter**.
3. Confirm the new pass code in *196.101 Confirm user pass code*.

WARNING! Store the pass code in a safe place. If the pass code is lost, the user lock cannot be opened even by FIMER.

4. In parameter *196.102 User lock functionality*, define the actions that you want to prevent (we recommend you select all the actions unless otherwise required by the application).
5. Enter an invalid (random) pass code into parameter *196.02 Passcode*.
6. Activate parameter *196.08 Control board boot*, or cycle the power to the control unit.
7. Check that parameters *196.100…196.102* are hidden. If they are not, enter another random pass code into parameter *196.02*.

To reopen the lock, enter your pass code into parameter *196.02 Passcode*. This will again make parameters *196.100…196.102* visible.

Access levels

Access levels lists the different access levels linked to certification levels. The access levels are activated based on the pass code entered into parameter *196.02 Passcode*. Parameter*196.03 Access level status* shows which access level is activated.

Access level	User
Basic O&M	Open level. No password needed.
Expert	Maintenance and service engineers.
Master	Certified service engineers.

Tabel 8: Access levels

For the password, contact your local FIMER representative.

Settings

Parameters *196.02 Passcode* (page *132*) and *196.100…196.102*.

4

Parameters

This chapter describes the parameters of the inverter. The parameters are either editable or read-only. The editable parameters can be used to change the inverter settings and they are saved periodically to permanent memory.

The read-only parameters (actual values) can be used to view the inverter status. An actual value is the result of a measurement or calculation by the inverter, or it contains status information.

Terms and abbreviations

Term	Definition
Bit list	Bit list
Data	Data parameter
Default	Default value for an editable parameter.
FbEq16b	16-bit fieldbus equivalent: The scaling between the value shown on the control unit and the integer used in fieldbus communication when a 16-bit value is selected. A dash (-) indicates that the parameter is not accessible in 16-bit format.
FbEq32b	32-bit fieldbus equivalent: The scaling between the value shown on the control unit and the integer used in fieldbus communication when a 32-bit value is selected.
List	Selection list.
No.	Parameter number.
Other	The value is taken from another parameter. Choosing “Other” shows a parameter list in which the user can specify the source parameter.
Other [bit]	The value is taken from a specific bit in another parameter. The source is selected from a parameter list.
PB	Packed Boolean (bit list).
Real	Real number.
Type	Parameter type.

Summary of parameter groups

Group	Contents	Page
101 Actual values	*Basic signals for monitoring the inverter.*	*58*
104 Warnings and faults	*Information on warnings and faults.*	*59*
107 System info	*Inverter hardware and firmware information.*	*60*
112 Standard AI	*Configuration of standard analog inputs.*	*60*
114 Extension I/O module 1	*Configuration of I/O extension module 1.*	*60*
115 Extension I/O module 2	*Configuration of I/O extension module 2.*	*61*
116 Extension I/O module 3	*Configuration of I/O extension module 3.*	*61*
124 Reactive power reference	*Settings for reactive power reference selection, limitation and ramping.*	*62*
125 FRT support curve	*Settings for FRT support curve.*	*66*
126 FRT tripping curve	*Settings for FRT tripping curve.*	*70*
130 Limits	*Operation limits of the inverter.*	*73*
135 Grid monitoring	*Settings for grid monitoring.*	*78*
147 Data storage	*Parameters that can be written to and read from by using source and target settings of other parameters.*	*86*
150 FBA	*Fieldbus adapter communication configuration.*	*89*
151 FBA A settings	*Fieldbus adapter A configuration.*	*95*
152 FBA A data in	*Selection of data to be transferred from Inverter to fieldbus controller through fieldbus adapter A.*	*98*
153 FBA A data out	*Selection of data to be transferred from fieldbus controller to inverter through fieldbus adapter A.*	*98*
154 FBA B settings	*Fieldbus adapter B configuration.*	*98*
155 FBA B data in	*Selection of data to be transferred from the inverter to fieldbus controller through fieldbus adapter B.*	*100*
156 FBA B data out	*Selection of data to be transferred from fieldbus controller to the inverter through fieldbus adapter B.*	*100*
164 SCADA configuration	*SCADA configuration.*	*101*
165 SCADA data in	*Inverter SCADA data in.*	*102*
166 SCADA data out	*Inverter SCADA data out.*	*102*
173 Inverter status	*Inverter control and status words.*	*102*
174 DC input current monitor	*DC input current monitor.*	*106*
176 Customer IOs	*Customer inputs and outputs.*	*114*
177 MV Station	*Medium voltage station parameters including MV transformer and MV switchgear.*	*116*
178 MPPT settings	*MPPT settings.*	*125*
184 Energy metering	*Energy metering parameters.*	*126*
185 Health monitoring	*Health monitoring inhibits starting.*	*127*
189 Inverter control	*Inverter control settings.*	*128*
190 Grid measurements	*Settings for grid voltage measurements of the inverter.*	*130*
195 HW configuration	*Various hardware-related settings.*	*131*
196 System	*Systems settings: Language selection, parameter save and restore, control unit reboot.*	*132*
199 PLC diagnostics	*PLC diagnostics settings.*	*135*
204 PLC Extension Inputs	*PLC extension inputs.*	*136*
205 PLC Extension Outputs	*PLC output signals.*	*143*
208 DC input monitor	*DC input voltage monitoring related parameter group.*	*144*

Parameter listing

No.	Name/Value	Description	Def/ FbEq16/32
101 Actual values		Basic signals for monitoring the inverter. All parameters in this group are read-only unless otherwise noted.	
101.01	DC voltage	Measured intermediate circuit voltage.	- / *Real*
	0.00 … 2000.00 V	Intermediate circuit voltage.	1 = 1 V/ 100 = 1 V
101.02	Line current	Calculated phase current.	- / *Real*
	0.00 … 30000.00 A	Phase current.	1 = 1 A/ 100 = 1 A
101.03	Line current %	Calculated phase current in percent of the nominal current.	- / *Real*
	0.0 … 1000.0 %	Phase current in percent of the nominal current.	1 = 1%/ 10 = 1%
101.04	Active current	Measured active current.	- / *Real*
	-30000.00 … 30000.00 A	Active current.	1 = 1 A/ 100 = 1 A
101.05	Active current %	Active current in percent of the nominal value.	- / *Real*
	-1000.0 … 1000.0%	Active current in percent of the nominal value.	1 = 1%/ 10 = 1%
101.06	Reactive current	Reactive phase current.	- / *Real*
	-30000.00 … 30000.00 A	Reactive phase current.	1 = 1 A/ 100 = 1 A
101.07	Reactive current %	Reactive current in percent of the nominal value.	- / *Real*
	-1000.0 … 1000.0%	Reactive current in percent of the nominal value.	1 = 1%/ 10 = 1%
101.08	Frequency	Estimated grid frequency. If parameter *91.1 Bamu enable* = ON, then line frequency is calculated from measured grid voltage.	- / *Real*
	0.00 … 100.00 Hz	Grid frequency.	100 = 1 Hz
101.09	Grid voltage	Measured mains voltage. Main voltage is measured when parameter *91.1 Bamu enable* = ON.	- / *Real*
	0.00 … 2000.00 V	Mains voltage.	1 = 1 V/ 100 = 1 V
101.10	Apparent power	Calculated output apparent power.	- / *Real*
	-30000.00 … 30000.00 kVA	Output apparent power.	1 = 1 kVA/ 100 = 1 kVA
101.11	Apparent power %	Calculated output apparent power in percentage of the nominal value.	- / *Real*
	-1000.0 … 1000.0%	Output apparent power in percentage.	1 = 1%/ 10 = 1%
101.12	Active power	Calculated output active power.	- / *Real*
	-30000.00 … 30000.00 kW	Output active power.	1 = 1 kW/ 100 = 1 kW
101.13	Active Power %	Calculated output active power in percentage of nominal value.	- / *Real*
	-1000.0 … 1000.0%	Output active power in percentage of nominal value.	1 = 1%/ 10 = 1%

No.	Name/Value	Description	Def/ FbEq16/32
101.14	Reactive power	Calculated output reactive power.	- / *Real*
	-30000.00 … 30000.00 kVAr	Output reactive power.	1 = 1 kVAr/ 100 = 1 kVAr
101.15	Reactive power %	Calculated output reactive power in percentage of nominal value.	- / *Real*
	-1000.0 … 1000.0%	Output reactive power in percentage of nominal value.	1 = 1%/ 10 = 1%
101.16	CosPhi	Calculated power factor (CosPhi).	- / *Real*
	-1.00 … 1.00	Power factor (CosPhi).	100 = 1
101.20	Converter current	Measured line current.	- / *Real*
	0.00 … 30000.00 A	Line current.	1 = 1 A/ 100 = 1 A
101.25	kWh to grid	Counts the kWh generated from inverter into the grid.	- / *Real*
	0... 1000 kWh	kWh generated from inverter into the grid.	1 = 1 kWh
101.26	MWh to grid	Counts the MWh generated from inverter into the grid.	- / *Real*
	0... 1000 MWh	MWh generated from inverter into the grid.	1 = 1 MWh
101.27	GWh to grid	Counts the GWh generated from inverter into the grid.	- / *Real*
	0... 32767 GWh	GWh generated from inverter into the grid.	1 = 1 GWh
101.64	Nominal power	Nominal power of the inverter.	- / *Real*
	0 … 30000 kW	Nominal power of the inverter.	1 = 1 kW
104 Warnings and faults		Information on warnings and faults. For description of individual warning and fault codes, see chapter *Troubleshooting* on page *153*. All parameters in this group are read-only unless otherwise noted.	
104.01	Tripping fault	Event code of the active fault.	- / *Data*
104.02	Active fault 2	Event code of the second active fault.	- / *Data*
104.03	Active fault 3	Event code of the third active fault.	- / *Data*
104.04	Active fault 4	Event code of the fourth active fault.	- / *Data*
104.05	Active fault 5	Event code of the fifth active fault.	- / *Data*
104.06	Active warning 1	Event code of the active warning.	- / *Data*
104.07	Active warning 2	Event code of the second active warning.	- / *Data*
104.08	Active warning 3	Event code of the third active warning.	- / *Data*
104.09	Active warning 4	Event code of the fourth active warning.	- / *Data*
104.10	Active warning 5	Event code of the fifth active warning.	- / *Data*
104.11	Latest fault	Event code of the previously reset fault.	- / *Data*
104.12	2nd latest fault	Event code of the second previously reset fault.	- / *Data*
104.13	3rd latest fault	Event code of the third previously reset fault.	- / *Data*
104.14	4th latest fault	Event code of the fourth previously reset fault.	- / *Data*
104.15	5th latest fault	Event code of the fifth previously reset fault.	- / *Data*
104.16	Latest warning	Event code of the previously cleared warning.	- / *Data*
104.17	2nd latest warning	Event code of the second previously cleared warning.	- / *Data*
104.18	3rd latest warning	Event code of the third previously cleared warning.	- / *Data*
104.19	4th latest warning	Event code of the fourth previously cleared warning.	- / *Data*
104.20	5th latest warning	Event code of the fifth previously cleared warning.	- / *Data*

No.	Name/Value	Description	Def/ FbEq16/32
107 System info		Inverter hardware and firmware information. All parameters in this group are read-only.	
107.03	Rating id	Shows inverter rating ID.	- / *Real*
107.04	Firmware name	Shows firmware name.	- / *Data*
107.05	Firmware ver	Shows firmware version	- / *Data*
107.06	Loading package name	Shows firmware loading package name.	- / *Data*
107.07	Loading package version	Shows firmware loading package version number.	- / *Data*
107.08	Bootloader version	Shows version number of the firmware bootloader.	- / *Data*
107.09	Preboot version	Shows version number of the pre-bootloader.	- / *Data*
107.10	Safety critical hash	Shows 32-bit hash code computed from the safety critical source code.	0x0000/ *Data*
	0x0000...0xffff	32-bit hash code	-
107.11	Cpu usage	Shows CPU usage.	- / *Real*
	0 … 100%	CPU usage in percent.	1 = 1%
107.12	PU logic version name	Shows version name of the power unit FPGA logic.	- / *Data*
107.17	PLC SW version	Shows PLC software version number.	- / *Data*
112 Standard AI		Configuration of standard analog inputs.	
112.15	AI1 unit selection	Selects the unit of measurement for analog input AI1. The input type can be selected using a jumper in the control unit (see the appropriate hardware manual).	mA/ *List*
	V	Voltage	0
	mA	Milliamperes	1
112.25	AI2 unit selection	Selects the unit of measurement for analog input AI2. The input type can be selected using a jumper in the control unit (see the appropriate hardware manual).	mA/ *List*
	V	Voltage	0
	mA	Milliamperes	1
114 Extension I/O module 1		Configuration of I/O extension module 1. **Note**: Contents of this parameter group vary according to the selected I/O extension module type.	
114.01	Module 1 type	Activates and specifies the type of I/O extension module 1.	None/ *List*
	None	Inactive.	0
	FIO-01	FIO-01.	1
	FIO-11	FIO-11.	2
	FAIO-01	FAIO-01.	3
114.02	Module 1 location	Specifies node number (1...3) on the control unit into which the I/O extension module is installed. (Node 1 = slot 1, node 2 = slot 2, node 3 = slot 3). Alternatively, specifies the node ID of the slot on an FEA-0x extension adapter.	Slot 1/ *List*
	Not selected		0
	Slot 1		1
	Slot 2		2
	Slot 3		3

No.	Name/Value	Description	Def/ FbEq16/32
114.03	Module 1 status	Shows status of I/O extension module 1. This parameter is read-only.	No option/ *List*
	No option	No module detected in the specified slot.	0
	FIO-01	An FIO-01 module is detected and is active.	1
	FEN-01	An FEN-01 module is detected and is active.	2
	FEN-11	An FEN-11 module is detected and is active.	3
	FEN-21	An FEN-21 module is detected and is active.	4
	FIO-11	An FIO-11 module is detected and is active.	5
	FEN-31	An FEN-31 module is detected and is active.	6
	FAIO-01	An FAIO-01 module is detected and is active.	7
115 Extension I/O module 2		Configuration of I/O extension module 2. See also section Programmable I/O extensions. **Note**: Contents of this parameter group vary according to the selected I/O extension module type.	
115.01	Module 2 type	Selects option module 2 type.	None/ *List*
	None	Inactive	0
	FIO-01	FIO-01	1
	FIO-11	FIO-11	2
	FAIO-01	FIO-01	3
115.02	Module 2 location	Selects option module 2 location	Slot 1/ *List*
	Not selected		0
	Slot 1		1
	Slot 2		2
	Slot 3		3
115.03	Module 2 status	Shows status of I/O extension module 2. This parameter is read-only.	No option/ *List*
	No option	No module is detected in the specified slot.	0
	FIO-01	An FIO-01 module is detected and is active.	1
	FIO-11	An FIO-11 module is detected and is active.	5
	FAIO-01	An FAIO-01 module is detected and is active.	7
116 Extension I/O module 3		Configuration of I/O extension module 3. See also section Programmable I/O extensions. **Note**: The contents of the parameter group vary according to the selected I/O extension module type.	
116.01	Module 3 type	Selects option module 3 type.	None/ *List*
	None	Inactive.	0
	FIO-01	FIO-01	1
	FIO-11	FIO-11	2
	FAIO-01	FIO-01	3
116.02	Module 3 location	Selects option module 3 location.	Slot 1/ *List*
	Not selected		0
	Slot 1		1
	Slot 2		2
	Slot 3		3

No.	Name/Value	Description	Def/ FbEq16/32
116.03	Module 3 status	Shows status of I/O extension module 2.	No option/ *List*
	No option	No module is detected in the specified slot.	0
	FIO-01	An FIO-01 module is detected and is active.	1
	FIO-11	An FIO-11 module is detected and is active.	5
	FAIO-01	An FAIO-01 module is detected and is active.	7
124 Reactive power reference		Settings for reactive power reference selection, limitation and ramping.	
124.01	User Qref	Writes reactive power reference value. The unit is selected with parameter *124.06 Q power ref type*.	- / *Real*
	-	Reactive power reference value	1 = 1%/ 100 = 1%
124.02	Q power ref selection	Selects control signal location for reactive power reference.	User ref/ *List*
	User ref	Value of parameter *124.01 User Qref*.	0
	AI1 scaled	Parameter *112.12 AI1 scaled value*.	1
	AI2 scaled	Parameter *112.22 AI2 scaled value*.	2
	FB A ref1	Fieldbus adapter A reference 1.	3
	FB A ref2	Fieldbus adapter A reference 2.	4
	DDCS ctrl ref1	Parameter *103.11 DDCS controller ref 1*.	5
	DDCS ctrl ref2	Parameter *103.12 DDCS controller ref 2*.	6
	M/F ref1	Master follower reference 1.	7
	M/F ref2	Master follower reference 2.	8
124.03	Qref 1	Shows reactive power reference selected with *124.02 Q power ref selection*. This parameter is read-only.	- / *Real*
	-	Reactive power reference value	1 = 1% 100 = 1 %
124.04	Q ref scale	Defines scaling factor for *124.03 Qref 1*.	1.00 /*Real*
	-1000.00 … 1000.00	Scaling factor.	1 = 1/ 100 = 1
124.05	Qref 2	Shows reactive power reference value (*124.03 Qref 1*) after scaling. This parameter is read-only.	- / *Real*
	-200.00...200.00 %	Reactive power reference value.	1 = 1%/ 100 = 1%
124.06	Q power ref type	Selects reactive power reference type and unit.	Qref [%]/ *List*
	Ireact ref [A]	Reactive current reference in Amperes.	0
	Ireact ref [%]	Reactive current reference in % of nominal current.	1
	Qref [kVAr]	Reactive power reference in kVAr.	2
	Qref [%]	Reactive power reference in % of nominal power.	3
	Phi	Reactive power reference angle in degrees 1 = 1 degree.	4
	CosPhi	Reactive power reference in cosphi 0.9 = 0.9 capacitive.	5
	AC volt ref [V]	AC voltage reference in Volts.	6

No.	Name/Value	Description	Def/ FbEq16/32
	AC volt ref [%]	AC voltage reference in % of nominal voltage.	7
	Q(x) regulation curve	Q(x) regulation curve.	8
124.07	Ireact ref %	Shows reactive current reference in percent. This parameter is read-only.	- / *Real*
	-1000.0 … 1000.0%	Reactive current reference in percent.	1 = 1%/ 10 = 1%
124.08	Ireact ref	Shows reactive current reference in Amperes. This parameter is read-only.	- / *Real*
	-	Reactive current reference.	1 = 1 A/ 100 = 1 A
124.09	Q power ref %	Shows reactive power reference in percent of the nominal power. This parameter is read-only.	- / *Real*
	-1000.0 … 1000.0%	Reactive power reference in percent.	1 = 1%/ 10 = 1%
124.10	Q power ref	Shows reactive power reference in kVAr. This parameter is read-only.	- / *Real*
	-	Reactive power reference in kVAr.	1 = 1 kVAr/ 10 = 1 kVAr
124.11	Ireact ref max %	Defines maximum limit for the reactive current reference in percent.	120.0%/ *Real*
	0.0 … 200.0%	Maximum reactive current reference in percent.	1 = 1%/ 10 = 1%
124.12	Ireact ref min %	Defines minimum limit for the reactive current reference in percent.	-120.0%/ *Real*
	-200.0… 0.0%	Minimum reactive current reference in percent.	10 = 1%
124.13	Ireact ref lim %	Shows the limited output reactive current reference. This parameter is read-only.	- / *Real*
	-200.0 … 200.0%	Limited output reactive current reference,	10 = 1%
124.14	Ireact ref ramp up	Defines reactive current ramp up time from zero to nominal current.	1000 ms / *Real*
	0 … 60000 ms	Reactive current ramp up time in milliseconds.	1 = 1 ms
124.15	Ireact ref ramp down	Defines reactive current ramp down time from nominal current to zero.	1000 ms / *Real*
	0 … 60000 ms	Reactive current ramp down time in milliseconds.	1 = 1 ms
124.16	Ireact ref out %	Shows percent of output reactive current reference for the controller. This parameter is read-only.	- / *Real*
	-200.0 … 200.0%	Output value of reactive current reference in %.	1 = 1 % / 10 = 1 %
124.17	Ireact ref out	Shows output of reactive current reference in Amperes for the controller. This parameter is read-only.	- /*Real*
	-	Output value of reactive current reference in Amperes.	1 = 1 A/ 100 = 1 A

No.	Name/Value	Description	Def/ FbEq16/32
124.18	Q power ref out %	Shows output value of reactive power reference in percent of the nominal power for the controller. This parameter is read-only.	- /*Real*
	-200.0 … 200.0%	Output value of reactive power reference.	1 = 1%/ 10 = 1%
124.19	Q power ref out	Shows output value of reactive power reference in kVAr for the controller. This parameter is read-only.	- / *Real*
	-	Output value of reactive power reference.	1 = 1 kVAr/ 10 = 1 kVAr
124.20	AC voltage control gain	Defines relative gain of the AC voltage controller used in the reactive power reference chain.	10.0 / *Real*
	0.0 … 100.0	Relative gain of the AC voltage controller.	10 = 1
124.21	AC voltage control integ time	Defines integration time of the AC voltage controller used in the reactive power reference chain.	100 ms / *Real*
	0 … 30000 ms	Integration time of the AC voltage controller.	1 = 1 ms
124.22	AC voltage diff max %	Defines maximum limit for AC voltage difference.	10.0%/ *Real*
	0.0 … 30.0%	Maximum limit of AC voltage difference.	1 = 1%/ 10 = 1%
124.23	AC voltage diff min %	Defines maximum negative limit for the AC voltage difference (reference - actual) used in the reactive power reference chain.	-10.0%/ *Real*
	-30.0 … 0.0%	Maximum negative limit for AC voltage difference.	1 = 1%/ 10 = 1%
124.24	AC voltage control sig	Selects the grid voltage signal for AC voltage control.	Max phase rms voltage/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
124.25	Deadband range	Defines deadband range around nominal voltage where the AC voltage control is not active.	0.0%/ *Real*
	0.0 … 100.0%	Deadband range.	1 = 1%/ 10 = 1%
124.26	Deadband gain	Defines gain for the user reactive power reference during deadband operation.	1.0 / *Real*
	1.0 … 100.0	Deadband gain.	1 = 1 / 10 = 1
124.27	AC control base grid voltage	Defines AC control base value for grid voltage estimate. The value of this parameter is used to convert voltages to power unit.	400 V/ *Real*
	100 … 1000 V	AC control base value for grid voltage estimate.	1 = 1 V
124.29	Combined operation of Qref and Q(x) curve	Sets the combined operation mode of Q-ref and Q(x) curve.	Disabled/ *List*
	Disabled	Selected Qref is used	0
	Qref until Q(x) activated	Qref selection is followed until Q(x) curve is activated	1
	Qref while Qref smaller than Q(x)-ref	Qref is used until it is larger than the reference from the Q(x) curve	2

No.	Name/Value	Description	Def/ FbEq16/32
124.30	Q(x) curve	Selects input signal used in Q(x) regulation curve.	Q(U)/ *List*
	Q(U)	Input: grid AC voltage Output: reactive power reference	0
	Q(P)	Input: actual power Output: reactive power reference	1
	CosPhi(P)	Input: actual power Output: cos phi	2
	CosPhi(U)	Input: grid AC voltage Output: cos phi	3
124.31	Lock-in level	Defines lock-in level above which the Q(x) regulation curve is activated.	20.0%/ *Real*
	0.0 … 200.0%	Lock-in level.	1 = 1%/ 10 = 1%
124.32	Lock-out level	Defines lock-out level. If the signal goes below the lock-out level, the reactive power reference is reset to zero until the lock-in level is exceeded.	5.0%/ *Real*
	0.0 … 200.0%	Lock-out level.	1 = 1%/ 10 = 1%
124.33	Q(x) input level 1	Defines first input value for the Q(x) regulation curve. When the selected input signal reaches this value, the reactive power reference is set to the value defined with parameter *124.39 Q(x) output level 1*.	0.0%/ *Real*
	-	First input value for the Q(x) regulation curve.	1 = 1%/ 10 = 1%
124.34	Q(x) input level 2	Defines second input value for the Q(x) regulation curve.	0.0%/ *Real*
	-	Second input value for the Q(x) regulation curve.	1 = 1%/ 10 = 1%
124.35	Q(x) input level 3	Defines third input value for the Q(x) regulation curve.	0.0%/ *Real*
	-	Third input value for the Q(x) regulation curve.	1 = 1%/ 10 = 1%
124.36	Q(x) input level 4	Defines fourth input value for the Q(x) regulation curve.	0.0%/ *Real*
	-	Fourth input value for the Q(x) regulation curve.	1 = 1%/ 10 = 1%
124.37	Q(x) input level 5	Defines fifth input value for the Q(x) regulation curve.	0.0%/ *Real*
	-	Fifth input value for the Q(x) regulation curve.	1 = 1%/ 10 = 1%
124.38	Q(x) input level 6	Defines sixth input value for the Q(x) regulation curve.	0.0%/ *Real*
	-	Sixth input value for the Q(x) regulation curve.	1 = 1%/ 10 = 1%
124.39	Q(x) output level 1	Defines first reference output value for the Q(x) regulation curve. When the selected input signal reaches the value defined by parameter *124.33 Q(x) input level 1*, the reactive power reference is set to the value defined by this parameter.	0.0% / *Real*
	-	First reference output value for the Q(x) regulation curve.	1 = 1% / 100 = 1%
124.40	Q(x) output level 2	Defines second reference output value for the Q(x) regulation curve.	0.0% / *Real*
	-	Second reference output value for the Q(x) regulation curve.	1 = 1% / 100 = 1%

No.	Name/Value	Description	Def/ FbEq16/32
124.41	Q(x) output level 3	Defines third reference output value for the Q(x) regulation curve.	0.0% / *Real*
	-	Third reference output value for the Q(x) regulation curve.	1 = 1% / 100 = 1%
124.42	Q(x) output level 4	Defines fourth reference output value for the Q(x) regulation curve.	0.0% / *Real*
	-	Fourth reference output value for the Q(x) regulation curve.	1 = 1% / 100 = 1%
124.43	Q(x) output level 5	Defines fifth reference output value for the Q(x) regulation curve.	0.0% / *Real*
	-	Fifth reference output value for the Q(x) regulation curve.	1 = 1% / 100 = 1%
124.44	Q(x) output level 6	Defines sixth reference output value for the Q(x) regulation curve.	0.0% / *Real*
	-	Sixth reference output value for the Q(x) regulation curve.	1 = 1% / 100 = 1%
124.45	Q(U) activation delay	Defines activation delay time for Q(U) regulation curve.	0 ms/ *Real*
	0...600000 ms	Q(U) activation delay time	1 = 1 ms
124.46	Q(U) activation level low	Defines the lower threshold voltage level. When grid voltage drops below this level, the Q(U) regulation curve is activated after the activation delay.	100%/ *Real*
	0...200%	Q(U) lower threshold voltage level in %.	1 = 1%
124.47	Q(U) activation level high	Defines the higher threshold voltage level. When grid voltage exceeds this level, the Q(U) regulation curve is activated after the activation delay.	100%/ *Real*
	0...200%	Q(U) higher threshold voltage level in %.	1 = 1%
124.48	Q(x) voltage selection	Selects voltage signal for Q(x) regulation curve.	Average grid voltage/ *List*
	Average grid voltage	Average grid voltage.	0
	Max phase rms voltage	Maximum rms value of line-to-line voltage.	1
	Max LL rms voltage	Minimum rms value of line-to-line voltage.	2
125 FRT support curve		Settings for FRT support curve.	
125.01	Grid support	Selects grid support mode.	Disabled/ *List*
	Disabled	Grid support is disabled.	0
	No support	Grid support current is set to zero.	1
	K-factor	Grid support current is defined by starting point (P1) and grid support gains.	2
	Curve points	Grid support current is defined by curve points.	3
125.02	Gs Lv symm sig	Selects grid support voltage signal of symmetric dip.	Max phase rms voltage/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3

No.	Name/Value	Description	Def/ FbEq16/32
	Pos seq voltage	Positive sequence component of voltage.	4
125.03	Gs Lv asymm sig	Selects grid support voltage signal of asymmetric dip.	Max phase rms voltage/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
125.04	Lv Gs trig U %	Defines low voltage grid support trigger level.	90%/ *Real*
	0 … 100%	Low voltage grid support trigger level.	1 = 1%
125.05	Lv Gs K-factor	Defines low voltage grid support gain for capacitive reactive current.	1.00 /*Real*
	0.00 … 10.00	Low voltage grid support gain for capacitive reactive current.	100 = 1
125.06	Lv Gs P1 volt %	Defines low voltage grid support voltage level 1.	90%/*Real*
	0 … 100%	Low voltage grid support voltage level 1	1 = 1%
125.07	Lv Gs P1 cur %	Defines capacitive reactive current for low voltage grid support voltage level 1.	25%/*Real*
	0 … 100%	Capacitive reactive current for low voltage grid support voltage level 1.	1 = 1%
125.08	Lv Gs P2 volt %	Defines low voltage grid support voltage level 2.	80%/*Real*
	0 … 100%	Low voltage grid support voltage level 2	1 = 1%
125.09	Lv Gs P2 cur %	Defines capacitive reactive current for low voltage grid support voltage level 2.	50%/ *Real*
	0 … 100%	Capacitive reactive current for low voltage grid support voltage level 2	1 = 1%
125.10	Lv Gs P3 volt %	Defines low voltage grid support voltage level 3.	60%/ *Real*
	0 … 100%	Low voltage grid support voltage level 3.	1 = 1%
125.11	Lv Gs P3 cur %	Defines capacitive reactive current for low voltage grid support voltage level 3.	80%/ *Real*
	0 … 100%	Capacitive reactive current for low voltage grid support voltage level 3	1 = 1%
125.12	Lv Gs P4 volt %	Defines low voltage grid support voltage level 4.	25%/ *Real*
	0 … 100%	Low voltage grid support voltage level 4	1 = 1%
125.13	Lv Gs P4 cur %	Defines capacitive reactive current for low voltage grid support voltage level 4.	100%/ *Real*
	0 … 100%	Capacitive reactive current for low voltage grid support voltage level 4.	1 = 1%
125.14	Lv Gs P5 volt %	Defines low voltage grid support voltage level 5.	0%/ *Real*
	0 … 100%	Low voltage grid support voltage level 5.	1 = 1%
125.15	Lv Gs P5 cur %	Defines capacitive reactive current for low voltage grid support voltage level 5.	100%/ *Real*
	0 … 100%	Capacitive reactive current for low voltage grid support voltage level 5.	1 = 1%

No.	Name/Value	Description	Def/ FbEq16/32
125.16	Gs Hv symm sig	Selects grid support voltage signal of symmetric swell.	Same as Gs LV/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
	Same as Gs LV	See *125.02 Gs Lv symm sig* (page *66*).	5
125.17	Gs Hv asymm sig	Selects grid support voltage signal of asymmetric swell.	Same as Gs LV/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
	Same as Gs LV	See *125.02 Gs Lv symm sig* (page *66*).	5
125.18	Hv Gs trig U %	Defines high voltage grid support trigger level.	110 %/ *Real*
	100 … 150%	High voltage grid support trigger level.	1 = 1%
125.19	Hv Gs K-factor	Sets high voltage grid support gain for inductive reactive current.	1.00 / *Real*
	0.00 … 10.00	High voltage grid support gain for inductive reactive current.	100 = 1
125.20	Hv Gs P1 volt %	Defines high voltage grid support voltage level 1.	110%/ *Real*
	90 … 150%	High voltage grid support voltage level 1.	1 = 1%
125.21	Hv Gs P1 cur %	Defines inductive reactive current for high voltage grid support voltage level 1.	-10%/ *Real*
	-100 … 0%	Inductive reactive current for high voltage grid support voltage level 1.	1 = 1%
125.22	Hv Gs P2 volt %	Defines high voltage grid support voltage level 2.	125%/ *Real*
	90 … 150%	High voltage grid support voltage level 2.	1 = 1%
125.23	Hv Gs P2 cur %	Defines inductive reactive current for high voltage grid support voltage level 2.	-30%/ *Real*
	-100 … 0%	Inductive reactive current for high voltage grid support voltage level 2.	1 = 1%
125.24	Hv Gs P3 volt %	Defines high voltage grid support voltage level 3.	150%/ *Real*
	90 … 150%	High voltage grid support voltage level 3.	1 = 1%
125.25	Hv Gs P3 cur %	Defines inductive reactive current for high voltage grid support voltage level 3.	-50%/ *Real*
	-100 … 0%	Inductive reactive current for high voltage grid support voltage level 3.	1 = 1%
125.28	Frt Ireact ref ramp up	Defines FRT reactive current ramp up time.	10 ms/ *Real*
	0 … 1000 ms	FRT reactive current ramp up time.	1 = 1 ms
125.29	Frt Ireact ref ramp down	Defines FRT reactive current ramp down time.	10 ms/ *Real*
	0 … 1000 ms	FRT reactive current ramp down time.	1 = 1 ms
125.30	Frt Ipow ref ramp up	Defines FRT active current ramp up time.	10 ms/ *Real*
	0 … 1000 ms	FRT active current ramp up time.	1 = 1 ms

No.	Name/Value	Description	Def/ FbEq16/32
125.31	Frt Ipow ref ramp down	Defines FRT active current ramp down time.	10 ms/ *Real*
	0 … 1000 ms	FRT active current ramp down time.	1 = 1 ms
125.32	Frt Ireact ref %	Shows FRT reactive current reference. This parameter is read-only.	-/ *Real*
	-200.0 … 200.0%	FRT reactive current reference.	1 = 1%/ 10 = 1%
125.33	Frt Ireact ref out %	Shows ramped FRT reactive current reference. This parameter is read-only.	-/ *Real*
	-200.0 … 200.0%	Ramped FRT reactive current reference.	1 = 1%/ 10 = 1%
125.34	Frt Ipow ref %	Shows FRT active current reference. This parameter is read-only.	- / *Real*
	-200.0 … 200.0%	FRT active current reference.	1 = 1%/ 10 = 1%
125.35	Frt Ipow ref out %	Shows ramped FRT active current reference. This parameter is read-only.	- / *Real*
	-200.0 … 200.0%	Ramped FRT active current reference.	1 = 1%/ 10 = 1%
125.36	Gs after dip time	Defines duration of grid support after reaching the normal voltage region.	500 ms/ *Real*
	0 … 300000 ms	Duration of grid support.	- / 1 = 1 ms
125.37	Frt Imax %	Defines total current limit in percentage of nominal current at FRT function.	100%/ *Real*
	0 … 200%	Total current limit in percentage of nominal current at FRT function.	1 = 1%
125.39	Frt AC ctrl ref %	Defines the reference of FRT AC voltage controller at voltage dip.	90 %/ *Real*
	0 … 110 %	FRT AC voltage controller reference.	10 = 1 %
125.41	Frt AC control integ time	Defines the integration time of the FRT AC voltage controller.	100 s/ *Real*
	0 … 30000 s	FRT AC voltage controller integration time.	1 = 1 %
125.42	Frt AC diff max %	Defines the maximum input for FRT AC voltage controller.	10 %/ *Real*
	0 … 30 %	FRT AC voltage controller maximum input.	1 = 1 %
125.43	Frt AC diff min %	Defines the minimum input for FRT AC voltage controller.	-10 %/ *Real*
	-30 … 0 %	FRT AC voltage controller minimum input.	1 = 1 %
125.44	Frt AC Ireact ref max %	Defines the maximum limit for FRT AC voltage controller.	100 %/ *Real*
	0 … 200 %	FRT AC voltage controller maximum limit.	1 = 1 %
125.45	Frt AC Ireact ref min %	Defines the minimum limit for FRT AC voltage controller.	-100 %/ *Real*
	-200 … 0 %	FRT AC voltage controller minimum limit.	1 = 1 %
125.49	Gs prefault average time	Defines averaging window time for grid support reference voltage and grid support base current.	60 s/ *Real*
	1 … 300 s	Averaging window time	1 = 1 s

No.	Name/Value	Description	Def/ FbEq16/32
125.50	Gs base current	Selects base level for the reactive current used during the grid support function.	Prefault average current/ *List*
	Zero	Base current is zero.	0
	Prefault average current	Base current is sliding average of reactive current. Average time is determined by parameter *125.49 Gs prefault average time*.	2
125.51	Gs reference voltage	Selects reference voltage signal used during the grid support function.	Prefault average voltage/ *List*
	Nominal voltage	Nominal voltage is used to calculate the fault ride through (FRT) grid support current.	0
	Prefault average voltage	Sliding average for AC voltage used in grid support. Time for average is determined in parameter *125.49 GS prefault average time*.	2
125.52	Gs average voltage	Selects grid support averaging voltage signal. When reference voltage is set as prefault average, this parameter defines which voltage is used to calculate the average voltage.	Pos seq voltage/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
125.53	Gs active power reserve	Defines active power reserve in fault ride through.	0 %/ *Real*
	0 … 100 %	Active power reserve in fault ride through.	1 = 1 %
125.54	Gs max reserve current	Defines maximum active current reserve in fault ride through. This limits reserve current because scaling between power and current may be complicated when grid voltage is very low.	10 %/ *Real*
	0 … 100 %	Maximum active current reserve in fault ride through.	1 = 1 %
126 FRT tripping curve		Settings for FRT tripping curve.	
126.01	FRT enable	Enables FRT tripping curve.	No/ *List*
	No	FRT function disabled.	0
	Yes	FRT function enabled.	1
126.02	Lv Rt symm sig	Selects voltage signal of low voltage symmetric dip.	Pos seq voltage/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
126.03	Lv Rt asymm sig	Selects voltage signal of low voltage asymmetric dip.	Pos seq voltage/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0

No.	Name/Value	Description	Def/ FbEq16/32
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
126.04	Hv Rt symm sig	Selects voltage signal of high voltage symmetric dip.	Max phase rms voltage/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
126.05	Hv Rt asymm sig	Selects voltage signal of high voltage asymmetric dip.	Max phase rms voltage/ *List*
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
126.06	Asymm/symm limit	Defines negative sequence voltage level when the dip is considered as asymmetric dip.	3%/ *Real*
	0 … 100%	Asymmetric dip limit	1 = 1%
126.10	Lv Rt trig U %	Activates low voltage tripping curve function if the mains voltage is below the trig level.	85%/ *Real*
	0 … 100%	Low voltage tripping curve trig level.	1 = 1%
126.11	Lv Rt recover hyst U %	Defines low voltage tripping curve function recover hysteresis. The curve is deactivated when mains voltage is above the trigger limit plus hysteresis.	5%/ *Real*
	0 … 20%	Low voltage tripping curve function recover hysteresis.	1 = 1%
126.12	Lv Rt sec 1 time	Defines duration of low voltage tripping curve (Lv Rt) section 1. If duration is greater than zero, the Lv Rt section is enabled.	600 ms/ *Real*
	0 … 300000 ms	Low voltage tripping curve section 1 duration.	1 = 1 ms
126.13	Lv Rt sec 2 time	Defines duration of low voltage tripping curve (Lv Rt) section 2. If duration is greater than zero, the Lv Rt section is enabled.	600 ms/ *Real*
	0 … 300000 ms	Low voltage tripping curve section 2 duration.	1 = 1 ms
126.14	Lv Rt sec 3 time	Defines duration of low voltage tripping curve (Lv Rt) section 3. If duration is greater than zero, the Lv Rt section is enabled.	600 ms/ *Real*
	0 … 300000 ms	Low voltage tripping curve section 3 duration.	1 = 1 ms
126.15	Lv Rt sec 4 time	Defines duration of low voltage tripping curve (Lv Rt) section 4. If duration is greater than zero, the Lv Rt section is enabled.	600 ms/ *Real*
	0 … 300000 ms	Low voltage tripping curve section 4 duration.	1 = 1 ms
126.16	Lv Rt sec 5 time	Defines duration of low voltage tripping curve (Lv Rt) section 5. If duration is greater than zero, the Lv Rt section is enabled.	600 ms/ *Real*

No.	Name/Value	Description	Def/ FbEq16/32
	0 … 300000 ms	Low voltage tripping curve section 5 duration.	1 = 1 ms
126.17	Lv Rt ext time	Defines extended duration of low voltage tripping curve (Lv Rt) section. If duration is greater than zero, the extended Lv Rt section is enabled. This kind of extended section is required for a few grid codes.	0 ms/ *Real*
	0 … 300000 ms	Low voltage tripping curve section extended duration.	1 = 1 ms
126.18	Lv Rt S1 start U %	Defines starting voltage level of section 1.	0%/ *Real*
	0 … 100%	Starting voltage level of section 1.	1 = 1%
126.19	Lv Rt S1 end U %	Defines final voltage level of section 1.	0%/ *Real*
	0 … 100%	Final voltage level of section 1.	1 = 1%
126.20	Lv Rt S2 start U %	Defines starting voltage level of section 2.	0%/ *Real*
	0 … 100%	Starting voltage level of section 2.	1 = 1%
126.21	Lv Rt S2 end U %	Defines final voltage level of section 2.	20%/ *Real*
	0 … 100%	Final voltage level of section 2.	1 = 1%
126.22	Lv Rt S3 start U %	Defines starting voltage level of section 3.	20%/ *Real*
	0 … 100%	Starting voltage level of the section 3.	1 = 1%
126.23	Lv Rt S3 end U %	Defines final voltage level of section 3.	40%/ *Real*
	0 … 100%	Final voltage level of section 3	1 = 1%
126.24	Lv Rt S4 start U %	Defines starting voltage level of section 4.	40%/ *Real*
	0 … 100%	Starting voltage level of section 4.	1 = 1%
126.25	Lv Rt S4 end U %	Defines final voltage level of section 4.	60%/ *Real*
	0 … 100%	Final voltage level of section 4.	1 = 1%
126.26	Lv Rt S5 start U %	Defines starting voltage level of section 5.	60%/ *Real*
	0 … 100%	Starting voltage level of section 5.	1 = 1%
126.27	Lv Rt S5 end U %	Defines final voltage level of section 5.	80%/ *Real*
	0 … 100%	Final voltage level of section 5.	1 = 1%
126.28	Lv Rt ext U %	Defines voltage level of extended section. The extended section is required in some grid codes.	80%/ *Real*
	0 … 100%	Voltage level of extended section.	1 = 1%
126.30	Hv Rt trig U %	Activates high voltage tripping curve function when mains voltage is above the trigger level.	115%/ *Real*
	0 … 150%	High voltage tripping curve function trigger level.	1 = 1%
126.31	Hv Rt recover hyst U %	Defines high voltage tripping curve function recover hysteresis. The curve is deactivated when the mains voltage is below the trigger limit minus hysteresis.	5%/ *Real*
	0 … 20%	High voltage tripping curve function recover hysteresis.	1 = 1%
126.32	Hv Rt sec 1 time	Defines duration of high voltage tripping curve (Hv Rt) section 1. If duration is greater than zero, the low voltage tripping curve (Lv Rt) section is enabled.	100 ms/ *Real*
	0 … 5000 ms	High voltage tripping curve section 1 duration.	1 = 1 ms
126.33	Hv Rt sec 2 time	Defines duration of high voltage tripping curve (Hv Rt) section 2. If duration is greater than zero, the low voltage tripping curve (Lv Rt) section is enabled.	400 ms/ *Real*
	0 … 5000 ms	High voltage tripping curve section 2 duration.	1 = 1 ms
126.34	Hv Rt sec 3 time	Defines duration of high voltage tripping curve (Hv Rt) section 3. If duration is greater than zero, the low voltage tripping curve (Lv Rt) section is enabled.	2000 ms/ *Real*
	0 … 5000 ms	High voltage tripping curve section 3 duration.	1 = 1 ms

No.	Name/Value	Description	Def/ FbEq16/32
126.37	Hv Rt S1 start U %	Defines starting voltage level of section 1.	130%/ *Real*
	0 … 150%	Starting voltage level of section 1.	1 = 1%
126.38	Hv Rt S1 end U %	Defines final voltage level of section 1.	130%/ *Real*
	0 … 150%	Final voltage level of section 1.	1 = 1%
126.39	Hv Rt S2 start U %	Defines starting voltage level of section 2.	120%/ *Real*
	0 … 150%	Starting voltage level of section 2.	1 = 1%
126.40	Hv Rt S2 end U %	Defines final voltage level of section 2.	120%/ *Real*
	0 … 150%	Final voltage level of section 2.	1 = 1%
126.41	Hv Rt S3 start U %	Defines starting voltage level of section 3.	115%/ *Real*
	0 … 150%	Starting voltage level of section 3.	1 = 1%
126.42	Hv Rt S3 end U %	Defines final voltage level of section 3.	115%/ *Real*
	0 … 150%	Final voltage level of section 3.	1 = 1%
126.45	Lv Rt trip action	Sets low voltage tripping curve event type, fault or pure event. Inverter stops production in both cases. Fault needs to be manually reset and pure event automatically resets.	Internal/ *List*
	Internal	Inverter trips and returns to normal action automatically.	0
	Fault	Inverter trips and requires a fault reset.	1
126.46	Hv Rt trip action	Sets high voltage tripping curve event type, fault or pure event. Inverter stops production in both cases. Fault needs to be manually reset and pure event automatically resets.	Internal/ *List*
	Internal	Inverter trips and returns to normal action automatically.	0
	Fault	Inverter trips and requires a fault reset.	1
126.45	Lv Rt trip action	Selects LVRT trip action.	Internal/ *List*
	Internal		0
	Fault		1
126.46	Hv Rt trip action	Selects HVRT trip action.	Internal/ *List*
	Internal		0
	Fault		1
130 Limits		Operation limits of the inverter.	
130.01	Limit word 1	Shows active power limitation status. This parameter is read-only.	0x0000/ *Bit list*
	b0:P reference max		
	b1: P reference min		
	b2: User P max	Parameter *130.49 User power limit min %* is limiting.	
	b3: User P min		
	b4: Reserved		
	b5: Power ramp gradient		
	b6: Stop ramp		
	b7: P(f)		
	b8: Grid restore ramp		
	b9: Grid connect ramp		
	b10: External P limit		

No.	Name/Value	Description	Def/ FbEq16/32
	b11: FRT recovery ramp		
	b12: P(U)		
	b13: Flat-top		
	b14: Input current		
	b15: Grid current		
130.02	Limit word 2	Shows reactive power limitation status. This parameter is read-only.	0x0000/ *Bit list*
	b0: Q ref max	Reactive power reference limited by parameter 124.11 Ireact ref max %.	
	b1: Q ref min	Reactive power reference limited by parameter124.12 Ireact ref min %.	
	b2: Stopping		
	b3: Reserved		
	b4: AC overvoltage protection		
	b5...b6: Reserved		
	b7: AC control max		
	b8: AC control min		
	b9...b14: Reserved		
	b15: Grid current		
130.04	Limit word 4	Shows current based limitation status. This parameter is read-only.	0x0000/ *Bit list*
	b0...b1: Reserved		
	b2: I max user		
	b3: Iout Temperature		
	b4: MV Station limit		
	b5...b6: Reserved		
	b7: Nominal power		
	b8 … b15: Reserved		
130.05	Limit word 5	Shows temperature based input current limitation status. This parameter is read-only.	0x0000/ *Bit list*
	b0: Idc CS temperature		
	b1: Idc PS temperature		
	b2: Idc IGBT temperature		
	b3: Idc LCL temperature		
	b4: Idc ambient temperature		
	b5: Power section 1		
	b6: Power section 2		
	b7: Power section 3		
	b8: Power section 4		
	b9 … b15: Reserved		
130.06	Limit word 6	Shows temperature based grid current limitation status. This parameter is read-only.	0x0000/ *Bit list*
	b0: Iout CS temperature		

No.	Name/Value	Description	Def/ FbEq16/32
	b1: Iout PS temperature		
	b2: Iout IGBT temperature		
	b3: Iout LCL temperature		
	b4: Iout ambient temperature		
	b5...b15: Reserved		
130.11	Active power limit to grid	Shows maximum allowed active power to grid. This parameter is read-only.	-/ *Real*
	-		1 = 1 kW
130.13	Reactive power limit	Shows maximum allowed reactive power. This parameter is read-only.	-/ *Real*
	-		1 = 1 kVAr
130.46	Current limit %	Defines customer limit for maximum line current in percents.This value limits reactive current if line current exceeds limit.	130 %/ *Real*
	0...200 %		1 = 1 %
130.48	User power limit max %	Defines customer limit for maximum power.	130 %/ *Real*
	0...200 %	Customer limt for maximum power in percent.	1 = 1%/ 10 = 1 %
130.49	User power limit min %	Defines customer limit for minimum power.	-130 %/ *Real*
	-200...0 %	Customer limit for minimum power in percent.	
130.51	Power factor limitation	Enables power factor limitation function.	Disabled/ *List*
	Disabled		0
	Enabled		1
130.52	Power factor min inductive	Sets minimum inductive power factor limit.	-0.9/ *Real*
	-1...-0.1	Minimum inductive power factor limit.	1000 = 1
130.53	Power factor min capacitive	Sets minimum capacitive power factor limit.	0.85/ *Real*
	0.1...1.0	Minimum inductive power factor limit.	1000 = 1
130.54	Power factor Qind reserve	Sets inductive reactive power when power factor limitation function is active. This reactive power is available even when active power is zero.	-100/ *Real*
	-5000...0	Inductive reactive power.	1 = 1
130.55	Power factor Qcap reserve	Sets capacitive reactive power when power factor limitation function is active. This reactive power is available even when active power is zero.	100/ *Real*
	0...5000	Capacitive reactive power.	1 = 1
130.62	P(f) limit type	Selects P(f) limiter type.	Disabled/ *List*
	Disabled	P(f) limiter function is disabled.	0
	Free running	See *Free running P(f) limitation curve* (page *37*).	1
	Incremental	See *Incremental P(f) limitation curve* (page *36*).	2
130.63	P(f) corner frequency	Defines corner frequency above the nominal frequency where limitation starts.	0.20 Hz/ *Real*
	0.00...30.00 Hz	P(f) corner frequency.	100 = 1 Hz

No.	Name/Value	Description	Def/ FbEq16/32
130.64	P(f) limit gradient	Sets limit gradient in percent of corner power per Hz.	40.0%/Hz/ *Real*
	0.5...200.0%/Hz	Limit gradient in percent of corner power per Hz.	10 =1%/Hz
130.65	P(f) release frequency	Defines frequency above the nominal frequency when limitation is released and ramping limit up is started.	0.20 Hz/ *Real*
	0.00...30.00 Hz	Release frequency	100 = 1 Hz
130.66	P(f) release time	Defines delay time after frequency dropped below release frequency before ramping limit up is started.	0 s/ *Real*
	0...600 s	Delay time	1 = 1 s
130.67	P(f) release ramp	Defines active power ramping slope after releasing the limit.	10%/min/ *Real*
	5...600%/min	Release ramp	1 = 1%/min
130.68	P(f) release ramp ref	Selects release ramp reference of the P(f) limiter.	Nominal/ *List*
	Nominal	Nominal power	1
	Corner power	Active power when the corner frequency has been crossed.	2
	Pdelta	Power difference between the corner power and the minimum limited power during P(f) limitation.	3
130.69	P(f) activation delay	Sets delay time before activating the functionality.	0 ms/ *Real*
	0...5000 ms	Delay time	1 = 1 ms
130.70	Startup power ramp type	Selects when to activate power ramping after grid connection.	Off/ *List*
	Off	Power ramp is not activated.	0
	After grid fault	Power ramp only after grid fault occurred.	1
	Always	Power ramp always when connecting to grid.	2
130.71	Normal startup ramp	Sets active power ramp used after normal grid connection.	10%/min/ *Real*
	0...600%/min	Active power ramp.	1 = 1%/min
130.72	After grid fault startup ramp	Sets active power ramp used in reconnection after grid fault.	10%/min/ *Real*
	0...600 %/min	Active power ramp	1 = 1 %/min
130.73	FRT recovery	Enables active power ramping after fault ride through.	Disabled/ *List*
	Disabled		0
	Enabled		1
130.74	FRT recovery ramp	Defines the active power ramp used after fault ride through.	500 %/s/ *List*
	10...1000 %/s	Fault ride through recovery ramp	1 = 1 %/s
130.75	External power limit	Defines the external active power limit, for example, from fieldbus.	200.0%/ *Real*
	0.0...200.0 %	External active power limit.	10 = 1 %
130.76	P(U) limiter	Selects P(U) limiter type.	Disabled/ *List*
	Disabled	P(U) limiter function is disabled.	0
	Constant limit	See *Constant P(U) limitation* (page *34*).	1
	Free running droop limit	See *Droop P(U) limitation curve* (page *36*).	2
	Decremental droop limit	See *Droop P(U) limitation curve* (page *36*).	3
130.77	P(U) trigger level	Defines P(U) trigger level.	110.0%/ *Real*
	0.0...200.0 %	P(U) trigger level.	10 = 1 %

No.	Name/Value	Description	Def/ FbEq16/32
130.78	P(U) release level	Defines P(U) release level.	110%/ *Real*
	0.0...200.0 %	P(U) release level.	10 = 1 %
130.79	P(U) limit level	Defines P(U) active power limit level.	20.0%/ *Real*
	0.0...100.0 %	P(U) limit level.	10 = 1 %
130.80	P(U) limit ramp	Defines P(U) limit ramp.	50%/min/ *Real*
	5...100 %	P(U) limit ramp.	1 = 1 %/min
130.81	P(U) release ramp	Defines P(U) release ramp.	20%/min/ *Real*
	5...100 %/min	P(U) release ramp.	1 = 1 %/min
130.82	P(U) end level	Sets voltage level when power limitation reached its maximum.	115.0%/ *Real*
	0.0...200.0 %	P(U) end level.	10 = 1 %
130.83	P(U) filtering time constant	Sets time constant for P(U) voltage filtering.	1 s/ *Real*
	0...90 s	P(U) voltage filtering time constant.	1 = 1 s
130.84	P(U) reference power	Sets used power for P(U) limitation. When trigger limit is exceeded, used power is either nominal power or active power.	Trigger level power/ *List*
	Trigger level power	Power level when trigger level is exceeded.	0
	Nominal power	Nominal power.	1
130.85	P(U) release time	Sets delay time to release the power limit. The timer starts after the voltage has dropped below the release voltage.	0 s/ *Real*
	0...600 s	P(U) voltage filtering time constant.	1 = 1 s
130.86	P(U) limit voltage selection	Selects used voltage signal in P(U) limitation.	Average grid voltage/ *Real*
	Average grid voltage	Average grid voltage.	0
	Max phase rms voltage	Maximum rms value of phase voltage.	1
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	2
130.90	Flat-top limit	Sets a fixed active power limit.	200.0%/ *Real*
	0.0...200.0 %	Fixed active power limit.	10 = 1 %
130.92	Active power ramping	Enables active power ramping.	Disabled/ *List*
	Disabled	Active power ramping is disabled.	0
	Enabled	Active power ramping is enabled.	1
130.93	Active power ramp	Defines active power ramp.	100 %/min/ *Real*
	5...3000 %/min	Active power ramp	1 = 1 %/min
130.94	Shut down ramp	Defines shut down ramp.	100.00%/s/ *Real*
	0.01...1000.00 %/s	Shut down ramp	10 = 1 %/s / 100 = 1 %/s
130.98	External limit ramp up	Defines ramp up time for external power limit (par. *130.75*).	1000 ms/ *Real*
	0...600000 ms	Ramp up time	1 = 1 ms
130.99	External limit ramp down	Defines ramp down time for external power limit (par. *130.75*).	1000 ms/ *Real*
	0...600000 ms	External limit ramp down	1 = 1 ms

No.	Name/Value	Description	Def/ FbEq16/32
130.101	Priority	Defines priority of active current or reactive current when current must be limited.	Active current/ *List*
	Active current		0
	Reactive current		1
135 Grid monitoring		Settings for grid monitoring.	
135.01	Grid code	Selects grid code. Changing this value sets default and/or mandatory values for all other grid parameters.	Not selected/ *List*
	Not selected	Grid code not selected	0
	Custom		6
	Dubai		10
	Egypt		11
	ERCOT		12
	Germany		16
	HECO		17
	IEEE 1547		18
	Italy		20
	Jordan IRR-TIC		21
	Jordan IRR-DCC-MV		22
	Romania		25
	Rule 21		26
	South Africa		28
	Turkey		37
	WECC		39
135.10	Initial connection delay	Defines delay time for initial grid connection after power up or inverter is enabled.	5 s/ *Real*
	5...300 s	Delay time for initial grid connection.	1 = 1 s
135.11	Reconnection delay	Defines delay time for reconnection due to grid monitoring.	60 s/ *Real*
	3...300 s	Reconnection delay time.	1 = 1 s
135.12	Quick disturbance limit	Enables quick reconnection delay when value is larger than zero and allows quick reconnection if the grid returns to normal condition within the time limit.	0 s/ *Real*
	0...300 s	Quick reconnection limit.	1 = 1 s
135.13	Quick reconnection delay	Defines delay time for quick reconnection after grid returns to normal condition.	5 s/ *Real*
	0...300 s	Quick reconnection delay time.	1 = 1 s
135.16	External trip	Signal for external grid monitoring trip.	0 / *Real*
	0 … 1	Signal for external grid monitoring trip.	1 = 1
135.19	Zero cross monitor enable	Enables zero cross detection in grid monitoring.	1 / *Real*
	0...1	Zero cross detection in grid monitoring	1 = 1
135.20	Connect underfrequency type	Selects type for under frequency protection limit during startup.	Disconnected/ *List*
	Disabled	Under frequency protection disabled.	0

No.	Name/Value	Description	Def/ FbEq16/32
	Disconnected	Under frequency disconnected.	1
	Reconnection	Under frequency reconnected.	2
135.21	Connect underfrequency limit	Defines underfrequency limit used only when connecting to grid. When the inverter is connected this limit is disabled. See also parameter *135.20 Connect underfrequency type*.	-0.50 Hz/ *Real*
	-30.00...0.00 Hz	Underfrequency limit.	1 = 1 Hz/ 100 = 1 Hz
135.22	Connect overfrequency type	Selects type for overfrequency protection limit during startup.	Disconnected/ *List*
	Disabled	Limit is disabled.	0
	Disconnected	Limit is enabled when the inverter is disconnected from the grid.	1
	Reconnection	Limit is enabled when inverter trips to overfrequency.	2
135.23	Connect overfrequency limit	Defines overfrequency limit used only when connecting to the grid. The limit is disabled when the inverter is connected. See also parameter *135.22 Connect overfrequency type*.	0.20 Hz/ *Real*
	0.00...30.00 Hz	Overfrequency limit.	1 = 1 Hz/ 100 = 1 Hz
135.24	Connect undervoltage type	Enables undervoltage protection that defines the behaviour of *135.25 Connect undervoltage limit*.	Enabled/ *List*
	Disabled	Undervoltage protection is disabled. Does not check the limit defined in parameter *135.25 Connect undervoltage limit*.	0
	Enabled	Undervoltage protection is enabled. Connection to grid is allowed only when grid voltage is above the limit defined in parameter *135.25 Connect undervoltage limit*.	1
135.25	Connect undervoltage limit	Defines undervoltage limit used only when the inverter is not connected. The limit is disabled when inverter is connected. The purpose is to allow different connection and disconnection limits. See also parameter *135.24 Connect undervoltage type*.	90 %/ *Real*
	0...100 %	Undervoltage connection limit.	1 = 1 %
135.26	Connect overvoltage type	Enables overvoltage protection that defines the behaviour of *135.27 Connect overvoltage limit*. When enabled, connecting to grid is allowed only when grid voltage is below the limit. When disabled, this limit is not checked.	Enabled/ *List*
	Disabled	Overvoltage protection is disabled. Does not check the limit defined in parameter *135.27 Connect overvoltage limit*.	0
	Enabled	Overvoltage protection is enabled. Connection to grid is allowed only when grid voltage is below the limit defined in parameter *135.27 Connect overvoltage limit*.	1
135.27	Connect overvoltage limit	Defines overvoltage limit used only when the inverter is not connected. The limit is disabled when inverter is connected. The purpose is to allow different connection and disconnection limits. See also parameter *135.26* Connect overvoltage type.	110 %/ *Real*
	100...130 %	Overvoltage connection limit.	1 = 1 %

No.	Name/Value	Description	Def/ FbEq16/32
135.30	Underfrequency enable 1	Enables underfrequency protection 1.	1 / *Real*
	0...1	0 - Underfrequency protection 1 is disabled 1 - Underfrequency protection 1 is enabled	1 = 1
135.31	Underfrequency limit 1	Defines limit for underfrequency protection 1.	-2.0 Hz/ *Real*
	-30.0...0.0 Hz	Underfrequency protection 1 limit.	1 = 1 Hz/ 10 = 1 Hz
135.32	Underfrequency time 1	Defines trip time for underfrequency protection 1.	200 ms/ *Real*
	100...600000 ms	Underfrequency protection 1 trip time.	1 = 1 ms
135.33	Underfrequency enable 2	Enables underfrequency protection 2.	1 / *Real*
	0...1	0 - Underfrequency protection 2 disabled 1 - Underfrequency protection 2 enabled	1 = 1
135.34	Underfrequency limit 2	Defines limit for underfrequency protection 2.	-1.0 Hz/ *Real*
	-30.0...0.0 Hz	Underfrequency protection 2 limit.	1 = 1 Hz/ 10 = 1 Hz
135.35	Underfrequency time 2	Defines trip time for underfrequency protection 2.	500 ms/ *Real*
	100...600000 ms	Underfrequency protection 2 trip time.	1 = 1 ms
135.40	Overfrequency enable 1	Enables overfrequency protection 1.	1 / *Real*
	0...1	0 - Overfrequency protection 1 is disabled 1 - Overfrequency protection 1 is enabled	1 = 1
135.41	Overfrequency limit 1	Defines limit for overfrequency protection 1.	2.0 Hz/ *Real*
	0.0...30.0 Hz	Overfrequency protection 1 limit.	1 = 1 Hz/ 10 = 1 Hz
135.42	Overfrequency time 1	Defines trip time for overfrequency protection 1.	100 ms/ *Real*
	100...600000 ms	Overfrequency protection 1 trip time.	1 = 1 ms
135.43	Overfrequency enable 2	Enables overfrequency protection 2.	1/ *Real*
	0...1	0 - Overfrequency protection 2 is disabled 1 - Overfrequency protection 2 is enabled	1 = 1
135.44	Overfrequency limit 2	Defines limit for overfrequency protection 2.	1.0 Hz/ *Real*
	0.0...30.0 Hz	Overfrequency protection 2 limit.	1 = 1 Hz/ 10 = 1 Hz
135.45	Overfrequency time 2	Defines trip time for overfrequency protection 2.	500 ms/ *Real*
	100...600000 ms	Overfrequency protection 2 trip time.	1 = 1 ms
135.50	Undervoltage enable 1	Enables undervoltage condition 1.	1 / *Real*
	0...1	0 - Undervoltage condition 1 is disabled. 1 - Undervoltage condition 1 is enabled.	1 = 1
135.51	Undervoltage limit 1	Defines limit for undervoltage condition 1.	70 %/ *Real*
	0...100 %	Undervoltage condition 1 limit.	1 = 1 %
135.52	Undervoltage time 1	Defines tripping time for undervoltage condition 1.	200 ms/ *Real*
	100...600000 ms	Undervoltage condition 1 trip time.	1 = 1 ms
135.53	Undervoltage enable 2	Enables undervoltage condition 2.	1/ *Real*
	0...1	0 - Undervoltage condition 2 is disabled. 1 - Undervoltage condition 2 is enabled.	1 = 1
135.54	Undervoltage limit 2	Defines limit for undervoltage condition 2.	80 %/ *Real*
	0...100 %	Undervoltage condition 2 limit.	1 = 1 %

No.	Name/Value	Description	Def/ FbEq16/32
135.55	Undervoltage time 2	Defines tripping time for undervoltage condition 2.	500 ms/ *Real*
	100...600000 ms	Undervoltage condition 2 trip time.	1 = 1 ms
135.56	Undervoltage enable 3	Enables undervoltage condition 3.	0 / *Real*
	0...1	0 - Undervoltage condition 3 disabled. 1 - Undervoltage condition 3 enabled.	1 = 1
135.57	Undervoltage limit 3	Defines limit for undervoltage condition 3.	80 %/ *Real*
	0...100 %	Undervoltage condition 3 limit.	1 = 1 %
135.58	Undervoltage time 3	Defines tripping time for undervoltage condition 3.	100 ms/ *Real*
	100...600000 ms	Undervoltage condition 3 trip time.	1 = 1 ms
135.59	Undervoltage enable 4	Enables undervoltage condition 4.	0 / *Real*
	0...1	0 - Undervoltage condition 4 disabled. 1 - Undervoltage condition 4 enabled.	1 = 1
135.60	Undervoltage limit 4	Defines limit for undervoltage condition 4.	80 %/ *Real*
	0...100 %	Undervoltage condition 4 limit.	1 = 1 %
135.61	Undervoltage time 4	Defines tripping time for undervoltage condition 4.	100 ms/ *Real*
	100...600000 ms	Undervoltage condition 4 trip time.	1 = 1 ms
135.63	Overvoltage enable 1	Enables overvoltage protection 1.	1 / *Real*
	0...1	0 - Overvoltage protection 1 disabled. 1 - Overvoltage protection 1 enabled.	1 = 1
135.64	Overvoltage limit 1	Defines limit for overvoltage protection 1.	120 %/ *Real*
	100...200 %	Overvoltage protection 1 limit.	1 = 1 %
135.65	Overvoltage time 1	Defines trip time for overvoltage protection 1.	0 ms/ *Real*
	100...600000 ms	Overvoltage protection 1 trip time.	1 = 1 ms
135.66	Overvoltage enable 2	Enables overvoltage protection 2.	1/ *Real*
	0...1	0 - Overvoltage protection 2 disabled. 1 - Overvoltage protection 2 enabled.	1 = 1
135.67	Overvoltage limit 2	Defines limit for overvoltage protection 2.	115 %/ *Real*
	100...200 %	Overvoltage protection 2 limit.	1 = 1 %
135.68	Overvoltage time 2	Defines trip time for overvoltage protection 2.	1000 ms/ *Real*
	100...660000 ms	Overvoltage protection 2 trip time.	1 = 1 ms
135.69	Overvoltage enable 3	Enables overvoltage protection 3.	0/ *Real*
	0...1	0 - Overvoltage protection 3 disabled. 1 - Overvoltage protection 3 enabled.	1 = 1
135.70	Overvoltage limit 3	Defines limit for overvoltage protection 3.	130 %/ *Real*
	100...200 %	Overvoltage protection 3 limit.	1 = 1 %
135.71	Overvoltage time 3	Defines trip time for overvoltage protection 3.	100 ms/ *Real*
	100...600000 ms	Overvoltage protection 3 trip time.	1 = 1 ms
135.72	Overvoltage enable 4	Enables overvoltage protection 4.	0 / *Real*
	0...1	0 - Overvoltage protection 4 disabled. 1 - Overvoltage protection 4 enabled.	1 = 1
135.73	Overvoltage limit 4	Defines limit for overvoltage protection 4.	130 %/ *Real*
	100...200 %	Overvoltage protection 4 limit.	1 = 1 %
135.74	Overvoltage time 4	Defines trip time for overvoltage protection 4.	100 ms/ *Real*
	100...600000 ms	Overvoltage protection 4 trip time.	1 = 1 ms

No.	Name/Value	Description	Def/ FbEq16/32
135.75	Sliding overvoltage enable	Enables sliding overvoltage protection.	0 / *Real*
	0...1	0 - Sliding overvoltage protection disabled. 1 - Sliding overvoltage protection enabled.	1 = 1
135.76	Sliding overvoltage limit	Defines limit for sliding overvoltage protection.	120 %/ *Real*
	100...200 %	Sliding overvoltage protection limit.	1 = 1 %
135.77	Sliding overvoltage time	Defines trip time for sliding overvoltage protection.	100 ms/ *Real*
	100...600000 ms	Sliding overvoltage protection trip time.	1 = 1 ms
135.80	Combinatory trip	Enables combinatory protection.	0 / *Real*
	0...1	0 - Combinatory protection disabled. 1 - Combinatory protection enabled.	1 = 1
135.81	Combinatory trip time	Sets trip time for combinatory protection.	100 ms/ *Real*
	100...600000 ms	Combinatory protection trip time.	1 = 1 ms
135.84	Comb pos seq voltage limit	Defines positive sequence voltage limit in percentage of nominal line-to-line AC voltage for combinatory protection.	130%/ *Real*
	0...200%	Combinatory protection limit for positive sequence voltage.	1 = 1%
135.85	Comb neg seq voltage limit	Defines negative sequence voltage limit in percentage of nominal line-to-line AC voltage for combinatory protection.	10%/ *Real*
	0...200%	Combinatory protection limit for negative sequence voltage.	1 = 1%
135.86	Comb underfrequency limit	Defines limit for combinatory underfrequency protection.	-5.0 Hz/ *Real*
	-30.0...0.0 Hz	Combinatory underfrequency protection limit.	1 = 1 Hz/ 10 = 1 Hz
135.87	Comb overfrequency limit	Defines limit for combinatory overfrequency protection.	5.0 Hz/ *Real*
	0.0...30.0 Hz	Combinatory overfrequency protection limit.	1 = 1 Hz/ 10 = 1 Hz
135.100	Anti-islanding	Enables anti-islanding (AI) function.	0 / *Real*
	0...1	0 - Anti-islanding function disabled. 1 - Anti-islanding function enabled.	1 = 1
135.101	AI underfrequency enable	Enables anti-islanding underfrequency protection.	0 / *Real*
	0...1	0 - Anti-islanding underfrequency protection disabled. 1 - Anti-islanding underfrequency protection enabled.	1 = 1
135.102	AI underfrequency limit	Defines limit for anti-islanding underfrequency protection.	-5.0 Hz/ *Real*
	-30.0...0.0 Hz	Anti-islanding underfrequency protection limit.	1 = 1 Hz/ 10 = 1 Hz
135.103	AI overfrequency enable	Enables anti-islanding overfrequency protection.	0 / *Real*
	0...1	0 - Anti-islanding overfrequency protection disabled. 1 - Anti-islanding overfrequency protection enabled.	1 = 1
135.104	AI overfrequency limit	Defines limit for anti-islanding overfrequency protection.	5.0 Hz/ *Real*
	0.0...30.0 Hz	Anti-islanding overfrequency protection limit.	1 = 1 Hz/ 10 = 1 Hz

No.	Name/Value	Description	Def/ FbEq16/32
135.105	AI undervoltage enable	Enables anti-islanding undervoltage protection. Instant tripping without time delay occurs when anti-islanding undervoltage limit is crossed.	0 / *Real*
	0...1	0 - Anti-islanding undervoltage protection disabled. 1 - Anti-islanding undervoltage protection enabled.	1 = 1
135.106	AI undervoltage limit	Defines limit for anti-islanding undervoltage protection.	7%/ *Real*
	0...100%	Anti-islanding undervoltage protection limit.	1 = 1%
135.107	AI overvoltage enable	Enables anti-islanding overvoltage protection. Instant tripping without time delay occurs when anti-islanding overvoltage limit is crossed.	0 / *Real*
	0...1	0 - Anti-islanding overvoltage protection disabled. 1 - Anti-islanding overvoltage protection enabled.	1 = 1
135.108	AI overvoltage limit	Defines limit for anti-islanding overvoltage protection.	130%/ *Real*
	100...200%	Anti-islanding overvoltage protection.	1 = 1%
135.110	Rate of change of freq enable	Enables rate of change of frequency protection.	0 / *Real*
	0...1	0 - Rate of change of frequency protection disabled. 1 - Rate of change of frequency protection enabled.	1 = 1
135.111	Rate of change of freq limit	Defines rate in which frequency is allowed to change.	1.0 / *Real*
	0.0...10.0	Rate of frequency change.	1 = 1 / 10 = 1
135.131	Overfrequency enable 3	Enables overfrequency protection 3.	0/ *Real*
	0...1	0 - Overfrequency protection 3 disabled. 1 - Overfrequency protection 3 enabled.	1 = 1
135.132	Overfrequency limit 3	Defines limit for overfrequency protection 3.	1.0 Hz/ *Real*
	0.0...30.0 Hz	Overfrequency protection 3 limit.	1 = 1 Hz/ 10 = 1 Hz
135.133	Overfrequency time 3	Defines time for overfrequency protection 3.	100 ms/ *Real*
	100...600000 ms	Overfrequency protection 3 time.	1 = 1 ms
135.134	Overfrequency enable 4	Enables overfrequency protection 4.	0/ *Real*
	0...1	0 - Overfrequency protection 4 disabled. 1 - Overfrequency protection 4 enabled.	1 = 1
135.135	Overfrequency limit 4	Defines limit for overfrequency protection 4.	1.0 Hz/ *Real*
	0.0...30.0 Hz	Overfrequency protection 4 limit.	1 = 1 Hz/ 10 = 1 Hz
135.136	Overfrequency time 4	Defines time for overfrequency protection 4.	100 ms/ *Real*
	100...600000 ms	Overfrequency protection 4 time.	1 = 1 ms
135.137	Underfrequency enable 3	Enables underfrequency protection 3.	0/ *Real*
	0...1	0 - Underfrequency protection 3 disabled. 1 - Underfrequency protection 3 enabled.	1 = 1
135.138	Underfrequency limit 3	Defines limit for underfrequency protection 3.	-1.0 Hz/ *Real*
	-30.0...0.0 Hz	Underfrequency protection 3 limit.	1 = 1 Hz/ 10 = 1 Hz
135.139	Underfrequency time 3	Defines time for underfrequency protection 3.	100 ms/ *Real*
	100...600000 ms	Underfrequency protection 3 time.	1 = 1 ms

No.	Name/Value	Description	Def/ FbEq16/32
135.140	Underfrequency enable 4	Enables underfrequency protection 4.	0/ *Real*
	0...1	0 - Underfrequency protection 4 disabled. 1 - Underfrequency protection 4 enabled.	1 = 1
135.141	Underfrequency limit 4	Defines limit for underfrequency protection 4.	-1.0 Hz/ *Real*
	-30.0...0.0 Hz	Underfrequency protection 4 limit.	1 = 1 Hz/ 10 = 1 Hz
135.142	Underfrequency time 4	Defines time for underfrequency protection 4.	100 ms/ *Real*
	100...600000 ms	Underfrequency protection 4 time.	1 = 1 ms
135.143	Underfrequency enable 5	Enables underfrequency protection 5.	0/ *Real*
	0...1	0 - Underfrequency protection 5 disabled. 1 - Underfrequency protection 5 enabled.	1 = 1
135.144	Underfrequency limit 5	Defines limit for underfrequency protection 5.	-1.0 Hz/ *Real*
	-30.0...0.0 Hz	Underfrequency protection 5 limit.	1 = 1 Hz/ 10 = 1 Hz
135.145	Underfrequency time 5	Defines time for underfrequency protection 5.	100 ms/ *Real*
	100...600000 ms	Underfrequency protection 5 time.	1 = 1 ms
135.146	Underfrequency enable 6	Enables underfrequency protection 6.	0/ *Real*
	0...1	0 - Underfrequency protection 6 disabled. 1 - Underfrequency protection 6 enabled.	1 = 1
135.147	Underfrequency limit 6	Defines limit for underfrequency protection 6.	-1.0 Hz/ *Real*
	-30.0...0.0 Hz	Underfrequency protection 6 limit.	1 = 1 Hz/ 10 = 1 Hz
135.148	Underfrequency time 6	Defines time for underfrequency protection 6.	100 ms/ *Real*
	100...600000 ms	Underfrequency protection 6 time.	1 = 1 ms
135.200	Generate fault from grid disturbances	Generates fault when grid is not stable. Some grid codes may require a fault from grid disturbances.	Disabled/ *List*
	Disabled		0
	Enabled		1
135.248	AI disturbance gain	Defines the anti-island disturbance gain for the PLL. Actual gain is the difference between active current in p.u. and this value. This setting is used if the fixed value is set to zero. Otherwise disturbance is set to the fixed constant value.	3.0/ *Real*
	1.0 ... 10.0		10 = 1
135.249	AI fixed disturbance	Defines the fixed value for anti-island PLL disturbance. If this value is: • non-zero, it is used as disturbance to PLL to detect island situation. • zero, the disturbance is calculated based on AI disturbance gain parameter.	0.0/ *Real*
135.250	Grid monitoring SW1	Grid monitoring status word 1. This parameter is read-only.	0x0000/ *Bit list*
	b0: Grid stable	Grid is stable.	
	b1: Parameters	Grid monitoring settings are loaded successfully.	
	b2 … b15	Reserved	

No.	Name/Value	Description	Def/ FbEq16/32
135.251	Grid monitoring SW2	Grid monitoring status word 2. This parameter is read-only.	0x0000/ *Bit list*
	b0: Connect underfrequency	Connect underfrequency is not within limit.	
	b1: Connect overfrequency	Connect overfrequency is not within limit.	
	b2: Connect undervoltage	Connect undervoltage is not within limit.	
	b3: Connect overvoltage	Connect overvoltage is not within limit.	
	b4: Underfrequency 1	Underfrequency 1 is not within limit.	
	b5: Underfrequency 2	Underfrequency 2 is not within limit.	
	b6: Overfrequency 1	Overfrequency 1 is not within limit.	
	b7: Overfrequency 2	Overfrequency 2 is not within limit.	
	b8: Undervoltage 1	Undervoltage 1 is not within limit.	
	b9: Undervoltage 2	Undervoltage 2 is not within limit.	
	b10: Undervoltage 3	Undervoltage 3 is not within limit.	
	b11: Undervoltage 4	Undervoltage 4 is not within limit.	
	b12: Overvoltage 1	Overvoltage 1 is not within limit.	
	b13: Overvoltage 2	Overvoltage 2 is not within limit.	
	b14: Overvoltage 3	Overvoltage 3 is not within limit.	
	b15: Overvoltage 4	Overvoltage 4 is not within limit.	
135.252	Grid monitoring SW3	Grid monitoring status word 3. This parameter is read-only.	0x0000/ *Bit list*
	b0: Reserved		
	b1: Sliding overvoltage	Sliding voltage in not within limit	
	b2: Combinatory limit	Combinatory limit is not within limit	
	b3: Extreme AC overvoltage	Internal AC overvoltage	
	b4: RoCoF	Rate of change of frequency is too high.	
	b5: Anti-islanding underfrequency	Anti-islanding underfrequency is not within limit.	
	b6: Anti-islanding overfrequency	Anti-islanding overfrequency is not within limit.	
	b7: Anti-islanding undervoltage	Anti-islanding undervoltage is not within limit.	
	b8: Anti-islanding overvoltage	Anti-islanding overvoltage is not within limit.	
	b9: Anti-islanding	Anti-islanding signal is too high.	
	b10: Underfrequency 3	Underfrequency 3 is not within limit.	
	b11: Underfrequency 4	Underfrequency 4 is not within limit.	
	b12: Underfrequency 5	Underfrequency 5 is not within limit.	
	b13: Underfrequency 6	Underfrequency 6 is not within limit.	
	b14: Overfrequency 3	Overfrequency 3 is not within limit.	
	b15: Overfrequency 4	Overfrequency 4 is not within limit.	

No.	Name/Value	Description	Def/ FbEq16/32
147 Data storage		Parameters that can be written to and read from by using source and target settings of other parameters. Note that there are different storage parameters for different data types.	
147.01	Data storage 1 real32	Data storage parameter 1.	-/ *Real*
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.02	Data storage 2 real32	Data storage parameter 2.	-/ *Real*
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.03	Data storage 3 real32	Data storage parameter 3.	-/ *Real*
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.04	Data storage 4 real32	Data storage parameter 4.	-/ *Real*
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.05	Data storage 5 real32	Data storage parameter 5.	-/ *Real*
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.06	Data storage 6 real32	Data storage parameter 6.	-/ *Real*
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.07	Data storage 7 real32	Data storage parameter 7.	-/ *Real*
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.08	Data storage 8 real32	Data storage parameter 8.	-/ *Real*
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.11	Data storage 1 int32	Data storage parameter 9.	-/ *Real*
	-2147483648 … 2147483647	32-bit integer type data.	1 = 1
147.12	Data storage 2 int32	Data storage parameter 10.	-/ *Real*
	-2147483648 … 2147483647	32-bit integer type data.	1 = 1
147.13	Data storage 3 int32	Data storage parameter 11.	-/ *Real*
	-2147483648 … 2147483647	32-bit integer type data.	1 = 1
147.14	Data storage 4 int32	Data storage parameter 12.	-/ *Real*
	-2147483648 … 2147483647	32-bit integer type data.	1 = 1
147.15	Data storage 5 int32	Data storage parameter 13.	-/ *Real*
	-2147483648 … 2147483647	32-bit integer type data.	1 = 1
147.16	Data storage 6 int32	Data storage parameter 14.	-/ *Real*
	-2147483648 … 2147483647	32-bit integer type data.	1 = 1
147.17	Data storage 7 int32	Data storage parameter 15.	-/ *Real*
	-2147483648 … 2147483647	32-bit integer type data.	1 = 1

No.	Name/Value	Description	Def/ FbEq16/32
147.18	Data storage 8 int32	Data storage parameter 16.	-/ *Real*
	-2147483648 … 2147483647	32-bit integer type data.	1 = 1
147.21	Data storage 1 int16	Data storage parameter 17.	-/ *Real*
	-32768 … 32767	16-bit integer type data.	1 = 1
147.22	Data storage 2 int16	Data storage parameter 18.	-/ *Real*
	-32768 … 32767	16-bit integer type data.	1 = 1
147.23	Data storage 3 int16	Data storage parameter 19.	-/ *Real*
	-32768 … 32767	16-bit integer type data.	1 = 1
147.24	Data storage 4 int16	Data storage parameter 20.	-/ *Real*
	-32768 … 32767	16-bit integer type data.	1 = 1
147.25	Data storage 5 int16	Data storage parameter 21.	-/ *Real*
	-32768 … 32767	16-bit integer type data.	1 = 1
147.26	Data storage 6 int16	Data storage parameter 22.	-/ *Real*
	-32768 … 32767	16-bit integer type data.	1 = 1
147.27	Data storage 7 int16	Data storage parameter 23.	-/ *Real*
	-32768 … 32767	16-bit integer type data.	1 = 1
147.28	Data storage 8 int16	Data storage parameter 24.	-/ *Real*
	-32768 … 32767	16-bit integer type data.	1 = 1
147.31	Data storage 1 real32 type	Defines scaling of parameter *147.01 Data storage 1 real32* to and from 16-bit integer format. This scaling is used when the data storage parameter is the target of received 16-bit data (defined in parameter group *162 DDCS receive*), or when the data storage parameter is the source of transmitted 16-bit data (defined in parameter group *161 DDCS transmit*). The setting also defines the visible range of the storage parameter.	Unscaled/ *List*
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
	Voltage	The scaling is defined by parameter *146.04 UDC voltage scaling*.	3
	Active power	The scaling is defined by parameter *146.01 Power scaling*.	4
	Reactive power	The scaling is defined by parameter *146.02 Reactive power scaling*.	5
147.32	Data storage 2 real32 type	Defines 16-bit scaling of parameter *147.02 Data storage 2 real32*.	Unscaled/ *List*
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
	Voltage	The scaling is defined by parameter *146.04 UDC voltage scaling*.	3
	Active power	The scaling is defined by parameter *146.01 Power scaling*.	4

No.	Name/Value	Description	Def/ FbEq16/32
	Reactive power	The scaling is defined by parameter *146.02 Reactive power scaling*.	5
147.33	Data storage 3 real32 type	Defines 16-bit scaling of parameter *147.03 Data storage 3 real32*.	Unscaled/ *List*
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
	Voltage	The scaling is defined by parameter *146.04 UDC voltage scaling*.	3
	Active power	The scaling is defined by parameter *146.01 Power scaling*.	4
	Reactive power	The scaling is defined by parameter *146.02 Reactive power scaling*.	5
147.34	Data storage 4 real32 type	Defines 16-bit scaling of parameter *147.04 Data storage 4 real32*.	Unscaled/ *List*
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
	Voltage	The scaling is defined by parameter *146.04 UDC voltage scaling*.	3
	Active power	The scaling is defined by parameter *146.01 Power scaling*.	4
	Reactive power	The scaling is defined by parameter *146.02 Reactive power scaling*.	5
147.35	Data storage 5 real32 type	Defines 16-bit scaling of parameter *147.05 Data storage 5 real32*.	Unscaled/ *List*
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
	Voltage	The scaling is defined by parameter *146.04 UDC voltage scaling*.	3
	Active power	The scaling is defined by parameter *146.01 Power scaling*.	4
	Reactive power	The scaling is defined by parameter *146.02 Reactive power scaling*.	5
147.36	Data storage 6 real32 type	Defines 16-bit scaling of parameter *147.06 Data storage 6 real32*.	Unscaled/ *List*
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
	Voltage	The scaling is defined by parameter *146.04 UDC voltage scaling*.	3
	Active power	The scaling is defined by parameter *146.01 Power scaling*.	4
	Reactive power	The scaling is defined by parameter *146.02 Reactive power scaling*.	5

No.	Name/Value	Description	Def/ FbEq16/32
147.37	Data storage 7 real32 type	Defines 16-bit scaling of parameter *147.07 Data storage 7 real32*.	Unscaled/ *List*
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
	Voltage	The scaling is defined by parameter *146.04 UDC voltage scaling*.	3
	Active power	The scaling is defined by parameter *146.01 Power scaling*.	4
	Reactive power	The scaling is defined by parameter *146.02 Reactive power scaling*.	5
147.38	Data storage 8 real32 type	Defines 16-bit scaling of parameter *147.08 Data storage 8 real32*.	Unscaled/ *List*
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
	Voltage	The scaling is defined by parameter *146.04 UDC voltage scaling*.	3
	Active power	The scaling is defined by parameter *146.01 Power scaling*.	4
	Reactive power	The scaling is defined by parameter *146.02 Reactive power scaling*.	5
150 FBA		Fieldbus adapter communication configuration.	
150.01	FBA A Enable	Enables communication between the inverter and fieldbus adapter A, and specifies the slot the adapter is installed into.	Option slot 2/ *List*
	Disabled	Communication between inverter and fieldbus adapter A disabled.	0
	Option slot 1	Communication between inverter and fieldbus adapter A enabled. The adapter is in slot 1.	1
	Option slot 2	Communication between inverter and fieldbus adapter A enabled. The adapter is in slot 2.	2
	Option slot 3	Communication between inverter and fieldbus adapter A enabled. The adapter is in slot 3.	3
150.02	FBA A comm loss func	Selects how the inverter should react when fieldbus communication breaks. The time delay is defined by parameter *150.03 FBA A comm loss t out*.	No action/ *List*
	No action	Communication break does not cause any actions.	0
	Fault	Inverter trips on PANEL LOSS (FFFF) fault. The inverter stops and disconnects from the grid.	1
	Fault always	When communication is lost, the inverter trips on fault and coasts to stop always.	2

No.	Name/Value	Description	Def/ FbEq16/32
	Warning	Inverter generates only warning, no other actions are taken due to comm loss.	3
150.03	FBA A comm loss t out	Defines time delay before the action defined by parameter *150.02 FBA A comm loss func* is taken. Time count starts when the communication link fails to update the message.	0.3 s/ *Real*
	0.3 … s	Time delay.	10 = 1 s
150.04	FBA A ref1 type	Selects type and scaling of reference 1 received from fieldbus adapter A.	Voltage or power/ *List*
	Voltage or power	Type and scaling is chosen automatically according to the currently active operation mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	Reserved.	3
	Active power		4
	Reactive power		5
150.05	FBA A ref2 type	Selects type and scaling of reference 2 received from fieldbus adapter A.	Voltage or power/ *List*
	Voltage or power	Type and scaling is chosen automatically according to the currently active operation mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	Reserved.	3
	Active power		4
	Reactive power		5
150.07	FBA A act1 type	Selects type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter A.	Voltage or power/ *List*
	Voltage or power	Type and scaling is chosen automatically according to the currently active operation mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	Reserved.	3
	Active power		4
	Reactive power		5
150.08	FBA A act2 type	Selects type and scaling of actual value 2 transmitted to the fieldbus network through fieldbus adapter A.	Voltage or power/ *List*
	Voltage or power	Type and scaling is chosen automatically according to the currently active operation mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	Reserved.	3
	Active power		4
	Reactive power		5

No.	Name/Value	Description	Def/ FbEq16/32
150.09	FBA A SW tr src	Selects source for fieldbus status word when parameter *150.06* is set to *Transparent* mode.	Not selected/ *List*
	Not selected	No source selected.	0
	Other	See *Terms and abbreviations* on page *55*.	
150.10	FBA A act1 transparent source	Selects source for fieldbus actual value 1 when parameter *150.07* is set to *Transparen*t mode.	Not selected/ *List*
	Not selected	No source selected.	0
	Other	See *Terms and abbreviations* on page *55*.	
150.11	FBA A act2 transparent source	Selects source for fieldbus actual value 2 when parameter *150.0*8 is set to *Transparent* mode.	Not selected/ *List*
	Not selected	No source selected.	0
	Other	See *Terms and abbreviations* on page *55*.	
150.12	FBA A debug mode	Enables display of raw (unmodified) data received from and sent to fieldbus adapter A in parameters *150.13*…*150.18*. This functionality should only be used for debugging.	Disabled/ *List*
	Disabled	Display of raw data from fieldbus adapter A disabled.	0
	Fast	Debug mode is enabled. Cyclical data update is as fast as possible which increases the CPU load on the inverter.	1
150.13	FBA A Control Word	Shows control word sent by the master (PLC) to fieldbus adapter A. This parameter is read-only.	-/ *Data*
150.14	FBA A Reference REF1	Shows raw reference REF1 sent by the master (PLC) to fieldbus adapter A. This parameter is read-only.	-/ *Real*
	-2147483648... 2147483647	Fieldbus adapter A reference value 1.	1 = 1
150.15	FBA A Reference REF2	Shows raw reference REF2 sent by the master (PLC) to fieldbus adapter A. This parameter is read-only.	-/ *Real*
	-2147483648... 2147483647	Fieldbus adapter A reference value 2.	1 = 1
150.16	FBA A Status Word	Shows status word sent by fieldbus adapter A to the master (PLC). This parameter is read-only.	-/ *Data*
150.17	FBA A Actual value 1	Shows raw actual value ACT1 sent by fieldbus adapter A to the master (PLC). This parameter is read-only.	-/ *Real*
	-2147483648... 2147483647	Fieldbus adapter A actual value 1.	1 = 1
150.18	FBA A Actual value 2	Shows raw actual value ACT2 sent by fieldbus adapter A to the master (PLC). This parameter is read-only.	-/ *Real*
	-2147483648... 2147483647	Fieldbus adapter A actual value 2.	1 = 1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/
FbEq16/32</th></tr>
<tr><td>150.21</td><td>FBA A Timelevel sel</td><td>Selects communication speed.
In general, lower speeds reduce CPU load. The table below shows the read/write intervals for cyclic and acyclic data with each parameter setting.
<table><tr><th>Selection</th><th>Cyclic*</th><th>Acyclic**</th></tr><tr><td>Monitoring</td><td>10 ms</td><td>10 ms</td></tr><tr><td>Normal</td><td>2 ms</td><td>10 ms</td></tr><tr><td>Fast</td><td>500 µs</td><td>2 ms</td></tr><tr><td>Very fast</td><td>250 µs</td><td>2 µs</td></tr></table>
*Cyclic data consists of fieldbus Control and Status words, Ref1, Ref2, Act1 and Act2.
**Acyclic data consists of the parameter data mapped to parameter groups 155 FBA B data in and 156 FBA B data out.</td><td>Fast/ List</td></tr>
<tr><td></td><td>Monitoring</td><td>Low speed. Optimized for PC tool communication and monitoring usage.</td><td>0</td></tr>
<tr><td></td><td>Normal</td><td>Normal speed.</td><td>1</td></tr>
<tr><td></td><td>Fast</td><td>Fast speed.</td><td>2</td></tr>
<tr><td>150.31</td><td>FBA B Enable</td><td>Enables communication between the inverter and fieldbus adapter B, and specifies the slot the adapter is installed into.</td><td>Disabled/ List</td></tr>
<tr><td></td><td>Disabled</td><td>Communication between inverter and fieldbus adapter B disabled.</td><td>0</td></tr>
<tr><td></td><td>Option slot 1</td><td>Communication between inverter and fieldbus adapter B enabled. The adapter is in slot 1.</td><td>1</td></tr>
<tr><td></td><td>Option slot 2</td><td>Communication between inverter and fieldbus adapter B enabled. The adapter is in slot 2.</td><td>2</td></tr>
<tr><td></td><td>Option slot 3</td><td>Communication between inverter and fieldbus adapter B enabled. The adapter is in slot 3.</td><td>3</td></tr>
<tr><td>150.32</td><td>FBA B comm loss func</td><td>Selects how the inverter reacts in a fieldbus communication break. The time delay is defined by parameter 50.03 Comm loss t out.</td><td>No action/ Real</td></tr>
<tr><td></td><td>No action</td><td>Communication break does not cause any actions.</td><td>0</td></tr>
<tr><td></td><td>Fault</td><td>Inverter trips on fault PANEL LOSS (FFFF) and the inverter coasts to stop.</td><td>1</td></tr>
<tr><td></td><td>Fault always</td><td>Inverter trips on fault and the inverter coasts to stop always, when communication lost is noticed.</td><td>2</td></tr>
<tr><td></td><td>Warning</td><td>Inverter generates only warning, no other actions are taken due to comm loss.</td><td>3</td></tr>
<tr><td>150.33</td><td>FBA B comm loss t out</td><td>Defines time delay before the action defined by parameter 50.02 Comm loss func is taken. Time count starts when the link fails to update the message.</td><td>0.3 s/ Real</td></tr>
<tr><td></td><td>0.3 … s</td><td>Time delay.</td><td>10 = 1 s</td></tr>
<tr><td>150.34</td><td>FBA B ref1 type</td><td>Selects type and scaling of reference 1 received from fieldbus adapter B.</td><td>Voltage or power/ List</td></tr>
<tr><td></td><td>Voltage or power</td><td>Type and scaling is chosen automatically according to the currently active operation mode.</td><td>0</td></tr>
<tr><td></td><td>Transparent</td><td>No scaling is applied.</td><td>1</td></tr>
<tr><td></td><td>General</td><td>Generic reference without a specific unit.</td><td>2</td></tr>
</table>

No.	Name/Value	Description	Def/ FbEq16/32
	DC voltage	Reserved.	3
	Active power		4
	Reactive power		5
150.35	FBA B ref2 type	Selects type and scaling of reference 2 received from fieldbus adapter B.	Voltage or power/ *List*
	Voltage or power	Type and scaling is chosen automatically according to the currently active operation mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	Reserved.	3
	Active power		4
	Reactive power		5
150.37	FBA B act1 type	Selects type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter B.	Voltage or power/ *List*
	Voltage or power	Type and scaling is chosen automatically according to the currently active operation mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	Reserved.	3
	Active power		4
	Reactive power		5
150.38	FBA B act2 type	Selects type and scaling of actual value 2 transmitted to the fieldbus network through fieldbus adapter B.	Voltage or power/ *List*
	Voltage or power	Type and scaling is chosen automatically according to the currently active operation mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	Reserved.	3
	Active power		4
	Reactive power		5
150.40	FBA B act1 transparent source	When parameter *150.37 FBA B act1 type* is set to *Transparent* mode, this parameter selects the type of actual value 1 transmitted to the fieldbus network through fieldbus adapter B.	Not selected/ *List*
	Not selected	No source selected.	0
	Other	See *Terms and abbreviations* on page *55*.	
150.41	FBA B act2 transparent source	Selects type of actual value 2 transmitted to the fieldbus network through fieldbus adapter B.	Not selected/ *List*
	Not selected	No source selected.	0
	Other	See *Terms and abbreviations* on page *55*.	

No.	Name/Value	Description	Def/ FbEq16/32
150.42	FBA B debug mode	Enables the display of raw (unmodified) data received from and sent to fieldbus adapter B in parameters *150.43*…*150.48*. This functionality should only be used for debugging.	Disabled/ *List*
	Disabled	Display of raw data from fieldbus adapter B disabled.	0
	Fast	Debug mode is enabled. Cyclical data update is as fast as possible which increases the CPU load on the inverter.	1
150.43	FBA B Control Word	Shows raw (unmodified) control word sent by the master (PLC) to fieldbus adapter B if debugging is enabled by parameter *150.42 FBA B debug mode*. This parameter is read-only.	-/ *Data*
150.44	FBA B Reference REF1	Shows raw (unmodified) reference REF1 sent by the master (PLC) to fieldbus adapter B if debugging is enabled by parameter *150.42 FBA B debug mode*. This parameter is read-only.	-/ *Real*
	-2147483648... 2147483647	Fieldbus adapter B reference value 1.	1 = 1
150.45	FBA B Reference REF2	Shows raw (unmodified) reference REF2 sent by the master (PLC) to fieldbus adapter B if debugging is enabled by parameter *150.42 FBA B debug mode*. This parameter is read-only.	-/ *Real*
	-2147483648... 2147483647	Fieldbus adapter B reference value 2.	1 = 1
150.46	FBA B Status Word	Shows raw (unmodified) status word sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter *150.42 FBA B debug mode*. This parameter is read-only.	-/ *Data*
150.47	FBA B Actual value 1	Shows raw (unmodified) actual value ACT1 sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter *150.42 FBA B debug mode*. This parameter is read-only.	-/ *Real*
	-2147483648... 2147483647	Fieldbus adapter B actual value 1.	1 = 1
150.48	FBA B Actual value 2	Shows raw (unmodified) actual value ACT2 sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter *150.42 FBA B debug mode*. This parameter is read-only.	-/ *Real*
	-2147483648... 2147483647	Fieldbus adapter B reference value 2.	1 = 1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/
FbEq16/32</th></tr>
<tr><td>150.51</td><td>FBA B Timelevel sel</td><td>Selects communication speed.
In general, lower speeds reduce CPU load. The table below shows the read/write intervals for cyclic and acyclic data with each parameter setting.
<table><tr><th>Selection</th><th>Cyclic*</th><th>Acyclic**</th></tr><tr><td>Monitoring</td><td>10 ms</td><td>10 ms</td></tr><tr><td>Normal</td><td>2 ms</td><td>10 ms</td></tr><tr><td>Fast</td><td>500 µs</td><td>2 ms</td></tr><tr><td>Very fast</td><td>250 µs</td><td>500 µs</td></tr></table>
*Cyclic data consists of fieldbus Control and Status words, Ref1, Ref2, Act1 and Act2.
**Acyclic data consists of the parameter data mapped to parameter groups 155 FBA B data in and 156 FBA B data out.</td><td>Normal/ List</td></tr>
<tr><td></td><td>Monitoring</td><td>Low speed. Optimized for PC tool communication and monitoring usage.</td><td>0</td></tr>
<tr><td></td><td>Normal</td><td>Normal speed.</td><td>1</td></tr>
<tr><td></td><td>Fast</td><td>Fast speed.</td><td>2</td></tr>
<tr><td colspan="2">151 FBA A settings</td><td>Fieldbus adapter A configuration.
Note: FBA A is reversed for internal communication. We recommend not to modify these parameters.</td><td></td></tr>
<tr><td>151.01</td><td>FBA type</td><td>Shows the type of connected fieldbus adapter module.</td><td>None/ List</td></tr>
<tr><td></td><td>None</td><td>Module is not found or is not properly connected.</td><td>0</td></tr>
<tr><td></td><td>Profibus-DP</td><td></td><td>1</td></tr>
<tr><td></td><td>CANopen</td><td></td><td>32</td></tr>
<tr><td></td><td>DeviceNet</td><td></td><td>37</td></tr>
<tr><td></td><td>Ethernet</td><td></td><td>128</td></tr>
<tr><td></td><td>PROFInet IO</td><td></td><td>132</td></tr>
<tr><td></td><td>EtherCAT</td><td></td><td>135</td></tr>
<tr><td></td><td>ETH Pwrlink</td><td></td><td>136</td></tr>
<tr><td></td><td>RS-485 comm</td><td></td><td>485</td></tr>
<tr><td></td><td>SERCOS</td><td></td><td>62944</td></tr>
<tr><td></td><td>LonWorks</td><td></td><td>21</td></tr>
<tr><td></td><td>ControlNet</td><td></td><td>101</td></tr>
<tr><td></td><td>CCLink</td><td></td><td>144</td></tr>
<tr><td></td><td>Macro</td><td></td><td>6144</td></tr>
<tr><td></td><td>J1939</td><td></td><td>61456</td></tr>
<tr><td></td><td>Fieldbus</td><td></td><td>61696</td></tr>
<tr><td></td><td>Sercos III</td><td></td><td>62947</td></tr>
<tr><td></td><td>BACnet/IP</td><td></td><td>47808</td></tr>
<tr><td></td><td>Ethernet/IP</td><td></td><td>2222</td></tr>
<tr><td></td><td>Modbus/IP</td><td></td><td>502</td></tr>
<tr><td>151.02</td><td>FBA Par2</td><td>Parameters 151.02…151.26 are adapter module-specific. For more information, see the documentation of the fieldbus adapter module. Note that not all of these parameters are necessarily in use.</td><td>-/ Real</td></tr>
<tr><td></td><td>0...3</td><td></td><td>1 = 1</td></tr>
</table>

No.	Name/Value	Description	Def/ FbEq16/32
151.03	FBA Par3	See description in parameter *151.02 FBA Par2*.	-/ *Real*
	1...247		1 = 1
151.04	FBA Par4	See description in parameter *151.02 FBA Par2*.	-/ *Real*
	0...5		1 = 1
151.05	FBA Par5	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...3		1 = 1
151.06	FBA Par6	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.07	FBA Par7	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...2		1 = 1
151.08	FBA Par8	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.09	FBA Par9	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.10	FBA Par10	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.11	FBA Par11	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...1		1 = 1
151.12	FBA Par12	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...3		1 = 1
151.13	FBA Par13	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.14	FBA Par14	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.15	FBA Par15	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.16	FBA Par16	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.17	FBA Par17	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.18	FBA Par18	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.19	FBA Par19	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.20	FBA Par20	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.21	FBA Par21	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.22	FBA Par22	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.23	FBA Par23	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
151.24	FBA Par24	See parameter *151.02 FBA Par2*.	-/ *Real*
	1		1 = 1

No.	Name/Value	Description	Def/ FbEq16/32
151.25	FBA Par25	See parameter *151.02 FBA Par2*.	-/ *Real*
	0...5		1 = 1
151.26	FBA Par26	See parameter *151.02 FBA Par2*.	-/ *Real*
	-		1 = 1
151.27	FBA par refresh	Validates any changed fieldbus adapter module configuration settings. After refreshing, the value reverts automatically to *Done*. **Note:** This parameter cannot be changed while the inverter is running.	Done/ *List*
	Done	Refreshing done.	0
	Configure	Refreshing.	1
151.28	Par table ver	Shows parameter table revision of the fieldbus adapter module mapping file stored in the memory of the inverter. In format axyz, where a = major revision number; xy = minor revision number; z = correction number. This parameter is read-only.	-/ *Data*
151.29	Drive type code	Shows the type code of fieldbus adapter module mapping file stored in the memory of the inverter. This parameter is read-only.	-/ *Real*
151.30	Mapping file ver	Shows fieldbus adapter module mapping file revision stored in the memory of the inverter in decimal format. Example: Integer 263 -> 0x107 = revision 1.07 This parameter is read-only.	-/ *Real*
151.31	D2FBA comm sta	Shows status of fieldbus adapter module communication.	Idle/ *List*
	Idle	Adapter is not configured.	0
	Exec.init	Adapter is initializing.	1
	Time out	A timeout has occurred in the communication between the adapter and the inverter.	2
	Conf.err	Adapter configuration error: The major or minor revision code of the common program revision in the fieldbus adapter module is not the revision required by the module (see parameter *151.32 FBA comm SW ver*) or mapping file upload has failed more than three times.	3
	Off-line	Adapter is off-line.	4
	On-line	Adapter is on-line.	5
	Reset	Adapter is performing a hardware reset.	6
151.32	FBA comm SW ver	Shows common program revision of the adapter module in format axyz, where a = major revision number, xy = minor revision number, z = correction number. Example: 190A = revision 1.90A.	-/ *Data*
151.33	FBA appl SW ver	Shows application program revision of the adapter module in format axyz, where a = major revision number, xy = minor revision number, z = correction number or letter. Example: 190A = revision 1.90A.	-/ *Data*

No.	Name/Value	Description	Def/ FbEq16/32
152 FBA A data in		Selection of data to be transferred from Inverter to fieldbus controller through fieldbus adapter A. **Note:** 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
152.01	FBA data in1	Parameters *152.01*…*152.12* select data to be transferred from the inverter to the fieldbus controller through fieldbus adapter A.	None/ *List*
	None	None.	0
	CW 16bit	Virtual address for 16bit control word.	1
	Ref1 16bit	Virtual address for 16bit reference 1.	2
	Ref2 16bit	Virtual address for 16bit reference 2.	3
	SW 16bit	Virtual address for 16bit status word.	4
	Act1 16bit	Virtual address for 16bit actual value 1.	5
	Act2 16bit	Virtual address for 16bit actual value 2.	6
	CW 32bit	Virtual address for 32bit control word.	7
	Ref1 32bit	Virtual address for 32bit reference 1.	8
	Ref2 32bit	Virtual address for 32bit reference 2.	9
	SW 32bit	Virtual address for 32bit status word.	10
	Act1 32bit	Virtual address for 32bit actual value 1.	11
	Act2 32bit	Virtual address for 32bit actual value 2.	12
	Other	See *Terms and abbreviations* on page *55*.	
...	...	...	
152.12	FBA data in12	See parameter *152.01 FBA data in1*.	None/ *List*
153 FBA A data out		Selection of data to be transferred from fieldbus controller to inverter through fieldbus adapter A. **Note:** 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
153.01	FBA data out1	Parameters *153.01*…*153.12* select data to be transferred from the fieldbus controller to the inverter through fieldbus adapter A. Transfer speed can be set with parameter *150.21 FBA A Timelevel sel*.	None/ *List*
	None	None.	0
	CW 16bit	Virtual address for 16bit control word.	1
	Ref1 16bit	Virtual address for 16bit reference 1.	2
	Ref2 16bit	Virtual address for 16bit reference 2.	3
	CW 32bit	Virtual address for 32bit control word.	4
	Ref1 32bit	Virtual address for 32bit reference 1.	5
	Ref2 32bit	Virtual address for 32bit reference 2.	6
	Other	See *Terms and abbreviations* on page *55*.	
...	...	...	
153.12	FBA data out12	See parameter *153.01 FBA data out1*.	None/ *List*
154 FBA B settings		Fieldbus adapter B configuration.	
154.01	FBA type	Shows the type of connected fieldbus adapter module.	None/ *List*
	None	Module is not found or is not properly connected.	0
	Profibus-DP		1

No.	Name/Value	Description	Def/ FbEq16/32
	CANopen		32
	DeviceNet		37
	Ethernet		128
	PROFInet IO		132
	EtherCAT		135
	ETH Pwrlink		136
	RS-485 comm		485
	SERCOS		62944
	LonWorks		21
	ControlNet		101
	CCLink		144
	Macro		6144
	J1939		61456
	Fieldbus		61696
	Sercos III		62947
	BACnet/IP		47808
	Ethernet/IP		2222
	Modbus/TCP		502
154.02	FBA Par2	Parameters *154.02*…*154.26* are adapter module-specific. For more information, see the documentation of fieldbus adapter module. Note that not all of these parameters are necessarily in use.	-/ *Real*
	0...65535		1 = 1
...	...	…	…
154.26	FBA Par26	See parameter *154.02 FBA Par2*.	-/ *Real*
	0...65535		1 = 1
154.27	FBA par refresh	Validates any changed fieldbus adapter module configuration settings. After refreshing, the value reverts automatically to *Done*. **Note:** This parameter cannot be changed while the inverter is running.	Done/ *List*
	Done	Refreshing done.	0
	Configure	Refreshing.	1
154.28	Par table ver	Shows parameter table revision of the fieldbus adapter module mapping file stored in the inverter memory in format *axyz*, where *a* = major revision number *xy* = minor revision number *z* = correction number. This parameter is read-only.	-/ *Data*
154.29	Drive type code	Shows the inverter type code of the fieldbus adapter module mapping file stored in the memory of the inverter. This parameter is read-only.	-/ *Real*
	0...65535	I type code of fieldbus adapter module mapping file.	1 = 1

No.	Name/Value	Description	Def/ FbEq16/32
154.30	Mapping file ver	Shows fieldbus adapter module mapping file revision stored in the memory of the inverter in decimal format. Example: Integer 263 -> 0x107 = revision 1.07 This parameter is read-only.	-/ *Real*
	0...65535	Mapping file revision.	1 = 1
154.32	FBA comm SW ver	Shows common program revision of the adapter module in format *axyz*, where *a* = major revision number, *xy* = minor revision numbers. *z* = correction letter. Example: 190A = revision 1.90A.	-/ *Data*
154.33	FBA appl SW ver	Shows application program revision of the adapter module in format *axyz*, where *a* = major revision number, *xy* = minor revision numbers, *z* = correction letter. Example: 190A = revision 1.90A.	-/ *Data*
155 FBA B data in		Selection of data to be transferred from the inverter to fieldbus controller through fieldbus adapter B. **Note:** 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
155.01	FBA data in1	Parameters *155.01*…*155.12* select data to be transferred from the inverter to the fieldbus controller through fieldbus adapter B.	None/ *List*
	None	None.	0
	CW 16bit	Virtual address for 16bit control word.	1
	Ref1 16bit	Virtual address for 16bit reference 1.	2
	Ref2 16bit	Virtual address for 16bit reference 2.	3
	SW 16bit	Virtual address for 16bit status word.	4
	Act1 16bit	Virtual address for 16bit actual value 1.	5
	Act2 16bit	Virtual address for 16bit actual value 2.	6
	CW 32bit	Virtual address for 32bit control word.	7
	Ref1 32bit	Virtual address for 32bit reference 1.	8
	Ref2 32bit	Virtual address for 32bit reference 2.	9
	SW 32bit	Virtual address for 32bit status word.	10
	Act1 32bit	Virtual address for 32bit actual value 1.	11
	Act2 32bit	Virtual address for 32bit actual value 2.	12
...	...	...	
155.12	FBA data in12	See parameter *155.01 FBA data in1*	None/ *List*
156 FBA B data out		Selection of data to be transferred from fieldbus controller to the inverter through fieldbus adapter B. **Note:** 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
156.01	FBA B data out1	Parameters *156.01*…*156.12* select data to be transferred from the fieldbus controller to the inverter through fieldbus adapter B. Transfer speed can be set with parameter *150.51 FBA B Timelevel sel*.	None/ *List*
	None	None.	0

No.	Name/Value	Description	Def/ FbEq16/32
	CW 16bit	Control Word (16 bits)	1
	Ref1 16bit	Reference Ref1 (16 bits)	2
	Ref2 16bit	Reference Ref2 (16 bits)	3
	CW 32bit	Control Word (32 bits)	4
	Ref1 32bit	Reference Ref1 (32 bits)	5
	Ref2 32bit	Reference Ref2 (32 bits)	6
	Other	See *Terms and abbreviations* on page *55*.	-
...	...	...	
156.12	FBA B data out12	See parameter *156.01 FBA B data out1*.	None/ *List*
164 SCADA configuration		SCADA configuration.	
164.01	SCADA operation	Enables SCADA input and output parameters or SCADA monitoring only.	Disabled/ *List*
	Disabled		0
	Enabled		1
	Monitoring only		2
164.02	SCADA profile	Defines how SCADA input/output data is mapped to SCADA parameters.	Profile 1/ *List*
	Profile 1	PVS980-58	0
	Profile 2	PVS800-57B	1
	Profile 3	PVS980-58BC (energy storage)	2
	Reserved	-	3
164.04	Power scale	SCADA scales active power limit according to this value.	2000.0 kW/ *Real*
	0.0...5000.0 kW		10 = 1 kW
164.10	Heartbeat loss event	Selects the event which is triggered when SCADA heartbeat is lost.	Warning/ *List*
	No action		0
	Warning		1
	Fault		2
	Pure event		3
164.11	Comm hold-off after loss event	Defines time for which SCADA communication stays in hold-off state after communication has returned. During timeout, the control commands are frozen. If value is zero, the Timeout function is disabled.	120.00 s/ *Real*
	0.00...3600.00 s		1 = 1 s
164.12	Heartbeat max interval	Defines time in which heartbeat echo returns to the interval. Otherwise communication is interpreted to be lost.	5 s/ *Real*
	1...600 s		1 = 1 s

No.	Name/Value	Description	Def/ FbEq16/32
164.13	Comm hold-off on boot up	Defines the time in which watchdog is not monitoring the link status, and when control commands from SCADA are neglected in the boot up. This value is used to prevent false alarms and control commands from SCADA during the inverter start-up, when the communication link is not yet established. If value is zero, the feature is disabled.	60 s/ *Real*
	0...600 s		1 = 1 s
165 SCADA data in		Inverter SCADA data in.	
165.01 ... 165.15	Data in 1 ... Data in 15	Inverter SCADA interface data in.	-/ *Real*
	0...65535		1 = 1
165.50 ... 165.56	Data in 50 ... Data in 56	Inverter SCADA interface data in.	-/ *Real*
.	0...65535		1 = 1
166 SCADA data out		Inverter SCADA data out.	
166.01 ... 166.11	Data out 1 ... Data out 11	Inverter SCADA interface data out.	-/ *Real*
	0...65535		1 = 1
166.50 ... 166.160	Data out 50 ... Data out 160	Inverter SCADA interface data out.	-/ *Real*
	0...65535		1 = 1
173 Inverter status		Inverter control and status words. All parameters in this group are read-only unless otherwise specified.	
173.01	Main status word	Main status word of the inverter. See *Operational description* on page *14*.	0b0000/ *Bit list*
	b0: Ready	Ready to operate	
	b1: Faulted	Faulted	
	b2: Warning	Warning active	
	b3: MPPT enabled	MPPT enabled	
	b4: Grid stable	Grid stable	
	b5: DC voltage within range	DC voltage is within the range	
	b6: Inhibits	Start is inhibited	
	b7: Reduced run	Reduced run active	
	b8: Redundant run	Redundant run active	
	b9: Q-compensation	Q-compensation or night Q production is active	
	b10: Limited	Active or reactive power is limited	
	b11: Grid connected	Grid is connected	
	b12...b15: Reserved	-	
173.02	Inverter main state	Shows main state of the inverter.	Initialize/ *List*
	Initialize	Initializing	0

No.	Name/Value	Description	Def/ FbEq16/32
	Service mode	Service mode	1
	Commissioning mode	Commissioning mode	2
	Disconnected	Disconnected from the grid	3
	Disconnecting	Running disconnect routines	4
	Connecting	Running connect routines	5
	Connected	Connected to grid	6
173.03	MPPT unit state	Shows the state of MPPT unit.	Ready on/ *List*
	Disabled	Run or start disabled.	0
	Ready on	MPPT unit is ready to start. No active faults.	1
	Ready run	MPPT unit is ready to start modulating. DC voltage is up.	2
	Starting	Grid current controller is starting.	3
	Running	Inverter is producing power and following reactive current reference.	4
	Reserved	State is reserved for future usage.	5
	Stopping	Grid current controller is stopped.	6
	Faulted	Fault is active. MPPT unit is waiting for reset.	7
173.04	Start command SW	Shows status of start and trip commands. 1 = Start command is on. **Note**: To start, all start commands must be on.	0b0000/ *Bit list*
	b0: Inverter enabled	Inverter operation status.	
	b1: Transfer trip IO	Transfer trip status from IO.	
	b2: Transfer trip SCADA	Transfer trip status from SCADA.	
	b3: Shutdown IO	Shut down status from IO.	
	b4: Shutdown SCADA	Shut down status from SCADA.	
	b5: Start switch	Start switch status.	
	b6...b15: Reserved		
173.05	Internal inverter inhibitors 1	Indicates the internal conditions that are inhibiting the inverter from connecting to grid.	0b0000/ *Bit list*
	b0: Operation disabled		
	b1: External start signal		
	b2: Fault		
	b3: Configuration not complete		
	b4: Too low ambient temperature		
	b5: Too low power section temperature		
	b6: Too high ambient temperature		
	b7: Excess humidity		
	b8: PLC link lost		
	b9: Buffers not full		
	b10: MV breaker open command		
	b11: Country code not set		

No.	Name/Value	Description	Def/ FbEq16/32
	b12: Service mode		
	b13: Commissioning mode		
	b14: Grid unstable		
	b15: Grid delay		
173.06	Internal inverter inhibitors 2	Indicates the internal conditions that are inhibiting the inverter from connecting to grid.	0b0000/ *Bit list*
	b0...b1: Reserved		
	b2: Open door		
	b3...b15: Reserved		
173.06	Internal inverter inhibitors 2	Shows which of the internal conditions inhibit inverter from connecting to grid.	0b0000/ *Bit list*
	b0: Thermal protection		
	b1: Fan control		
	b2...b15: Reserved		
173.07	Internal inverter inhibitors 3	Indicates the internal conditions that are inhibiting the inverter from connecting to grid.	0b0000/ *Bit list*
	b0: Power module not ready		
	b1: Low input voltage		
	b2: High input voltage		
	b3: Wake-up monitor		
	b4: Grounding		
	b5: Insulation resistance		
	b6: AC disconnection device open		
	b7...b15: Reserved		
173.11	Output power status	Shows the status of power production.	Disconnected/ *List*
	Disconnected	Inverter is disconnected from the grid.	0
	Starting	Inverter is running start routines	1
	MPP tracking	Inverter is tracking MPP.	2
	Minimum DC voltage	MPPT is running against minimum DC voltage.	3
	Maximum DC voltage	MPPT is running against maximum DC voltage.	4
	Active power limit	Active power is limited.	5
	Reactive power limit	Reactive power is limited.	6
	Both limits	Both active and reactive powers are limited.	7
	Power reference	Inverter is in power reference mode (test mode).	8
	User DC reference	Inverter is in user reference mode (test mode).	9
	Q compensation	Inverter is in Q compensation mode.	10
173.12	Disconnect trigger	Shows the reason for latest disconnection from grid.	Connected/ *List*
	Connected		0
	Grid unstable		1
	External command		2
	Power too low		3

No.	Name/Value	Description	Def/ FbEq16/32
	Too high DC voltage		4
	Not enabled		5
	Active fault		6
	Other		7
	No disconnection		8
173.20	Grid monitoring ready in	Shows remaining time before connection is allowed by grid monitoring.	-/ *Real*
	0 … 10000 s	Grid monitoring ready time.	1 = 1 s
173.21	Start logic ready in	Shows remaining time before connection is allowed by start and wake-up monitor.	-/ *Real*
	0 … 10000 s	Grid monitoring ready time.	1 = 1 s
173.23	PU ready in	Shows remaining time before connection is allowed by power unit.	-/ *Real*
	0 … 10000 s	Power unit ready time.	1 = 1 s
173.24	State machine ready in	Shows remaining time before connection is allowed by inverter state machine.	-/ *Real*
	0 … 10000 s	Inverter state machine ready time.	1 = 1 s
173.30	Start logic stopping in	Shows the time before disconnection by start/stop logic. Used mainly for evening shutdown due to low power.	-/ *Real*
	0 … 10000 s	Start logic stop time.	1 = 1 s
173.35	Grounding state	Shows state of grounding state machine.	-/ *List*
	Disabled	Grounding is disabled and system is not grounded.	0
	Forced grounding	Grounding is connecting after forced command.	1
	Grounded (forced)	Grounded by forced command.	2
	Forcing failed	Forced grounding failed.	3
	Faulted	Inverter is faulted and grounding state machine is in faulted state.Inverter is faulted and grounding state machine in faulted state.	4
	Ungrounded night	Ungrounded night mode. Input voltage is low and grounding is open.	5
	Insulation measurement	Insulation measurement ongoing.	6
	Grounding connecting	Grounding is ongoing, Monitoring is not yet enabled.	7
	Grounded operation	Grounded and monitored operation.	8
	Grounded night	Grounded night mode. Input voltage is low and grounding is closed.	9
	Grounding opening	Grounding is opening.	10
	Grounding for night	Grounding is closing for night.	11
	Ungrounded operation	Ungrounded operation.	12
	Open during operation	Grounding is opening during operation.	13
	Grounding during operation	Grounding is closing during operation.	14
	Ungrounding for night	Grounding is opening for night.	15
173.36	Insulation resistance device state	Shows the state of insulation resistance measurement device.	-/ *List*
	Disabled	Device is disabled.	0
	Not ready	Device is measuring and result is not yet valid.	1

No.	Name/Value	Description	Def/ FbEq16/32
	Measuring	Device is measuring and result is valid.	2
	Failed	Device is broken. Measurement has taken too much time.	3
173.37	Minimum input DC voltage for connection	Minimum input DC voltage required for connection. If inverter is not connected and the minimum input DC voltage level is not met, inverter start is inhibited.	-/ *Real*
	0.0...10000.0 V	DC voltage.	10 = 1 V
174 DC input current monitor		DC input current monitor. Parameter 174.51...174.122 are read-only. **Note**: Variant dependent. Information may not be available in all variants. Available with option G417 DC input current measurement.	
174.01	Connected DC inputs 1-12	Connection setup for each DC input. When DC input is configured as connected, the enabled supervision features (e.g., Current sanity check, Overcurrent, Reverse current, Fuse monitoring and Current deviation) are activated. True = DC input connected. False = DC input not connected.	0b0000/ *Bit list*
	b0: DC input 1		
	b1: DC input 2		
	b2: DC input 3		
	b3: DC input 4		
	b4: DC input 5		
	b5: DC input 6		
	b6: DC input 7		
	b7: DC input 8		
	b8: DC input 9		
	b9: DC input 10		
	b10: DC input 11		
	b11: DC input 12		
	b12...b15: Reserved		
174.02	Connected DC inputs 13-24	Connection setup for each DC input. When DC input is configured as connected, the enabled supervision features (e.g., Current sanity check, Overcurrent, Reverse current, Fuse monitoring and Current deviation) are activated. True = DC input connected. False = DC input not connected.	0b0000/ *Bit list*
	b0: DC input 13		
	b1: DC input 14		
	b2: DC input 15		
	b3: DC input 16		
	b4: DC input 17		
	b5: DC input 18		
	b6: DC input 19		
	b7: DC input 20		

No.	Name/Value	Description	Def/ FbEq16/32
	b8: DC input 21		
	b9: DC input 22		
	b10: DC input 23		
	b11: DC input 24		
	b12...b15: Reserved		
174.03	Connected DC inputs 25-36	Connection setup for each DC input. When DC input is configured as connected, the enabled supervision features (e.g., Current sanity check, Overcurrent, Reverse current, Fuse monitoring and Current deviation) are activated. True = DC input connected. False = DC input not connected.	0b0000/ *Bit list*
	b0: DC input 25		
	b1: DC input 26		
	b2: DC input 27		
	b3: DC input 28		
	b4: DC input 29		
	b5: DC input 30		
	b6: DC input 31		
	b7: DC input 32		
	b8: DC input 33		
	b9: DC input 34		
	b10: DC input 35		
	b11: DC input 36		
	b12...b15: Reserved		
174.04	Connected DC inputs 37-48 Not in use	Connection setup for each DC input. When DC input is configured as connected, the enabled supervision features (e.g., Current sanity check, Overcurrent, Reverse current, Fuse monitoring and Current deviation) are activated. True = DC input connected. False = DC input not connected.	0b0000/ *Bit list*
	b0: DC input 37		
	b1: DC input 38		
	b2: DC input 39		
	b3: DC input 40		
	b4: DC input 41		
	b5: DC input 42		
	b6: DC input 43		
	b7: DC input 44		
	b8: DC input 45		
	b9: DC input 46		
	b10: DC input 47		
	b11: DC input 48		
	b12...b15: Reserved		

No.	Name/Value	Description	Def/ FbEq16/32
174.05	Overcurrent detection	Enables DC input overcurrent detection.	Enabled/ *List*
	Disabled		0
	Enabled		1
174.06	Overcurrent instant limit	Defines instant DC input overcurrent limit that causes a fault.	200.0 A/ *Real*
	0.0 … 2000.0 A	DC input overcurrent limit.	1 = 1 A/ 10 = 1 A
174.07	Overcurrent delayed limit	Defines delayed DC input overcurrent limit that causes a fault after the current is over the value for the time defined in parameter *174.08 Overcurrent time delay*.	180.0 A/ *Real*
	0.0 … 2000.0 A	Delayed overcurrent limit.	1 = 1 A/ 10 = 1 A
174.08	Overcurrent time delay	Defines delay time for the DC input overcurrent fault. The fault occurs when current is beyond the defined limit for the duration of delay.	10.0 s/ *Real*
	0.0...999.0 s	Delay time	1 = 1 s/ 10 = 1 s
174.09	Reverse current detection	Enables reverse DC input current detection. Reverse DC input current can be detected only with option G417.	Enabled/ *List*
	Disabled		0
	Enabled		1
174.10	Delayed Reverse current limit	Defines delayed input reverse current limit that causes a fault after the current is below the value for the time defined in parameter *174.11 Reverse current time delay*.	-10.0 / *Real*
	-100.0...0.0 A	Delayed input reverse current limit.	1 = 1 A/ 10 = 1 A
174.11	Reverse current time delay	Defines delay time for the DC input reverse current fault. The fault occurs when current is below the defined limit for the duration of the delay.	10.0 s/ *Real*
	0.0...999.0 s	DC input reverse current fault delay time.	1 = 1 s/ 10 = 1 s
174.14	Current deviation action	Selects event type when a deviation is detected in DC input current.	Warning/ *List*
	No	No action selected.	0
	Warning		1
	Fault		2
174.15	Current deviation delay	Sets the duration of how long the current deviation must be above limit before defined action is triggered.	1 min/ *Real*
	0...1440 min	Current deviation delay time.	1 = 1 min
174.16	Comparison mode	Selects comparison mode of the DC input current deviation detection. See *Current deviation detection* (page *40*)	Relative/ *List*
	Absolute		1
	Relative		2
174.17	Reference type	Selects mean or maximum values of DC input currents calculated within one module or using all existing modules (global). These values are used in current deviation supervision	Mean/ *List*
	Max		1
	Mean		2

No.	Name/Value	Description	Def/ FbEq16/32
174.18	Global reference	Enables the use of global reference with all existing modules. Comparison is done using all existing input currents. See also *Current deviation detection* (page *40*).	Enable/d *List*
	Disabled		0
	Enabled		1
174.19	Relative current limit	Sets the relative DC input current limit: maximum allowed difference in percent between each DC input and reference value.	30%/ *Real*
	0...100%	Relative DC input current limit.	1 = 1%
174.20	Absolute current limit	Sets the absolute DC input current limit: maximum allowed difference in amperes between each DC input and reference value.	30.0 A/ *Real*
	0.0...100.0 A	Absolute current limit in ampere.	1 = 1 A/ 10 = 1 A
174.21	Relative threshold	Sets the relative DC input current threshold value. Below this value the relative difference detection is disabled.	20.0 A/ *Real*
	0.0...100.0 A	Relative DC input current threshold.	1 = 1 A/ 10 = 1 A
174.22	Fuse monitor action	Selects action for detecting blown fuse. The detection is based on current measurement.	Warning/ *List*
	No	No action selected.	0
	Warning		1
	Fault		2
174.23	Blown fuse detection limit	Defines current limit to detect a blown fuse. If current is below this limit, the fuse is determined as blown.	2.0 A/ *Real*
	0.0...100.0 A	Blown fuse tolerance limit.	1 = 1 A/ 10 = 1 A
174.24	Blown fuse active boundary	Defines the boundary for detecting a blown fuse. If mean current of the corresponding power module is below this value, then blown fuse detection function is disabled.	20.0 A/ *Real*
	0.0...100.0 A	Blown fuse detection limit.	1 = 1 A/ 10 = 1 A
174.51	DC input 1 current	Shows DC input 1 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.52	DC input 2 current	Shows DC input 2 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.53	DC input 3 current	Shows DC input 3 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.54	DC input 4 current	Shows DC input 4 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.55	DC input 5 current	Shows DC input 5 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.56	DC input 6 current	Shows DC input 6 current.	-/ *Real*

No.	Name/Value	Description	Def/ FbEq16/32
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.57	DC input 7 current	Shows DC input 7 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.58	DC input 8 current	Shows DC input 8 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.59	DC input 9 current	Shows DC input 9 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.60	DC input 10 current	Shows DC input 10 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.61	DC input 11 current	Shows DC input 11 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.62	DC input 12 current	Shows DC input 12 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.43	DC input 13 current	Shows DC input 13 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.44	DC input 14 current	Shows DC input 14 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.45	DC input 15 current	Shows DC input 15 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.46	DC input 16 current	Shows DC input 16 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.47	DC input 17 current	Shows DC input 17 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.48	DC input 18 current	Shows DC input 18 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.49	DC input 19 current	Shows DC input 19 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.50	DC input 20 current	Shows DC input 20 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.71	DC input 13 current	Shows DC input 13 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.72	DC input 14 current	Shows DC input 14 current.	-/ *Real*

No.	Name/Value	Description	Def/ FbEq16/32
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.73	DC input 15 current	Shows DC input 15 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.74	DC input 16 current	Shows DC input 16 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.75	DC input 17 current	Shows DC input 17 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.76	DC input 18 current	Shows DC input 18 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.77	DC input 19 current	Shows DC input 19 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.78	DC input 20 current	Shows DC input 20 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.79	DC input 21 current	Shows DC input 21 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.80	DC input 22 current	Shows DC input 22 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.81	DC input 23 current	Shows DC input 23 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.82	DC input 24 current	Shows DC input 24 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.91	DC input 25 current	Shows DC input 25 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.92	DC input 26 current	Shows DC input 26 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.93	DC input 27 current	Shows DC input 27 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.94	DC input 28 current	Shows DC input 28 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.95	DC input 29 current	Shows DC input 29 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.96	DC input 30 current	Shows DC input 30 current.	-/ *Real*

No.	Name/Value	Description	Def/ FbEq16/32
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.97	DC input 31 current	Shows DC input 31 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.98	DC input 32 current	Shows DC input 32 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.99	DC input 33 current	Shows DC input 33 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.100	DC input 34 current	Shows DC input 34 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.101	DC input 35 current	Shows DC input 35 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.102	DC input 36 current	Shows DC input 36 current.	-/ *Real*
	-200.0 … 500.0 A		1 = 1 A/ 10 = 1 A
174.123	DC input current meas status 1-12	Shows if measurement is faulty for DC input currents 1-12. True = Measurement is faulty. False = Not found faulty.	0b0000/ *Bit list*
	b0: DC input 1 measurement status		
	b1: DC input 2 measurement status		
	b2: DC input 3 measurement status		
	b3: DC input 4 measurement status		
	b4: DC input 5 measurement status		
	b5: DC input 6 measurement status		
	b6: DC input 7 measurement status		
	b7: DC input 8 measurement status		
	b8: DC input 9 measurement status		
	b9: DC input 10 measurement status		
	b10: DC input 11 measurement status		
	b11: DC input 12 measurement status		
	b12...b15: Reserved		

No.	Name/Value	Description	Def/ FbEq16/32
174.124	DC input current meas status 13-24	Shows if measurement is faulty for DC input currents 13-24. True = Measurement is faulty. False = Not found faulty.	0b0000/ *Bit list*
	b0: DC input 13 measurement status		
	b1: DC input 14 measurement status		
	b2: DC input 15 measurement status		
	b3: DC input 16 measurement status		
	b4: DC input 17 measurement status		
	b5: DC input 18 measurement status		
	b6: DC input 19 measurement status		
	b7: DC input 20 measurement status		
	b8: DC input 21 measurement status		
	b9: DC input 22 measurement status		
	b10: DC input 23 measurement status		
	b11: DC input 24 measurement status		
	b12...b15: Reserved		
174.125	DC input current meas status 25-36	Shows if measurement is faulty for DC input currents 25-36. True = Measurement is faulty. False = Not found faulty.	0b0000/ *Bit list*
	b0: DC input 25 measurement status		
	b1: DC input 26 measurement status		
	b2: DC input 27 measurement status		
	b3: DC input 28 measurement status		
	b4: DC input 29 measurement status		
	b5: DC input 30 measurement status		
	b6: DC input 31 measurement status		
	b7: DC input 32 measurement status		
	b8: DC input 33 measurement status		

No.	Name/Value	Description	Def/ FbEq16/32
	b9: DC input 34 measurement status		
	b10: DC input 35 measurement status		
	b11: DC input 36 measurement status		
	b12...b15: Reserved		
176 Customer IOs		Customer inputs and outputs. Analog inputs are with 32-bit unit values for pointed value usage. See also *Customer I/O* (page *49*).	
176.01	User AI1	Analog input “User AI1” value as a 32-bit unit.	- / *Real*
	0...4294967295		1 = 1
176.02	User AI2	Analog input “User AI2” value as a 32-bit unit.	- / *Real*
	0...4294967295		1 = 1
176.12	PCC CPU RO 1 sourceUser RO1 source	Selects the source for the user relay output RO1 (PLC PM564 RO4).	Not connected/ *List*
	Not connected		0
	Connected		1
	Grounding status		2
	Insulation resistance status		3
	MV breaker status		4
	Contactor control duplication		5
	Other	See *Terms and abbreviations* on page *55*.	-
176.21	External fault 1 source	Selects source for customer IO external fault 1 signal. See also *MV station monitoring and control* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-

No.	Name/Value	Description	Def/ FbEq16/32
176.22	External fault 1 action	Selects action type in the event of customer IO external fault 1.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
176.23	External fault 1 action delay	Defines delay time for customer IO external fault 1 action.	0 s/ *List*
	0...3600 s		1 = 1 s
176.24	External fault 1 failure logic	Selects customer IO external fault 1 failure logic as active high or active low.	Active High/ *List*
	Active Low		0
	Active High		1
176.26	External fault 2 source	Selects source for customer IO external fault 2 signal. See also *MV station monitoring and control* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
176.27	External fault 2 action	Selects action type in the event of customer IO external fault 2.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
176.28	External fault 2 action delay	Defines delay time for customer IO external fault 2 action.	0 s/ *List*
	0...3600 s		1 = 1 s
176.29	External fault 2 failure logic	Selects customer IO external fault 2 failure logic as active high or active low.	Active High/ *List*
	Active Low		0
	Active High		1

No.	Name/Value	Description	Def/ FbEq16/32
176.31	External fault 3 source	Selects source for customer IO external fault 3 signal. See also *MV station monitoring and control* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
176.32	External fault 3 action	Selects action type in the event of customer IO external fault 3.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
176.33	External fault 3 action delay	Defines delay time for customer IO external fault 3 action.	0 s/ *List*
	0...3600 s		1 = 1 s
176.34	External fault 3 failure logic	Selects customer IO external fault 3 failure logic as active high or active low.	Active High/ *List*
	Active Low		0
	Active High		1
177 MV Station		Medium voltage station parameters including MV transformer and MV switchgear.	
177.11	MV temperature alarm source	Selects source for medium voltage transformer overtemperature alarm. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8

No.	Name/Value	Description	Def/ FbEq16/32
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
177.12	Transformer temperature alarm action	Selects medium voltage transformer overtemperature alarm action.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.13	Transformer temperature alarm delay	Defines delay time for medium voltage transformer overtemperature alarm action.	0 / *Real*
	0...3600 s	Delay time	1 = 1 s
177.14	Transformer temperature alarm current	Defines current limit for medium voltage transformer overtemperature alarm. The limit is active with all actions, except for “no action”.	10000 A/ *Real*
	0....10000 A	Transformer overtemperature alarm current limit.	1 = 1 A
177.15	Transformer temperature alarm failure logic	Selects medium voltage transformer overtemperature alarm failure logic.	Active High/ *List*
	Active Low		0
	Active High		1
177.16	MV temperature fault source	Sets source for medium voltage transformer overtemperature fault. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-

No.	Name/Value	Description	Def/ FbEq16/32
177.17	Transformer temperature fault action	Selects medium voltage overtemperature fault action.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.18	Transformer temperature fault delay	Defines delay time for medium voltage transformer overtemperature fault action.	0 s/ *Real*
	0...3600 s	Delay time	1 = 1 s
177.19	Transformer temperature fault current limit	Defines current limit for medium voltage transformer overtemperature fault. The limit is active with all actions, except “no action”.	10000 A/ *Real*
	0....10000 A	Transformer overtemperature fault current limit.	1 = 1 A
177.20	Transformer temperature fault failure logic	Selects the logic for medium voltage transformer overtemperature fault failure. The fault is active high or active low.	Active High/ *List*
	Active Low		0
	Active High		1
177.21	MV low oil level source	Selects source for medium voltage transformer low oil level signal. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
177.22	Transformer low oil level action	Selects medium voltage transformer low oil level action.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3

No.	Name/Value	Description	Def/ FbEq16/32
	Fault and delayed MV breaker opening		4
177.23	Transformer low oil level delay	Defines delay time for medium voltage transformer low oil level action.	0 s/ *Real*
	0...3600 s		1 = 1 s
177.24	Transformer low oil level current limit	Defines current limit for medium voltage transformer low oil level. The limit is active with all actions, except for “no action”.	10000 A/ *Real*
	0....10000 A		1 = 1 A
177.25	Transformer low oil level failure logic	Selects failure logic for medium voltage transformer low oil level. The alarm is active high or active low.	Active High/ *List*
	Active Low		0
	Active High		1
177.26	MV overpressure source	Selects source for medium voltage transformer overpressure signal. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
177.27	Transformer overpressure action	Selects medium voltage transformer overpressure action.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.28	Transformer overpressure delay	Defines delay time for medium voltage transformer overpressure action.	0 s/ *Real*
	0...3600 s		1 = 1 s

No.	Name/Value	Description	Def/ FbEq16/32
177.29	Transformer overpressure current limit	Defines current limit for medium voltage transformer overpressure. The limit is active with all actions, except for “no action”.	10000 A/ *Real*
	0....10000 A		1 = 1 A
177.30	Transformer overpressure failure logic	Selects failure logic for medium voltage transformer overpressure. The alarm is active high or active low.	Active High/ *List*
	Active Low		0
	Active High		1
177.31	MV vacuum failure source	Selects source for medium voltage transformer vacuum failure signal. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
177.32	Transformer vacuum failure action	Defines medium voltage transformer vacuum failure action.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.33	Transformer vacuum failure delay	Defines delay time for medium voltage transformer vacuum failure action.	0 s/ *Real*
	0...3600 s	Transformer vacuum failure delay time.	1 = 1 s
177.34	Transformer vacuum failure current limit	Defines current limit for medium voltage transformer vacuum failure. The limit is active with all actions, except the “no action”.	10000 A/ *Real*
	0....10000 A	Transformer vacuum failure current limit.	1 = 1 A
177.35	Transformer vacuum failure logic	Defines failure logic for medium voltage transformer vacuum. The alarm is active high or active low.	Active High/ *List*
	Active Low		0
	Active High		1

No.	Name/Value	Description	Def/ FbEq16/32
177.36	MV gas discharge source	Selects source for medium voltage transformer gas discharge signal. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
177.37	Transformer gas discharge action	Selects medium voltage transformer gas discharge action.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.38	Transformer gas discharge delay	Defines delay time for medium voltage transformer gas discharge action.	0 s/ *Real*
	0...3600 s	Transformer gas discharge delay time.	1 = 1 s
177.39	Transformer gas discharge current limit	Defines current limit for medium voltage transformer gas discharge. The limit is active with all actions, except the “no action”.	10000 A/ *Real*
	0....10000 A	Transformer gas discharge current limit.	1 = 1 A
177.40	Transformer gas discharge failure logic	Selects logic for medium voltage transformer gas discharge failure.	Active High/ *List*
	Active Low		0
	Active High		1
177.41	MV breaker opening source	Selects source for medium voltage breaker opening alarm signal. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5

No.	Name/Value	Description	Def/ FbEq16/32
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
177.42	MV breaker feedback action	Selects medium voltage breaker opening signal action.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.43	MV breaker feedback action delay	Defines delay time for medium voltage breaker opening action.	0 s/ *Real*
	0...3600 s	Breaker opening action delay time.	1 = 1 s
177.44	MV breaker feedback power limit	Defines power limit for medium voltage breaker opening. The limit is active with all actions, except the “no action”.	1000 A/ *Real*
	0....10000 A	Breaker opening power limit.	1 = 1 A
177.45	MV breaker feedback failure logic	Selects how the inverter should react to a medium voltage breaker opening failure.	Active High/ *List*
	Active Low	Alarm is active low.	0
	Active High	Alarm is active high.	1
177.46	MV side phase lost source	Selects source for medium voltage side phase lost signal. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-

No.	Name/Value	Description	Def/ FbEq16/32
177.47	MV phase loss detection action	Selects medium voltage side phase lost signal action.	No action/ *List*
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.48	MV phase loss detection action delay	Defines delay time for medium voltage side phase lost action.	0 s/ *Real*
	0...3600 s	Phase lost action delay time.	1 = 1 s
177.49	MV phase loss detection power limit	Defines limit for medium voltage side phase lost power. The limit is active with all actions, except the “no action”.	1000 A/ *Real*
	0....10000 A	Phase lost power limit.	1 = 1 A
177.50	MV phase loss detection failure logic	Selects logic for medium voltage side phase lost failure. The alarm is active high or active low.	Active High/ *List*
	Active Low		0
	Active High		1
177.51	Transformer temperature 1 source	Selects analog input source for the medium voltage transformer coil temperature signal. See also *Analog inputs* on page *50*.	Zero/ *List*
	Zero		0
	User AI1		1
	User AI2		2
177.52	Transformer temperature 1	Shows medium voltage transformer coil temperature. This parameter is read-only.	-/ *Real*
	-100.0...400.0 °C	Transformer coil temperature.	1 = 1 °C/ 10 = 1 °C
177.53	Transformer temperature 1 at 4 mA current	Sets medium voltage transformer coil temperature when the temperature sensor current is 4 mA.	0 °C/ *Real*
	-200...400 °C		1 = 1 °C
177.54	Transformer temperature 1 at 20 mA current	Sets medium voltage transformer coil temperature when the temperature sensor current is 20 mA.	200 °C/ *Real*
	-200...400 °C		1 = 1 °C
177.55	Transformer temperature 1 warning limit	Defines limit for medium voltage transformer coil temperature warning.	90 °C/ *Real*
	0...200 °C	Transformer coil temperature warning limit.	1 = 1 °C
177.56	Transformer temperature 1 fault limit	Defines limit for medium voltage transformer coil temperature fault.	100 °C/ *Real*
	0...200 °C	Transformer coil temperature fault limit.	1 = 1 °C

No.	Name/Value	Description	Def/ FbEq16/32
177.57	Transformer temperature 1, current limit temperature 1	Defines temperature 1 of the medium voltage transformer coil temperature related current limitation curve. At this temperature current is limited to point 1 value. The inverter shows a warning to indicate this temperature.	90 °C/ *Real*
	0...200 °C	Temperature 1.	1 = 1 °C
177.58	Transformer temperature 1, current limit temperature 2	Defines temperature 2 of the medium voltage transformer coil temperature related current limitation curve. At this temperature current is limited to point 2 value.	95 °C/ *Real*
	0...200 °C	Temperature 2.	1 = 1 °C
177.59	Transformer temperature 1, current limit temperature 3	Defines temperature 3 of the medium voltage transformer coil temperature related current limitation curve. At this temperature current is limited to 0%. Also a fault is triggered.	100 °C/ *Real*
	0...200 °C	Temperature 3.	1 = 1 °C
177.60	Transformer temperature 1, current limit current 1	Defines current 1 value of the medium voltage transformer coil temperature related current limitation curve. This is the limited current when temperature is at limit 1.	3600 A/ *Real*
	0....10000 A	Current limit 1.	-/ 1 = 1 A
177.61	Transformer temperature 1, current limit current 2	Defines current 2 value of the medium voltage transformer coil temperature related current limitation curve. This is the limited current when temperature is at limit 2.	1000 A/ *Real*
	0....10000 A	Current limit 2.	-/ 1 = 1 A
177.63	Transformer temperature 2 source	Selects analog input source for the medium voltage transformer oil temperature signal. See also *Analog inputs* on page *50*.	Zero/ *List*
	Zero		0
	User AI1		1
	User AI2		2
177.64	Transformer temperature 2	Shows temperature of medium voltage transformer oil. This parameter is read-only.	-/ *Real*
	-100.0...400.0 °C	Transformer temperature.	1 = 1 °C / 10 = 1 °C
177.65	Transformer temperature 2 at 4 mA current	Defines temperature of medium voltage transformer oil, when temperature sensor current is 4 mA.	0 °C/ *Real*
	-200...400 °C		1 = 1 °C
177.66	Transformer temperature 2 at 20 mA current	Defines temperature of medium voltage transformer oil, when temperature sensor current is 20 mA.	200 °C/ *Real*
	-200...400 °C		1 = 1 °C
177.67	Transformer temperature 2 warning limit	Defines limit to indicate a warning when medium voltage transformer oil temperature is more than this value.	90 °C/ *Real*
	0...200 °C		1 = 1 °C
177.68	Transformer temperature 2 fault limit	Defines limit to trigger a fault when medium voltage transformer oil temperature is more than this value.	100 °C/ *Real*
	0...200 °C		1 = 1 °C

No.	Name/Value	Description	Def/ FbEq16/32
177.69	Transformer temperature 2, current limit temperature 1	Defines temperature 1 value of the medium voltage transformer oil temperature related current limitation curve. At this temperature current is limited to point 1 value. A warning is indicated at this temperature.	90 °C/ *Real*
	0...200 °C	Temperature 1 value.	1 = 1 °C
177.70	Transformer temperature 2, current limit temperature 2	Defines temperature 2 value of the medium voltage transformer oil temperature related current limitation curve. At this temperature current is limited to point 2 value.	95 °C/ *Real*
	0...200 °C	Temperature 2 value.	1 = 1 °C
177.71	Transformer temperature 2, current limit temperature 3	Defines temperature 3 value of the medium voltage transformer oil temperature related current limitation curve. At this temperature current is limited to 0%. A fault is triggered at this temperature.	100 °C/ *Real*
	0...200 °C	Temperature 3 value.	1 = 1 °C
177.72	Transformer temperature 2, current limit current 1	Defines current 1 value of the medium voltage transformer oil temperature related current limitation curve. This is the limited current when temperature is at limit 1.	3600 A/ *Real*
	0...10000 A	Current 1 value.	-/ 1 = 1 A
177.73	Transformer temperature 2, current limit current 2	Defines current 2 value of the medium voltage transformer oil temperature related current limitation curve. This is the limited current when temperature is at limit 2.	1000 A/ *Real*
	0...10000 A	Current 2 value.	-/ 1 = 1 A
177.81	MV breaker opening status	Shows status of medium voltage breaker opening. This parameter is an interface for relay output source. This parameter is read-only.	-/ *Bit list*
	b0:MV breaker open command	When MV breaker is controlled to open, this bit is set accordingly. Actual relay output source can be pointed to this bit.	
	b1...b15: Reserved	Reserved	
177.90	Current limits ramp down rate	Sets ramp down rate for current limit ramping due to medium voltage station limitation.	1000 A/ *Real*
	0...10000 A	Ramp down rate for current limit.	-/ 1 = 1 A
178 MPPT settings		MPPT settings.	
178.40	FRT fast recovery	Sets the inverter to restore MPPT operating point after FRT event.	On/ *List*
	Off		0
	On		1
178.41	FRT recovery ramp	Defines fast recovery ramp. After FRT event voltage reference is ramped down with this rate to the value that was measured before the event.	600 V/s/ *Real*
	0 … 2000 V/s	Fast recovery ramp.	1 = 1 V/s
178.42	FRT recovery delay	Defines delay time for the MPPT operation restart after FRT recovery.	3.0 s/ *Real*
	0.0 … 10.0 s	FRT recovery delay time.	1 = 1 s

No.	Name/Value	Description	Def/ FbEq16/32
184 Energy metering		Energy metering parameters.	
184.06	Total Energy	Shows total kWh produced. This parameter is read-only.	-/ *Real*
	0...4294967295 kWh	Total kWh produced.	-/ 1 = 1 kWh
184.07	Total Energy Frac	Shows total energy (W) produced. This parameter is read-only.	-/ *Real*
	0...65535 W	Total energy (W) produced	1 = 1 W
184.09	Total kVAh supplied	Shows total kVAh supplied. This parameter is read-only.	-/ *Real*
	0...4294967295 kVAh	Total kVAh supplied.	-/ 1 = 1 kVAh
184.10	Total kVAh supplied Frac	Shows total kVAh supplied. This parameter is read-only.	-/ *Real*
	0...65535	Total kVAh supplied.	1 = 1
184.12	Energy counter, resettable	Shows total energy produced since the last reset. Writing 0 resets the counter. This parameter is read-only.	-/ *Real*
	0.00... 4294967.30 kWh	Total kWh produced since last reset.	1 = 1 kWh/ 100 = 1 kWh
184.13	kVAh Energy counter, resettable	Shows total energy produced (kVAh) since the last reset. Writing 0 resets the counter. This parameter is read-only.	-/ *Real*
	0.00... 4294967.30 kVAh	Total kVAh produced since last reset.	1 = 1 kVAh/ 100 = 1 kVAh
184.14	Daily kWh supplied	Shows kWh supplied today. This parameter is read-only.	-/ *Real*
	0.0...4294967.3 kWh	kWh supplied today.	1 = 1 kWh/ 10 = 1 kWh
184.15	Daily kVAh supplied	Shows kVAh supplied today. This parameter is read-only.	-/ *Real*
	0.0...4294967.3 kVAh	kVAh supplied today.	1 = 1 kVAh/ 10 = 1 kVAh
184.16	Daily kWh supplied (MWh part)	Shows kWh supplied today (MWh part).	-/ *Real*
	0...4294967 MWh	MWh supplied today (MWh part).	1 = 1 MWh/ 10 = 1 MWh
184.17	Daily kWh supplied (kWh part)	Shows kWh supplied today (kWh part).	-/ *Real*
	0...4294967 kWh	kWh supplied today (kWh part).	1 = 1 kWh/ 10 = 1 kWh
184.18	Daily kVAh supplied (MVAh part)	Shows kVAh supplied today (MVAh part).	-/ *Real*
	0...4294967 MVAh	MVAh supplied today (MVAh part).	1 = 1 MVAh/ 10 = 1 kVAh
184.19	Daily kVAh supplied (kVAh part)	Shows kVAh supplied today (kVAh part).	-/ *Real*
	0...4294967 kVAh	kVAh supplied today (kVAh part).	1 = 1 kVAh/ 10 = 1 kVAh

No.	Name/Value	Description	Def/ FbEq16/32
184.20	Total energy (GWh part)	Shows total supplied energy (GWh part).	-/ *Real*
	0...4294967 GWh	Total supplied energy (GWh part).	1 = 1 GWh/ 10 = 1 GWh
184.21	Total energy (MWh part)	Shows total supplied energy (MWh part).	-/ *Real*
	0...4294967 MWh	Total supplied energy (MWh part).	1 = 1 MWh/ 10 = 1 MWh
184.22	Total energy (kWh part)	Shows total supplied energy (kWh part).	-/ *Real*
	0...4294967 kWh	Total supplied energy (kWh part).	1 = 1 kWh/ 10 = 1 kWh
184.23	Total kVAh supplied (GVAh part)	Shows total supplied energy (GVAh part).	-/ *Real*
	0...4294967 GVAh	Total supplied energy (GVAh part).	1 = 1 GVAh/ 10 = 1 GVAh
184.24	Total kVAh supplied (MVAh part)	Shows total supplied energy (MVAh part).	-/ *Real*
	0...4294967 MVAh	Total supplied energy (MVAh part).	1 = 1 MVAh/ 10 = 1 MVAh
184.25	Total kVAh supplied (kVAh part)	Shows total supplied energy (kVAh part).	-/ *Real*
	0...4294967 kVAh	Total supplied energy (kVAh part).	1 = 1 kVAh/ 10 = 1 kVAh
185 Health monitoring		Health monitoring inhibits starting. All active modules must have healthy power supply and buffer status. 0 = Run 1 = Inhibited	
185.01	Main circuit SPD status	Shows main circuit surge protection device status.	0b0000/ *Bit list*
	b0: SPD	Status of surge protection device circuit	
	b1 … b15: Reserved	-	
185.02	DC input fuse status	Shows the DC input fuse status.	0b0000/ *Bit list*
	b0: DC fuse/breaker	DC fuse/breaker status	
	b1 … b15: Reserved		
185.03	48 V power supply status	Shows the status of the 48 V power supply.	0b0000/ *Bit list*
	b0: 48 V PSU	48 V power supply status	
	b1 … b15: Reserved		
	b1 … b15: Reserved	-	
185.04	48 V buffer status	Shows the 48 V buffer status.	0b0000/ *Bit list*
	b0: 48 V buffer	48 V buffer status	
	b1 … b15: Reserved		
	b1 … b15: Reserved	-	
185.05	24 V buffer status	Shows the 24 V buffer status.	0b0000/ *Bit list*
	b0: 24 V buffer	24 V buffer status	
	b1 … b15: Reserved	-	

No.	Name/Value	Description	Def/ FbEq16/32
185.06	Aux protection devices status	Shows the status of auxiliary protection devices, which include circuit breakers and surge protectors.	0b0000/ *Bit list*
	b0: Aux CB	Auxiliary circuit breaker status	
	b1 … b15: Reserved	-	
185.10	Smoke detector status	Shows the smoke detector status. True = OK	0b0000/ *Bit list*
	b0: Smoke detector	Show the status of smoke detector.	
	b1 … b15	Reserved	
185.11	LCL overheat sensor status	Shows status of LCL overheat sensor.	0b0000/ *Bit list*
	b0: Module 1	Monitored status of module 1 LCL overheat sensor.	
	b1: Module 2	-	
	b2 … b15: Reserved	-	
	b1: Module 2	Monitored status of module 2 LCL overheat sensor.	
	b2: Module 3	Monitored status of module 3 LCL overheat sensor.	
	b3: Module 4	Monitored status of module 4 LCL overheat sensor.	
	b4 … b15: Reserved	-	
185.28	AC fuse feedback status	Shows the status of AC fuse feedbacks.	0b0000/ *Bit list*
	b0: Front (power sections 1 and 2)	Status of AC fuse feedbacks for power sections 1 and 2.	
	b1: Back (power sections 3 and 4)	Status of AC fuse feedbacks for power sections 3 and 4.	
	b2 … b15	Reserved	
185.30	24 V buffer fail date	Shows the date for the latest occurrence of a 24 V buffer fail event.	-/ Data
185.31	24 V buffer fail time	Shows the time for the latest occurrence of a 24 V buffer fail event.	-/ Data
185.32	24 V buffer fail count	Counts the number of times that the 24 V buffer has signaled that its input source has failed.	-/ *Real*
	0...65535		1 = 1
185.33	AC busbar overheat status	Shows the status flag of the AC busbar temperature monitoring.	0b0000/ *Bit list*
	b0: AC busbar	AC busbar overheat status	
	b1 … b15	Reserved	
189 Inverter control		Inverter control settings.	
189.01	Inverter operation	Enables inverter operation.	Disabled/ *List*
	Disabled	Inverter operation is disabled. Inverter disconnects from AC grid.	0
	Enabled	Inverter operation enabled.	1
189.03	IO transfer trip source	Selects source for IO transfer trip. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1

No.	Name/Value	Description	Def/ FbEq16/32
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
189.04	SCADA transfer trip	Shows SCADA transfer trip status.	Inactive/ *List*
	Inactive	SCADA transfer trip not active.	0
	Active	SCADA transfer trip activated.	1
189.05	Transfer trip event	Sets event for transfer trip.	No action/ *List*
	No action		0
	Warning		1
	Fault		2
	Pure event		3
189.06	IO shutdown source	Sets source for IO ramped shut down. See also *Digital inputs* on page *49*.	Off/ *List*
	Off		0
	On		1
	Digital input X61.1		2
	Digital input X61.2		3
	Digital input X61.3		4
	Digital input X61.4		5
	Digital input X61.5		6
	Digital input X61.6		7
	Digital input X61.7		8
	Spare DI8		9
	Spare DI9		10
	Spare DI10		11
	Spare DI11		12
	Spare DI12		13
	Other	See *Terms and abbreviations* on page *55*.	-
189.07	SCADA shutdown	Shows SCADA ramped shut down status.	Inactive/ *List*
	Inactive	SCADA ramped shut down not active.	0
	Active	SCADA ramped shut down activated.	1
189.08	Shutdown event	Sets event for ramped shut down.	No action/ *List*
	No action		0

No.	Name/Value	Description	Def/ FbEq16/32
	Warning		1
	Fault		2
	Pure event		3
189.11	Reset active faults	Resets active faults of the inverter.	0 / *Real*
	0 … 1		1 = 1
190 Grid measurements		Settings for grid voltage measurements of the inverter. All parameters in this group are read-only, otherwise noted.	
190.01	Phase voltage U	Shows rms value of phase voltage U.	-/ *Real*
	0.00 … 2000.00 V	U phase voltage.	1 = 1 V/ 100 = 1 V
190.02	Phase voltage V	Shows rms value of phase voltage V.	-/ *Real*
	0.00 … 2000.00 V	V phase voltage.	1 = 1 V/ 100 = 1 V
190.03	Phase voltage W	Shows rms value of phase voltage W.	-/ *Real*
	0.00 … 2000.00 V	W phase voltage.	1 = 1 V/ 100 = 1 V
190.04	Phase voltage max	Shows maximum rms value of phase voltage.	-/ *Real*
	0.00 … 2000.00 V	Maximum phase voltage.	1 = 1 V/ 100 = 1 V
190.05	Phase voltage min	Shows minimum rms value of phase voltage.	-/ *Real*
	0.00 … 2000.00 V	Minimum phase voltage.	1 = 1 V/ 100 = 1 V
190.06	Main voltage U-V	Shows rms value of line-to-line voltage U-V.	-/ *Real*
	0.00 … 2000.00 V	U-V line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.07	Main voltage V-W	Shows rms value of line-to-line voltage V-W.	-/ *Real*
	0.00 … 2000.00 V	V-W line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.08	Main voltage W-U	Shows rms value of line-to-line voltage W-U.	-/ *Real*
	0.00 … 2000.00 V	W-U line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.09	Main voltage max	Shows maximum rms value of line-to-line voltages.	-/ *Real*
	0.00 … 2000.00 V	Maximum line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.10	Main voltage min	Shows minimum rms value of line-to-line voltages.	-/ *Real*
	0.00 … 2000.00 V	Minimum line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.11	Phase voltage pos seq	Shows positive sequence value of phase voltage.	-/ *Real*
	0.00 … 2000.00 V	Positive sequence of phase voltage.	1 = 1 V/ 100 = 1 V
190.12	Phase voltage neg seq	Shows negative sequence value of phase voltage.	-/ *Real*
	0.00 … 2000.00 V	Negative sequence of phase voltage.	1 = 1 V/ 100 = 1 V
190.13	Main voltage pos seq	Shows positive sequence value of line-to-line voltage.	-/ *Real*
	0.00 … 2000.00 V	Positive sequence of line-to-line voltage.	1 = 1 V/ 100 = 1 V

No.	Name/Value	Description	Def/ FbEq16/32
190.14	Main voltage neg seq	Shows negative sequence value of line-to-line voltage.	-/ *Real*
	0.00 … 2000.00 V	Negative sequence of line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.15	Frequency	Shows estimated frequency of the measured voltage.	-/ *Real*
	0.00 … 100.00 Hz	Estimated frequency of measured voltage.	1 = 1 Hz/ 100 = 1 Hz
195 HW configuration		Various hardware-related settings.	
195.13	Reduced run disable mask	Reduced run disable mask. If a bit for a module is set, the module is disabled.	0b0000/ *Bit list*
	b0: Module 1		
	b1: Module 2		
	b2: Module 3		
	b3: Module 4		
	b4: Module 5		
	b5: Module 6		
	b6: Module 7		
	b7: Module 8		
	b8: Module 9		
	b9: Module 10		
	b10: Module 11		
	b11: Module 12		
	b12...b15: Reserved		
195.14	Connected modules	Shows connected and found modules of parallel connection (bit field). This parameter is read-only.	0b0000/ *Bit list*
	b0: Module 1		
	b1: Module 2		
	b2: Module 3		
	b3: Module 4		
	b4: Module 5		
	b5: Module 6		
	b6: Module 7		
	b7: Module 8		
	b8: Module 9		
	b9: Module 10		
	b10: Module 11		
	b11: Module 12		
	b12...b15: Reserved		

No.	Name/Value	Description	Def/ FbEq16/32
195.15	DIsabled modules state mask	Disabled modules state mask. If a bit for a module is set, the module is disabled for reduced operation and the check of the disabled modules states is enabled, the communication for the disabled module is expected. If the bit for module is not set, the module is disabled and the check for disabled modules states is enabled, the communication for the disabled module is not expected. If the check is disabled, the state does not matter.	0b0000/ *Bit list*
	b0: Module 1		
	b1: Module 2		
	b2: Module 3		
	b3: Module 4		
	b4: Module 5		
	b5: Module 6		
	b6: Module 7		
	b7: Module 8		
	b8: Module 9		
	b9: Module 10		
	b10: Module 11		
	b11: Module 12		
	b12...b15: Reserved		
195.16	Check disabled module state	If the check for the disabled module state is enabled, the communication state of the disabled modules (reduced operation) is checked and it should match the "Disabled modules state mask" parameter. If the check is disabled, the communication state of a disabled module is not monitored.	-/ *Real*
196 System		Systems settings: Language selection, parameter save and restore, control unit reboot.	
196.01	Language	Selects language of the parameter interface and other displayed information.	Not selected/ *List*
	Not selected	Default value of the parameter and means that language has not been selected.	0
	English	English (United States)	1
196.02	Passcode	Pass codes can be entered into this parameter to activate further access levels, for example, additional parameters, parameter lock, etc. See parameter *196.03 Access level status*. Entering “358” toggles the parameter lock, which prevents the changing of all other parameters through the control panel or the Drive composer PC tool.	-/ *Real*
196.03	Access level status	Shows which access level is activated by pass codes entered into parameter *196.02 Passcode*. This parameter is read-only.	0x0000/ *Bit list*
	b0: OnM		
	b1: Expert		
	b2: Master		
	b3: Factory		

No.	Name/Value	Description	Def/ FbEq16/32
	b4...b10: Reserved		
	b11: OEM access level 1		
	b12: OEM access level 2		
	b13: OEM access level 3		
	b14: Parameter lock		
	b15: Reserved.		
196.06	Param restore	Restores original settings of the application, i.e. parameter factory default values. **Note**: This parameter cannot be changed while the inverter is running.	Done/ *List*
	Done	Restoring is completed.	0
	Restore defs	All editable parameter values are restored to default values, except • I/O extension module settings • control panel/PC communication settings • fieldbus adapter settings	1
	Clear all	All editable parameter values are restored to default values, except • control panel/PC communication settings • fieldbus adapter settings PC tool communication is interrupted during the restoring.	2
196.07	Param save	Saves valid parameter values to the permanent memory. **Note**: A new parameter value is saved automatically when changed from the PC tool or panel but not when altered through a fieldbus connection.	Done/ *List*
	Done	Save completed.	0
	Save	Save in progress.	1
196.08	Control board boot	Changing the value of this parameter to 1 reboots the control unit. The value reverts to 0 automatically.	-/ *Real*
	0 … 1	1 = Reboot control unit.	1 = 1
196.20	Time synchronization source	Defines first priority source for synchronizing date and time of the inverter from an external source.	DDCS Controller/ *List*
	Internal	No external time synchronization for date and time of the inverter.	0
	DDCS Controller	AC800M automation PLC through CI858, Module bus.	1
	Fieldbus A or B	Fieldbus channel A or B.	2
	Fieldbus A	Fieldbus channel A.	3
	Fieldbus B	Fieldbus channel B.	4
	D2D or M/F	D2D-communication master, or master in master/follower link.	5
	Embedded FB	Embedded fieldbus	6
	Embedded Ethernet	Ethernet port in BCU.	7
	Panel link	User’s panel e.g. ACS-AP-I or inverter composer-tool.	8

No.	Name/Value	Description	Def/ FbEq16/32
	Ethernet tool link	Drive Composer PC tool Ethernet link.	9
196.24	Full days since 1st Jan 1980	Sets day count starting from 1st January 1980. This parameter, together with *196.25 Time in minutes within 24 h* and *196.26 Time in ms within one minute* makes it possible to set the date and time in the inverter via the parameter interface from a fieldbus or application program. This may be necessary if the fieldbus protocol does not support time synchronization.	12055 days/ *Real*
	1 … 59999 days	Days since beginning of 1980.	1 = 1 days
196.25	Time in minutes within 24 h	Sets the number of full minutes passed since midnight. For example, the value 860 corresponds to 2:20 pm. See parameter *196.24 Full days since 1st Jan 1980*.	0 min/ *Real*
	0 … 1439 min	Minutes since midnight.	1 = 1 min
196.26	Time in ms within one minute	Sets the number of milliseconds passed since last minute. See parameter *196.24 Full days since 1st Jan 1980*.	0 ms/ *Real*
	0 … 59999 ms	Number of milliseconds since last minute.	1 = 1 ms
196.29	Time source status	Shows the status and priority of active time source. This parameter is read-only.	0b0000/ *Bit list*
	b0: Time tick received	1 = 1st priority tick received: Tick was received from 1st priority source.	
	b1: Aux Time tick received	1 = 2nd priority tick received: Tick was received from 2nd priority source.	
	b2: Tick interval is too long	1 = Yes: Tick interval too long (accuracy compromised).	
	b3 DDCS controller	1 = Tick received: Tick is received from an external controller.	
	b4: Master/Follower	1 = Tick received: Tick is received through the master/follower link.	
	b5: Reserved	-	
	b6: D2D	1 = Tick received: Tick is received through the inverter-to-inverter link.	
	b7: FbusA	1 = Tick received: Tick is received through fieldbus interface A.	
	b8: FbusB	1 = Tick received: Tick has been received through fieldbus interface B.	
	b9: EFB	1 = Tick received: Tick was received through the embedded fieldbus interface.	
	b10: Ethernet	1 = Tick received: Tick was received through the Ethernet port on the BCU control unit.	
	b11: Panel link	1 = Tick received: Tick is received from the control panel, or Drive composer PC tool connected to the control panel.	
	b12: Ethernet tool link	1 = Tick received: Tick is received from Drive composer PC tool through an FENA-xx module.	
	b13 Parameter setting	1 = Tick received: Tick is set by parameters *196.24*…*196.26*.	
	b14 RTC	1 = RTC time in use: Time and date is read from the real-time clock.	

No.	Name/Value	Description	Def/ FbEq16/32
	b15 Drive On-Time	1 = Inverter on-time in use: Time and date are displaying inverter on-time.	
196.61	User data logger status word	Shows the status of user data logger. This parameter is read-only.	0x0000/ *Bit list*
	b0: Running	User data logger is running. This bit is cleared after post trigger time has passed.	
	b1: Triggered	User data logger has triggered. This bit is cleared when user data logger is re-started.	
	b2: Data available	Data logger contains data that can be read. Note: this bit is not cleared after it has risen because triggered data is saved into ZMU.	
	b3: Configured	User data logger configured. Note: this bit is not cleared after it has risen because configuration data is saved into ZMU.	
	b4 … b15: Reserved		
196.100	Change user passcode	Defines recent user passcode.	- / *Real*
196.101	Confirm user passcode	Confirms recently changed user passcode in parameter *196.100*.	- / *Real*
196.102	User lock functionality	Defines which functions are locked when user lock is on.	- / *Real*
	b0: Disable access levels		
	b1: Freeze parameter lock state		
	b2: Disable file download		
	b3: Disable FB write to hidden		
	b4...b6: Reserved		
	b7: Disable panel bluetooth		
	b8...b10: Reserved		
	b11: Disable OEM access level 1		
	b12: Disable OEM access level 2		
	b13: Disable OEM access level 3		
	b14...b15: Reserved		
199 PLC diagnostics		PLC diagnostics settings.	
199.01	Number of PLC errors in buffer	Shows number of PLC errors in buffer.	0/ *Real*
199.11	PLC error class 1	Shows PLC error class 1.	0/ *Real*
	0...65535		1 = 1
199.12	PLC error component 1	Shows PLC error component 1.	0/ *Real*
	0...65535		1 = 1
199.13	PLC error device 1	Shows PLC error device 1.	0/ *Real*
	0...65535		1 = 1
199.14	PLC error module 1	Shows PLC error module 1.	0/ *Real*

No.	Name/Value	Description	Def/ FbEq16/32
	0...65535		1 = 1
199.15	PLC error channel 1	Shows PLC error channel 1.	0/ *Real*
	0...65535		1 = 1
199.16	PLC error identifier 1	Shows PLC error identifier 1.	0/ *Real*
	0...65535		1 = 1
199.21	PLC error class 2	Shows PLC error class 2.	0/ *Real*
	0...65535		1 = 1
199.22	PLC error component 2	Shows PLC error component 2.	0/ *Real*
	0...65535		1 = 1
199.23	PLC error device 2	Shows PLC error device 2.	0/ *Real*
	0...65535		1 = 1
199.24	PLC error module 2	Shows PLC error module 2.	0/ *Real*
	0...65535		1 = 1
199.25	PLC error channel 2	Shows PLC error channel 2.	0/ *Real*
	0...65535		1 = 1
199.26	PLC error identifier 2	Shows PLC error identifier 2.	0/ *Real*
	0...65535		1 = 1
199.31	PLC error class 3	Shows PLC error class 3.	0/ *Real*
	0...65535		1 = 1
199.32	PLC error component 3	Shows PLC error component 3.	0/ *Real*
	0...65535		1 = 1
199.33	PLC error device 3	Shows PLC error device 3.	0/ *Real*
	0...65535		1 = 1
199.34	PLC error module 3	Shows PLC error module 3.	0/ *Real*
	0...65535		1 = 1
199.35	PLC error channel 3	Shows PLC error channel 3.	0/ *Real*
	0...65535		1 = 1
199.36	PLC error identifier 3	Shows PLC error identifier 3.	0/ *Real*
	0...65535		1 = 1
204 PLC Extension Inputs		PLC extension inputs.	
204.01	PLC digital Inputs 1	PLC CPU unit PM564 digital inputs	0x0000/ *Bit list*
	b0: Main circuit SPD status		
	b1: Smoke detector		
	b2: Digital input X61.2		
	b3: Digital input X61.3		
	b4: Digital input X61.4		
	b5: Digital input X61.5		
	b6 … b15 Reserved		

No.	Name/Value	Description	Def/ FbEq16/32
204.02	PLC digital inputs 2	PLC I/O unit DX571 # 1 digital inputs	0x0000/ *Bit list*
	b0: M1 LCL overheating status		
	b1: M1 AC contactor status		
	b2: M1 DC contactor status		
	b3: M2 LCL overheating status		
	b4: M2 AC contactor status		
	b5: M2 DC contactor status		
	b6: M3 LCL overheating status		
	b7: M3 AC contactor status		
	b8: M3 DC contactor status		
	b9: M4 LCL overheating status		
	b10: M4 AC contactor status		
	b11: M4 DC contactor status		
	b12: AC fuse status front		
	b13: AC fuse status back		
	b14: AC breaker tripped		
	b15: AC breaker status		
204.03	PLC digital inputs 3	PLC I/O unit DX571 # 2 digital inputs.	0x0000/ *Bit list*
	b0: Combined 48 V power supply and buffer status		
	b1: DC section fan status		
	b2: AC section fan status		
	b3: Power sections 1 and 3 fan status		
	b4: Power sections 2 and 4 status		
	b5: M1 fan status		
	b6: M2 fan status		
	b7: M3 fan status		
	b8: M4 fan status		

No.	Name/Value	Description	Def/ FbEq16/32
	b9: DC fuse/breaker status		
	b10: Digital input X61.6		
	b11: Digital input X61.7		
	b12: Reserved		
	b13: Reserved		
	b14: Reserved		
	b15: Reserved		
204.04	Dummy 1	Dummy parameter.	-/ *Real*
	0...65535		1 = 1
204.05	Dummy 2	Dummy parameter.	-/ *Real*
	0...65535		1 = 1
204.06	PLC watchdog read	PLC reads this parameter and copies the value to PLC watchdog write parameter. This parameter also has the reboot/error return acknowledgement signal in bit 8. It means that PLC has noticed the reboot or the error acknowledgement signal.	-/ *Real*
	0...65535		1 = 1
204.75	Power section humidity	Defines the humidity measured from the power section.	-/ *Real*
	0...65535		1 = 1
204.76	Control section humidity	Defines the humidity measured from the control section.	-/ *Real*
	0...65535		1 = 1
204.77	Air intake temperature	Raw data of the air intake temperature measurement.	-/ *Real*
	0...65535		1 = 1
204.78	AC section temperature	Raw data of the AC section temperature measurement.	-/ *Real*
	0...65535		1 = 1
204.79	Power sections 1 and 3 temperature	Raw data of the power section 1 and 3 temperature measurement.	-/ *Real*
	0...65535		1 = 1
204.80	Power sections 2 and 4 temperature	Raw data of the power section 2 and 4 temperature measurement.	-/ *Real*
	0...65535		1 = 1
204.81	DC section temperature	Raw data of the DC section temperature measurement.	-/ *Real*
	0...65535		1 = 1
204.82	User AI1	User AI1 (PLC AI523_1 AI7)	-/ *Real*
	0...65535		1 = 1
204.83	User AI2	User AI2 (PLC AI523_1 AI8)	-/ *Real*
	0...65535		1 = 1
204.84	AI3 (Not available)	AI3 (Not available)	-/ *Real*
	0...65535		1 = 1
204.85	AI4 (Not available)	AI4 (Not available)	-/ *Real*
	0...65535		1 = 1
204.86	AI5 (Not available)	AI5 (Not available)	-/ *Real*
	0...65535		1 = 1
204.87	AI6 (Not available)	AI6 (Not available)	-/ *Real*
	0...65535		1 = 1

No.	Name/Value	Description	Def/ FbEq16/32
204.88	AI7 (Not available)	AI7 (Not available)	-/ *Real*
	0...65535		1 = 1
204.89	AI8 (Not available)	AI8 (Not available)	-/ *Real*
	0...65535		1 = 1
204.90	AI9 (Not available)	AI9 (Not available)	-/ *Real*
	0...65535		1 = 1
204.91	AI10 (Not available)	AI10 (Not available)	-/ *Real*
	0...65535		1 = 1
204.92	AI11 (Not available)	AI11 (Not available)	-/ *Real*
	0...65535		1 = 1
204.93	DC input current 1	Defines DC input 1 current measurement.	-/ *Real*
	0...65535		1 = 1
204.94	DC input current 2	Defines DC input 2 current measurement.	-/ *Real*
	0...65535		1 = 1
204.95	DC input current 3	Defines DC input 3 current measurement.	-/ *Real*
	0...65535		1 = 1
204.96	DC input current 4	Defines DC input 4 current measurement.	-/ *Real*
	0...65535		1 = 1
204.97	DC input current 5	Defines DC input 5 current measurement.	-/ *Real*
	0...65535		1 = 1
204.98	DC input current 6	Defines DC input 6 current measurement.	-/ *Real*
	0...65535		1 = 1
204.99	DC input current 7	Defines DC input 7 current measurement.	-/ *Real*
	0...65535		1 = 1
204.100	DC input current 8	Defines DC input 8 current measurement.	-/ *Real*
	0...65535		1 = 1
204.101	DC input current 9	Defines DC input 9 current measurement.	-/ *Real*
	0...65535		1 = 1
204.102	DC input current 10	Defines DC input 10 current measurement.	-/ *Real*
	0...65535		1 = 1
204.103	DC input current 11	Defines DC input 11 current measurement.	-/ *Real*
	0...65535		1 = 1
204.104	DC input current 12	Defines DC input 12 current measurement.	-/ *Real*
	0...65535		1 = 1
204.105	DC input current 13	Defines DC input 13 current measurement.	-/ *Real*
	0...65535		1 = 1
204.106	DC input current 14	Defines DC input 14 current measurement.	-/ *Real*
	0...65535		1 = 1
204.107	DC input current 15	Defines DC input 15 current measurement.	-/ *Real*
	0...65535		1 = 1
204.108	DC input current 16	Defines DC input 16 current measurement.	-/ *Real*
	0...65535		1 = 1
204.109	DC input current 17	Defines DC input 17 current measurement.	-/ *Real*
	0...65535		1 = 1

No.	Name/Value	Description	Def/ FbEq16/32
204.110	DC input current 18	Defines DC input 18 current measurement.	-/ *Real*
	0...65535		1 = 1
204.111	DC input current 19	Defines DC input 19 current measurement.	-/ *Real*
	0...65535		1 = 1
204.112	DC input current 20	Defines DC input 20 current measurement.	-/ *Real*
	0...65535		1 = 1
204.113	DC input current 21	Defines DC input 21 current measurement.	-/ *Real*
	0...65535		1 = 1
204.114	DC input current 22	Defines DC input 22 current measurement.	-/ *Real*
	0...65535		1 = 1
204.115	DC input current 23	Defines DC input 23 current measurement.	-/ *Real*
	0...65535		1 = 1
204.116	DC input current 24	Defines DC input 24 current measurement.	-/ *Real*
	0...65535		1 = 1
204.117	DC input current 25	Defines DC input 25 current measurement.	-/ *Real*
	0...65535		1 = 1
204.118	DC input current 26	Defines DC input 26 current measurement.	-/ *Real*
	0...65535		1 = 1
204.119	DC input current 27	Defines DC input 27 current measurement.	-/ *Real*
	0...65535		1 = 1
204.120	DC input current 28	Defines DC input 28 current measurement.	-/ *Real*
	0...65535		1 = 1
204.121	DC input current 29	Defines DC input 29 current measurement.	-/ *Real*
	0...65535		1 = 1
204.122	DC input current 30	Defines DC input 30 current measurement.	-/ *Real*
	0...65535		1 = 1
204.123	DC input current 31	Defines DC input 31 current measurement.	-/ *Real*
	0...65535		1 = 1
204.124	DC input current 32	Defines DC input 32 current measurement.	-/ *Real*
	0...65535		1 = 1
204.125	DC input current 33	Defines DC input 33 current measurement.	-/ *Real*
	0...65535		1 = 1
204.126	DC input current 34	Defines DC input 34 current measurement.	-/ *Real*
	0...65535		1 = 1
204.127	DC input current 35	Defines DC input 35 current measurement.	-/ *Real*
	0...65535		1 = 1
204.128	DC input current 36	Defines DC input 36 current measurement.	-/ *Real*
	0...65535		1 = 1
204.129	DC input current 37	Defines DC input 37 current measurement.	-/ *Real*
	0...65535		1 = 1
204.130	DC input current 38	Defines DC input 38 current measurement.	-/ *Real*
	0...65535		1 = 1
204.131	DC input current 39	Defines DC input 39 current measurement.	-/ *Real*
	0...65535		1 = 1

No.	Name/Value	Description	Def/ FbEq16/32
204.132	DC input current 40	Defines DC input 40 current measurement.	-/ *Real*
	0...65535		1 = 1
204.133	DC input current 41	Defines DC input 41 current measurement.	-/ *Real*
	0...65535		1 = 1
204.134	DC input current 42	Defines DC input 42 current measurement.	-/ *Real*
	0...65535		1 = 1
204.135	DC input current 43	Defines DC input 43 current measurement.	-/ *Real*
	0...65535		1 = 1
204.136	DC input current 44	Defines DC input 44 current measurement.	-/ *Real*
	0...65535		1 = 1
204.137	DC input current 45	Defines DC input 45 current measurement.	-/ *Real*
	0...65535		1 = 1
204.138	DC input current 46	Defines DC input 46 current measurement.	-/ *Real*
	0...65535		1 = 1
204.139	DC input current 47	Defines DC input 47 current measurement.	-/ *Real*
	0...65535		1 = 1
204.140	DC input current 48	Defines DC input 48 current measurement.	-/ *Real*
	0...65535		1 = 1
204.141	PLC error class	Defines PLC error class.	-/ *Real*
	0...65535		1 = 1
204.142	PLC error component	Defines PLC error, fault component.	-/ *List*
	0...65535		1 = 1
	External communication module		1
	External communication module		6
	Local I/P		8
	CPU		9
	Internal communication module		10
	COM1		11
	COM2		12
	FBP		13
	I/O bus		14
	User		15
204.143	PLC error device	Defines component specific PLC error, faulty device. See AC500 documentation.	-/ *Real*
	0...65535		1 = 1
204.144	PLC error module	Defines device specific PLC error, faulty module.	-/ *List*
	0...65535		1 = 1
	Initialization		1
	Runtime		2
	Project/configuration		3
	Protocol		4
	Device itself		31

No.	Name/Value	Description	Def/ FbEq16/32
204.145	PLC error channel	Defines module specific PLC error fault channel. See AC500 documentation.	-/ *Real*
	0...65535		1 = 1
204.146	PLC error identifier	Defines PLC error identifier. See AC500 documentation.	-/ *Real*
	0...65535		1 = 1
204.147	PLC error state	Defines output status of PLC read error. The error status is a combination of the states “Error has come”, “Error has gone” and “Error has been acknowledged”. See AC500 documentation.	-/ *Real*
	0...65535		1 = 1
204.148	PLC CPU load	Defines PLC CPU load.	-/ *Real*
	0...65535		1 = 1
204.201	PLC SW version, lower bits	Defines PLC software version lower bits.	-/ *Real*
	0...65535		1 = 1
204.202	PLC SW version, upper bits	Defines PLC software version upper bits.	-/ *Real*
	0...65535		1 =1
204.203	PLC runtime system version	Defines PLC runtime system version.	-/ *Real*
	0...65535		1 =1
204.204	PLC bootcode version	Defines PLC bootcode version.	-/ *Real*
	0...65535		1 = 1
204.205	PLC onboard I/O version	Defines PLC onboard I/O version.	-/ *Real*
	0...65535		1 = 1
204.206	PLC software MD5 hash #1	Defines PLC software MD5 hash bytes 0 and 1.	-/ *Real*
	0...65535		1 = 1
204.207	PLC software MD5 hash #2	Defines PLC software MD5 hash bytes 2 and 3.	-/ *Real*
	0...65535		1 = 1
204.208	PLC software MD5 hash #3	Defines PLC software MD5 hash bytes 4 and 5.	-/ *Real*
	0...65535		1 = 1
204.209	PLC software MD5 hash #4	Defines PLC software MD5 hash bytes 6 and 7.	-/ *Real*
	0...65535		1 = 1
204.251	PLC error code	Defines PLC error code.	-/ *Real*
	0...65535		1 = 1

No.	Name/Value	Description	Def/ FbEq16/32
205 PLC Extension Outputs		PLC output signals.	
205.01	Spare AO1	PLC CPU module PM564 analog voltage output of power module 3 cabinet fan control signal.	-/ *Real*
	0...65535		1 = 1
205.02	PLC Relay Outputs 1	PLC CPU unit PM564 relay outputs 1.	0x0000/ *Bit list*
	b0: Green status lamp		
	b1: Orange status lamp		
	b2: Red status lamp		
	b3: Control section heating		
	b4: Power section heating		
	b5: Spare RO1		
	b6 … 15 Reserved		
205.03	PLC Relay Outputs 2	PLC I/O unit DX571 # 1 relay outputs 2.	0x0000/ *Bit list*
	b0: M1 Charging contactor command		
	b1: M2 Charging contactor command		
	b2: M3 Charging contactor command		
	b3: M4 Charging contactor command		
	b4: M1 AC contactor command		
	b5: M2 AC contactor command		
	b6: M3 AC contactor command		
	b7: M4 AC contactor command		
	b8: M1 DC contactor command		
	b9: M2 DC contactor command		
	b10: M3 DC contactor command		
	b11: M4 DC contactor command		
	b12: AC breaker trip reset		
	b13: AC breaker close command		
	b14: AC breaker open command		

No.	Name/Value	Description	Def/ FbEq16/32
	b15: DC breakers open command		
205.04	PLC watchdog write	Shows the value that PLC reads and copies from the “PLC watchdog read” parameter. This parameter is read-only.	-/ *Real*
	0...65535		1 = 1
205.05	PLC diagnostics counter	Defines PLC diagnostics counter.	0/ *Real*
	0...1024		1 = 1
205.06	PLC watchdog threshold	Defines PLC link watchdog threshold level.	1500 ms/ *Real*
	1...10000 ms	Threshold level	1 = 1 ms
205.07	PLC CPU reboot	Defines the state 1 to reboot PLC.	-/ *Real*
	0...65535		1 = 1
205.08	PLC error acknowledgement	Defines the value for acknowledging PLC error. Value 1 indicates that an error in the PLC is acknowledged.	-/ *Real*
	0...65535		1 = 1
205.09	PLC configuration code	Defines PLC configuration code.	-/ *Real*
	0...255		1 = 1
208 DC input monitor		DC input voltage monitoring related parameter group.	
208.01	Input voltage	Shows DC input voltage. This parameter is read-only.	-/ *Real*
	-		1 = 1 V
208.03	Input power	Shows DC input power. This parameter is read-only.	-/ *Real*
	0.0...10000.0 kW	Power in kilowatts.	1 = 1 kW/ 10 = 1 kW
208.04	Input current	Shows input current of the inverter. This parameter is read-only.	0 / *Real*
	-4000...4000 A	Power module input current.	1 = 1 A
208.09	Input current monitoring	Enables DC current monitoring function.	Enabled/ *List*
	Disabled	DC current monitoring disabled.	0
	Enabled	DC current monitoring enabled.	1
208.12	Reverse current limit	Defines reverse current limit. A smaller current value is interpreted as reverse current.	-100.0 A/ *Real*
	-500.0...100.0 A	Reverse current limit.	10 = 1 A
208.13	Reverse current delay	Defines duration for which DC input current has to be more negative than the limit at which a trip is triggered.	2 s/ *Real*
	0...2000 s	Reverse time limit	1 = 1 s

No.	Name/Value	Description	Def/ FbEq16/32
210 Grounding supervision		Grounding supervision parameters.	
210.01	Grounding mode	Sets used grounding mode.	Off/ *List*
	Off	Grounding mode is Off.	0
	Forced	Grounding mode is forced. Grounding is closed without measuring the insulation resistance.	1
	Automatic	Grounding mode is set automatically. The actual state machine runs independently based on the settings in parameters *210.03*...*210.03* and the internal states of the inverter.	2
210.02	Grounding device	Sets the used grounding device/board.	MGND-01/ *List*
	MGND-01	Using this board functional grounding can be performed from either the positive pole (option code +F282) or negative pole (standard).	1
	MGND-21	Reserved	2
210.03	Grounding state	Shows grounding state. This parameter is read-only	-/ *List*
	Disabled	Grounding is disabled and system is not grounded.	0
	Forced grounding	Grounding is connecting after forced command.	1
	Grounded (forced)	Grounded by forced command.	2
	Forcing failed	Forced grounding failed.	3
	Faulted	Inverter is faulted and grounding state machine is in faulted state.Inverter is faulted and grounding state machine in faulted state.	4
	Ungrounded night	Ungrounded night mode. Input voltage is low and grounding is open.	5
	Insulation measurement	Insulation measurement ongoing.	6
	Grounding connecting	Grounding is ongoing, Monitoring is not yet enabled.	7
	Grounded operation	Grounded and monitored operation.	8
	Grounded night	Grounded night mode. Input voltage is low and grounding is closed.	9
	Grounding opening	Grounding is opening.	10
	Grounding for night	Grounding is closing for night.	11
	Ungrounded operation	Ungrounded operation.	12
	Open during operation	Grounding is opening during operation.	13
	Grounding during operation	Grounding is closing during operation.	14
	Ungrounding for night	Grounding is opening for night.	15

No.	Name/Value	Description	Def/ FbEq16/32
210.04	Ignore insulation resistance	Ignores insulation resistance measurement before grounding. This action allows grounding when the insulation resistance is low, e.g., during high moisture mornings. In all cases, grounding is opened (removed), if there is a high grounding voltage or current.	Disabled/ *List*
	Disabled	Ignore insulation resistance disabled.	0
	Enabled	Ignore insulation resistance enabled.	1
210.05	Ungrounded operation	Enables ungrounded operation. Set this parameter if the type of panel in use can function without grounding. **Note**: Grounding is open (removed) when input voltage is higher than the limit to allow insulation resistance measurement.	Disabled/ *List*
	Disabled	Ungrounded operation disabled.	0
	Enabled	Ungrounded operation enabled.	1
210.06	Unground on fault	Enables ungrounding function in the event of fault.	Disabled / *List*
	Disabled	Ungrounding on fault is disabled.	0
	Enabled	Ungrounding on fault is enabled.	1
210.07	Night grounding	Enables night grounding function. Night grounding means grounding is active while input voltage is low. **Note**: Grounding is open (removed) when the input voltage is higher than the limit to allow insulation resistance measurement.	Disabled/ *List*
	Disabled	Night grounding is disabled.	0
	Enabled	Night grounding is enabled.	1
210.08	Wake-up voltage	Defines wake-up voltage.	500 V/ *Real*
	0...1000 V	Wake-up volt.age	1 = 1 V
210.09	Night mode voltage	Defines night mode voltage.	400 V/ *Real*
	0...1000 V	Night mode voltage.	1 = 1 V
210.12	Grounding circuit voltage fail action	Selects how the inverter should react in the event of a grounding circuit voltage failure.	Warning/ *List*
	Warning	Indicates *57606 Grounding circuit over voltage* warning code in the event of grounding circuit voltage failure.	0
	Fault	Triggers a *37126 Grounding circuit over voltage* fault code in the event of grounding circuit voltage failure.	1
210.13	Grounding current limit	Defines limit for rms value of the grounding current. When value is beyond this limit, a fault/warning is activated.	0.25 A/ *Real*
	0.00...7.00 A	Grounding current limit.	1 = 1 A/ 100 = 1 A
210.14	Total grounding current	Shows rms value of the grounding current. This parameter is read-only.	-/ *Real*
	0.000...10.000 A	Total grounding current	1 = 1 A/ 1000 = 1 A
210.15	Resistive grounding current	Shows resistive grounding current. This parameter is read-only.	-/ *Real*
	-10.000...10.000 A	Resistive grounding current	1 = 1 A/ 1000 = 1 A

No.	Name/Value	Description	Def/ FbEq16/32
210.16	Grounding current fault action	Selects how the inverter should react in the event of residual current failure.	Warning/ *List*
	No	No action selected.	0
	Warning	Indicates *57605 Residual current* warning code in the event of residual current failure.	1
	Fault	Triggers *37125 Residual current* fault code in the event of residual current failure.	2
210.17	Grounding current time limit	Defines disconnection time for residual current fault.	0.160 s/ *Real*
	0.000...2.000 s	Grounding current time limit.	1 = 1 s/ 1000 = 1 s
210.18	Sudden change current fault action	Selects how the inverter should react if a sudden change fault occurred.	No/ *List*
	No	No action selected.	0
	Warning	Indicates *57604 Grounding current sudden change* warning code in the event of a sudden change in current fault.	1
	Fault	Triggers *37124 Grounding current sudden change* fault code in the event of a sudden change in current fault.	2
210.26	Insulation resistance device	Selects insulation measurement device.	MIRU/-01 *List*
	MIRU-01	MIRU-01 is used as the measurement device.	1
	Bender isoPV1685		2
210.27	Insulation resistance device state	Shows insulation measurement device state. This parameter is read-only.	-/ *List*
	Disabled	Device is disabled.	0
	Not ready	Device is measuring and result is not yet valid.	1
	Measuring	Device is measuring and result is valid.	2
	Failed	Device is broken. Measurement has taken too much time.	3
210.28	Insulation resistance limit	Defines insulation resistance limit. A lower value than this limit results in fault/warning.	3000 Ohm/ *Real*
	0...10000000 Ohm	Resistance value.	1 = 1 Ohm
210.29	Insulation resistance	Shows insulation resistance value. This parameter is read-only.	-/ *Real*
	0...1000000000 Ohm	Resistance value.	
210.30	Insulation resistance fault action	Selects how the inverter should react for the insulation resistance fault.	Warning/ *List*
	No	No action selected	0
	Warning	Indicates *57686 Insulation resistance* warning code if the insulation resistance is not within limits.	1
	Fault	Triggers *37127 Insulation resistance* fault code if the insulation resistance is not within limits.	2

No.	Name/Value	Description	Def/ FbEq16/32
210.33	MIRU self-test	Enables insulation resistance measurement device (MIRU) self test.	Disabled/ *List*
	Disabled	MIRU self test disabled.	0
	Enabled	MIRU self test enabled.	1
210.34	Self-test voltage	Defines input voltage limit when insulation resistance measurement device (MIRU) self test is activated before connecting to the grid.	500 V/ *Real*
	0...1000 V	Voltage	1 = 1 V
210.35	Status word	Shows the status of relay output source. When grounding or insulation resistance measurement is enabled, bits in the parameter are set accordingly.	0b0000/ *Bit list*
	b0: Grounding contactor command		-
	b1: Insulation measurement disable command		-
	b2...15: Reserved		-
210.37	Pre-grounding insulation resistance	Shows the last measured insulation resistance before grounding. This parameter is read-only.	- / *Real*
	0.... Ohm		1 = 1 Ohm
211 Temperature monitoring		Temperature monitoring related parameters. All parameters in this group are read-only unless otherwise specified.	
211.01	Ambient temperature	Shows the ambient air temperature (PT100).	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.02	Control board temperature	Shows control board temperature measured from the BCU-12 NTC.	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.03	AC section air temperature	Shows AC section air tamperature (PT100).	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.04	DC section air temperature	Shows DC section air temperature (PT100).	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.05	Power sections 1 and 3 air temperature	Shows power sections 1 and 3 air temperature (PT100).	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.06	Power sections 2 and 4 air temperature	Shows power sections 2 and 4 air temperature (PT100).	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.07	Highest cabinet air temperature	Shows highest cabinet air temperature. Measured from AC section, DC section, power sections 1 and 3 and power sections 2 and 4.	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.08	Highest IGBT M1 temperature	Shows module 1 highest IGBT temperature.	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C

No.	Name/Value	Description	Def/ FbEq16/32
211.09	Highest IGBT M2 temperature	Shows module 2 highest IGBT temperature.	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.10	Highest IGBT M3 temperature	Shows module 3 highest IGBT temperature.	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.11	Highest IGBT M4 temperature	Shows module 4 highest IGBT temperature.	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
211.12	Highest IGBT temperature	Shows highest IGBT temperature.	-/ *Real*
	-100.0 … 200.0 °C		10 = 1 °C
213 Wake-up monitor		Parameters for wake-up/sleep monitor and state machine.	
213.02	Wake-up state	Shows wake-up monitor state for debugging. This parameter is read-only.	Initialize/ *List*
	Initialize	Inverter is initializing or not yet ready for operation.	0
	First start	Inverter waits for DC voltage to settle between limits.	1
	Disconnected wake	After inverter has completed sleep, it checks when input voltage is suitable for grid connection.	2
	Connected wake	Inverter is connected to grid. It monitors the power level to be high enough and the wake timer has expired.	3
	Low power	Inverter is operating, but power is lower than the minimum limit.	4
	Reconnect	When power is too low for a long time, a reconnection is not allowed for the duration of the set time limit.	5
	Reconnect open DC	When power is too low for long time and DC voltage goes too low, the DC contactors are opened.	6
	Connected sleep	Inverter operated normally. Wake-up is completed and inverter is checking sleep conditions.	7
	Fault recover	A fault has occurred and the inverter used the first start limits and tries to connect back.	8
	Going to sleep	Power of the inverter drops below going to sleep limit.	9
	Disconnected sleep	Inverter shuts down and waits for the cool down period, until a wake-up can be tried.	10
	Wakeup count over	Reconnection was attempted number of times. A cool down for many hours will be done before further reconnection.	11
213.04	Max daily connect attempts	Defines limit for daily connection attempts. When the limit exceeds, a timer (parameter *213.15 Timeout for exceeding daily connections*) waits for multiple hours before the next attempt.	10/ *Real*
	0 … 20	Daily connection attempts limit.	1 = 1
213.05	Min input voltage for wake-up	Defines minimum voltage for the wake-up of inverter. The limit is set in percentage of the peak value of the grid's phase-to-phase voltage.	125.0%/ *Real*
	0.0 … 200.0%	Percent of peak value of the grid's phase-to-phase voltage.	10 = 1%

No.	Name/Value	Description	Def/ FbEq16/32
213.07	Delay for grid connection	Defines time that the voltage is required to be between the minimum voltage (parameter *213.05 Min input voltage for wake-up*) and the maximum voltage (1500 V) for connecting to the DC input and grid.	5 min/ *Real*
	0...100 min	Connection voltage time limit.	1 = 1 min
213.08	Min input voltage for first start	Defines minimum voltage for the first wake-up of inverter. The value is a percent of the peak value of the grid's phase-to-phase voltage.	100.0%/ *Real*
	0.0...200.0%	Percent of peak value of the grid's phase-to-phase voltage.	10 = 1%
213.10	Delay for first start	Defines the duration for which DC input voltage should be between the limits of minimum voltage (parameter *213.08 Min input voltage for wake-up*) and maximum voltage (1500 V) for connecting the inverter to DC input and grid for the first time.	0 min/ *Real*
	0 … 2000 min	Time limit for connecting the inverter.	1 = 1 min
213.11	Time for wake-up completed	Defines the duration when the wake-up is considered to be completed. After this timer the inverter starts checking the sleep conditions.	60 min/ *Real*
	0 … 2000 min	Time for wake-up completed.	1 = 1 min
213.12	Min power for wake-up	Defines minimum power level for the inverter to stay connected to the grid during wakeup.	0.5%/ *Real*
	0.0 … 100.0%	Minimum power level for wake up.	10 = 1%
213.13	Disconnection delay in wake-up	Defines the duration that the inverter stays connected to the grid when produced power is less than the limit defined in parameter *213.12 Min power for wake-up*.	20 min/ *Real*
	0 … 2000 min	Time inverter stays connected to the grid.	1 = 1 min
213.14	Reconnection delay	Defines delay time before a reconnection to the grid is attempted again.	10 min/ *Real*
	0 … 2000 min	Delay time for reconnection.	1 = 1 min
213.15	Timeout for exceeding daily connections	Defines delay time for new attempts of reconnection after the limit (parameter *213.04 Max daily connect attempts*) is exceeded.	12 h/ *Real*
	0 … 24 h	Delay time for new attempts of reconnection.	1 = 1 h
213.16	Min power for sleep	Defines minimum power level for disconnecting the inverter in the evening.	0.5%/ *Real*
	0 … 100%	Percent of minimum power level for sleep.	1 = 1%
213.17	Disconnection delay for sleep-mode	Defines the time limit for disconnection. The inverter power is below the limit (*213.16 Min power for sleep*) for this duration.	20 min/ *Real*
	0 … 2000 min	Time limit for disconnection.	1 = 1 min
213.18	Evening cool down delay	Defines the time limit for which connecting the inverter is not tried again after sleep mode is completed.	40 min/ *Real*
	0 … 2000 min	Time limit for cool down.	1 = 1 min
213.19	Fault time limit	Defines the duration for which the wake-up state machine stays in fault recovery mode, before moving back to first start mode.	10 min/ *Real*
	0 … 2000 min	Time limit for cool down.	1 = 1 min
213.21	Min DC voltage for DC contactors to stay closed	Defines minimum DC voltage when DC contactors are kept closed. The value is percent of peak value of the grid's phase-to-phase voltage.	102.0%/ *Real*

No.	Name/Value	Description	Def/ FbEq16/32
	0.0 … 200.0%	Percent of the diode rectified DC voltage.	10 = 1%
213.51	Night Q production	Activates Night Q production mode.	Disabled/ *List*
	Disabled	Night Q production mode disabled	0
	Enabled	Night Q production mode enabled	1
	Force on	Night Q production mode forced to On	3
213.52	Night Q low power	Defines reactive power level required for the night Q production to be active.	50 kVAr/ *Real*
	0...1000 kVAr	Night Q reactive power in kVAr.	1 = 1 kVAr
213.53	Night Q delay	Defines time for which reactive power reference should be below the low power limit for night Q production mode to be deactivated.	10 s/ *Real*
	0...3600 s	Night Q reactive power delay time in seconds.	1 = 1 s
213.54	Night Q reference	Defines reactive power reference for night Q production. If value is set to 0 kVAr, the normal Qref is used.	0 kVAr/ *Real*
	-4000... 4000 kVAr	Night Q reactive power reference in kVAr.	1 = 1 kVAr
214 Switch control		Switch control parameters. All parameters in this group are read-only unless otherwise specified.	
214.01	Feedback status	Shows status of switch feedback signals.	0b0000/ *Bit list*
	b0: AC contactor 1	AC contactor 1	
	b1: AC contactor 2	AC contactor 2	
	b2: AC contactor 3	AC contactor 3	
	b3: AC contactor 4	AC contactor 4	
	b4: DC contactor 1	DC contactor 1	
	b5: DC contactor 2	DC contactor 2	
	b6: DC contactor 3	DC contactor 3	
	b7: DC contactor 4	DC contactor 4	
	b8: AC breaker	AC breaker	
	b9...b15: Reserved		
214.05	DC contactor 1 switchings	Shows number of counts that contactor is switched on.	0/ *Real*
	0...4294967295	DC contactor 1 switching counts.	1 = 1
214.06	DC contactor 2 switchings	Shows number of counts that contactor is switched on.	0 / *Real*
	0...4294967295	DC contactor 2 switching counts.	1 = 1
214.07	DC contactor 3 switchings	Shows the number of counts that the contactor is switched on.	0 / *Real*
	0...4294967295	DC contactor 3 switching counts.	1 = 1
214.08	DC contactor 4 switchings	Shows the number of counts that the contactor is switched on.	0 / *Real*
	0...4294967295	DC contactor 4 switching counts.	1 = 1
214.09	AC contactor 1 switchings	Shows number of counts that contactor is switched on.	0 / *Real*
	0...4294967295	AC contactor 1 switching counts.	1 = 1
214.10	AC contactor 2 switchings	Shows number of counts that contactor is switched on.	0 / *Real*

No.	Name/Value	Description	Def/ FbEq16/32
	0...4294967295	AC contactor 2 switching counts.	1 = 1
214.11	AC contactor 3 switchings	Shows the number of counts that the contactor is switched on.	0 / *Real*
	0...4294967295	AC contactor 3switching counts.	1 = 1
214.12	AC contactor 4 switchings	Shows the number of counts that the contactor is switched on.	0 / *Real*
	0...4294967295	AC contactor 4 switching counts.	1 = 1
214.13	AC breaker 1 switchings	Shows number of counts that breaker 1 is switched on.	0 / *Real*
	0...4294967295	AC breaker 1 switching counts.	1 = 1

5

Troubleshooting

The chapter lists fault, warning and event messages including possible causes and corrective actions.

Fault, warning and event codes

The fault and warning code is displayed on the control panel, as well as on the Drive composer PC tool. A fault and warning message indicates an abnormal status. Most fault and warning causes can be identified and corrected using the information in this chapter. Otherwise, contact your local FIMER representative. In addition to faults and warnings, there are pure events that are only recorded in the event logs of the inverter.

- **Faults**

Faults stop the inverter and require a manual or an automatic reset. Some faults cannot be reset and require an inverter restart. Refer to *Reset a fault* on page *154*. For the list of fault codes, refer to *Fault messages* on page *155*.

- **Warnings**

Warnings give information about abnormal operating conditions. Warnings can indicate limited output power and can prevent the inverter from starting (refer to parameters *173.05 Internal inverter inhibitors 1*, *173.06 Internal inverter inhibitors 2* and *173.07 Internal inverter inhibitors 3*). For the list of warning codes, refer to *Warning messages* on page *166*.

- **Pure events**

Pure events indicate abnormal conditions, for example, tripping events due to grid disturbances. For the list of pure event codes, refer to *Pure events* on page *176*.

Reset a fault

After the cause of a fault is corrected, the active fault can be reset from control panel, Drive composer PC tool, I/O interface, or fieldbus. When fault is removed, the inverter can be restarted. Some faults may be restarted by an autoreset feature. Autoreset is indicated in event logs.

Event history

You can access the event history from the **Events** menu. The menu has submenus for active faults, active warnings, faults and other events.

Active faults show all currently active faults.

Active warnings show all currently active warnings.

Faults show the faults that are reset.

Other events include, for example, all fault resets, pure events, activation and deactivation stamps for warnings.

You can also access the event history from parameter group *104 Warnings and faults*. The group shows the codes of active warnings and faults (a maximum of five each) and five previously occurred warnings and faults.

Auxiliary codes

Some events generate an auxiliary code that helps to identify the problem.

On the control panel: The auxiliary code is stored as part of the details of the event.

In the Drive composer PC tool: The auxiliary code is shown in the event listing.

Fault messages

If there is an active fault message, reset the inverter using any of these methods:

- Press the “Reset” button on the control unit
- Issue a reset through parameter *189.11 Reset active faults*
- Power-cycle the inverter

Monitor the inverter for a few minutes to see whether it resumes normal operation.

- If the inverter appears to operate normally, monitor the operation closely for a few days.
- If a fault cannot be reset or if it occurs frequently, record the event date and time, serial number of the inverter, and contact your system supplier.

Code in Dec (Hex)	Fault	Cause	What to do
11776 (0x2e00)	Overcurrent	Output current has exceeded the internal fault limit due to failure in AC connection, grid, transformer, or inverter main circuit.	Save the support package data and PSL2 logger data. See *Using the PSL2 data logger* (page *227*). Contact our local FIMER representative.
11778 (0x2e02)	Short circuit (This fault cannot be reset.)	Short-circuit detected in output due to inverter main circuit failure or There may be power factor correction capacitors in the output. This fault requires a reboot of control unit either by switching the power off and on, or using parameter *196.08 Control board boot*.	Save the support package data and PSL2 logger data. See *Using the PSL2 data logger* (page *227*). Contact our local FIMER representative.
11781 (0x2e05)	BU current difference	Current difference is detected in the branching unit due to current difference between power modules and internal fault in power module.	Save the support package data and PSL2 logger data. See *Using the PSL2 data logger* (page *227*). Contact our local FIMER representative.
11785 (0x2e09)	DC short circuit	Short circuit in DC input due to DC input cabling or inverter main circuit failure.	Save the support package data and PSL2 logger data. See *Using the PSL2 data logger* (page *227*). Contact our local FIMER representative.
15873 (0x3e01)	Frt Grid Fault	Grid fault occurred when BAMU measured grid voltage moves outside the user defined Fault Ride Through window.	Reset fault when the grid situation has stabilized.
15876 (0x3e04)	DC link overvoltage	Intermediate circuit DC voltage has exceeded.	Contact your local FIMER representative.

Code in Dec (Hex)	Fault	Cause	What to do
15877 (0x3e05)	DC link undervoltage	Intermediate circuit DC voltage is not sufficient.	Contact your local FIMER representative.
15878 (0x3e06)	BU DC link difference	Difference in DC voltages between parallel-connected power modules.	Contact your local FIMER representative.
15879 (0x3e07)	BU voltage difference	Difference in AC voltages between parallel-connected power modules.	Contact your local FIMER representative.
15880 (0x3e08)	LSU charging	Intermediate DC voltage charging time exceeded. Voltage level or d*u*/d*t* or charging current is not acceptable. Aux. code: 1 = indicates voltage rise is not acceptable 2 = indicates DC voltage level is not acceptable 3 = indicates charging current is too high 4 = indicates charging time is too high 8 = indicates DC voltage dropped too low	Check aux. code. Contact your local FIMER representative.
15882 (0x3e0a)	LSU charging busbar	Charging circuit fault.	Contact your local FIMER representative.
15885 (0x3e0d)	Overvoltage Fault	Grid monitoring voltage exceeded limits.	Reset fault when grid situation has stabilized.
15886 (0x3e0e)	Undervoltage fault	Grid monitoring voltage exceeded limits.	Reset fault when grid situation has stabilized.
15888 (0x3e10)	DC unbalance fault	Unbalance between DC link upper and lower branch capacitor voltage.	Reset the fault once. If fault persists, wait for further instructions. Contact your local FIMER representative.
19971 (0x4e03)	Excess temperature	IGBT temperature exceeded limits.	Check • ambient conditions • air flow and fan operation • air inlets for dust pick up or obstacles.
19972 (0x4e04)	Excess temperature difference	Too high temperature difference: • between IGBTs of different phases or • between measurements of single module.	Refer to the *Commissioning and maintenance manual*. If problem persists check the aux. code and contact your local FIMER representative.

Code in Dec (Hex)	Fault	Cause	What to do
19975 (0x4e07)	Control board temperature	Control board (BCU-12) temperature is too high. Aux. code 1 = indicates sensor is faulty	Check • control board temperature in parameter *211.02 Control board temperature*. • control cabinet air flow. If sensor is faulty, change the control board.
24067 (0x5e03)	XSTO circuit open	Circuit connected to XSTO:IN1 and/or XSTO:IN2 is open.	Verify connection to ground from XSTO:IN1 and XSTO:IN2 on BCU-12.
24069 (0x5e05)	Rating ID mismatch	Inverter hardware does not match the rating id stored in memory unit.	If the fault persists, contact your local FIMER representative.
24071 (0x5e07)	PU communication	Maximum charging time exceeded or connection to BAMU/power modules is not functional.	Check • charging fuses and resistors • the fuse in auxiliary power board of the power module • fiber optic cable connections. If aux. code is 7, check the connection to BAMU.
24072 (0x5e08)	Power unit lost	The connection between control unit and power unit is lost during running state.	Contact your local FIMER representative.
24077 (0x5e0d)	PU communication configuration	Optical fibers are in wrong position or rating id is wrong. Aux.code indicates channel of wrong configuration.	Check • aux. code • if BAMU fibers are on channel 5.
24078 (0x5e0e)	Reduced run	Some xINTs are missing. Not all power modules are found.	Check • charging fuses and resistors • the fuse in auxiliary power board of the power module • fiber optic cable connections.
24079 (0x5e0f)	PU state feedback	State feedback supervises the state feedback signals from output phases and compares the signals with actual control signals. All output phases are sampled individually.	Save the support package data and PSL2 logger data. See *Using the PSL2 data logger* (page *227*). Contact our local FIMER representative.
24082 (0x5e12)	Bamu configuration	Incorrect jumper settings on BAMU board.	• Check jumper settings on BAMU board. • Set all jumpers to sw select mode.
24084 (0x5e14)	Measurement circuit temperature	Problem with internal temperature measurement of inverter.	Contact your local FIMER representative.

Code in Dec (Hex)	Fault	Cause	What to do
24085 (0x5e15)	Overtemperature hw	Power module temperature exceeded.	Refer to the commissioning and maintenance manual. If the problem persists, check the aux. code and contact your local FIMER representative.
28168 (0x6e08)	Memory Unit Detached	Memory unit detached. This fault cannot be reset.	Check memory unit connection.
28185 (0x6e19)	Synchronization fault	Inverter cannot synchronize to grid, because grid is unstable or there is loose connection.	Reset fault if it occurred again and contact your local FIMER representative.
28186 (0x6e1a)	Rating ID fault	Rating id load failed. Memory unit might be corrupted.	Replace memory unit. If fault persists, contact your local FIMER representative.
28187 (0x6e1b)	Backup/Restore Timeout	Parameter backup/Restore timeout error detected.	Check panel / PC-tool connection and retry Backup/Restore, if problem persists contact your local FIMER representative.
28188 (0x6e1c)	Fast power off	Inverter has received a fast power off command.	1. Check that it is safe to continue operation. 2. Return fast power off pushbutton to normal position. 3. Restart inverter.
32257 (0x7e01)	Panel loss	Control panel loss fault detected. Control panel or PC tool selected as active control location for inverter has stopped communicating.	Check: • PC tool or control panel connection • control panel connector. Replace control panel in mounting platform.
32266 (0x7e0a)	Overfrequency	Gridmonitoring frequency exceeded limits.	Reset fault when grid situation has stabilized.
32267 (0x7e0b)	FBA A communication	Fieldbus adapter module A communication fault. Cyclical communication between inverter and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost.	Check: • status of field bus communication. See user documentation of fieldbus interface • settings of parameter groups: *150 FBA*, *151 FBA A settings*, *152 FBA A data in* and *153 FBA A data out* • cable connections • communication master is able to communicate.

Code in Dec (Hex)	Fault	Cause	What to do
32268 (0x7e0c)	FBA B communication	Fieldbus adapter B communication fault. Cyclical communication between inverter and fieldbus adapter module B or between PLC and fieldbus adapter module A is lost.	Check: • status of fieldbus communication. See user documentation of fieldbus interface. • settings of parameter groups: *150 FBA*, *154 FBA B settings*, *155 FBA B data in* and *156 FBA B data out*. • cable connections • communication master is able to communicate.
36352 (0x8e00)	Overvoltage fault	Inverter tripped due to grid overvoltage monitoring limits. Aux code: 1 = Overvoltage1 (U1ab) 2 = Overvoltage1 (U1bc) 3 = Overvoltage1 (U1ca) 4 = Overvoltage2 (U1ab) 5 = Overvoltage2 (U1bc) 6 = Overvoltage2 (U1ca) 7 = Overvoltage3 (U1ab) 8 = Overvoltage3 (U1bc) 9 = Overvoltage3 (U1ca) 20 = Overvoltage1 (GridEst) 21 = Overvoltage2 (GridEst) 22 = Overvoltage3 (GridEst)	• Check aux. code. • Check limits in parameter group *135 Grid monitoring*. • Reset fault.
36353 (0x8e01)	Undervoltage fault	Inverter tripped due to grid undervoltage monitoring limits. Aux. code: 1 = Undervoltage1 (U1ab) 2 = Undervoltage1 (U1bc) 3 = Undervoltage1 (U1ca) 4 = Undervoltage2 (U1ab) 5 = Undervoltage2 (U1bc) 6 = Undervoltage2 (U1ca) 11 = Undervoltage1 (GridEst) 12 = Undervoltage2 (GridEst)	• Check aux. code. • Check limits in parameter group *135 Grid monitoring*. • Reset fault.
36354 (0x8e02)	Overfrequency fault	Inverter tripped due to grid overfrequency monitoring limits.	• Check limits in parameter group *135 Grid monitoring*. • Reset fault.
36355 (0x8e03)	Underfrequency fault	Inverter tripped due to grid underfrequency monitoring limits.	• Check limits in parameter group *135 Grid monitoring*. • Reset fault.
36356 (0x8e04)	Sliding overvoltage fault	Inverter tripped due to grid sliding overvoltage monitoring limits.	• Check limits in parameter group *135 Grid monitoring*. • Reset fault.

Code in Dec (Hex)	Fault	Cause	What to do
36357 (0x8e05)	Rate of change of frequency fault	Inverter tripped due to grid rate of change of frequency monitoring limits.	• Check limits in parameter group *135 Grid monitoring*. • Reset fault.
37121 (0x9101)	Over temperature	Over temperature fault level has been exceeded.	• Check inverter cooling. • Refer to the *Commissioning and maintenance manual*. • If problem persists check the aux. code and contact your local FIMER representative.
37123 (0x9103)	Excess humidity	The relative humidity of cabinet has exceeded the fault level regardless of humidity control attempt.	Check that doors and coolers are closed properly. if problem persists contact your local FIMER representative
37124 (0x9104)	Grounding current sudden change	Grounding current supervision limit exceeded.	Contact your local FIMER representative.
37125 (0x9105)	Residual current	Grounding current supervision limit exceeded.	Contact your local FIMER representative.
37126 (0x9106)	Grounding circuit over voltage	Grounding circuit over voltage detected. The fuse on grounding circuit may be broken.	Contact your local FIMER representative.
37127 (0x9107)	Insulation resistance	Measured insulation resistance is too low.	Check settings in parameter group *210 Grounding supervision*. Contact your local FIMER representative.
37128 (0x9108)	Reverse current	Reverse current / backfeed detected. Aux. code (format XY): X = indicates faulty module number Y = indicates faulty DC input number.	• Check aux. code • Contact your local FIMER representative.
37129 (0x9109)	DC Overcurrent	DC Overcurrent limit exceeded. Aux. code (format XY): X = indicates module number Y = indicates DC input number	• Check aux. code • Contact your local FIMER representative.
37130 (0x910a)	External fault 1	Customer IO external fault 1	Check settings in parameter group *176 Customer IOs*.
37131 (0x910b)	External fault 2	Customer IO external fault 2	Check settings in parameter group *176 Customer IOs*.
37132 (0x910c)	External fault 3	Customer IO external fault 3	Check settings in parameter group *176 Customer IOs*.

Code in Dec (Hex)	Fault	Cause	What to do
37149 (0x911d)	Temperature sensor fail	Possible temperature sensor failure detected. At least one temperature measurements is beyond sanity check limits.	Check: • parameter group *211 Temperature monitoring* for sensor fail status • PLC PT100 sensor wiring.
37151 (0x911f)	Humidity sensor failure	Sensor failure detected in one or more humidity measurements.	Check PLC humidity sensor wiring
37152 (0x9120)	AC contactor failed to open	AC contactor failed to open.	Check: • parameter group *214 Switch control* to know the failed module • AC contactor wiring connections.
37153 (0x9121)	AC contactor failed to close	AC contactor failed to close.	
37154 (0x9122)	Open AC contactor	AC contactor is open unintentionally.	
37155 (0x9123)	Closed AC contactor	AC contactor closed unintentionally.	
37156 (0x9124)	DC contactor opening	DC contactor failed to open.	Check: • parameter group *214 Switch control* to know the failed module • DC contactor wiring connections.
37157 (0x9125)	DC contactor closing	DC contactor failed to close.	
37158 (0x9126)	Open DC contactor	DC contactor is open unintentionally.	
37159 (0x9127)	Closed DC contactor	DC contactor closed unintentionally.	
37161 (0x9129)	MV transformer gas discharge fault	Medium voltage transformer gas discharge fault occurred.	Check MV transformer.
37162 (0x912a)	MV side phase lost fault	Medium voltage side phase is lost.	Check MV transformer.
37163 (0x912b)	MV transformer overpressure fault	Medium voltage transformer overpressure fault occurred.	Check MV transformer.
37164 (0x912c)	MV breaker opened fault	Medium voltage breaker is opened.	Check MV transformer.
37165 (0x912d)	MV transformer vacuum fault	Medium voltage transformer vacuum fault occurred.	Check MV transformer.
37166 (0x912e)	MV transformer low oil level fault	Medium voltage transformer low oil level fault occurred.	Check MV transformer.
37167 (0x912f)	MV transformer temperature fault	Medium voltage transformer overtemperature fault occurred.	Check MV transformer.
37168 (0x9130)	Main circuit SPD	Main circuit surge protection device failure.	Check • surge protection device and its wiring • parameter *185.01 Main circuit SPD status*.

Code in Dec (Hex)	Fault	Cause	What to do
37169 (0x9131)	DC fuse	DC fuse is blown.	See aux. code for module information. Check • parameter *185.02 DC input fuse status* to know the failed module • DC input fuses and wiring.
37170 (0x9132)	48 V power supply	48 V power supply failed.	See aux. code for module information. Check • parameter *185.03 48 V power supply status* to know the failed module • wiring of 48 V power supply.
37171 (0x9133)	48 V buffer	48 V buffer failed.	See aux. code for module information. Check • parameter *185.04 48 V buffer status* to know the failed module • wiring of 48 V buffers.
37172 (0x9134)	24 V buffer	24 V buffer failed.	See aux. code for module information. Check • parameter *185.05 24 V buffer status* to know the failed module • wiring of 24 V buffers.
37173 (0x9135)	Aux circuit breaker	Auxiliary circuit breaker failed.	See aux. code for module information. Check • parameter *185.06 Aux protection devices status* to know the failed module • wiring of auxiliary circuit breaker.
37174 (0x9136)	LCL pressure sensor	LCL pressure sensor failed.	See aux. code for module information. Check the wiring of the LCL pressure sensor.
37175 (0x9137)	AC door	AC door is open.	See aux. code for module information. Check the AC door.
37176 (0x9138)	DC door	DC door is open.	See aux. code for module information. Check the DC door.

Code in Dec (Hex)	Fault	Cause	What to do
37177 (0x9139)	Smoke detector	Smoke detector has detected smoke inside control cabinet.	Check • Inverter for smoke • parameter *185.10 Smoke detector status* to know the failed module. Contact your local FIMER representative.
37178 (0x913a)	LCL overheat	LCL filter overheated. See aux. code for module information.	• Check inverter cooling. • Rfer to the *Commissioning and maintenance manual*. • If problem persists check the aux. code and contact your local FIMER representative.
37179 (0x913b)	Not supported PLC HW configuration	PLC version and firmware version are not compatible.	Check parameter *107.17 PLC SW version*.
37184 (0x9140)	AC breaker tripped	AC breaker tripped.	Check • aux. code to identify breaker • breaker settings and wiring.
37185 (0x9141)	AC breaker closing	AC breaker failed to close.	Check • aux. code to identify breaker • breaker settings and wiring.
37186 (0x9142)	AC breaker opening	AC breaker failed to open.	Check • aux. code to identify breaker • breaker settings and wiring.
37200 (0x9150)	Transfer trip	Transfer trip command received.	Remove command and reset fault.
37201 (0x9151)	Shutdown	Shut down command received from digital input or SCADA.	Remove command and reset fault.
37202 (0x9152)	DC input current deviation	Current deviation detected.	• Check aux. code (format XY), to know which DC input activated the fault. X = module number Y = DC input number • Examine the affected DC input for shading. • Make sure that panels in affected DC inputs are not damaged. • Make sure that the DC input monitoring configuration settings are feasible.

Code in Dec (Hex)	Fault	Cause	What to do
37203 (0x9153)	Blown DC input fuse	One or more DC input fuse(s) failed.	• Check aux. code (format XY), to know which DC input activated the fault. X = module number Y = DC input number • Check fuse indicators in DC section to locate the blown fuse.
37204 (0x9154)	DC input current measurement faulty	One or more DC input current measurement failed. Aux. code (format XYZ) indicates the failed power module. If X = 1, measurement failed due to calibration function If X = 0, measurement is out of range. Y = indicates the module number. E.g. 1 refers to module 1. Z = indicates DC input number. For example, aux. code 112, means calibration function reported faulty current in DC input 2 of module 1.	• Check DC input connections and sensor. • Check aux. code.
37205 (0x9155)	MV Breaker opening	Medium voltage breaker is commanded to be opened and might remove the auxiliary control power from the inverter.	Check that operation is safe and close the MV breaker.
37206 (0x9156)	DC current measurement faulty	One or more DC current measurement failed.	• Check DC connections and sensor. • Check aux. code to know the failed power module, for example, number 1 refers to module 1.
37207 (0x9157)	SCADA communication lost	SCADA communication is lost. Communication is lost if heartbeat echo is not received within the defined time.	Verify that heartbeat is echoed back to system. If echo interval is too long, modify heartbeat maximum interval with parameter *164.12 Heartbeat max interval*.
37208 (0x9158)	SCADA communication timeout	SCADA communication timeout. Communication is lost when SCADA does not return heartbeat within the defined time. Aux. code 4 indicates that communication has returned but is currently in timeout state. Control commands are frozen during timeout state.	Wait for communication timeout to pass. Timeout length can be configured with parameter *164.11 Comm hold-off after loss event*.

Code in Dec (Hex)	Fault	Cause	What to do
37375 (0x91ff)	Solar SW	Internal error occurred.	Contact your local FIMER representative.
37382 (0x9206)	AC busbar overheating	The inverter has tripped because of busbar overheating in the AC section. Inverter operation cannot continue. Contact FIMER.	The fault can be reset when the busbar temperature has decreased to normal values. Check the busbar assembly for components that might have caused hotspots to develop, check the cooling system, fans and filters. Contact your local FIMER representative.
37388 (0x9400)	Main fans failure	A fan fail has been detected in the main fan group.	For more information, check the fan failure status parameter and the aux code.
37389 (0x9401)	Power module fans failure	A fan fail has been detected in the power module fan group.	For more information, check the fan failure status parameter and the aux code.

Warning messages

Warnings do not prevent inverter power feed to grid, but output power may be limited.

Code	Warning	Cause	What to do
37632 (0x9300)	Main fans failure	A fan failure was detected in the main fan group.	For more information, check the fan failure status parameter and the aux code.
37633 (0x9301)	Power module fans failure	A fan failure was detected in the power module fan group.	For more information, check the fan failure status parameter and the aux code.
37634 (0x9302)	Main fans feedback	A fan RPM feedback failure was detected in the main fan group.	For more information, check the fan failure status parameter and the aux code.
37635 (0x9303)	Power module fans feedback	A fan RPM feedback failure was detected in the power module fan group.	For more information, check the fan failure status parameter and the aux code.
44544 (0xae00)	Current calibration	Current calibration is about to be performed. Current offset and gain measurement calibration will be performed at next start.	-
44549 (0xae05)	BU current difference	Current difference detected by branching unit.	Check • current difference between power modules • power module internal fault Contact your local FIMER representative.
44553 (0xae09)	DC link overvoltage	• Excessive intermediate circuit DC voltage. • DC-output from solar panels is too high.	Check the dimensioning and installation of solar arrays.
44556 (0xae0c)	BU DC link difference	Unbalance in DC link voltage of parallel modules has exceeded limit.	Contact your local FIMER representative.
44562 (0xae12)	IGBT overtemperature	Estimated inverter IGBT temperature is excessive.	Check: • ambient conditions • air flow • fan operation • heat exchangers and grills for dust pick-up.
44564 (0xae14)	Excess temperature	Temperature measurement from power unit is too high	Check: • ambient conditions • air flow • fan operation • heat exchangers and grills for dust pick-up.

Code	Warning	Cause	What to do
44565 (0xae15)	Excess temperature difference	Too high temperature difference between IGBTs of different phases.	Check: • ambient conditions • air flow • fan operation • heat exchangers and grills for dust pick-up.
44566 (0xae16)	IGBT temperature	Inverter module IGBT temperature is excessive.	Check: • ambient conditions • air flow • fan operation • heat exchangers and grills for dust pick-up.
44567 (0xae17)	PU communication	Communication error detected between control unit and power unit.	Check that communication cables are correctly fixed in the communication unit. If warning persists, contact your local FIMER representative.
44569 (0xae19)	Measurement circuit temperature	Problem with internal temperature measurement of inverter.	Contact your local FIMER representative.
44570 (0xae1a)	PU board powerfail	Power unit power supply failure	Contact your local FIMER representative.
44577 (0xae21)	Flash erase speed exceeded	Inverter FW not working in optimal way.	Contact your local FIMER representative.
44581 (0xae25)	FBA A parameter conflict	Settings in parameter groups *150 FBA* and *151 FBA A settings* are configured wrongly.	Reboot the system. If problem persists contact you local FIMER representative.
44582 (0xae26)	FBA B Parameter conflict	Settings in parameter groups *150 FBA* and *154 FBA B settings* are configured wrongly.	1. Check settings in parameter groups *150 FBA* and *154 FBA B settings*. *See* fieldbus adapter manual. 2. After making necessary changes refresh the setting with parameter *154.27 FBA par refresh*.
44583 (0xae27)	AI parametrization	AI parametrization error detected. Current/voltage dip switch setting on the BCU of an analog input does not correspond to parameter settings.	• Check positions of AI type dip switches on BCU, set both to I (current). • Check that parameters *112.15 AI1 unit selection* and *112.25 AI2 unit selection* are set to mA. • Reboot BCU. Contact your local FIMER representative.
44592 (0xae30)	FBA A communication	Communication lost between BCU and fieldbus adapter or external master and fieldbus adapter.	Reboot system. If problem persists contact you local FIMER representative.

Code	Warning	Cause	What to do
44593 (0xae31)	FBA B communication	Communication lost between BCU and fieldbus adapter or external master and fieldbus adapter.	Check • status of fieldbus communication. See user documentation of fieldbus interface. • settings of parameter groups *150 FBA*, *154 FBA B settings*, *155 FBA B data in* and *156 FBA B data out*. • cable connections • the communication of master.
44606 (0xae3e)	Panel loss	Control panel or PC tool has stopped communicating.	1. Check PC tool or control panel connection. 2. Check control panel connector. 3. Replace control panel in mounting platform.
44631 (0xae57)	Autoreset	A fault is about to be autoreset. This is an informative warning.	
44640 (0xae60)	Control board temperature	Control board temperature is too high.	Check • control board temperature with parameter *211.02 Control board temperature*. • control cabinet air flow. If sensor is faulty (aux. code = 1), change control board.
44648 (0xae68)	Fast power off	Fast power off signal received from push button.	1. Check that it is safe to continue operation. 2. Return fast power off pushbutton to normal position. 3. Restart inverter.
44654 (0xae6e)	Internal SW error	Internal memory error detected.	Check aux. code and contact your local FIMER representative.
44655 (0xae6f)	Ambient temperature	Power derating due to ambient temperature.	Ambient temperature is too high.
44656 (0xae70)	Overtemperature hw	Power module overtemperature.	Check aux. code and contact your local FIMER representative.
44661 (0xae75)	SD card	SD card is not operating properly. Saving power unit diagnostic data on SD card may not be possible.	Check that SD card is properly inserted in the control unit or replace the SD card.
44665 (0xae79)	Power fail saving	Power fail saving is requested too frequently. Due to limited saving interval some of the requests do not trigger saving and power fail data might be lost. This might be caused by DC voltage oscillation.	Check DC voltage stability. Contact your local FIMER representative.

Code	Warning	Cause	What to do
44682 (0xae8a)	User lock is open	User lock is open.	Activate lock by entering an invalid pass code with parameter *196.02 Passcode*.
44683 (0xae8b)	User pass code not confirmed	User pass code input parameter "Change user pass code", is not moved to "Confirm user pass code" parameter.	Check user lock functionality.
44684 (0xae8c)	Control unit battery	Control unit battery voltage is low. Real time clock may not preserve its time.	Replace control unit CR2032 battery.
57600 (0xe100)	Cold power section temperature	The minimum operational power section temperature is deceeded. The inverter start may be inhibited.	Wait for the power section temperature to rise.
57601 (0xe101)	Over temperature	Over temperature warning level exceeded. Nominal output current may not be available. Aux. code: 1 = indicates temperature exceeded warning limit in control section 2 = indicates temperature exceeded warning limit in power section 3 = indicates temperature exceeded warning limit in LCL section 4 = indicates temperature exceeded warning limit in IGBT module	Check aux. code. Contact your local FIMER representative.
57603 (0xe103)	Excess humidity	The relative humidity of cabinet has exceeded the warning level regardless of humidity control attempt. Aux.code: 1 = indicates excess humidity in control section 2 = indicates excess humidity in power section	Humidity level is too high. Wait for the inverter humidity to rise,
57604 (0xe104)	Grounding current sudden change	Sudden change in grounding current is detected.	External conditions changed, that is grounding impedance.
57605 (0xe105)	Residual current	Residual current warning	External conditions changed, that is, grounding impedance. Check parameters *210.13*...*210.17*.
57606 (0xe106)	Grounding circuit over voltage	MGND internal fuse is blown out.	1. Check MGND card condition. Internal fuse broken. 2. Replace MGND card.

Code	Warning	Cause	What to do
57607 (0xe107)	Insulation resistance	Insulation resistance below limit	External conditions changed, that is grounding impedance. Check parameters .
57612 (0xe10c)	Module 1 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 1 (M1).	Contact your local ABB representative.
57613 (0xe10d)	Module 2 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 2 (M2).	Contact your local ABB representative.
57620 (0xe114)	Temperature sensor fail	Temperature sensor failure detected. At least one of temperature measurements has exceeded sanity check limits.	Check status parameter of failed temperature sensor with parameter 211.62 Sensor fail status.
57621 (0xe115)	Humidity sensor failure	Sensor failure detected in one or more humidity measurements.	Check the humidity sensor for failure.
57622 (0xe116)	PLC manual test mode active	PLC manual test mode is active. Normal inverter operation is not possible.	Check parameter 209.01 PLC manual test mode.
57623 (0xe117)	Hot ambient temperature	The maximum operational ambient temperature is exceeded. Inverter operation may be inhibited.	Wait for ambient temperature to increase.
57624 (0xe118)	Cold ambient temperature	The minimum operational ambient temperature deceeded. Inverter operation may be inhibited.	Wait for ambient temperature to increase.
57625 (0xe119)	Option code not defined	Option code is not yet defined. Inverter start inhibited.	Check that parameters 206.101...120 is not set to “Not defined”. Select correct module manually.
57626 (0xe11a)	Wrong PLC HW configuration	PLC hardware and set option codes do not match. Aux code 1: configuration code is not set.	• Check that parameters 206.102 and 206.103 are set according to the inverter nameplate option codes. • Reboot the inverter. • If problem persists, contact your local FIMER representative.
57627 (0xe11b)	DC voltage not stable for starting	DC voltage oscillation during start sequence. DC voltage has not stabilized to open circuit voltage and inverter start up failed.	Check DC input voltage with parameter *208.01 Input voltage*. Try to disable and enable the inverter with parameter *189.01 Inverter operation*. If problem persists, contact FIMER.
57628 (0xe11c)	Night Q feature not supported	Night Q mode is not supported in this inverter.	Contact your local FIMER representative.

Code	Warning	Cause	What to do
57629 (0xe11d)	PLC link fault	Internal PLC communication failure, inverter is stopped.	Reboot aux. power from the inverter twice. If problem persists, contact your local FIMER representative.
57630 (0xe11e)	DC input reverse connected	Negative voltage detected in DC input. DC input positive and negative voltages are connected in reverse order.	Check connection of DC positive and negative poles.
57631 (0xe11f)	Nominal voltage out of range	Nominal grid voltage has exceeded limits.	Check parameter 135.02 Nominal LL voltage.
57632 (0xe120)	No country code selected	No country or grid code is selected	Select country or grid code with parameter *135.01 Grid code*.
57633 (0xe121)	AC breaker	AC breaker did not close within the expected time.	Check AC breaker connections.
57634 (0xe122)	AC breaker manually opened	Inverter opened AC breakers after receiving a user command.	Contact you local FIMER representative.
57635 (0xe123)	External warning 1	Customer IO external warning 1	Customer specific warning, check parameter group *176 Customer IOs*.
57636 (0xe124)	External warning 2	Customer IO external warning 2	Customer specific warning, check parameter group *176 Customer IOs*.
57637 (0xe125)	External warning 3	Customer IO external warning 3	Customer specific warning, check parameter group *176 Customer IOs*.
57639 (0xe127)	Wrong PLC inverter type	PLC and BCON softwares are not for same inverter (PVS980 / PVS800)	Check software version of the PLC or the inverter Firmware version.
57640 (0xe128)	Wrong PLC type	PLC hardware differs from parametrization. PLC XC / eCo type is not correct.	Contact you local FIMER representative.
57641 (0xe129)	MV transformer gas discharge warning	Medium voltage transformer gas discharge input triggered.	Check parameter group *177 MV Station*.
57642 (0xe12a)	MV breaker opened warning	Medium voltage breaker is opened.	Check parameter group *177 MV Station*.
57643 (0xe12b)	MV transformer temperature warning	Medium voltage transformer temperature is too high.	Check parameter group *177 MV Station*.
57644 (0xe12c)	MV transformer low oil level warning	Medium voltage transformer oil level is too low.	Check parameter group *177 MV Station*.
57645 (0xe12d)	MV transformer vacuum warning	Medium voltage transformer vacuum failure.	Check parameter group *177 MV Station*.
57646 (0xe12e)	MV side phase lost warning	Medium voltage side phase is lost.	Check parameter group *177 MV Station*.
57647 (0xe12f)	MV transformer overpressure warning	Medium voltage transformer overpressure.	Check parameter group *177 MV Station*.

Code	Warning	Cause	What to do
57648 (0xe130)	DC link overvoltage	DC link voltage is too high to start or to keep running.	Check parameter *101.01 DC voltage*. Contact your local FIMER representative.
57649 (0xe131)	Input overvoltage	Input voltage is too high to start or to keep running.	Check parameter *208.01 Input voltage*. Contact your local FIMER representative.
57651 (0xe133)	Main circuit SPD	Main circuit surge protection device indicates a failure.	Check • surge protection device and its wiring • parameter *185.01 Main circuit SPD status*.
57652 (0xe134)	DC fuse	DC fuse is blown. See aux. code for module information.	Check • parameter *185.02 DC input fuse status* to know the failed module • DC input fuses and wiring.
57653 (0xe135)	48 V power supply	48 V power supply failed. See aux. code for module information.	Check • parameter *185.03 48 V power supply status* to know the failed module • 48 V power supply and wiring.
57654 (0xe136)	48 V buffer	48 buffer failed. See aux. code for module information.	Check • parameter *185.04 48 V buffer status* to know the failed module • 48 V buffer and wiring.
57655 (0xe137)	24 V buffer	24 buffer failed. See aux. code for module information.	Check • parameter *185.05 24 V buffer status* 185.05 to know the failed module • 24V buffer and wiring.
57656 (0xe138)	Aux circuit breaker	Auxiliary circuit breaker failed. See aux. code for module information.	Check • parameter *185.06 Aux protection devices status* to know the failed module • auxiliary circuit breaker and wiring.
57657 (0xe139)	LCL pressure sensor	LCL pressure sensor fail. See aux. code for module information.	Check the LCL pressure sensor and wiring.
57658 (0xe13a)	Smoke detector	Smoke detected inside control cabinet.	Check inverters for smoke. Contact your local FIMER representative.
57659 (0xe13b)	LCL overheat	LCL filter overheated. See aux. code for module information.	Check • parameter *185.11 LCL overheat sensor status* to know the failed module • LCL filter.

Code	Warning	Cause	What to do
57661 (0xe13d)	AC disconnection device not selected	Option code is not yet defined. Inverter start inhibited.	• Check that parameters 206.101...120 is not set to “Not defined”. • Select correct module manually.
57667 (0xe143)	Configuration change pending	A change in module configuration is requested but configuration update is not allowed while inverter is enabled.	If configuration change is required, disable the operation with parameter *189.01 Inverter operation*.
57668 (0xe144)	Disabling all modules requested	All modules are requested to be disabled.	Enable at least one module for operating system.
57669 (0xe145)	Disabling non-existing module	A module not existing in configuration is requested to be disabled.	Check module disable forcing parameters.
57671 (0xe147)	Heating CB or aux SPD	Heating circuit breaker or auxiliary SPD failed because auxiliary circuit breaker monitoring signal is down but 48 V power supply status is OK.	See aux. code for module information.
57672 (0xe148)	PLC version not supported	PLC software version is not supported.	Update PLC software version.
57680 (0xe150)	Transfer trip	Transfer trip command received.	Remove command.
57681 (0xe151)	Shutdown	Shut down command received from digital input or SCADA.	Remove command.
57682 (0xe152)	DC input configuration	DC input is connected even though it is not configured as connected. Aux. code (format XY): X = indicates faulty module number Y = indicates faulty DC input number.	• Check aux. code. • Check M1...M4 connected DC inputs from parameter group *174 DC input current monitor*.
57683 (0xe153)	DC input current deviation	Current deviation detected. Aux. code (format XY): X = indicates faulty module number Y = indicates faulty DC input number.	• Check aux. code. • Examine affected DC input for shading. • Make sure panels in affected DC inputs are not damaged. • Make sure DC input monitoring configuration settings are feasible.
57684 (0xe154)	Blown DC input fuse	Blown DC input fuse detected. Aux. code (format XY): X = indicates faulty module number Y = indicates faulty DC input number.	Check aux. code. If warning persists, contact your local FIMER representative to replace failed DC input fuses.

Code	Warning	Cause	What to do
57685 (0xe155)	DC input current measurement	DC input current measurement is out of range. Connection is lost or sensor is broken. One or more DC input current measurement has/have failed. Aux. code (format XYZ) indicates the failed power module. If X = 1, measurement failed due to calibration function If X = 0, measurement is out of range. Y = indicates the module number. E.g. 1 refers to module 1. Z = indicates DC input number. For example, aux. code 112, means calibration function reported faulty current in DC input 2 of module 1.	• Check aux. code. • Check DC input connections and sensor. • Check wiring and sensor.
57686 (0xe156)	Insulation resistance device	Insulation resistance device has not produced a valid measurement in time.	Verify wiring and connection to MIRU.
57687 (0xe157)	Grounding signal	Grounding current signal is invalid.	Check signal cable.
57688 (0xe158)	DC current measurement faulty	DC current measurement is found faulty. One or more DC current measurement has/have failed. Connection is lost or sensor is broken. This check is done when DC contactors are open.	• Check DC connections and sensor. • Check active warnings from event log. • Check aux. code, to know which module activated the warning. • Check wiring and sensor.
57689 (0xe159)	SCADA communication lost	SCADA communication lost. Communication is lost if heartbeat echo is not received within defined time.	Verify that heartbeat is echoed back to system. If echo interval is too long, modify heartbeat max interval with parameter *164.12 Heartbeat max interval*.
57690 (0xe15a)	SCADA communication timeout	SCADA communication timeout. Communication is lost when heartbeat was not returned by SCADA within define time of specification. Aux. code 4 indicates that communication has returned but is currently in timeout state. Control commands are frozen during timeout state.	Wait for communication timeout to pass. Timeout length can be configured with parameter *164.11 Comm hold-off after loss event*
57854 (0xe1fe)	Autoreset	Autoreset is active and is about to reset inverter.	Autoreset resets faults after defined time is elapsed.

Code	Warning	Cause	What to do
57865 (0xe209)	AC busbar overheating	The inverter has given a warning because of busbar overheating in the AC section. Inverter operation must not continue. Contact FIMER.	The inverter should not be operated with high power output when this warning is present. The warning ceases when the busbar temperature decreases to normal values. Check the busbar assembly for components that might have caused hotspots to develop, check the cooling system, fans and filters. Contact your local FIMER representative.
58151 (0xe327)	AC fuse monitor warning	Grid is unstable, or grid phases are missing over a predefined time.	Check grid status, AC connections and AC fuses of the modules.

Pure events

Pure events are recorded in the event logs of the drive.

Code in Dec (Hex)	Pure event	Cause	What to do
48649 (0xbe09)	SSW internal diagnostics	System SW diagnostics has recorded an exceptional event during normal execution of system SW.	Check aux. code and contact your local FIMER representative.
58112 (0xe300)	Grid undervoltage trip	Grid undervoltage trip.	Inverter automatically starts operation when normal conditions are achieved.
58113 (0xe301)	Grid overvoltage trip	Grid overvoltage trip.	Inverter automatically starts operation when normal conditions are achieved.
58114 (0xe302)	Grid underfrequency trip	Grid underfrequency trip.	Inverter automatically starts operation when normal conditions are achieved.
58115 (0xe303)	Grid overfrequency trip	Grid overfrequency trip.	Inverter automatically starts operation when normal conditions are achieved.
58116 (0xe304)	Grid 1 phase anti-island trip	Grid single phase anti-islanding trip.	Inverter automatically starts operation when normal conditions are achieved.
58117 (0xe305)	Grid anti-islanding trip	Grid anti-islanding trip.	Inverter automatically starts operation when normal conditions are achieved.
58118 (0xe306)	Grid RoCoF trip	Grid rate of change of frequency (RoCoF) trip.	Inverter automatically starts operation when normal conditions are achieved.
58119 (0xe307)	Grid combinatory trip	Grid combinatory trip.	Inverter automatically starts operation when normal conditions are achieved.
58120 (0xe308)	Grid sliding average trip	Grid sliding average trip.	Inverter automatically starts operation when normal conditions are achieved.
58121 (0xe309)	Grid zero cross trip	Grid zero cross trip.	Inverter automatically starts operation when normal conditions are achieved.
58122 (0xe30a)	Extreme AC overvoltage	Extreme AC overvoltage.	Inverter automatically starts operation when normal conditions are achieved.
58128 (0xe310)	Grid LVRT trip	Grid low voltage ride through (LVRT) trip.	Inverter automatically starts operation when normal conditions are achieved.
58129 (0xe311)	Grid HVRT trip	Grid high voltage ride through (HVRT) trip.	Inverter automatically starts operation when normal conditions are achieved.

Code in Dec (Hex)	Pure event	Cause	What to do
58130 (0xe312)	Grid external monitor trip	Grid external monitor trip.	Inverter automatically starts operation when normal conditions are achieved.
58144 (0xe320)	Transfer trip	Transfer trip command received.	Remove command.
58145 (0xe321)	Shutdown	Shut down command received from digital input or SCADA.	Remove command.
58146 (0xe322)	DC current measurement faulty	DC current measurement is found faulty. Connection is lost or sensor is broken. This check is done when DC contactors are open.	Check DC connections and sensor. Aux. code shows which module activated the warning. For example, number 1 refers to module 1.
58147 (0xe323)	SCADA communication timeout	SCADA communication timeout. Communication is lost when heartbeat was not returned by SCADA in time defined in specification. Aux. code 4 indicates that communication has returned but is currently in timeout state.	Control commands are frozen during timeout state. Timeout length can be configured with parameter *164.11 Comm hold-off after loss event*.
58148 (0xe324	SCADA communication lost	SCADA communication is lost. Communication is lost if heartbeat echo is not received within defined time (see aux. code 3).	-

6

Communication interfaces

This chapter describes how the inverter can be controlled by external devices over a communication or fieldbus network through an optional fieldbus adapter module.

System overview

WARNING! Do not connect the inverter to a public data network.
Refer to *Cybersecurity disclaimer* on page *8*.

You can connect the inverter to an external control system through an optional fieldbus adapter that is mounted on the inverter control unit.

The inverter interface for a fieldbus connection is fieldbus adapter B (FBA B), while the fieldbus adapter A is reserved for internal inverter communication. The inverter can be configured to receive all of its control information through the fieldbus interfaces, or the control can be distributed between the fieldbus interfaces and other available sources.

Note: The text and examples in this chapter describe the configuration of one fieldbus adapter (FBA B) with parameters *150.31*...*150.33* and parameter groups *154 FBA B settings*…*156 FBA B data out*.

Fieldbus adapters are available for various communication systems and protocols:

- EtherNet/IP™ (FENA-21 adapter)
- Modbus/RTU (FSCA-01 adapter)
- Modbus/TCP (FENA-21 adapter)
- PROFINET IO (FENA-21 adapter)

The cyclic communication between a fieldbus system and the inverter supply unit consists of 16/32-bit input and output data words.

Connecting the inverter to a data network

The inverter connects to a communication or fieldbus network with a communication adapter module installed on the BCU control unit of the inverter.

Tabel 9:Communication adapters describes the different types of communication adapters that are most commonly used.

Adapter type	Protocol
FENA-21	Modbus/TCP, EtherNet/IP, PROFINET IO
FSCA-01	Modbus/RTU

Tabel 9: Communication adapters

For more information, refer to the documentation for the adapter.

Setting up fieldbus control

1. Install the fieldbus adapter module mechanically and electrically according to the instructions given in the User's manual of the module.
2. Power up the inverter.
3. Enable communication between the inverter and the fieldbus adapter module with parameter *150.31 FBA B Enable*.
4. Select how the inverter should react to a fieldbus communication break with parameter *150.32 FBA B comm loss func*.

   This function monitors both the communication between the fieldbus master and the adapter module, and the communication between the adapter module and the inverter.
5. Define the time between communication break detection and the selected action with parameter *150.33 FBA B comm loss t out*.
6. Select application-specific values for the rest of the parameters in group *150 FBA*.
7. Set the fieldbus adapter module configuration parameters in group *154 FBA B settings*. As a minimum, set the required node address and the control profile. Set profile to transparent 16 mode.

   Note: The parameter indices and names vary depending on the fieldbus adapter in use.
8. Define the process data transferred to and from the inverter using parameter groups *155 FBA B data in* and *156 FBA B data out* or use direct addressing.
9. Save valid parameter values to permanent memory by setting parameter *196.07 Param save* manually to save.
10. Validate the settings in parameter groups *154 FBA B settings*, *155 FBA B data in* and *156 FBA B data out* by setting parameter *154.27 FBA par refresh* to configure.

Further information

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