

FUNC DATA



GENERAL PURPOSE AC DRIVES SINGLE PHASE 0.4 - 2.2KW THREE PHASE 0.4 - 7.5KW

WARNING

- RISK OF INJURY OR ELECTRIC SHOCK
 Refer to the user's manual before installation and operation.
- RISK OF ELECTRIC SHOCK
- Do not remove this cover while applying power and at least 5 min, after disconnecting power.

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- Ron and slop keys function only in keypad.



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Caution

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Powerful, compact inverters supported by cutting-edge technology. Dynamic torque-vector control ensures optimum motor control.

- Even with a compact body size, this series has a high starting torque of 200% at 0.5Hz and motor wow in the low speed range is suppressed to approximately half that of conventional inverters.
- Equipped with intelligent functions such as automatic energy-saving, PID control, auto-tuning, and RS485 communication, and enhanced maintenance/protection functions such as inrush-current suppression and lifetime early warning.

Dynamic torque-vector control

Dynamic torque-vector control system performs high-speed calculation to determine the required motor power for the load status. This exclusive technology ensures optimal control of voltage and current vectors for maximum output torque.

High starting torque of 200% at 0.5Hz

Ideal for heavy industrial loads such as lifts, hoists and mixers. Also available for a second motor by changeover operation.



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Trip-free operation

The much improved current limiting function (Automatic deceleration, stall prevention) provides continuous stable operation even for an impact load.

The above graph shows an example of torque characteristics when combining the Jaguar VXSM (in torque vector mode) with a standard three-phase, 4 pole, motor. Continuous operation torque is for limits of allowable load torque when using the motor within the allowable temperature range and is not for motor output torque.

The motor output torque is shown by the short-time operation torque.

Reduced motor wow at low speed

VXSM's unique On-Delay compensation method reduces motor wow at low speed to approximately half of that of conventional inverters.

Compact

Miniaturization of minimum level in the class

Compared to the previous VXS series, the volume is reduced to approximately 50%. (single-phase 200V, 0.4kW)

Uniform height dimension

Considerd devices

Built-in inrushas standard

The capacity of per contractors can be

Low noise

Reduces interference and load cells.

Equipped with termi REACTOR for harmo power factor improver

Quiet motor when drivi frequency settings



for varia for high a secon f the sec n otors

Wide variation

Range up to 7.5kW

Extensively arranged three-phase 400V series, facilitating the unification of applying inverters to machines and equipment.

Single-phase 200V series (2.2kW or smaller)

Protective functions, Maintenance

Indication of main circuit capacitor life and accumulated operation time

Automatic control of cooling fans

Overheat early warning of heat sink

Protective function of input/output phase loss

Easy operation and wiring

Simple remote control

Remote control is available by removing

keypad panel and using an optional extension cable



Multiple Function display

Indicates output frequency, output current, output voltage, motor speed, trip history, etc.



Simple wiring

Only requires removing covers of the main circuit and control circuit terminal blocks adopting screw terminal, without detaching the keypad panel.

Multiple drive programming by optional copy unit

The copy unit can download parameter sets into several VXSM / CubCM units quickly and easily.

Global products

Conforms to major world safety standards: UL, cUL, TÜV, CE

Complies with EMC Directive (Emissions) when connected via optional EMC filter (see pages 21/22) and a shielded motor cable is used.

Connection to fieldbus: Profibus-DP, Interbus-S, DeviceNet, Modbus Plus, CAN Open (Option)



Wide range of inverters: three-phase 400V and single-phase 200V. Water-proof (IP54) models are also available soon.

Nominal applied motors [kW]	Three-phase 400V series (IP20 model)	Single-phase 200V series (IP20 model)
0.4	VXSM40-3	VXSM40-1
0.75	VXSM75-3	VXSM75-1
1.5	VXSM150-3	VXSM150-1
2.2	VXSM220-3	VXSM220-1
4.0	VXSM400-3	
5.5	VXSM550-3	
7.5	VXSM750-3	





Three-phase 400V series

Туре	VXSM-3 Series		40	75	150	220	400	550	750
Nominal applied motor kW (0.4	0.75	1.5	2.2	4.0	5.5	7.5
	Rated capacity *1	l) kVA	1.1	1.9	2.8	4.1	6.8	9.9	13
	Rated voltage *2)) V	3-phase 380, 40), 415V/50Hz, 38	0, 400, 440, 460V	/60Hz			
Output	Rated current *3)	A	1.5	2.5	3.7	5.5	9.0	13	18
ratings			(1.4)	(2.1)	(3.7)	(5.3)	(8.7)	(12)	(16)
	Overload capabil	ity	150% of rated cur	rrent for 1min.	200% of rated cu	rrent for 0.5s			
	Rated frequency	Hz	50, 60Hz						
	Phases, Voltage,	Frequency	3-phase 38	0 to 480V 5	0/60Hz				
	Voltage / frequen	cy variations	Voltage: +10 to -	-15% (Voltage un	balance *4): 2% o	r less) Frequence	cy: +5 to −5%		
	Momentary voltage	e dip capability *5)	When the input w	oltage is 300V or	more, the inverte	r can be operated	continuously.		
Innut			When the input voltage drops below 300V from rated voltage, the inverter can be operated for 15ms.						
ratinge			The smooth recovery mode is selectable (by Auto-restart function).						
raunys	Rated current *6)	(with DCR)	0.82	1.5	2.9	4.2	7.1	10.0	13.5
	A	(without DCR)	1.8	3.5	6.2	9.2	14.9	21.5	27.9
	Required power		0.6	11	21	3.0	50	7.0	9.4
	supply capacity '	'7) kVA	0.0	1.1	2.1	0.0	0.0	7.0	0.4
Control	Starting torque		200% (with Dyna	imic torque-vecto	r control selected)			1	
	Braking torque (Standatd) *8)	70			40		20	
Braking	Braking torque (Jsing options)	150						
	DC injection brak	king	Starting frequence	cy: 0.0 to 60.0Hz	Braking time: 0	0.0 to 30.0s Bra	iking level: 0 to 10	0% of rated curre	nt
Enclosure (IEC 60529)			IP 20						
Cooling I	method		Natural cooling		Fan cooling				
			-UL/cUL -Low	Voltage Directive	-EMC Directive	-TUV			
Standard	Standards			atings, specificati	ons for low voltage	e adjustable frequ	ency a.c. power d	rive systems)	
			-IEC 61800-3 (E	VIC product stand	ard including spec	cific test methods)		1	
Mass		kq	1.1	1.2	1.3	1.4	1.9	4.5	4.5

Single-phase 200V series

Type	VXSM-1 Series		40	75	150	220			
Nominal	applied motor	kW	0.4	0.75	1.5	2.2			
	Rated capacity *1	1) kVA	1.1	1.9	3.0	4.1			
	Rated voltage *2) V		3-phase 200V/	50Hz 200, 22	20, 230V/60Hz	1	I		
Output	Rated current *3)	A	3.0	5.0	8.0	11			
ratings	,		(2.5)	(4.0)	(7.0)	(10)			
	Overload capabil	lity	150% of rated currer	nt for 1min. 200%	of rated current for 0	.5s			
	Rated frequency	Hz	50, 60Hz						
	Phases, Voltage,	Frequency	1-phase 200 t	o 240V 50/60H	z				
	Voltage / frequen	cy variations	Voltage: +10 to -10	% Frequency: +5	to –5%				
	Momentary voltage	e dip capability *5)	When the input volt	age is 165V or more	, the inverter can be	operated continuousl	y.		
Innut			When the input voltage drops below 165V from rated voltage, the inverter can be operated for 15ms.						
ratinge			The smooth recovery mode is selectable (by Auto-restart function).						
raungo	Rated current *6)	(with DCR)	3.5	6.5	11.8	17.7			
	A	(without DCR)	6.4	11.4	19.8	28.5			
	Required power		0.7	13	24	3.6			
	supply capacity '	*7) kVA	0.7	1.0	2.7	0.0			
Control	Starting torque		200% (with Dynami	c torque-vector conti	rol selected)				
	Braking torque (Standard) *8)	70 40						
Braking	Braking torque (Using options)	150						
	DC injection brak	king	Starting frequency: 0.0 to 60.0Hz Braking time: 0.0 to 30.0s Braking level: 0 to 100% of rated current						
Enclosure (IEC 60529)			IP 20						
Cooling method			Natural cooling		Fan cooling				
			-UL/cUL -Low Voltage Directive -EMC Directive -TÜV						
Standard	Standards		-IEC 61800-2 (Ratir	ngs, specifications fo	r low voltage adjusta	ble frequency a.c. po	ower drive systems)		
			-IEC 61800-3 (EMC	product standard in	cluding specific test	nethods)			
Mass		kg	0.7	1.2	1.8	1.9			

NOTES:

*1) Inverter output capacity (kVA) at 440V in 400V series, 220V in 200V series. *2) Output voltage cannot exceed the power supply voltage. *3) Current derating may be required in case of low impedance loads such as high frequency motor. Use the inverter at the current () or below where carrier frequency setting is higher than 4kHz (F26: 4 to 15) or the amb. temp. is 40°C or higher. *4) Refer to the IEC 61800-3 (5.2.3). *5) Tested at standard load condition (85% load). *6) This value is under original calculation method. (Refer to the Technical Information.) *7) When optional power-factor correcting DC REACTOR (DCR) is used. *8) With a nominal applied motor, this value is average torque when the motor decelerates and stops from 60 Hz. (It may change according to motor loss.)

Conformity to Low Voltage Directive

Conformity to EMC Directive

The VXSM Series conforms to the Low Voltage Directive with EN50178

- Emission requirement
 Footprint filters in compliance with EN61800-3 are provided for all models (optional)
- Immunity requirement The VXSM Series inverters meet EN61800-3 as standard.

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	ltem	Explanation			
Output	Maximum frequency	50 to 400Hz *1)			
frequency	Base frequency	25 to 400Hz			
	Starting frequency				
	Carrier frequency *2)	0.75 to 15kHz			
	Accuracy (Stability)	 Analog setting : ±0.2% of Maximum frequency (at 25±10°C) 			
		• Digital setting : ±0.01% of Maximum frequency (at -10 to +50°C)			
	Setting resolution	• Analog setting : 1/3000 of Maximum frequency ex.) 0.02Hz at 60Hz, 0.04Hz at 120Hz, 0.15Hz at 400Hz			
		• Digital setting : 0.01Hz at Maximum frequency of up to 99.99Hz (0.1Hz at Maximum frequency of 100.0Hz and above)			
		• LINK setting : • 1/20000 of Maximum frequency ex.) 0.003Hz at 60Hz, 0.006Hz at 120Hz, 0.02Hz at 400Hz			
		• 0.01Hz (Fixed)			
Control	Control method	V/f control (Sinusoidal PWM control) Dynamic torque-vector control (Sinusoidal PWM control)			
	Voltage / freq. (V/f)	Adjustable at base and maximum frequency, with AVR control : 160 to 480V (400V series), 80 to 240V (200V series)			
	Operation method	Selectable Dy load characteristics: Constant torque load (Auto/manual), variable torque load (Manual)			
		Ubiginal input signal operation : PWD or HeV command, Coast-to-stop command, etc.			
		LINK Operation : HS485 (Standard) Profibus DP Interbus S DeviceNet Medbus Plus CAN Open (Option)			
	Frequency setting	• KEVPAD operation: On C key			
	(Frequency command)	Eviternal notentiometer (*) 1 to 5k()			
		• Analog input · 0 to +10V DC (0 to +5V DC) 4 to 20mA DC			
		(Reversible) 0 to $\pm 10V$ DC (0 to $\pm 5V$ DC)Reversible operation by polarized signal can be selected.			
		(Inverse) +10 to 0V DC, 20 to 4mA DCInverse mode operation can be selected.			
		• UP/DOWN control : Output frequency increases when UP signal is ON, and decreases when DOWN signal is ON.			
		Multistep frequency : Up to 16 different frequencies can be selected by digital input signal.			
		LINK operation : RS485 (Standard)			
		Profibus-DP, Interbus-S, DeviceNet, Modbus Plus, CAN Open (Option)			
	Running status signal	Transistor output (2 points) : RUN, FAR, FDT, OL, LU, TL, etc.			
		Relay output (1 point) : Alarm output (for any fault)			
		Analog (or pulse) output (1 point) : Output frequency, Output current, Output torque, etc.			
	Acceleration / Deceleration	0.01 to 3600s :• Independently adjustable acceleration and deceleration • 2 different times are selectable.			
	time	Mode select : Linear, S-curve (weak), S-curve (strong), Non-linear			
	Frequency limiter	High and Low limiters can be preset.			
	Bias frequency	Bias frequency can be preset.			
	Gain for frequency setting	Gain for frequency setting can be preset. (0.0 to 200.0%) ex.) Analog input 0 to +5V DC with 200% gain results in maximum frequency at 5V DC			
	lump frequency control	Indxinium nequency at 5V DC.			
	Botating motor pick up	A rotating motor (including inverse rotating mode) can be smoothly nicked up without stopping the motor (speed search			
	(Flying start)	method).			
	Auto-restart after	Automatic restart is available without stopping motor after a momentary power failure (speed search method). When			
	momentary power failure	"Smooth recovery" mode is selected, the motor speed drop is held minimum. (The inverter searches the motor speed,			
		and smoothly returns to setting frequency. Even if the motor circuit is temporarily opened, the inverter operates without			
		a hitch.)			
	Slip compensation	The inverter output frequency is controlled according to the load torque to keep motor speed constant. When the value is			
		set at "0.00" and " lorque-vector" is set at "active", the compensation value automatically selects a standard motor.			
	Droop operation	Silp compensation can be preset for the second motor.			
	Torque limiter	When the motor torque reaches a preset limiting level, this function automatically adjusts the output fragment to prevent the investor			
		from tripping due to an overcurrent.			
		Torque limiter 1 and 2 can be individually set, and are selectable with a digital input signal.			
	PID control	This function can control flowrate, pressure, etc. (with an analog feedback signal.)			
		KEYPAD operation (or key) : 0.0 to 100.0%			
		signal • Voltage input (Terminal 12) : 0 to +10V DC			
		• Current input (Terminal C1) :4 to 20mA DC			
		Multistep requency setting : Setting req. / Max. req. X 100 (%) Setting freq. / Max. req. X 100 (%)			
		• Feedback signal • Terminal 12 (0 to +10V DC or +10 to 0V DC)			
		Terminal C1 (4 to 20mA DC or 20 to 4mA DC)			
	Automatic deceleration	Torque limiter 1 (Braking) is set at "F41: 0" (Same as Torque limiter 2 (Braking)).			
		• In deceleration: The deceleration time is automatically extended up to 3 times the setting time for tripless operation even if braking			
		resistor not used.			
	Casand motorial antitice	• In constant speed operation: Based on regenerative energy, the trequency is increased and tripless operation is active.			
	Second motor's setting	This function is used for two motors switching operation. The second motor's V/f characteristics (base and maximum frequency) can be preset			
		The second motor's circuit parameter can be preset. Torque-vector control can be applied to both motors			
	Energy saving operation	This function minimizes inverter and motor losses at light load.			
	Fan stop operation	This function is used for silent operation or extending the fan's lifetime.			
		· · · · · · · · · · · · · · · · · · ·			

NOTES: (*) Option *1) For application at 120Hz or above, please contact IMO Precision Controls LTD. *2) Inverter may automatically reduce carrier frequency, in accordance with ambient temperature or output current for protecting inverter.

	Item		Explanation
Indication	Operation mode (Running)	Output frequency (Hz)	• Line speed (m/min)
(LED monitor)		Setting frequency (Hz)	PID reference value
		Output current (A)	 PID reference value (remote)
		Output voltage (V)	PID feedback value
		Motor synchronous speed (r/min)	
	Stopping	Selected setting value or output value	
	Trip mode	Displays the cause of trip by codes as follows.	dBH (Overheating at DB circuit)
		• OC1 (Overcurrent during acceleration)	• Ol 1 (Motor 1 overload)
		OC2 (Overcurrent during deceleration)	• OL2 (Motor 2 overload)
		• OC3 (Overcurrent during running at constant speed)	• OLU (Inverter unit overload)
		• Lin (Input phase loss)	• Er1 (Memory error)
		• OU1 (Overvoltage during acceleration)	• Er2 (KEYPAD panel communication error)
		• OU2 (Overvoltage during deceleration)	• Fr3 (CPU error)
		• OU3 (Overvoltage during running at constant speed)	• Er4 (Option error)
		• LU (Undervoltage)	• Er5 (Option error)
		• OH1 (Overheating at heat sink)	• Er7 (Output phase loss error, impedance unbalance)
		• OH2 (External thermal relay tripped)	• Fr8 (BS485 error)
	Bunning or trip mode	Trip history: Cause of trip by code (Even when main por	wer supply is off, trip history data of the last 4 trips are retained.)
	Charge Jamp	When the DC link circuit voltage is higher than 50V the cl	harde lamp is ON.
Protection	Overload	Protects the inverter by electronic thermal and detection	of inverter temperature
	Overvoltage	Detects DC link circuit overvoltage and stops the inverter	(400V series: 800V DC, 200V series: 400V DC)
		Protects the inverter against surge voltage between the r	nain circuit power line and the ground
		Detects DC link circuit updan/oltage and stops the inverte	pr. (400V sories: 400V DC, 200V sories: 200V DC)
		Detects DC link circuit undervoltage, and stops the inverte	ei. (4007 selles. 4007 DC, 2007 selles. 2007 DC)
		Priase loss protection for power line input.	
	Overneating	Protects the inverter by detection of inverter temperature	
	Short-circuit	Short-circuit protection for inverter output circuit	
	Ground fault	Ground fault protection for inverter output circuit (Detec	ting at start)
	Motor overload	• The inverter trips, and then protects the motor.	
		 Electronic thermal overload relay can be selected for st 	andard motor or inverter motor
		• Thermal time constant (0.5 to 10.0 minutes) can be pre	eset for a special motor.
		 The second motor's electronic thermal overload relay ca 	an be preset for 2-motor changeover operation.
	DB resistor overheating	Prevents DB resistor overheating by internal electronic (The inverter stops electricity discharge operation to pre-	thermal overload relay.
	Stall provention	Controle the output frequency to provent <i>BC</i> (overcurre	need the DD resision.
	Stan prevention	appleration	and the when the output current exceeds the limit value during
		Lowers the output frequency to hold almost constant to	raue when the output current exceeds the limit value during
		operation at constant speed	que when the output current exceeds the limit value during
		• Controls the output frequency to provent <i>DU</i> (overvelt	age) trip when the DC link circuit voltage exceeds the limit value
		during deceleration	age) the when the DO link circuit voltage exceeds the link value
	Output phase loss	When the inverter executes tuning, detects each phase in	mpedance unhalance
	Motor protection by	When the motor temporature exceeds allowable value th	
	PTC thermistor		
		When the inverter is tripped, it resets automatically and r	estarte
Condition		Free from corrosive gases flammable gases oil mist du	estants.
(Installation	Altitude	1000m or loss Applicable to 3000m with power derating	(_10%/1000m)
and	Antitude	10 to 150 °C	(=10 %) 100011)
operation)	Ambient temperature	E to 050/ DH (non condensise)	
operation	Amplent numbers		- 4h 001 l
		3 mm at from 2 to less than 9Hz, 9.8m/s ² at from 9 to less $2m/s^2$ at from 20 to less than 55Hz, $1m/s^2$ at from 55 to 1/s	STRAN ZUHZ
Storage condit	ion	ZIN/S ² at nom 20 to less than 35Hz, Thi/S ² at from 55 to le	
Storage condit		• remperature : -25 to +65 °C • Humidity : 5 to 95% P	n (non-condensing)

Basic Wiring Diagram

Keypad panel Operation

The following diagram is for reference only. For detailed wiring diagrams, refer to the relevant instruction manual



External signal input Operation

The following diagram is for reference only. For detailed wiring diagrams, refer to the relevant instruction manual



Terminal Functions

	Symbol	Terminal name	Function	Remarks	Func. code
Main	L1/R. L2/S.				
circuit	L3/T	Power input	Connect a 3-phase power supply.		
	L1/L, L2/N	Power input	Connect a 1-phase power supply.		
	U, V, W	Inverter output	Connect a 3-phase induction motor.		
	P1, P(+)	For DC REACTOR	Connect the DC REACTOR for power-factor correcting or harmonic current reducing.	DC REACTOR: Option	
	P(+), N(-)	For DC link circuit	Used for DC bus connection system.		
	P(+), DB	For EXTERNAL BRAKING RESISTOR	Connect the EXTERNAL BRAKING RESISTOR (Option)		
	G G	Grounding	Ground terminal for inverter chassis (housing).		
Analog input	13	Potentiometer power supply	+10V DC power supply for frequency setting POT (POT: 1 to $5k\Omega)$	Allowable maximum output current : 10mA	
	12	Voltage input	 0 to +10V DC/0 to 100% (0 to +5V DC/0 to 100%) Reversible operation can be selected by function setting. 0 to ±10V DC /0 to ±100% (0 to ±5V DC/0 to ±100%) 	 Input impedance: 22k Allowable maximum input voltage: ±15V DC If input voltage is 10 to 15V DC, the inverter estimates it to10V DC. 	F01, C30
		(PID control)	Used for PID control reference signal or feedback signal.		F01, H21
	C1	Current input	• 4 to 20mA DC/0 to 100%	• Input impedance: 250Ω	F01
		(PID control)	Used for PID control reference signal or feedback signal.		F01, H21
		(PTC-thermistor input)	The PTC-thermistor (for motor protection) can be connected to terminal C1 - 11.		H26, H27
	11	Common	Common for analog signal	Isolated from terminal CME and CM.	
Digital input	FWD	Forward operation command	FWD: ON The motor runs in the forward direction. FWD: OFF The motor decelerates and stops.	When FWD and REV are simultaneously ON, the motor decelerates and stops.	F02
	REV	Reverse operation command	REV: ON The motor runs in the reverse direction. REV: OFF The motor decelerates and stops.	The digital inputs can directly connent to source type output (PNP transistor output) circuit.	
	X1	Digital input 1	These terminals can be preset as follows.	• ON state maximum input voltage: 2V	E01 to E05
	X2	Digital input 2		•OFF state maximum terminal voltage: 22 to 27V	
	X3 X4	Digital input 3		(allowable maximum leakage current: 0.5mA) • The digital inputs can directly connent to source type	
	X5	Digital input 5		output (PNP transistor output) circuit.	
	(SS1) (SS2) (SS4) (SS8)	Multistep freq. selection	(SS1) : 2 (0, 1) different frequencies are selectable. (SS1,SS2) : 4 (0 to 3) different frequencies are selectable. (SS1,SS2,SS4) : 8 (0 to 7) different frequencies are selectable. (SS1,SS2,SS4,SS8) : 16 (0 to 15) different frequencies are selectable.	Frequency 0 is set by F01 (or C30). (All signals of SS1 to SS8 are OFF)	C05 to C19
	(RT1)	ACC / DEC time selection	(RT1) : 2 (0, 1) different ACC / DEC times are selectable.	Time 0 is set by F07/F08.	F07, F08 E10, E11
	(HLD) 3-wire operation stop command		Used for 3-wire operation. (HLD): ON The inverter self-holds FWD or REV signal. (HLD): OFF The inverter releases self-holding.		
	(BX)	Coast-to-stop command	(BX): ON Motor will coast-to-stop. (No alarm signal will be output.)	The motor restarts from 0Hz by turning off BX with the operation command (FWD or REV) ON. Assigned to terminal X4 at factory setting.	H11
	(RST)	Alarm reset	(RST): ON Faults are reset. (This signal should be held for more than 0.1s.)	 During normal operating, this signal is ignored. Assigned to X5 at factory setting. 	
	(THR)	Trip command (External fault)	(THR): OFF "OH2 trip" occurs and motor will coast-to-stop.	This alarm signal is held internally.	
	(Hz2/Hz1)	Freq. set 2 / Freq. set 1	(Hz2/Hz1): ON Freq. set 2 is effective.	If this signal is changed while the inverter is running, the signal is effective only after the inverter stops.	F01 / C30
	(M2/M1)	Motor 2 / Motor 1	(M2/M1): ON The motor circuit parameter and V/f characteristics are changed to the second motor's ones.	If this signal is changed while the inverter is running, the signal is effective only after the inverter stops.	P01 to P10 / A10 to A19
	(DCBRK)	DC brake command	(DCBRK): ON The DC injection brake is effective. (In the inverter deceleration mode)	If the operation command(FWD/REV) is input while DC braking is effective, the operation command (FWD/REV) has priority.	F20 to F22
	(TL2/TL1)	Torque limiter 2 / Torque limiter 1	(TL2/TL1): ON Torque limiter 2 is effective.		F40, F41 / E16, E17
	(UP)	UP command	(UP): ON The output frequency increases.	When UP and DOWN commands are simultaneously	F01, C30
	(DOWN)	DOWN command	(DOWN): ON The output frequency decreases. • The output frequency change rate is determined by ACC / DEC time. • Restarting frequency can be selected from 0Hz or setting value at the time of stop.	UN, DOWN signal is effective.	
	(WE-KP)	Write enable for KEYPAD	(WE-KP): ON The data is changed by KEYPAD.		
	(Hz/PID)	PID control cancel	(Hz/PID): ON The PID control is canceled, and frequency setting by KEYPAD		H20 to H25
	(IVS)	Inverse mode changeover	(IVS): ON Inverse mode is effective in analog signal input.	If this signal is changed while the inverter is running, the signal is effective only after the inverter stops.	F01, C30
	(LE)	Link enable (RS485, Bus)	(LE): ON The link operation is effective. Used to switch operation between ordinary operation and link operation to communication.	RS485: Standard, Bus: Option	H30
	СМ	Common	Common for digital signal	Isolated from CME and 11.	

Terminal Function

	Symbol	Terminal name	Function	Remarks	Func. code
Analog output	FM (11	Analog monitor (Common)	Output voltage (0 to 10V DC) is proportional to selected function's value as follows. The proportional coefficient and bias value can be preset. • Output frequency 1 (Before slip compensation) (0 to max. frequency) • Output frequency 2 (After slip compensation) (0 to max. frequency) • Output requency 2 (After slip compensation) (0 to 200%) • Output voltage (0 to 200%) • Output roque (0 to 200%) • Output roque (0 to 200%) • Load factor (0 to 200%) • Input power (0 to 200%) • PID feedback value (0 to 100%) • DC link circuit voltage (0 to 1000V)	Allowable maximum output current: 2mA	F29 F30, F31
Pulse output	FM (11)	Pulse rate monitor (Common)	 Pulse rate mode : Pulse rate is proportional to selected function's value* (50% duty pulse) Average voltage mode : Average voltage is proportional to selected function's value* (2670p/s pulse width control) Kinds of function to be output is same as those of analog output (FM). 	Allowable maximum output current : 2mA	F29 F33 to F35
Transistor output	P24	DC voltage supply	Power supply for transistor output load. (+24V DC, 50mA max.)	Link P24 to CMC and connect loads such as relays between Y1E, Y2E and CM.	
	Y1E Y2E	Transistor output 1 Transistor output 2	Output the selected signals from the following items.	ON state maximum output voltage : 2V (Allowable maximum source current : 50mA) OFF state maximum leakage current : 0.1mA (Allowable maximum voltage : 27V)	E20, E21
	(RUN)	Inverter running	Outputs ON signal when the output frequency is higher than starting frequency.		
	(FAR)	Frequency equivalence signal	Outputs ON signal when the difference between output frequency and setting frequency is smaller than FAR hysteresis width.		E30
	(FDT	Frequency level detection	Outputs ON signal by comparison of output frequency and preset value (level and hysteresis).		E31, E32
	(LU)	Undervoltage detection signal	Outputs ON signal when the inverter stops by undervoltage while the operation command is ON.		
	(B/D)	Torque polarity	Outputs ON signal in braking or stopping mode, and OFF signal in driving mode.		
	(TL)	Torque limiting	Outputs ON signal when the inverter is in torque-limiting mode.		
	(IPF	Auto-restarting	Outputs ON signal during auto restart operation (Instantaneous power failure) mode. (including "restart time")		
	(OL)	Overload early warning	Outputs ON signal when the electronic thermal value is higher than preset alarm level. Outputs ON signal when the output current value is higher than preset alarm level.		E33 to E35
	СМС	Common (transistor output)	Common for transistor output signal.	Isolated from terminals CM and 11.	
Relay	30A, 30B	Alarm relay output	Outputs a contact signal when a protective function is activated.	Contact rating :	F36
output	300		Changeable exciting mode active or non-exciting mode active by function "F36".	250V AC, 0.3A, cosø=0.3 48V DC, 0.5A, non-inductive (for LVD) 42V DC, 0.5A, non-inductive (for UL/cUL)	
LINK		RS485 I/O terminal	Connect the RS485 link signal.		

Terminal Arrangement



Keypad Panel 1

LED monitor

In Operation mode:

Program/Reset key

mode and program mode.

When tripped:

Switches between operation

changes to operation mode.

Displays the setting frequency, output current, voltage, motor speed, or line speed. In Trip mode: Displays code indicating the cause of trip.

Operation mode indication

■ RUN : This LED goes on during operating. ■ PANEL CONTROL : When Function code Keypad operation), this LED



Function/Data select key

Releases the trip-stop state and

Changes the displayed values of LED monitor, selects and stores the function codes and data codes.

Up/Down keys

In Operation mode: Increases or decreases the frequency or motor speed. In Program mode: Increases or decreases function code number and data set value.

Keypad panel operation

- 1. Turn on the power supply, press S or key to set the output frequency. When you press the key the motor will run at the set frequency and with function code/date at factory shipment. When you press the key, the motor will decelerate and stops.
- Procedure for selecting and changing function codes and data codes. The keypad operation how to select a function code and change its data code is explained below.
- ①. Press the key to select the program mode
- ②. Pressing key alternates the displayed data between the function and its data.
- 3. Vulli data display, press the
- key to change the data code.
- ④. Press the key to update the data for the selected function code.
 *In step ② above, if the or key is pressed when the function code is displayed, only the function code changes sequentially (see below).
 ()

Unit indication

Run key Starts the inverter.

In Stop mode: Invalid when the function code F [] is set at [] (external operation).

Displays the unit of the value shown on the LED monitor.

Stop key

Stops the inverter. **In Operation mode:** Invalid when the function code **F 3 2** is set at **1** (external operation).

The keypad panel modes are classified in the following 5 modes

Monitor, I	Mode	Program mode (operation stopped)	Program mode (during stopped)	Stop mode	Operation mode	Trip mode	
		Display the function code or data code. (Blinking)	Display the function code or data code. (Lighting)	Display the set frequency, output current, output voltage, motor speed, line speed. (Blinking)	Display the set frequency, output current, output voltage, motor speed, line speed. (Lighting)	Display the trip content or alarm history. (Blinking or lighting)	
		Indicates the PRG mode during stopping.	Indicates the PRG mode during operation.	Unit indication of the above value.	Unit indicates of the above value.	None	
Monitor	PRG MODE	PRG MODE Hz A V Lighting r/min m/min	PRG MODE Hz A V Lighting r/min m/min	PRG MODE Freq Hrz A V r/min m/min PRG MODE Current Hrz A V r/min m/min PRG MODE Voltage Hrz A V r/min m/min PRG MODE Voltage V r/min m/min PRG MODE Voltage V r/min m/min PRG MODE Voltage V r/min m/min PRG MODE	PRG MODE Freq. Hz A V <i>trinin m/min</i> PRG MODE Current Hz A V <i>trinin m/min</i> PRG MODE Voltage Hz A V <i>trinin m/min</i> PRG MODE Voltage V <i>trinin m/min</i> V <i>trinin m/min</i> V <i>trinin m/min</i> V <i>trinin m/min</i> V <i>trinin m/min</i> V <i>trinin m/min</i> PRG MODE	Not lit	
		Indicates whether keypad pan (On during keypad panel operation)	el operation or external signal op ation)	eration.		None (Lighting)	
	Run Indicates the operation has stopped. (□ RUN not lit)		Indicates during operation. (■ RUN lighting)	Indicates the operation has stopped. (□ RUN not lit)	Indicates during operation. (■ RUN lighting)	Indicates "stopping in trip mode". (■ RUN lighting)	
	P R G	Switches to the stop mode.	Switches to the stop Changes to operation mode.		Switches to "Program mode during operation".	Releases the trip and switches to "stop mode" or "operation mode"	
	FUNC	Changes the display between data code, stores data code, a function codes	function code and nd then updates	Shifts the value on the LED mo indication LED.	Invalid		
Keys	Increases/decreases function code number and data code.		Increases/decreases the data code number and stores data temporary.	Increases/decreases the settin line speed.	g of frequency, motor speed,	Displays the alarm history	
	RUN	Invalid	Invalid	Switches to operation mode	Invalid	Invalid	
	стор	Invalid	Switches to "stop mode" or "Program mode (operation stopped)".	Invalid	Switches to the stop mode.	Invalid	

* Procedure for selecting function codes and data codes (Ex. Changing data code from 1 of function code F 0 or)



	Eu	nction			Min	
	Co	de Name		Setting range	unit	Factory setting
Basic	FE	Data protection		0 : Data change enable		0
Functions				1 : Data protection	-	0
	FE	Frequency comma	nd 1	0 : KEYPAD operation (or key)		
				2 : Current input (terminal C1) (4 to 20mA DC)		
				3 : Voltage and current input (terminals 12 and C1)		0
				5 : Inverse mode operation (terminal 12) (+10 to 0V DC)	-	0
				6 : Inverse mode operation (terminal C1) (20 to 4mA DC)		
				8 : UP/DOWN control 2 (initial freq. = last value)		
	FC	Operation method		0 : KEYPAD operation (forward/reverse : by signal input)		
				1 : FWD or REV command signal operation 2 : KEVPAD operation (EWD)	-	2
				3 : KEYPAD operation (REV)		
	FD	3 Maximum frequence	cy 1	50 to 400Hz	1Hz	50
	FE	H Base frequency 1		25 to 400Hz	1Hz	50
	FE	S Rated voltage 1		0(Free), 160 to 480V (400V class)	1V	400
	_	(at Base frequenc	cy 1)	0(Free), 80 to 240V (200V class)		230
	14	 Maximum voitage (at Maximum frequ 	uency 1)	80 to 240V (200V class)	1V	400 230
	FD	Acceleration time 1		0.01 to 3600s	0.01s	6.00
	FC	B Deceleration time 1	1	0.01 to 3600s	0.01s	6.00
	FC	G Torque boost 1		0 : Automatic (for constant torque load)		
				1 : Manual (for variable torque load)	1	0
				3 to 31 : Manual (for constant torque load)		
	F .	C Electronic thermal	(Select)	0 : Inactive		
		for motor 1		1 : Active (for 4-pole standard motor) 2 : Active (for 4-pole inverter motor)	-	1
	F.	11	(Level)	Approx. 20 to 135% of rated current	0.01A	*1)
	F .	2 (Therma	I time constant)	0.5 to 10.0 min	0.1min	5.0
	F.	3 Electronic thermal		0 : Inactive		
		overload relay (for braking resisto	r)	1 : Active (for external braking resistor 2 : Active (for external braking resistor : Single phase only)	-	0
	E.	H Restart mode after	- /	0 : Inactive (Trip and alarm when power failure occurs.)		
		momentary power	failure	1 : Inactive (Trip, and alarm when power recovers.)		0
				 2 Inactive (Deceleration stop, and alarm.) 3 : Active (Momentarily stops and restarts at output frequency of before power failure) 	-	0
	_			4 : Active (Momentarily stops and restarts at starting frequency)		
	F 1	5 Frequency	(High)	0 to 400Hz	1Hz	70
	F i	6 limiter	(Low)	0 to 400Hz	1Hz	0
	F I	Gain (for frequenc	y setting signal)	0.0 to 200.0%	0.1%	100.0
		Blas frequency	(Charting from)		IHZ	0
	<u>r</u> a		(Starting level)	0.010 00.012	1%	0.0
	-		(Braking time)	0.0 (DC brake inactive) 0.1 to 30.0s	0.1e	0.0
		Starting frequency	(Erea.)	0.1 to 60 0Hz	0.13	0.5
			(Holdina time)	0.0 to 10.0s	0.1s	0.0
		Stop frequency	,	0.1 to 6.0Hz	0.1Hz	0.2
		Motor sound	(Carrier freq.)	0.75 to 15kHz	1kHz	15
			(Sound tone)			0
						v
					-	0
		FM	(Voltage adjust)	0 to 200%	1%	100
			(Function)	0 : Output frequency 1 (Before slip compensation)		
				2 : Output current		
				3 : Output voltage		0
				5 : Load factor	-	0
				6 : Input power 7 : PID feedback value		
				8 : DC link circuit voltage		
		FM	(Pulse rate)	300 to 6000 p/s (at full scale)	1p/s	1440
			(Voltage adjust)	0% : (Pluse rate output: 50% duty)	1%	0
			(Function)	Output frequency 1 (Refore slin compensation)		
			(i uncion)	1 : Output frequency 2 (After slip compensation)		
				2 : Output current 3 : Output voltage		
				4 : Output torque	-	0
				6 : Input power		
				7 : PID feedback value 8 : DC link circuit voltage		
		30Ry operation mo	ode	0 : The relay (30) excites on trip mode.		-
		eey operation mu		1 : The relay (30) excites on normal mode.		0
		Torque limiter 1	(Driving)	20 to 200, 999% (999: No limit) *2)	1%	180
			(Braking)	20 to 200, 999% (999: No limit) *2)	1%	150
		Torque-vector cont	rol 1	0 : Inactive 1 : Active	-	0

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped. Extension Terminal Functions

	Funct Code	ion Name	- Setting range	Setting range				
X1-X5 Terminal	<u>ED 1</u> <u>ED2</u> <u>ED3</u> <u>ED4</u> ED5	X1 terminal function X2 terminal function X3 terminal function X4 terminal function X5 terminal function	Selects from the following items. [SS1] 10 : Motor 2 / Motor 1 1 [SS2] 11 : DC brake command 2 [SS4] 12 : Torque limiter 2 / Torque limiter 1 3 [SS4] 13 : UP command 4 : ACC / DEC time selection (16 steps) [SS8] 13 : UP command 5 : 3-wire operation step command [HLD] 15 : Write enable for KEYPAD 6 : Coast-to-stop command [BX] 16 : PID control cancel 7 : Alarm reset [RST1] 17 : Inverse mode changeover 8 : Trip command (External fault) [THR] (terminals 12 and C1) 9 : Freq. set. 1 [H22/H21] 18 : Link enable (Bus, RS485)	[M2/M1] [DCBRK] [TL2/TL1] [UP] [DOWN] [WE-KP] [Hz/PID] [HZ/PID] [IVS] [LE]	-	0 1 2 6 7		
ACC 2 DEC 2	<u>E 10</u> E 1 1	Acceleration time 2	0.01 to 3600s		0.01s	10.0		
	E 16 E 19	Torque limiter 2 (Drivin (Brakin	20 to 200%, 999% (999: No limit) *2) 0 (Automatic deceleration control), 20 to 200%, 999% (999: No limit) *2)		1%	180		
Y1, Y2	820	Y1 terminal function	Selects from the following items.		-	0		
Terminal	1 53	Y2 terminal function	0 : Inverter running [RUN] 5 : Torque limiting [דנו ד	-	7		
			1 : Frequency equivalence signal [FAR] 6 : Auto-restarting 2 : Frequency level detection [FDT] 7 : Overload early warning 3 : Undervoltage detection signal [LU] 8 : Lifetime alarm (main circuit capacitor) 4 : Torque polarity detection (Braking/Driving) [B/D] 9 : 2nd Freq. equivalence detection	[IPF] [OL] [LIFE] [FAR2]				
	823	Frequency equivalence delay	0.01 to 10.0s		0.01s	0.1		
	830	FAR function signal (Hysteres	0.0 to 10.0 Hz		0.1Hz	2.5		
	E3 I	FDT function signal (Lev	0 to 400 Hz		1Hz	50		
	553	(Hysteres	0.0 to 30.0 Hz		0.1Hz	1.0		
	833	OL function signal (Mode sele	0 : Thermal calculation 1 : Output current		-	0		
	834	(Lev	Approx. 20 to 200% of rated current		0.01A	*1		
	835	(Time	0.0 to 60.0s		0.1s	10.0		
LED	<u> 240</u>	Display coefficient A	0.00 to 200.0		0.01	0.01		
wonitor	<u> </u>	Display coefficient B	0.00 to 200.0		0.01	0.00		
	E45	LED Display filter	0.0 to 5.0s		0.1s	0.5		

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped. Control Functions of Frequency

	Func	tion	Setting range	Min.	Factory setting
	Code	Name		unit	
Jump Hz	<u>LU 1</u> 607	Jump (Jump treq. 1)	0 to 400Hz	1Hz	0
Control	602	trequency (Jump treq. 2)		1Hz	0
	603	(Jump freq. 3)		1Hz	0
	104	(Hysteresis)	0 to 30Hz	1Hz	3
Multi-Hz	<u>LUS</u>	Multistep (Freq. 1)	0.00 to 400.0Hz	0.01Hz	0.00
Control	<u>L Ub</u>	trequency (Freq. 2)		0.01Hz	0.00
	<u>LU'I</u>	setting (Freq. 3)		0.01Hz	0.00
	108	(Freq. 4)		0.01Hz	0.00
	609	(Freq. 5)		0.01Hz	0.00
	LIU	(Freq. 6)		0.01Hz	0.00
	$L \Pi$	(Freq. 7)		0.01Hz	0.00
	6 12	(Freq. 8)		0.01Hz	0.00
	6 13	(Freq. 9)		0.01Hz	0.00
	<u>L 19</u> 6 16	(Freq.10)		0.01Hz	0.00
	6 15	(Freq.11)		0.01Hz	0.00
	L 16 C 10	(Freq.12)		0.01Hz	0.00
	<u>L 1'1</u>	(Freq.13)		0.01Hz	0.00
	L 18 C 18	(Freq.14)		0.01Hz	0.00
	<u>L 19</u>	(Freq.15)		0.01Hz	0.00
Operation	661	l imer operation	0 Inactire	-	0
operation	522	(Stage 1)		0.01s	0.00
	530	Erequency command 2	O · KEVPAD operation (or key)	0.013	0.00
	00		to Seme as F01	-	2
			8 : UP/DOWN control 2 (initial freq. = last value)		
	631	Offset (Terminal 12)	-5.0 to +5.0%	0.1%	0.0
	632	(Terminal C1)	-5.0 to +5.0%	0.1%	0.0
	633	Analog setting signal filter	0.00 to +5.00s	0.01s	0.05

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped. Motor Parameters

	Funct	ion Name	Setting range	Min.	Factory setting
Motor 1	PN 1	Number of motor 1 poles	2 to 14	2	4
	P02	Motor 1 (Capacity)	3.7kW or smaller : 0.01 to 5.50 kW 5.5kW or larger : 0.01 to 11.00 kW	0.01kW	*1)
	P03	(Rated current)	0.00 to 99.9 A	0.01A	*1)
	РОЧ	(Tuning)	: Inactive : Active (One time tuning of %R1 and %X (on motor stopping mode)) : Active (One time tuning of %R1, %X and Io (on motor running mode))		0
	<i>P0</i> 5	(On-line Tuning)	: Inactive : Active (Real time tuning of %R2)		0
	P05	(No-load current)	0.00 to 99.9 A	0.01A	*1)
	P07	(%R1 setting)	0.00 to 50.00 %	0.01%	*1)
	P08	(%X setting)	0.00 to 50.00 %		*1)
	P09	(Slip compensation control 1)	0.00 to +15.00Hz		0.00
	P 10	(Slip compensation response time)	0.01 to 10.00s	0.01s	0.50

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped. High Performance Functions

	Funct	ion		Mire	
	Code	Neme	Setting range	win.	Factory setting
High			Manifording only	16	0
Performance	nu i unn		Monitoring only		U
Functions	nuc una	Data initializing (Data react)		-	-
	000	Auto report (Timeo)		-	0
	<u>nun</u> 1100	Auto-reset (Times)		10	5
	705 1100	(Reset Interval)		IS	5
	nuo		1 : Active (Fan stops at low temperature mode) for 1.5kW or larger model only	-	0
	ноп	ACC/DEC (Mode select) pattern	0 : Linear 2 : S-curve (strong) 1 : S-curve (weak) 3 : Non-linear (For variable torque load)	-	0
	H09	Start mode (Rotating motor pick up)	0 : Inactive 1 : Active (Only when Auto-restart after momentary power failure mode) 2 : Active (All start modes)	-	1
	H 10	Energy-saving operation	0 : Inactive 1 : Active (Only when torque boost "F09" is set at manual setting mode.)	-	0
	НП	DEC mode	0 : Normal (according to "H07" mode)	-	0
	H 12	Instantaneous overcurrent	0 : Inactive	-	1
	11.13	Auto rootort (Postart time)		0.10	0.1
	ני ה עי ע	(Free fell rate)	0.00 to 100.00Hz/s	0.15	10.00
PID	<u>רו ה</u>	PID control (Mode soloct)		U.UTHZ/S	10.00
Control			Active (PID output 0 to 100% / Frefuency 0 to max.) Active (Inverse operation mode : PID output 0 to 100% / Frefuency max. to 0)	-	0
	H5 1	(Feedback signal)	0 : Terminal 12 (0 to +10V) 2 : Terminal 12 (+10 to 0V) 1 : Terminal C1 (4 to 20mA) 3 : Terminal C1 (20 to 4mA)	-	1
	H55	(P-gain)	0.01 to 10.00	0.01	0.10
	H23	(I-gain)	0.0 : Inactive 0.1 to 3600s	0.1s	0.0
	Н2Ч	(D-gain)	0.00 : Inactive 0.01 to 10.0s	0.01s	0.00
	<i>H25</i>	(Feedback filter)	0.0 to 60.0s	0.1s	0.5
Y1, Y2	H26	PTC thermistor (Mode select)	0 : Inactive 1 : Active	-	0
Terminal	H2J	(Level)	0.00 to 5.00V	0.01V	1.60
	H28	Droop operation	-9.9 to 0.0Hz	0.1Hz	0.0
Serial Link	H30	Serial link (Function select)	(Code) (Monitor) (Frequency command) (Operation command) 0: X - - X : Valid 1: X X - - Invalid 2: X - X X 3: X X X X	-	0
	<u> </u>	RS 485 (Address)	1 to 31	1	1
	H32	(Mode select on no response error)	0 : Trip and alarm (Er8) 1 : Operation for H33 timer, and alarm (Er8) 2 : Operation for H33 timer, and retry to communicate. * If the retry fails, then the inverter trips("Er 8"). 3 : Continuous operation	-	0
	<i>H33</i>	(Timer)	0 to 60.0s	0.1s	2.0
	НЗЧ	(Baud rate)	0 : 19200 bit/s 2 : 4800 4 : 1200 1 : 9600 3 : 2400		1
	урс	(Data length)	0 · 8 bit 1 · 7 bit		0
	1133 25 U	(Parity check)	0 · O ha checking 1 · Fuen parity 2 · Odd parity	-	0
	<u>900 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100</u>	(Stop hits)	0 · 1 bit 1 · 2 bit	-	0
	<u>438</u>	(No response error detection time)		15	0
	<u>830</u>	(Response interval)		0.01s	0.01
Diagnostic	840	Maximum temperature of heat sink	Monitoring only	°C	-
- agricotio	891	Maximum effective current	Monitoring only	Ă	-
	892	Main circuit capacitor lifetime	Monitoring only	0.1%	-
	н н <u>с</u> НЧЗ	Cooling fan accumulated operation time	Monitoring only	10h	-
	КЧЧ	Inverter ROM version	Monitoring only	-	-
	HHS	Keypad panel ROM version	Monitoring only	-	-
	НЧБ	Option ROM version	Monitoring only	-	-

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped. Alternative Motor Parameters

	Function		Satting range		Eastony patting
	Code	Name	oetung range	unit	Factory setting
Motor 2	801	Maximum frequency 2	50 to 400Hz	1Hz	50
	802	Base frequency 2	25 to 400Hz	1Hz	50
	<i>803</i>	Rated voltage 2 (at Base frequency 2)	0 (Free), 160 to 480V (400V class) 0 (Free), 80 to 240V (200V class)	1V	400 230
	<i>804</i>	Maximum voltage 2 (at Maximum frequency 2)	160 to 480V (400V class) 80 to 240V (200V class)	1V	400 230
	<i>R</i> 05	Torque boost 2	0 : Automatic (for constant torque load) 1 : Manual (for variable torque load) 2 : Manual (for proportional torque load) 3 : Manual (for constant torque load)	-	0
	805	Electronic thermal (Select) overload relay for motor 2	0 : Inactive 1 : Active (for 4-pole standard motor) 2 : Active (for 4-pole inverter motor)	-	1
	807	(Level)	Approx. 20 to 135% of rated current	0.01A	*1)
	808	(Thermal time constant)	0.5 to 10.0 min	0.1min	5.0
	809	Torque vector control 2	0 : Inactive 1 : Active	-	0
	<i>R 10</i>	Number of motor 2 poles	2 to 14	2	4
	811	Motor 2 (Capacity)	0.01 to 11.00 kw	0.01kW	*1)
	<i>B</i> 12	(Rated current)	0.00 to 99.9 A	0.01A	*1)
	R 13	(Tuning)	0 : Inactive 1 :Active (One time tuning of %R1 and %X (on motor stopping mode)) 2 :Active (One time tuning of %R1, %X and lo (on motor running mode))	-	0
	R 14	(On-line Tuning)	0 : Inactive 1 :Active (Real time tuning of %R1 and %X)	-	0
	<i>R</i> 15	(No-load current)	0.00 to 99.9 A	0.01A	*1)
	8 15	(%R1 setting)	0.00 to 50.00 %	0.01%	*1)
	B[17]	(%X setting)	0.00 to 50.00 %	0.01%	*1)
	8 18	Slip compensation control 2	0.00 to +15.00 Hz	0.01Hz	0.00
	8 19	(Slip compensation resnonse time)	0.01 to 10.00 s	0.01s	0.5

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped. **Protective Functions**

Function	Description		LED monitor
Overcurrent protection (Short-circuit)	 Stops running to protect inverter from an overcurrent resulting from overload. Stops running to protect inverter from an overcurrent due to a short-circuit in the 	During acceleration	0C 1
(Ground fault)	output circuit. • Stops running to protect inverter from an overcurrent due to a ground fault in the	During deceleration	530
	output circuit.	While running a constant speed	^t 0C3
Overvoltage protection	The inverter stops when it detects an overvoltage in the DC link circuit.	400V series : 800V DC or more During acceleration	0U I
		Protection is not assured if	002
		excess AC line voltage is applied While running a constant speed	^t 003
Incoming surge	Protects the inverter against surge voltage between the main circuit power line	• The inverter may be tripped by some other	
protection	 Protects the inverter against surge voltage in the main circuit power line. 	protective function.	
Undervoltage protection	Stops the inverter when the DC link circuit voltage drops below undervoltage level.	400V series : 400V DC or less 200V series : 200V DC or less	LU
Input phase loss protection	The inverter is protected from being damaged when open-phase fault occurs.		Lin
Overheat protection	Stops the inverter when it detects excess heat sink temperature in case of cooling fan failure or overload.		0H I
	• When the external braking resistor overheats, the inverter stops discharging and running.		дЪН
Electronic thermal	This function stops the inverter by detecting an inverter overload.		<u> </u>
overload relay (Motor protection)	 This function stops the inverter by detecting an overload in a standard motor or inverter motor 	Motor 1 overloa Motor 2 overloa	d <u>[][</u> d <u>[][2</u>
Stall prevention	When an output current exceeds the limit during acceleration, this function lowers	• The stall prevention function can be disabled	l.
(Momentary	output frequency to prevent the occurrence of an OC1 trip.		
overcurrent limitation)			
Alarm output	I he inverter stops on receiving external alarm signals. The inverter substant are releving external alarm signals.	Use THR terminal function (digital input).	UNC
(for any fault)	stopped.	Use the RST terminal function for signal input	ıt.
Alarm reset command	• An alarm-stop state of the inverter can be cleared with the RESET key or by a	• Even if main power input is turned off, alarm	
Al	digital input signal (HST).	history and trip-cause data are retained.	
Alarm history memory Storage of data on	The inverter can store and display details of the latest alarm history data.	-	
cause of trip			
Memory error	• The inverter checks memory data after power-on and when the data is written. If a memory error is detected, the inverter stops.		Er I
KEYPAD panel	 If an error is detected in communication between the inverter and KEYPAD when the Keypad papel is being used, the inverter stops 	When operated by external signals, the inverted continues running. The alarm output (for any continues running).	er E-Z
communication error		fault) is not output. Only Er2 is displayed.	
CPU error	 If the inverter detects a CPU error caused by noise or some other factor, the inverter stops. 		ЕгЗ
Option communication error	 If a checksum error or disconnection is detected during communication, the inverter issues an alarm. 		Есч
Option error	• If a linkage error or other option error is detected, the inverter issues an alarm.		ErS
Output phase loss error	If an unbalance of output circuits is detected during tuning, this function issues an alarm (and stops the inverter).		Ern
RS485 communication error	• If an RS485 communication error is detected, the inverter issues an alarm.		ErB

NOTES :

1)Retaining alarm signal when auxiliary controll power supply is not used :
 If the inverter power supply is cut off while an internal alarm signal is being output, the alarm signal cannot be retained.

2)To issue the RESET command, press the intervention of the KEYPAD panel or connect terminals RST and CM once and disconnect them afterwards. 3)Fault history data is stored for the past four trips.

External Dimensions











Power supply	Nominal applied	Туре	Dimensions(mm)						Fig.	
voltage	motor(kW)		W	Н	D	D1	D2	D3	D4	
3-phase	0.4	VXSM40-3	106	130	126	86	40	50.5	103	2
400V	0.75	VXSM75-3	106	130	150	86	64	62.5	115	2
	1.5	VXSM150-3	106	130	170	106	64	86.5	159	2
	2.2	VXSM220-3	106	130	170	106	64	86.5	159	2
	4.0	VXSM400-3	170	130	158	86	72	94.5	147	3
	5.5	VXSM550-3	180	220	158	-	-	117	146	4
	7.5	VXSM750-3	180	220	158	-	-	117	146	4
1-phase	0.4	VXSM40-1	70	130	118	86	32	60.2	107	1
200V	0.75	VXSM75-1	106	130	126	86	40	62.5	115	2
	1.5	VXSM150-1	170	130	158	86	72	94.5	147	3
	2.2	VXSM220-1	170	130	158	86	72	94.5	147	3

Options

Reactor, Filter, and Other Accessories

Name (Type)	Function	Mounting position
EMC compliance filter	This is a special filter which complies with the European EMC (Emission) Directive. This filter may be used together with a ferrite core, if required. Note: Other prerequisites must be fulfilled to ensure compliance with EMC Directives. Refer to operation manual for details.	
Please contact IMO for more details of this unit, or alternative AC Reactor	 frequency from 8 to 15kHz, this filter has the following functions: q Suppressing fluctuation of motor terminal voltage. Protects the motor insulation from being damaged by surge voltage. (400V series) W Suppressing leakage current from output side wiring. Reduces the leakage current caused when several motors are operated in parallel or connected with long wiring. * Total wiring length should be less than 400m. e Suppressing radial noise or inductive noise from output side wiring. Effective noise suppression device for long wiring applications such as plant. 	Power supply
DC REACTOR(DCR)	[Use the DCR to normalize the power supply in the following cases.] q The power transformer capacity is 500kVA or over and exceeds the inverter rated capacity by 10 times. w The inverter and a thyristor converter are connected with the same transformer. * Check if the thyristor converter uses a commutation reactor. If not, AC reactor must be connected to the power supply side. e Overvoltage trip occurs due to open/close of the phase-advancing capacitor for the power supply lines. r The voltage unbalance exceeds 2%. Voltage unbalance (%) = Max. voltage [V] – Min. Voltage [V] Koltage unbalance (%) = Max. voltage [V] – Min. Voltage [V] c Commutation reactor (IEC 61800-3 (5.2.3)) Power transformer capacity f Power transformer capacity f Commutation reacted reactor correcting capacitor for the power supply lines. r The voltage unbalance (%) = Max. voltage [V] – Min. Voltage [V] g E f For improving input power-factor, reducing harmonics] • Used to reduce input harmonic current (correcting power-factor)	Li L2 L3 L1'L2'L3' P1 P(+) Inverter U V W L1 L2 L3 L1'L2'L3' U V W M Motor
Copy unit	For batch data transfer (read, store, write) between an inverter unit and the copy unit	

-	
-	
-	



NOTES

NOTES

IMO Jaguar Drives 5 Year Warranty

IMO JAGUAR drives are covered by a unique 5 year warranty against failure arising as a result of inferior material or workmanship.

In the event of a unit failing within 5 years of despatch from IMO, we will repair or replace the drive free of charge.

Whenever possible, in the interest of providing the fastest service to our customers, we will replace the failed drive with a new or service exchange unit at IMO's discretion. This may not be possible, however, if the failed unit is in poor condition owing to abuse or neglect. In such circumstances, the customer may elect to have the unit repaired within the warranty if viable, but physical refurbishment will be chargeable.

IMO will, upon request, provide a service exchange unit in advance of receipt of the failed unit if an order number is provided along with details of the failed unit. Replacements will be dispatched at IMO's cost and credit will be issued upon receipt of the failed unit in good physical condition. Full credit will not be given if in IMO's judgment the unit has been physically or electrically abused. A no-fault-found charge will be levied upon units returned and found not to be faulty.

The terms of warranty do not provide for on-site service although a service engineer will be provided upon receipt of an order. IMO may elect to waive any charge should the findings on site indicate that any problem found lies within the scope of the warranty.

IMO Precision Controls Limited Technical Helpline Tel 00 44 (0) 20 8452 6444 8am to 6pm UK time Monday to Friday

IMO Precision Controls Limited is a registered ISO 9002 company.



Safety Precautions

Safety at Work

It is the responsibility of the owner, installer and user to ensure that the installation of the equipment and the way in which it is operated and maintained complies with the requirements of the Health & Safety at Work Act in the United Kingdom and other applicable legislation, regulations and codes of practice in the UK or elsewhere.

Only qualified personnel should install this equipment, after first reading and understanding the information in this publication. The installation instructions should be adhered to. Any question or doubt should be referred to IMO Precision Controls Ltd.

Operational Safety

Users and operators of the equipment must take all necessary precautions to prevent damage to equipment and especially to prevent the risk of injury to personnel working on or near the motor and the driven equipment.

The stop and start inputs should not be relied upon alone to ensure the safety of personnel. If a safety hazard could arise from the unexpected starting of the motor, an interlock mechanism should be provided to prevent the motor from running except when it is safe for it to do so.

Documentation

Every effort has been made by IMO Precision Controls Ltd to ensure that this document accurately and completely represents the Jaguar VXSM range of inverters at the time of going to press. Information with respect to installation is necessarily generalised, and the supplier accepts no liability for contingencies over which he has no control in respect of the selection, installation and/or operation of equipment.

In line with IMO's policy of continuous improvement, the contents of this document are subject to change without prior notice.

This documentation is only intended as a guide to the VXSM product. For more comprehensive information see the VXSM Instruction Manual available to download from our websitewww.imopc.com or by contacting IMO directly.

Full product range catalogue is also available, detailing IMO's state-of-the-art Industrial Automation and Control products.

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Applicable to standard motors

Driving a 3 phase standard motor

When driving a standard motor with an inverter, damage may occur in the insulation of the motor. Use the output circuit filter (OFL) if necessary after confirmation with the motor manufacturer. The use of a quality Motor does not require the output circuit filter because of its reinforced insulation.

Torque characteristics and temperature rise

When the inverter is used to operate a standard motor, the temperature rises a little higher than during operation by a commercial power supply. The cooling effect decreases in the low-speed range, reducing the allowable output torque. (If a constant torque is required in the low-speed range, use inverter rated motor or a motor equipped with a separately excited ventilating fan.)

Vibration

Use of an inverter does not increase vibration of a standard motor, but when the motor is mounted to a machine, resonance may be caused by the natural frequencies including the natural frequency of the machine system. • IMO recommend that you use rubber coupling or antivibration rubber.

• We also recommend that you use the inverter jump frequency control function to avoid resonance point in the motor operation.

Note that operation of a 2-pole motor at 60Hz or over may cause abnormal vibration.

Noise

When an inverter drives a standard motor, the motor noise level increases compared with driven by a commercial power supply. To reduce noise, set the inverter carrier frequency at a high level¹. High-speed operation at 60Hz or over can result in more noise.

Installation location

Use the inverter in an ambient temperature range between -10 to $50\,^{\circ}$ C.

• When driving an inverter of 22kW or smaller at a place in a temperature of 40°C or over, remove the ventilation covers. Install an inverter on non-flammable material. The inverter and braking resistor surfaces become hot under certain operating conditions.

Applicable to special motors

Explosion-proof motors

When driving an explosion-proof motor with an inverter, use a combination of a motor and an inverter that has been approved in advance. Such approved products are available in our special product series. Contact IMO for details.

Submersible motors and pumps

These motors have a larger rated current than standard motors. Select the inverter capacity so that these motors can run within the inverter rated current. These motors differ from standard motors in thermal characteristics. Set a small value according to the thermal time constant of motor for setting electronic thermal relay function.

Brake motors

For motors with parallel-connection brakes, obtain the brake power from the primary circuit (commercial power supply). If you connect the brake power to the inverter power output circuit by mistake, problems may occur. Do not use inverters for driving motors equipped with seriesconnection brakes.

Geared motors

When the power transmission mechanism uses an oillubricated gearbox or speed changer/reducer, continuous motor operation at low speed may cause poor lubrication.

Synchronous motors

It is necessary to use software suitable for the motor type. Contact IMO for details.

Single-phase motors

Single-phase motors are not suitable for inverter-driven variable speed operation. Use three-phase motors.
Even if a single-phase power supply is available, use a three-phase motor, because the inverter provides three-phase output.

Combination with peripheral device

Installing an MCCB

Install a MCCB or earth-leakage circuit breaker in the primary circuit of the inverter to protect wires.

Magnetic contactor in the secondary circuit

If a magnetic contactor is mounted in the secondary circuit for switching to the motor operation by commercial power supply or for any other purposes, ensure that the inverter and the motor are stopped before you turn on or off the contactor. For switching operation from/to commercial power supply, use of newly developed "Line/inverter changeover operation" function using terminals such as SW88, SW52-2, SW52-1, SW50, is recommended.

Magnetic contactor in the primary circuit

Do not open or close the magnetic contactor in the primary circuit more than once an hour. If frequent starts or stops are required during motor operation, send FWD or REV signals to the control terminal.

Protecting the motor

When you drive a motor with an inverter, the motor can be protected with an electronic thermal relay function of the inverter. In addition to the operation level, set the motor type (standard motor, inverter motor). For high-speed motors or water-cooled motors, set a small value as the thermal time constant and protect the motor in combination with the "cooling system OFF" signal. When driving several motors with an inverter, connect a thermal relay to each motor and turn off the inverter's electronic thermal relay function. If you connect the motor thermal relay to the motor with a long cable, high-frequency current may flow into the wiring floating capacity. This may cause the relay to trip at a current lower than the set value for the thermal relay. If this happens, lower the carrier frequency or use the output circuit filter (OFL).

Power-factor correcting capacitor

Do not mount the power-factor correcting capacitor in the inverter primary circuit. (Use the DC reactor to improve the inverter power factor) Do not use the power-factor correcting capacitor in the inverter secondary circuit. Overcurrent trip will occur, disabling motor operation.

Reducing noise

Use of filter and shielded wires are typical measures against noise that meets EMC Directives. For details, refer to the operation procedure manual.

Measures against surge current

If OU trip occurs while the inverter is stopped or operated under a light load, it is assumed that the surge current is generated by open/close of the phase-advancing capacitor in the power system.

• Connect a DC reactor to the inverter.

Megger test

When checking insulation resistance of the inverter, use a 500V megger and follow the instructions described in the instruction manual.

Wiring

Control circuit wiring length

When conducting a remote control, limit the wiring length between the inverter and operator box to 20m or less and use twisted shielded cable.

Wiring length between inverter and motor

If long wiring is used between the inverter and the motor, the inverter will overheat or trip because of overcurrent (under the influence of high-frequency current flowing into the floating capacity) in the wires connected to the phases. Ensure that the wiring is shorter than 50m for models 3.7kW or smaller, shorter than 100m for 5.5kW or larger. If these lengths must be exceeded, lower the carrier frequency or mount an output circuit filter (OFL). When wiring is longer than 50m, and Dynamic torque-vector control or vector with PG is selected, execute off-line auto-tuning.

Wiring size

Select a cable with a sufficient capacity by referring to the current value or recommended wire size.

Earthing

Securely ground the inverter using the earth terminal.

Inverter Capacity

Driving standard motor

Select an inverter from the capacity range of nominal applied motors shown in the inverter standard specifications table. When large starting torque is required or acceleration or deceleration is required in a short time, select an inverter with a capacity one class greater than the standard.

Driving special motor

Select an inverter that meets the following condition: Inverter rated current > Motor rated current.

Transportation, storage

When transporting or storing inverters, select the procedures and places that meet the environmental conditions given in the inverter specifications. Ensure that the above environmental conditions are met also when transporting an inverter mounted to a machine.

Full instruction manual available from the IMO website: www.imopc.com or call the telephone number below for assistance.

 $^{\scriptscriptstyle 1}$ Caution – this may cause EMC problems – check with IMO first.

If in doubt contact IMO.



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