

# 12. Specifications

## 12.1 Models and their standard specifications

### ■ Standard specifications

Item		Specification								
Input voltage		3-phase 240V								
Applicable motor (kW)		0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Rating	Type	VFS15								
	Form	2004PM-W1	2007PM-W1	2015PM-W1	2022PM-W1	2037PM-W1	2055PM-W1	2075PM-W1	2110PM-W1	2150PM-W1
	Capacity (kVA) Note 1)	1.3	1.8	3.0	4.2	6.7	10.5	12.6	20.6	25.1
	Rated output current (A) Note 2)	3.3 (3.3)	4.8 (4.4)	8.0 (7.9)	11.0 (10.0)	17.5 (16.4)	27.5 (25.0)	33.0 (33.0)	54.0 (49.0)	66.0 (60.0)
	Output voltage Note 3)	3-phase 200V to 240V								
Overload current rating		150%-60 seconds, 200%-0.5 second								
Power supply	Voltage-frequency	3-phase 200V to 240V - 50/60Hz								
	Allowable fluctuation	Voltage 170V to 264V Note 4), frequency ±5%								
	Required Power supply capacity (kVA) Note 5)	1.4	2.5	4.3	5.7	9.2	13.8	17.8	24.3	31.6
	Protective method (IEC60529)	IP20								
Cooling method		Self-cooling			Forced air-cooled					
Color		RAL7016								
Built-in filter		Basic filter								

Item		Specification													
Input voltage		1-phase 240V					3-phase 500V								
Applicable motor (kW)		0.2	0.4	0.75	1.5	2.2	0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Rating	Type	VFS15S													
	Form	2002PL-W1	2004PL-W1	2007PL-W1	2015PL-W1	2022PL-W1	4004PL-W1	4007PL-W1	4015PL-W1	4022PL-W1	4037PL-W1	4055PL-W1	4075PL-W1	4110PL-W1	4150PL-W1
	Capacity (kVA) Note 1)	0.6	1.3	1.8	3.0	4.2	1.1	1.8	3.1	4.2	7.2	10.9	13.0	21.1	25.1
	Rated output current (A) Note 2)	1.5 (1.5)	3.3 (3.3)	4.8 (4.4)	8.0 (7.9)	11.0 (10.0)	1.5 (1.5)	2.3 (2.1)	4.1 (3.7)	5.5 (5.0)	9.5 (8.6)	14.3 (13.0)	17.0 (17.0)	27.7 (25.0)	33.0 (30.0)
	Rated output voltage Note 3)	3-phase 200V to 240V					3-phase 380V to 500V								
Overload current rating		150%-60 seconds, 200%-0.5 second					150%-60 seconds, 200%-0.5 second								
Power supply	Voltage- frequency	1-phase 200V to 240V - 50/60Hz					3-phase 380V to 500V - 50/60Hz								
	Allowable fluctuation	Voltage 170V to 264V Note 4), frequency±5%					Voltage 323V to 550V Note 4), frequency ±5%								
	Required Power supply capacity (kVA) Note 5)	0.8	1.4	2.3	4.0	5.4	1.6	2.7	4.7	6.4	10.0	15.2	19.5	26.9	34.9
	Protective method (IEC60529)	IP20					IP20								
Cooling method		Self-cooling			Forced air-cooled		Forced air-cooled								
Color		RAL7016					RAL7016								
Built-in filter		EMC filter					EMC filter								

Note 1. Capacity is calculated at 220V for the 240V models, at 440V for the 500V models.

Note 2. Indicates rated output current setting when the PWM carrier frequency (parameter  $F_{300}$ ) is 4kHz or less. When exceeding 4kHz, the rated output current setting is indicated in the parentheses. It needs to be further reduced for PWM carrier frequencies above 12 kHz.

The rated output current is reduced even further for 500V models with a supply voltage of 480V or more.

The default setting of the PWM carrier frequency is 12kHz.

Note 3. Maximum output voltage is the same as the input voltage.

Note 4. At 180V-264V for the 240V models, at 342V-550V for the 500V models when the inverter is used continuously (load of 100%).

Note 5. Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

## ■ Common specification

	Item	Specification
Principal control functions	Control system	Sinusoidal PWM control
	Output voltage range Note1)	Adjustable within the range of 50 to 330V (240V class) and 50 to 660V (500V class) by correcting the supply voltage
	Output frequency range	0.1 to 500.0Hz, default setting: 0.5 to 60Hz, maximum frequency: 30 to 500Hz
	Minimum setting steps of frequency	Analog input : 1/1000 of the max. frequency (At 60Hz : 0.06Hz) ; VIA, VIB terminal (0-10V), VIC terminal (4-20mA) Operation panel setting : 0.01Hz (99.99Hz or less) , 0.1Hz (100.0Hz or more) Communication setting : 0.01Hz
	Frequency accuracy	Analog setting: within $\pm 0.5\%$ of the max. frequency ( $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ ) Digital setting : within $\pm 0.01\%$ of the max. frequency (-10 to $+60^{\circ}\text{C}$ )
	Voltage/frequency characteristics	V/f constant, variable torque, automatic torque boost, vector control, automatic energy-saving, dynamic automatic energy-saving control (for fan and pump), PM motor control, V/F 5-point setting, Auto-tuning. Base frequency (20-500Hz) adjusting to 1 & 2, torque boost (0-30%) adjusting to 1 & 2, adjusting frequency at start (0.1-10Hz)
	Frequency setting signal	Setting dial on the front panel, external frequency potentiometer (connectable to a potentiometer with a rated impedance of 1k-10k $\Omega$ ), 0-10Vdc / -10-+10Vdc (input impedance: 30k $\Omega$ ), 4-20mAdc (input impedance: 250 $\Omega$ ).
	Terminal block base frequency	The characteristic can be set arbitrarily by two-point setting. Possible to set: analog input (VIA, VIB, VIC).
	Frequency jump	Three frequencies can be set. Setting of the jump frequency and the range.
	Upper- and lower-limit frequencies	Upper-limit frequency: 0.5 to max. frequency, lower-limit frequency: 0 to upper-limit frequency
PWM carrier frequency	Adjustable range of 2.0k to 16.0kHz (default: 12.0kHz).	
PID control	Setting of proportional gain, integral gain, differential gain and control waiting time. Checking whether the PID set value and the feedback value agree.	
Operation specifications	Acceleration/deceleration time	Selectable from among acceleration/deceleration times 1 & 2 & 3 (0.0 to 3600 sec.). Automatic acceleration/deceleration function. S-pattern acceleration/deceleration 1 & 2 and S-braking adjustable. Control of forced rapid deceleration and dynamic rapid deceleration.
	DC braking	Braking start-up frequency: 0 to maximum frequency, braking rate: 0 to 100%, braking time: 0 to 25.5 seconds, emergency DC braking, motor shaft fixing control.
	Dynamic Braking Drive Circuit	Control and drive circuit is built in the inverter with the braking resistor outside (optional).
	Input terminal function (programmable)	Possible to select from among about 110 functions, such as forward/reverse run signal input, jog run signal input, operation base signal input and reset signal input, to assign to 8 input terminals. Logic selectable between sink and source.
	Output terminal functions (programmable)	Possible to select from among about 150 functions, such as upper/lower limit frequency signal output, low speed detection signal output, specified speed reach signal output and failure signal output, to assign to FL relay output, open collector output terminal, and RY output terminals.
	Forward/reverse run	The RUN and STOP keys on the operation panel are used to start and stop operation, respectively. Forward/reverse run possible through communication and logic inputs from the terminal block.
	Jog run	Jog mode, if selected, allows jog operation from the terminal block and also from remote keypad.
	Preset speed operation	Frequency references + 15-speed operation possible by changing the combination of 4 contacts on the terminal block.
	Retry operation	Capable of restarting automatically after a check of the main circuit elements in case the protective function is activated. 10 times (Max.) (selectable with a parameter)
	Various prohibition settings / Password setting	Possible to write-protect parameters and to prohibit the change of panel frequency settings and the use of operation panel for operation, emergency stop or resetting. Possible to write-protect parameters by setting 4 digits password and terminal input.
	Regenerative power ride-through control	Possible to keep the motor running using its regenerative energy in case of a momentary power failure (default: OFF).
	Auto-restart operation	In the event of a momentary power failure, the inverter reads the rotational speed of the coasting motor and outputs a frequency appropriate to the rotational speed in order to restart the motor smoothly. This function can also be used when switching to commercial power.
	Light-load high-speed operation	Increases the operating efficiency of the machine by increasing the rotational speed of the motor when it is operated under light load.
	Drooping function	When two or more inverters are used to operate a single load, this function prevents load from concentrating on one inverter due to unbalance.
	Override function	External input signal adjustment is possible to the operation frequency command value.
Relay output signal	1c- contact output and 1a- contact output Note2) Maximum switching capacity : 250Vac-2A , 30Vdc-2A ( $\cos\phi=1$ : at resistive load), 250Vac-1A ( $\cos\phi=0.4$ ) , 30Vdc-1A (L/R=7ms) Minimum permissible load : 5Vdc-100mA, 24Vdc-5mA	

Item	Specification	
Protective function	Protective function	Stall prevention, current limitation, over-current, output short circuit, over-voltage, over-voltage limitation, undervoltage, ground fault detection, input phase failure, output phase failure, overload protection by electronic thermal function, armature over-current at start-up, load side over-current at start-up, over-torque, undercurrent, overheating, cumulative operation time, life alarm, emergency stop, braking resistor overcurrent / overload, various pre-alarms
	Electronic thermal characteristic	Switching between standard motor and constant-torque VF motor, switching between motors 1 & 2, setting of overload trip time, adjustment of stall prevention levels 1 & 2, selection of overload stall
	Reset function	Panel reset / External signal reset / Power supply reset. This function is also used to save and clear trip records.
Display function	Alarms	Overcurrent, overvoltage, overload, overheat, communication error, under-voltage, setting error, retry in process, upper/lower limits
	Causes of failures	Overcurrent, overvoltage, overheat, output short-circuit, ground fault, overload on inverter, arm overcurrent at start-up, overcurrent on the load side at start-up, CPU fault, EEPROM fault, RAM fault, ROM fault, communication error. (Selectable: dynamic braking resistor overload, emergency stop, under-voltage, small current, over-torque, low-torque, motor overload, input phase failure, output phase failure)
	Monitoring function	Output frequency, frequency command value, operation frequency command, forward/reverse run, output current, input voltage (DC detection), output voltage, torque, inverter load factor, motor load factor, braking resistor load factor, input power, output power, information on input terminals, information on output terminals, overload and region setting, version of CPU1, version of CPU2, PID feedback value, stator frequency, causes of past trips 1to 8, parts replacement alarm, cumulative operation time, number of starting
	Past trip monitoring function	Stores data on the past eight trips: number of trips that occurred in succession, output frequency, frequency command value, forward/reverse run, output current, input voltage (DC detection), output voltage, information on input terminals, information on output terminals, and cumulative operation time when each trip occurred.
	Output for frequency meter	Analog output for meter: 1mA dc full-scale dc ammeter 0 - 20mA (4 to 20mA) output: DC ammeter (allowable load resistance: 600Ω or less) 0 - 10V output: DC voltmeter (allowable load resistance: 1kΩ or more) Maximum resolution: 1/1000
	4-digit 7-segments LED	Frequency: inverter output frequency Alarm: overcurrent pre-alarm "L", overvoltage pre-alarm "P", overload pre-alarm "L", overheat pre-alarm "H", communication pre-alarm "E". Status: inverter status (frequency, cause of activation of protective function, input/output voltage, output current, etc.) and parameter settings. Free-unit display: arbitrary unit (e.g. rotating speed) corresponding to output frequency.
	Indicator	Lamps indicating the inverter status by lighting, such as RUN lamp, MON lamp, PRG lamp, % lamp, Hz lamp. The charge lamp indicates that the main circuit capacitors are electrically charged.
Safety function	Safe Torque Off (STO) function according to EN/IEC 61508 SIL2 and ISO 13849-1 category 3 PL "d".	
Environments	Location of use	Indoors; not exposed to direct sunlight, corrosive gas, explosive gas, flammable gas, oil mist, or dust; and vibration of less than 5.9m/s <sup>2</sup> (10 to 55Hz).
	Elevation	3000 m or less (current reduction required over 1000 m) Note 3)
	Ambient temperature	-10 to +60°C Note 4)
	Storage temperature	-25 to +70°C (Temperature applicable for a short term.)
	Relative humidity	5 to 95% (free from condensation and vapor).

Note 1. Maximum output voltage is the same as the input voltage.

Note 2. A chattering (momentary ON/OFF of contact) is generated by external factors of the vibration and the impact, etc. In particular, please set the filter of 10ms or more, or timer for measures when connecting it directly with input unit terminal of programmable controller. Please use the OUT terminal as much as possible when the programmable controller is connected.

Note 3. Current must be reduced by 1% for each 100 m over 1000 m. For example, 90% at 2000m and 80% at 3000m.

Note 4. When using the inverter in locations with temperatures above 40°C, remove the protective label on the top of the inverter and use the inverter with the output current reduced according to section 6.18.

To align the inverters side-by-side horizontally, remove the protective label on the top of the inverter before use. When using the inverter in locations with temperatures above 40°C, use the inverter with the output current reduced.