TOSHIBA

VF-A7

New-Generation High-peformance Inverter TOSVERT

Renewal: *200V 37 to 90kW/400V 37 to 280kW*

Noise filter inside: *200V 0.4 to 7.5kW/400V 0.75 to 15kW*

Advanced sensorless vector control

Flexibility and application extensibility

Automatic setting functions

200V class 0.4 to 90kW
400V class 0.75 to 280kW

Debut of new-generation sensorless vector controlled inverter

Noise filter inside

200V class 0.4 to 7.5kW models
400V class 0.75 to 15kW models

Complies with the CE marking requirements

The 200V class 0.4 to 7.5kW and 400V class 0.75 to 15kW models comply with the CE marking requirements, since they install EMI noise filters inside conforming to the EMC directive.
The other models also can satisfy the EMC directive and the low-voltage directive if they are used together with a noise filter recommended by Toshiba. For details, please refer to the instruction manual.

UL

Soon to be released :
200V 37 to 90kW
400V 37 to 280kW

ISO 9001

VF-A7 series is designed and manufactured at the Works, which received the international quality assurance standard ISO 9001 certification in March 1995.

ISO 14001

The Works producing VF-A7 series is registered as an environment management system factory specified by ISO 14001.
Registration number: EC96J1062
Date of registration: January 29, 1997

New

Renewal : 200V 37 to 90kW 400V 37 to 280kW

① **Compact!**

② **Fin can be attached externally!**

③ **IP40 or IP54 protector options (Soon to be released)!**

Line-up

200V class	applicable motor power	400V class
VFA7-2004PL	0.4kW	
VFA7-2007PL	0.75kW	VFA7-4007PL
VFA7-2015PL	1.5kW	VFA7-4015PL
VFA7-2022PL	2.2kW	VFA7-4022PL
VFA7-2037PL	3.7kW	VFA7-4037PL
VFA7-2055PL	5.5kW	VFA7-4055PL
VFA7-2075PL	7.5kW	VFA7-4075PL
VFA7-2110P	11kW	VFA7-4110PL
VFA7-2150P	15kW	VFA7-4150PL
VFA7-2185P	18.5kW	VFA7-4185P
VFA7-2220P	22kW	VFA7-4220P
VFA7-2300P	30kW	VFA7-4300P
New VFA7-2370P1	37kW	New VFA7-4370P1
New VFA7-2450P1	45kW	New VFA7-4450P1
New VFA7-2550P1	55kW	New VFA7-4550P1
New VFA7-2750P1	75kW	New VFA7-4750P1
New VFA7-2900P1	90kW	New VFA7-4110KP1
	110kW	
	132kW	New VFA7-4132KP1
	160kW	New VFA7-4160KP1
	220kW	New VFA7-4220KP1
	280kW	New VFA7-4280KP1

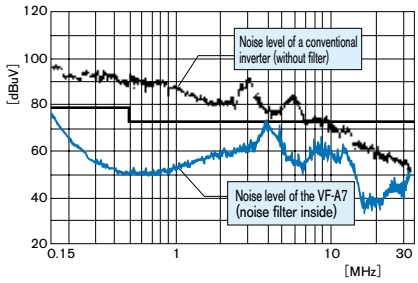
Contents

Superb Feature 1

VF-A7 solves problems caused by EMI noise.

Noise reduction

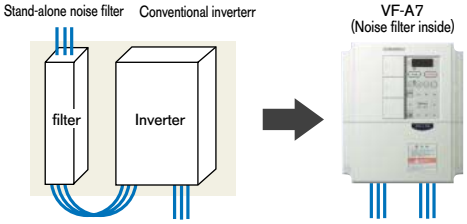
Both 200V class 0.4 to 7.5kW models and 400V class 0.4 to 15kW models install EMI noise filtere inside, which significantly reduce conducted and radiated noise, and thus to satisfy the CE marking requirements in EU.



Conforming to EU standard EN 55011 (Gr. 1, Class A)

Saving-space and easy wiring

The VF-A7 with EMI noise filter inside can be installed in a space 14 to 30% smaller than that required for an inverter with an external noise filter. In addition, it relieves you of wiring between it and a stand-alone, noise filter.



Superb Feature 2

VF-A7 enhances the dynamic performance of motors.

More than 200% torque even at 0.5Hz

The VF-A7 significantly increases the starting torque of the motor; VF-A7 produce more than 200% torque even at extremely low speeds. With the speed control range widened to 1:150, the VF-A7 can be used for higher-performance machines.

On-line automatic-tuning function

The VF-A7 has an online automatic-tuning function to automatically correct the motor constants for sensorless vector control even during operation. With this function, the VF-A7 enables the motor to accurately run and stably produce large torque without being affected by motor temperature.

Torque control (*1)

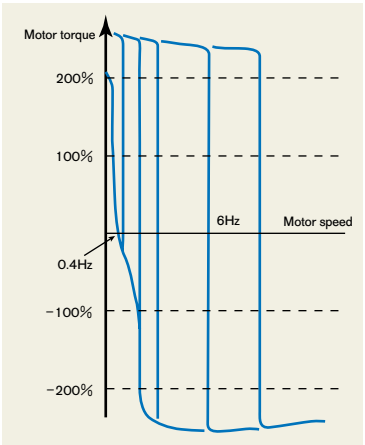
In addition to speed control by frequency reference signals, the VF-A7 can control motor torque by torque reference signals. Suitable for use in winding application, etc.

Torque limit

To prevent the machine from being damaged by excessive torque or the VF-A7 itself from tripping, the VF-A7 has the function of limiting the output torque of the motor.

Tap-stop control

When used for a conveyor application, the VF-A7 limits the torque produced by the motor so that the system can make a stable tap-stop.



Example torque characteristics of VFA7-2037PL with a 4P-3.7kw stardard motor.

Noise filter inside
200V class 0.4 to 7.5kW models
400V class 0.75 to 15kW models

Superb Feature 3

VF-A7 has a wide variety of options useful for a wide range of applications.

- Extended panel/Parameter writer
- Communication (Standard)
  (RS485)
- Communication (Optional)
  (RS232C,RS485,TOSLINE-F10M, TOSLINE-S20
  DeviceNet (*2), ProfiBus (*2))
- Add-on module options for vector control with sensor
  (Speed feedback, positioning control, torque control)
- Extended terminal board add-on cassette options
  (1) 12/16-bit binary, 3/4-digit BCD input
  (2) Extended input terminal (8 contacts)
  (3) Programmable analog output terminal (current/voltage output)
  (4) Programmable relay output terminal (2 circuits)
- Control power supply unit (up to 22kW models)
- Board type options for vector control with sensor
- Flange mounting kit (*2)

Superb Feature 4

VF-A7 can be applied to a wide range of applications from simple speed control to system application.

Automatic setting function

All you have to do for simple speed control for start-up is to connect it to a motor and a power supply source; the VF-A7 does not require cumbersome parameter setting to start operation.

(1) Automatic adjustment of acceleration/deceleration times
The VF-A7 automatically adjusts the acceleration/deceleration times according to the load applied. (The acceleration and deceleration times are changed constantly.)

(2) Automatic V/f mode setting
Sensorless vector control and on-line automatic tuning are setled at a time. So if you want to increase the starting torque and suppress the speed variance, easily can be settled and performed.

Flexibility and extensibility for system application

- The function of high speed operating at low load which improves the efficiency of operation, especially when the VF-A7 is used for crane/hoist application
- Vector control with sensor, which enable to control the torque, speed, position, of a motor with a higher accuracy
- Drooping control function ensuring optimum load sharing
- Override function useful for fine adjustment of line speed
- Sink/source and input/output logic switchable, which are convenient when the VF-A7 is used in combination with a programmable controller.
- Commercial power/inverter switching function which sufficiently backs up commercial power
- Input phase failure protective function which protects the capacitors in the main circuit
- Various communication functions can enable VF-A7 to be applied to system applications.

*1. At a sensorless vector control mode, torque control cannot be used for low-load, low speed area. Use torque control with sensor when more accurate control is required.
*2. Soon to be released

Flexibility for a wide variety of Drive systems

Easy communication with inverters

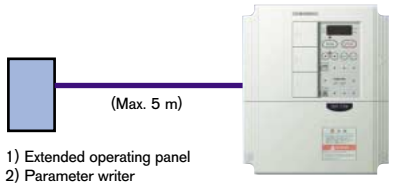
The communication options makes it more easy for setting and operating the VF-A7 inverter.

1 Extended panel

This operating panel is designed to set and operate the VF-A7 inverter with it attached on an inverter panel or from a remote place.

2 Parameter writer

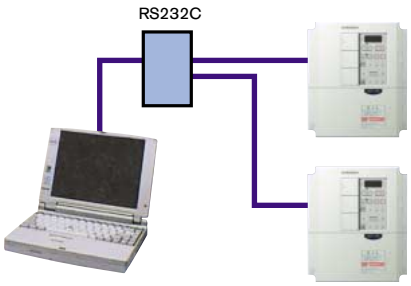
Designed for reading, copying and writing preset parameters by a single operation, so easily set the same parameters for two or more inverters of the same capacity. This unit can store parameters for up to three inverters at a time.



3 RS232C conversion unit

This unit allows you to easily set parameters, store or write data, communicating with a personal computer via an interface cable. This RS232C unit is a very useful communication tool which can be connected with two inverters simultaneously.

■Monitoring function ■Parameter setting function
■Command function ■Additional functions



Centralized control of inverters by a communication system

A number of inverters can be controlled easily by means of a communication system. The means of communication can be selected from among a personal computer, a programmable controller and a higher order network.

1 RS485 conversion unit

- Computer link
  With this unit, you can establish a network for data communication between a host computer and inverters.
- Communication between inverters up to 64 units.
  Without or with this unit, you can establish a frequency data communication network to carry out proportional operation of two or more inverters.

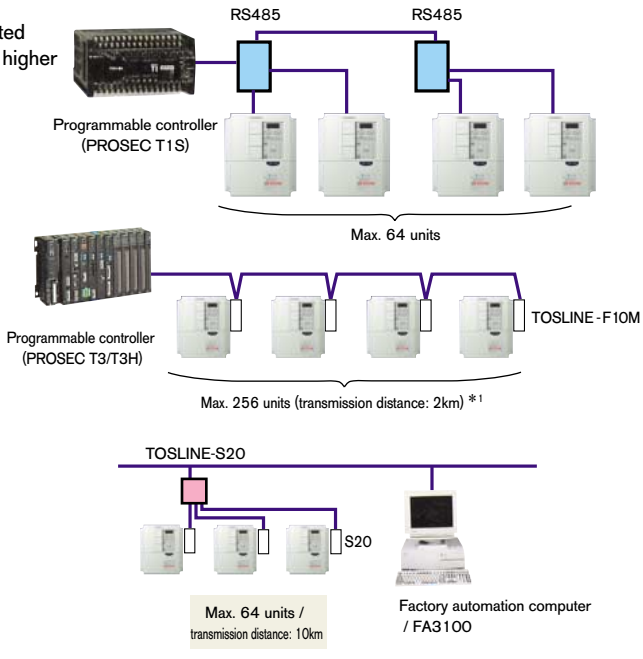
2 TOSLINE-F10M

Designed for communication with a Programmable controller over a field network. Bus-type data transfer unit which use shielded twisted pair cables and is designed specifically for TOSHIBA's industrial use for motor drives.

3 TOSLINE-S20

Designed for communication with a Programmable controller over a field network. This unit uses optical-fiber cables for high-speed data transfer (2 Mbps).

*1. It is necessary to install repeaters at 500 m-intervals.



Three in one - Inverter playing three different roles

Noise filter inside
200V class 0.4 to 7.5kW models
400V class 0.75 to 15kW models

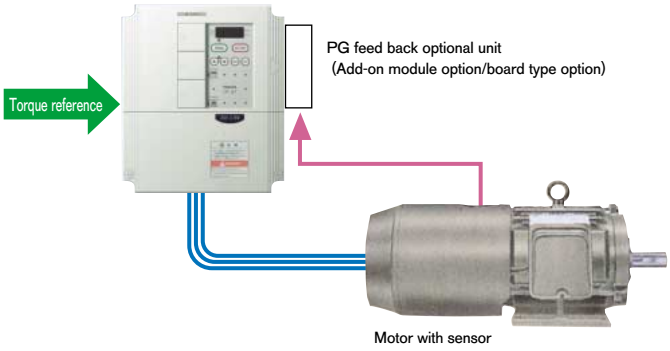
Sensorless vector control mode

If you use a standard motor (irrespective of its manufactiarer) and Then,
- If you need larger starting torque and
- More smoothly and stably operation even at extremely low speeds,
- If you want to reduce load fluctuations due to slip of the motor, or
- If you want to keep large torque at extremely low speeds, you can use the sensorless vector control function, just by setting on-line automatic-tuning. (*)

As a matter of course, the control mode can also be selected from among the conventional constant V/f control mode, automatic torque boost mode, variable torque mode and energy-saving mode.
(*) On-line automatic tuning can be performed with the motor kept in operation.

Torque control mode with/without a sensor

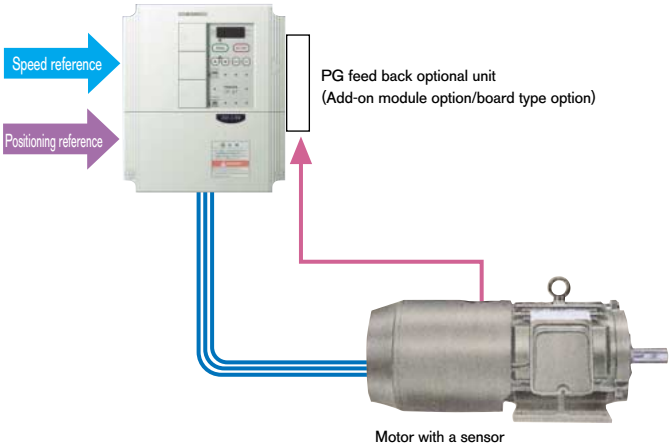
Use this mode, for example, if you want to keep even the tension at a winding application, etc.
- Motor torque can be controlled by combining a motor with sensor and the VF-A7 with PG feed back option unit.
- Motor torque can be controlled by analog signals. (The rotating speed of a motor is determined by the relationship between the load torque and the motor output torque.)
- The torque reference can be selected from 0 to +/-10 (5) V or 4 to 20 mA and 12/16-bit binary(option) and BCD input(option).



Note) The VF-A7 can control torque without using a sensor. Note, however, the its control accuracy deteriorates under low-load, or low-speed conditions.

Speed/positioning control mode with a sensor

- Combining a motor with a sensor and the VF-A7 with PG feed back option unit makes it possible to control the speed and position with a higher accuracy.
- In the positioning mode, the displacement and speed are adjusted using pulse reference. In this mode, the machine returns to its original position even if it is displaced because of external force.
- For injection molding machines, etc., this Combination can be used as an unsophisticated servo.



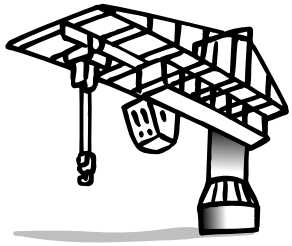
VF-A7 optimally controls any type of machine.

(1) Industrial machinery in general
Distribution and conveyor systems ... crane, hoist, automated warehouse
Textile machines ... Chemical fiber dyeing, finishing and spinning machines
Machining and machine tools ... Laths

(2) Fan, blower and pump: Fan, pump, air conditioning system
(3) Automatic service apparatus: Fitness apparatus, medical apparatus, washing machine
(4) High-tech systems and high-performance machines: Paper and film transfer/printing systems
(5) Simple positioning application: Elevator, extruding machine, injection molding machine, printing machine

Crane/hoist

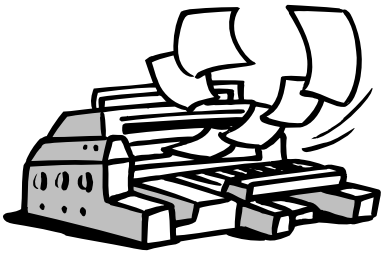
Preset-speed operation.... Preset-speed settings (Max. 16 preset speeds)
Combination with brake motors..... The VF-A7 makes the motor produce large torque even in extremely low speed ranges, thus can apply enough starting torque to the machine.
Speed change according to load.... The high-speed operation at low-load function makes it possible.
Driving up to 4 motors by one inverter..... Up to four motors can be driven simultaneously.
Keeping torque even when voltage.. fluctuates The VF-A7 compensates for voltage drop to maintain the low-speed torque at a required level.
High accuracy required for operation..... Sensorless vector control and on-line auto-tuning ensure accurate and smooth operation even in low speed ranges. The vector control with sensor is more useful for machines which require a still higher control accuracy. (An add-on module or board option is required)



High-tech systems and high performance machines

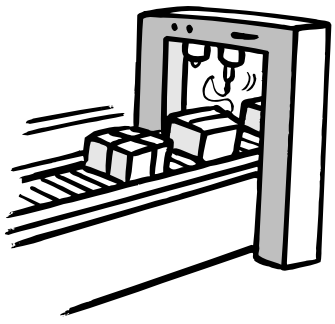
Paper/film transfer and printing systems

Torque control..... The moter torque can be controlled freely by external signals. This fanction is suited for winding application which need to keep the tension of paper, film, etc., even.
Drooping control..... This function can perform optimum load sharing.
Communication function.... This function allows centralized control of two or more inverters.
Digital reference input..... 12/16-bit binary input or BCD input can be used as reference (extended terminal board add-on module option) .
PG feed back options... (Add-on module options/ board type options) These options are designed for improving the accuracy of speed control, torque control and positioning control.



Transfer systems conveyor

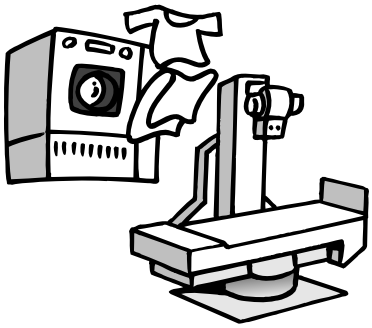
Enough starting torque ... More than 200% starting torque at 0.5 Hz
Preset-speed operation ... Preset-speed settings (Max.16 preset speed)
Combination with gear motors... Gears are protected against shocks by the b acklash protective function. (*1)
Driving up to 4 motors..... by one inverter Up to four motors can be driven simultaneously.
High accuracy required for operation... Vector control and on-line auto-tuning ensure accurate and smooth operation even in low speed ranges. The vector control with sensor is more usefule for machines which require a still higher control accuracy. (An add-on module option, board option is required.)



Automatic service apparatus

Fitness apparatus, medical apparatus, washing machine

Noise filter inside..... The noise filter inside prevents peripheral electronic devices from malfunctioning, and also reduces noise affecting on a radio, telephone, etc. (*2)
Smooth operation at low speeds... Sensorlass vector control and on-line auto-tuning ensure smooth operation even in low speed ranges.
More than 200% torque at 0.5 Hz... The VF-A7 produces large torque even at low speeds, so it is suitable for dyeing machines, fitness apparatus (Room Runner), etc. which require large torque in low speed ranges.
Operating direction switchable.. by analogue signals The operating direction can be switched between forward and reverse by applying a DC voltage of +/-10V.



*1: Planned *2: 200V 0.4-7.5kW models 400V 0.75-15kW models

Noise filter inside
200V class 0.4 to 7.5kW models
400V class 0.75 to 15kW models

Fans and blowers

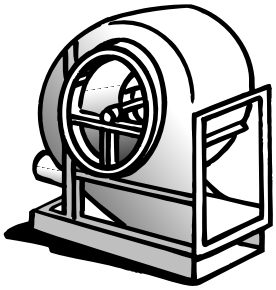
Noise filter inside..... The noise filter inside prevents nearby peripheral electronic devices from malfunctioning, and also reduces noise affecting on a radio, etc. (*2) So, suitable for air conditioning systems installed in buildings.

Commercial power/inverter operation switchable..... The power source can be switched just by useing output signals, so there is no need to install a time relay, or the like.

Automatic energy-saving operation... The VF-A7 efficiently saves energy by properly controlling current applied to the motor.

Auto-restart after a momentary power failure... This function enables the motor to restart even under free-run conditions.

Monitoring function ..... Standard monitor display can be selected from 29 items. Such as output current, input or output power.



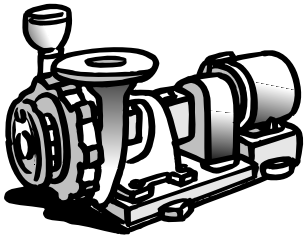
Pumps

Noise filter inside..... The built-in noise filter prevents nearby elec tric and electronic systems from malfunctioning, and reduces noise affecting on a radio, telephone, etc. (*2)

Automatic energy-saving operation... The VF-A7 efficiently saves energy by properly controlling current applied to the motor.

PID control..... Flow rate, room temperature, water level, etc., can be kept constant, by taking in the feed back signal from sensor.

Commercial power/inverter operation switchable..... The power source can be switched just by using output signals. So there is no need to install a time relay, or the like.



Machine tools

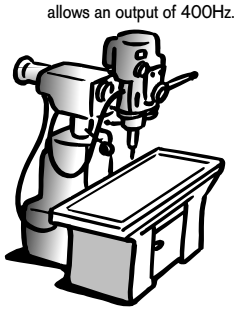
Prevention of breakage of drills... The overtorque detecting/limiting function is effective for preventing the breakage of drills.

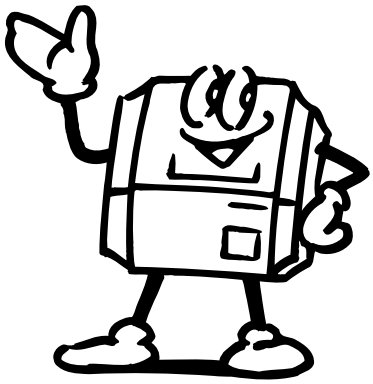
Digital reference input..... 12/16-bit binary input or BCD input can be used as reference if an option (extended terminal add-on cassette option) is added.

High accuracy required for operation.... Sensorless vector control and on-line auto-tuning ensure accurate and smooth operation even in low speed ranges. The vector control with sensor is more useful for machines which require a still higher control accuracy. (An add-on module, board type option is required.)

Operating direction switchable with an anelog signals... The operating direction can be switched between forward and reverse by applying a DC voltage of +/-10V.

High rotating speed..... Combining the VF-A7 with a high-speed motor allows an output of 400Hz.





Various functions for a wide range of applications

Function for crane/hoist application

Function intended for lifting gears
Especially useful when the VF-A7 is used for crane/hoist application. This function is designed to:

- Detect the load applied to the motor and increase its rotating speed to improve the machine's running efficiency, if the load is found to be relatively small,
- Detect the output torque and release the brake when the torque rises high enough, and

Drooping function

Designed to prevent a load from being applied to a single inverter, when two or more inverters are used to drive a motor.

Special analog input

The following constants can be adjusted under control of analog signals

- Acceleration/deceleration time reference frequency
- Upper-limit frequency
- Acceleration/deceleration time
- Manual torque boost amount

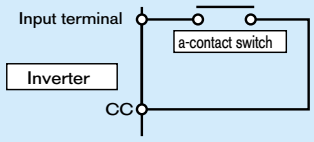
Standard display mode selection function

Items displayed when the power is turned on can be selected. By default, frequency is displayed but it can be changed to output current, input/output power, and so on.

Input/output programmable terminal functions

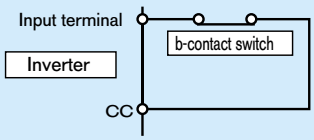
- A new menu item is added to the menu of the programmable terminal functions.
- The VF-A7 supports the entry by means of a-contact, in addition to b-contact which is the only one contact available to conventional models.

1) a-contact



* Shorting the circuit formed by the input terminal and the CC (common) terminal causes active. Suitable for forward/reverse switching,preset-speed operation, etc

2) b-contact



* Breaking the circuit formed by the input terminal and the CC (common) terminal causes active. Suitable for input of standby signals, reset signals, etc.

Sink/source switching function

For this switching, the plus common (P24) control terminal also can be used, in addition to the minus common (CC) terminal which is the only one terminal available to convenient models.

1 to 4 motors switching

The VF-A7 is capable of V/f switching of up to four motors, while the number of motors that conventional models can switch is two.

Commercial power/inverter switching function

The power source can be switched between the commercial power and the inverter, by switching the sequencer in it. (An external MCCB, etc., is required for this switching.)

PID control

The PID control function built in as standard performs PID control by signals fed back from a process converter such as pressure sensor.

Priority selection of input terminal

The control mode can be switched to frequency control with an input terminal, without using any switching sequence, while the operation frequency is being set from the control panel.

Input-phase failure protection

This function trips the inverter in case one of the three phases on the input side is failed.

Patterned operation function

This function is an unsophisticated PLC function which is designed to carry out operation in programmed patterns.

Override function

The preset frequency control values can be adjusted by impressing signals from an external control unit.

V/f 5-point settings

V/f characteristics can be set arbitrarily.

Preset-speed operation mode

When a machine is operated at preset speeds, different acceleration/deceleration time, torque limit and V/f characteristic can be selected on a speed-by-speed basis.

Noise filter inside
200V class 0.4 to 7.5kW models
400V class 0.75 to 15kW models

Standard specifications

■Model and standard specifications (Small- and middle-capacity models)

200V series

Item			Standerd specification													
Applicable motor (kW)			0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Rating	Type		VFA7—														
	Model		2004PL	2007PL	2015PL	2022PL	2037PL	2055PL	2075PL	2110P	2150P	2185P	2220P	2300P	2370P1	2450P1	2550P1
	Capacity (kVA) *1		1.0	2.0	3.0	4.0	6.5	9.5	13	19	25	28	34	46	55	69	84
	Rated output current (A)		3.0	5.0	8.0	10.5	16.6	25	33	49	66	73	88	120	144	180	220
	Rated output voltage		3phase 200 to 230V (The max. output voltage is the same as the input source voltage.)														
	Overload current rating		2 minutes at 150%, 0.5 seconds at 215%														
Electrical braking	Dynamic braking circuit		Dynamic braking circuit installed											Optional			
	Electrical braking	Dynamic braking circuit	Built-in braking resistor					Braking resistor or external braking unit (optional)									
		Dynamic braking resistor	Rating: 120W-70Ω				Rating: 120W-40Ω										
			Max. braking 150%, allowable duty cycle 3% ED			Max. braking 100%, allowable duty cycle 3% ED											
Input Power	Voltage/ frequency	Main circuit	3-phase 200 to 230V - 50/60Hz							3-phase 200 to 220V - 50Hz 200 to 230V - 60Hz							
		Control circuit *2	External circuit (optional)											Single-phase 200 to 220V - 50Hz 200 to 230V - 60Hz			
	Tolerance		Voltage +10/-15% *4, frequency +/-5%														
Protective method			Sealed structure (JEM1030) IP20 *3											Open structure (JEM1030)IP00			
Cooling method			Self cooling			Forced air cooling											
Color			Munsell 5Y-8/0.5														
EMI filter			Installed							External filter (optional)							

400V series

Item			Standerd specification													
Applicable motor (kW)			0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
Rating	Type		VFA7—														
	Model		4007PL	4015PL	4022PL	4037PL	4055PL	4075PL	4110PL	4150PL	4185P	4220P	4300P	4370P1	4450P1	4550P1	4750P1
	Capacity (kVA) *1		2.0	3.0	4.0	6.5	9.5	13	19	25	28	34	46	55	69	84	110
	Rated output current (A)		2.5	4.0	5.0	8.5	13	17	25	33	37	44	60	72	90	110	144
	Rated output voltage		3phase 380 to 460V (The max. output voltage is the same as the input source voltage.)														
	Overload current rating		2 minutes at 150%, 0.5 seconds at 215%														
Electrical braking	Dynamic braking circuit		Dynamic braking circuit installed										Optional				
	Electrical braking	Dynamic braking resistor	Built-in braking resistor			Braking resistor or external braking unit (optional)											
			Rating: 120W-150Ω														
			Max. braking 150%, allowable duty cycle 3% ED		Max. braking 100%, allowable duty cycle 3% ED												
Input Power	Voltage/ frequency	Main circuit	3-phase 380 to 460V - 50/60Hz										3-phase 380 to 440V - 50Hz 380 to 460V - 60Hz				
		Control circuit *2	External circuit (optional)										Single-phase 380 to 440V - 50Hz 380 to 460V - 60Hz				
	Tolerance		Voltage +10/-15% *4, frequency +/-5%														
Protective method			Sealed structure (JEM1030) IP20 *3										Open structure (JEM1030) IP00				
Cooling method			Forced air cooling														
Color			Munsell 5Y-8/0.5														
EMI filter			Installed								External filter (optional)						

Notes) *1: Capacity is calculated at 220V for the 200V models and at 440V for the 400V models
*2: An option is required for the 22kW and smaller models to be compatible with the control power supply (RO or SO).
*3: Each model has three through-holes for wiring of the main input circuit, main output circuit and control circuit. Seal them properly after wiring.
*4: +/-10% when the inverter is used continuously (load of 100%)

■Standard specifications (large-capacity models)

200V series

Item			Standerd specification	
Applicable motor (kW)			75	90
Rating	Type		VFA7—	
	Model		2750P1	2900P1
	Capacity (kVA) *1		110	133
	Rated output current (A)		288	350
	Rated output voltage		3phase 200 to 230V (The max. output voltage is the same as the input source voltage.)	
	Overload current rating		1 minutes at 150%, 0.3 seconds at 180%	
	Electrical braking	Dynamic braking	Built-in braking resistor drive circuit (optional)	
		Dynamic braking resistor	External braking resistor (optional)	
Input Power	Voltage/ frequenc	Main circuit	3phase 200 to 230V - 50/60Hz	
		Control circuit	Single-phase 200 to 230V - 50/60Hz	
	Tolerance		Voltage +10/-15% *2, frequency +/-5%	
Protective method			Open structure (JEM1030) IP00	
Cooling method			Forced air cooling	
Color			Front cover/main unit cover: Munsell 5Y-8/0.5	
EMI filter			External EMI filter (optional)	

400V series

Item			Standerd specification				
Applicable motor (kW)			90/110	132	160	220	280
Rating	Type		VFA7—				
	Model		4110KP1	4132KP1	4160KP1	4220KP1	4280KP1
	Capacity (kVA) *1		160	194	236	320	412
	Rated output current (A)		210	255	310	420	540
	Rated output voltage		3phase 380 to 460V (The max. output voltage is the same as the input source voltage.)				
	Overload current rating		1 minutes at 150%, 0.3 seconds at 180%				
	Electrical braking	Dynamic braking	Built-in braking resistor drive circuit (optional)				
		Dynamic braking resistor	External braking resistor (optional)				
Input Power	Voltage/ frequenc	Main circuit	3phase 380 to 460V - 50/60Hz				
		Control circuit	Single-phase 380 to 460V - 50/60Hz				
	Tolerance		Voltage +10/-15% *2, frequency +/-5%				
Protective method			Open structure (JEM1030) IP00				
Cooling method			Forced air cooling				
Color			Front cover/main unit cover: Munsell 5Y-8/0.5				
EMI filter			External EMI filter (optional)				

Notes) *1: Capacities is calculated at 220V for the 200V models and at 440V for the 400V models
*2: +/-10% when the inverter is used continuously (load of 100%)

■Specifications comparison between small/middle-capacity models and large-capacity models (differences only)

Item	Small- and middle-capacity models				Large-capacity models
	VFA7-2004PL～2150P VFA7-4007PL～4150PL	VFA7-2185P～2300P VFA7-4185P～4300P	VFA7-2370P1～2450P1 VFA7-4370P1～4550P1	VFA7-2550P1 VFA7-4750P1	VFA7-2750P1～2900P1 VFA7-4110KP1～4280KP1
1. Overload current rating	2 minutes at 150%, 0.5 seconds at 215%	2 minutes at 150%, 0.5 seconds at 215%	2 minutes at 150%, 0.5 seconds at 215%	2 minutes at 150%, 0.5 seconds at 215%	1 minutes at 150% 0.3 seconds at 180%
2. PWM carrier frequency	Default: 12kHz, adjustable in a range of 0.5 to 15kHz	Default: 12kHz, adjustable in a range of 0.5 to 15kHz	Default: 8kHz, adjustable in a range of 0.5 to 15kHz	Default: 2.2kHz, adjustable in a range of 0.5 to 8kHz	Default: 2.2kHz, adjustable in a range of 0.5 to 5kHz
3. Acceleration/deceleration time (factory default setting)	10 seconds	30 seconds	30 seconds	2550P1: 30 seconds 4750P1: 60 seconds	60 seconds

Noise filter inside
200V class 0.4 to 7.5kW models
400V class 0.75 to 15kW models

■General specifications

Item			Standard specification
Control specifications	Control method		Sinusoidal PWM control
	Output voltage adjustment		Main circuit voltage feedback control (Automatic regulation, "fixed" and "control off" selections possible)
	Output frequency range		0.01 to 400Hz, set to 0.01 to 80Hz by default, max. frequency adjustable from 30 to 400Hz
	Frequency setting resolution		0.01Hz: operation panel input (60Hz base), 0.015Hz: analog input (60Hz base, 12/16 bit/0-10Vdc)
	Frequency precision		+/-0.2% of the max. output frequency (25+/-10°C): analog input, +/-0.01% (25+/-10°C): digital input
	Voltage/frequency characteristic		Constant V/f, variable torque, automatic torque boost, vector control and automatic energy-saving control, base frequency 1・2・3・4 adjustment (25 to 400Hz) arbitrary V/f 5-point settings, torque boost adjustment (0 to 30%), start-up frequency adjustment (0 to 10Hz), end frequency adjustment (0 to 30Hz)
	Frequency setting signal		3kΩ petentiometer (1 to 10kΩ-potentiometer connection also possible), 0 to 10Vdc (input impedance Zin: 33kΩ), 0 to +/-10Vdc (Zin: 67kΩ), 4 to 20mAdc (Zin: 500Ω)
	Terminal board reference friquency input		2 sources can be set from a total of seven types, including analog input (RR, VI, II, RX, RX2), pulse and binary/BCD (*RX2 and binary/BCD: optional)
	Frequency jump		Can be set in three places, jump freguency and band setting
	Upper/lower limit frequencies		Upper limit frequency: 0 to maximum frequency, lower limit frequency: 0 to upper limit frequency
	PWM carrier frequency selections		Adjustable within a range of 0.5 to 15kHz (0.5 to 5kHz for 200V 75-90kW models and 400V 110-280kW models)
	PID control		proportional gainn, integral time, anti-hunting gain, filter delay adjustments
	Torque control *5		Current control reference: DC0 to +/-10V
Operation specifications	Acceleration/deceleration time		0.01 to 6000 sec., acceleration/deceleration time selectable from among 1, 2, 3 and 4, automatic acceleration/deceleration function, S-pattern accel eration/deceleration patterns 1 and 2 adjustment
	DC injection braking		Braking start frequency: adjustment (0 to 120Hz), braking current adjustment: (0 to 100%), braking time adjustment: (0 to 10 sec.), emergency stop braking function, motor shaft stationaly control function
	Forward/reverse run *1		Forward run F-CC "closed", reverse when R-CC "closed", reverse when both "closed" coast stop when ST-CC "opened", Energency stop from panel or terminal block
	Jog run *1		Jog run from panel with JOG mode selection. Terminal block operation possible with parameter settings.
	Preset-speed operation *1		Set frequency +15-speed preset speeds possible with open/close combinations. S1, S2,S3, S4 and CC Acceleration/deceleration time, torque limit and V/f selectable on a frequency
	Retry		When a pretective function activities, after main circuit devices are checked, running restarts. Settable to a max. of 10times.
	Soft-stall		Automatic load reduction control during overload (Default setting: OFF)
	Cooling fan ON/OFF		Fan is automatically stopped, When not nessesary to ensure to extended life time.
	Panel key operation ON/OFF switching		Prahibit functions such as resetonly or monitor only etc., can be scleclected. All key operations can be also prohibit. A protection reset function which requires special operation to enable it is available.
	Regenerative power ride-through control		Operation is continued even during momentary power failure using regenerative energy from the motor. (Default setting: OFF)
	Auto-restart in		The motor can be restarted at the same speed in the same direction it run under no-load conditions before stop. (Default setting: OFF)
	Simple pattern run		32 patterns in 4 groups (8 pattern in each group) can be set according to 15-speed operation frequency. Up to 32 patterns of operation, control from terminal board/repeated operation possibl.
	Commercial power/inverter switching		Power supply to motor, switchable between commercial power and inverter
	High-speed run at low-load		With this function, the load applied to the motor can be monitored. Its rotating speed is increased to improve the operation efficiency when the load applied to it is low.
	Drooping function		This function prevent a load from being imposed to a single inverter because of imbalance, when more than one inverter is used in combination to drive the load.
	Override function		Preset frequency control value adjustable by signals from an external control unit
Protection	Protective function		Stall prevention, current limit, overcurrent, overvoltage, load-side short-circuit, load-side ground fault, undervoltage, momentary power failure (15ms or longer), regeneration power ride-through control, electronic thermal overload protection, armature overcurrent during start-up, load-side overcur rent during start-up, dynamic braking resistor overload, heat sink overheat, emergency stop
	Electronic thermal characteristic		Standard motor/constant-torque VF motor switching, electronic thermal stall prevention operational level adjustment
	Reset		Reset triggered by closing 1a-contact (or opening 1b-contact), by control panel operation, or by turning on the power after turning off temporarily. Tripped state retention and clear settings
Display functions	4-digit 7-segment LED	Warning message	Stall prevention during operation, overcurrent suppression, overload, power source-side undervoltage (optional), DC circuit undervoltage, setting error, retry in process, upper/lower limits
		Fault causes	Overcurrent, overvoltage, heat sink overheat, load-side short-circuit, load-side ground fault, inverter overload, armature overcurrent during start-up, load-side overcurrent during start-up, EEPROM error, RAM error, ROM error, transfer error (dynamic braking resistor overload), (emergency stop), (undervoltage), (weak current), (overtorque), (motor overload), (output open-phase). Items in parentheses are selectable.
		Monitoring function	Operation frequency, operation frequency command, operating direction (forward/reverse), output current, DC voltage, output voltage, compensated frequency, terminal board input /output information, CPU version, control EEPROM version, tripping history, cumulative operation time, speed feedback, torque, torque command, torque current, exciting current, PID feedback value, motor overload rate, inverter overload rate, PBR overload rate, PBR load rate, power supply, output current, peak output current, peak DC voltage, motor counter pseudo PG, position pulse, RR input, VI/II input, RX input, RX2 input, FM output, AM output, fixed output for meter adjustment, flash memory version, main circuit EEPROM version, connection option types, previous default setting,previous automatic control (AU2), sink/source switching status
		Selectable unit display	Can select frequency display to match moter speed, line speed, etc. Selection of display of current in amperes/%, voltage involtage/%.
		Edit function	Parameters different from those set by default are retrieved automatically, so that parameters changed can be detected easily.
		User settings initialization	Original parameters set by user can be stored. Parameters stored can be reset to original user-defined parameters.
	LED	Charge indicater	Indicates that main circuit capacitors are chorged.
Input/output terminal logic switching			A-contact/B-contact switchable by making a selection from the programmable I/O terminal function menu. *1, *2 (Default setting: A-contact)
Sink/source switching			Common control terminal switchable between minus (CC) and plus (P24) (Default setting: minus common(CC))
Output signals	Fault detection signal		1c contact output (250Vac-2A-cosϕ = 1,250Vac-1A-cosϕ = 0.4, 30Vdc-1A)
	Low-speed/speed reach signal output *2		Open-collector output (24Vdc, Max. 50mA, output impedance: 33Ω)
	Upper/lower limit frequency output *2		Open-collector output (24Vdc, Max. 50mA, output impedance: 33Ω)
	Frequency meter output/ammeter output *3		Analog output, 1mAdc full-scale ammeter or 7.5Vdc-1mA voltmeter
	Pulse train frequency output		Open-collector output (24Vdc, Max. 50mA)
Communication functions			RS485 equipped as standard (connector: modular 8P, optional device required for communication with more than one unit) RS232C TOSLINE-F10M, TOSLINE-S20 optional. DeviceNet and ProfiBus are on the drawing board.
Service conditions	Service environment		Indoor, altitude 1000m or less, not subject to direct sunlight or corrosive/explosive gas or steam
	Ambient temperature		-10 to +50℃ (Max. 50℃, provided that the upper cover is removed when the ambient temperature exceeds 40℃.) *4, *5
	Storage temperature		-25 to +65℃
	Relative humidity		20 to 93% (no condensation allowed)
	Vibration		5.9m/s^2 or less (10 to 55Hz) (according to JIS C0040)

Notes)
*1. The 16 contact-input terminals (8 of which are optional) are programmable. For each of them, a signal can be selected from among 136 signals.
*2. For each programmable ON/OFF output terminal, a signal can be selected from among 119 signals.
*3. For each programmable analog output terminal, a signal can be selected from among 31 signals.
*4. When the cover is removed, the unit must be placed in the panel to prevent the charger from being exposed. For the 18.5kW and larger models, the unit can be used in a temperature rangeof *10 to +50℃ with the cover left attached.
*5. Sensorless vector control mode disable to torque control at low load or low speed. Vector control with sensor enable to high precision control.
*6. In case of the ambient temperature from 40℃ to 50℃, derate the load to 80% for -2150P and to 85% for -4150PL.
*7. The inverter is protected from over current by ground fault on the output side.

External dimensions

■Outline drawing

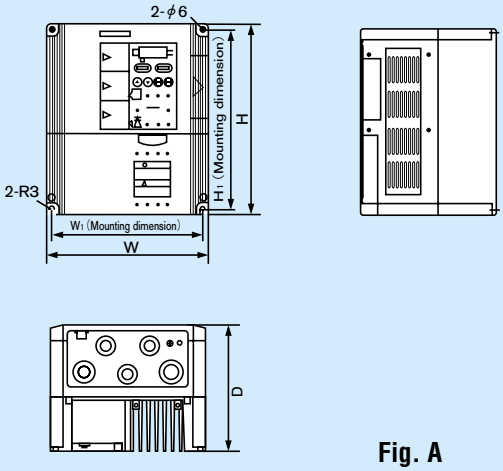


Fig. A

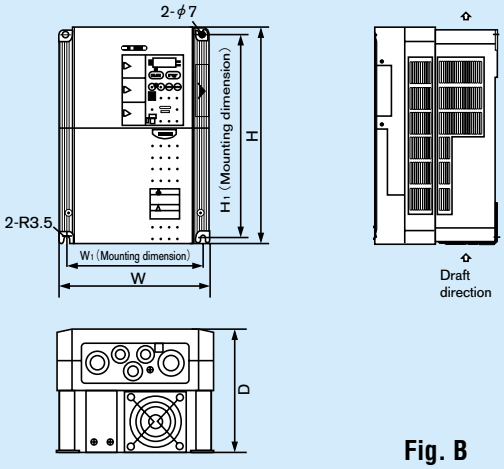


Fig. B

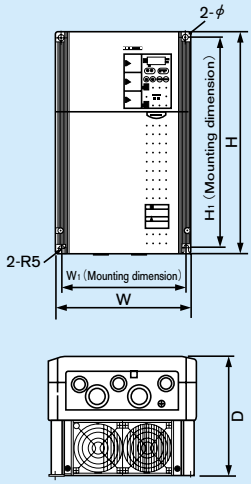


Fig. C

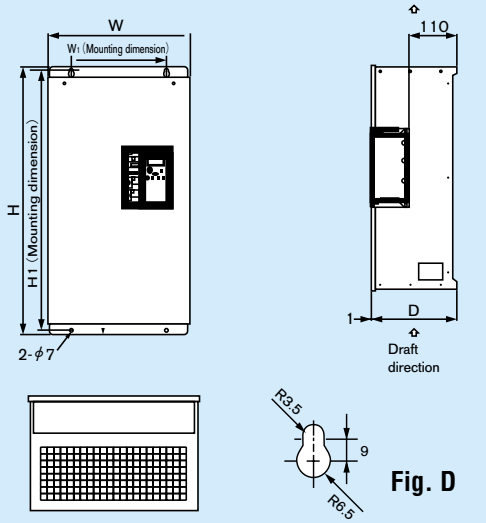
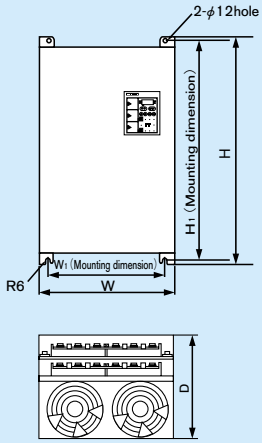


Fig. D



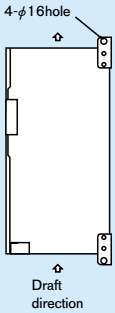
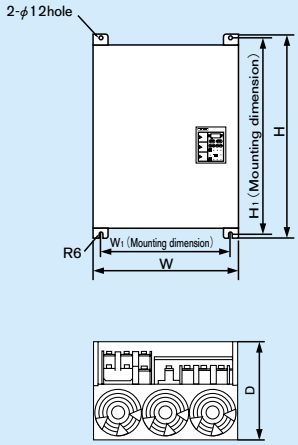


Fig. E



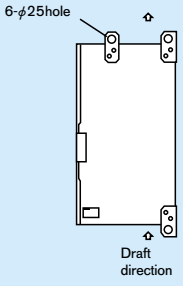


Fig. F

Noise filter inside
200V class 0.4 to 7.5kW models
400V class 0.75 to 15kW models

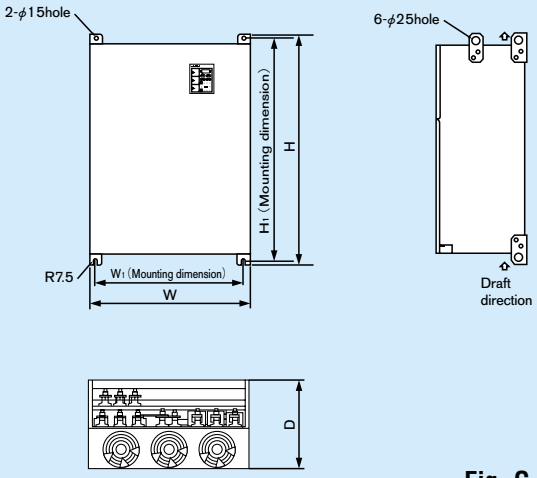


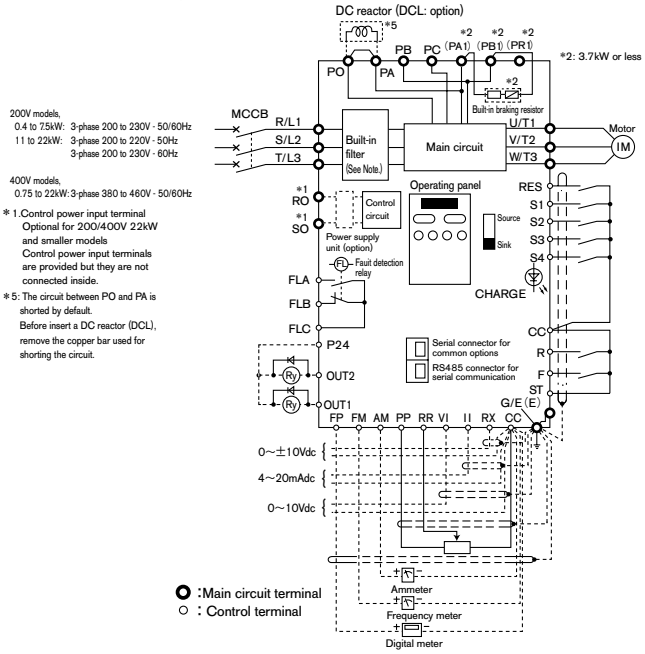
Fig. G

External dimensions/weights

Voltage class	Applicable motor capacity (kW)	Inverter type	Dimensions (mm)					External dimensions drawing	Approx. weight (kg)
			W	H	D	W_1	H_1		
200V	0.4	VFA7-2004PL	185	215	155	171	202	A	3.5
	0.75	VFA7-2007PL							3.5
	1.5	VFA7-2015PL							3.6
	2.2	VFA7-2022PL							4.0
	3.7	VFA7-2037PL							4.1
	5.5	VFA7-2055PL	210	300	173	190	280	B	6.6
	7.5	VFA7-2075PL							7.0
	11	VFA7-2110P	245	390	190	225	370	C	11
	15	VFA7-2150P							11
	18.5	VFA7-2185P			207				15.4
	22	VFA7-2220P							15.4
	30	VFA7-2300P	300	555	197	200	537	D	22.5
	New 37	VFA7-2370P1	370	630	290	317.5	609	E	44
	New 45	VFA7-2450P1							46
	New 55	VFA7-2550P1							46
	New 75	VFA7-2750P1	480	680	330	426	652	F	72
	New 90	VFA7-2900P1	660	950	370	598	920	G	148
400V	0.75	VFA7-4007PL	185	215	155	171	202	A	3.5
	1.5	VFA7-4015PL							3.6
	2.2	VFA7-4022PL							3.9
	3.7	VFA7-4037PL							4.1
	5.5	VFA7-4055PL	210	300	173	190	280	B	7.0
	7.5	VFA7-4075PL							7.1
	11	VFA7-4110PL	245	390	190	225	370	C	11
	15	VFA7-4150PL							11
	18.5	VFA7-4185P			207				15.4
	22	VFA7-4220P							15.4
	30	VFA7-4300P	300	555	197	200	537	D	24
	New 37	VFA7-4370P1	370	630	290	317.5	609	E	47
	New 45	VFA7-4450P1							48
	New 55	VFA7-4550P1							48
	New 75	VFA7-4750P1							49
	New 90/110	VFA7-4110KP1	480	680	330	426	652	F	75
	New 132	VFA7-4132KP1							77
	New 160	VFA7-4160KP1	660	950	370	598	920	G	159
	New 220	VFA7-4220KP1							166
	New 280	VFA7-4280KP1							168

Standard connection.

●Standard connection diagram for 22kW and smaller models



200V models,
0.4 to 7.5kW: 3-phase 200 to 230V - 50/60Hz
11 to 22kW: 3-phase 200 to 220V - 50Hz
3-phase 200 to 230V - 60Hz

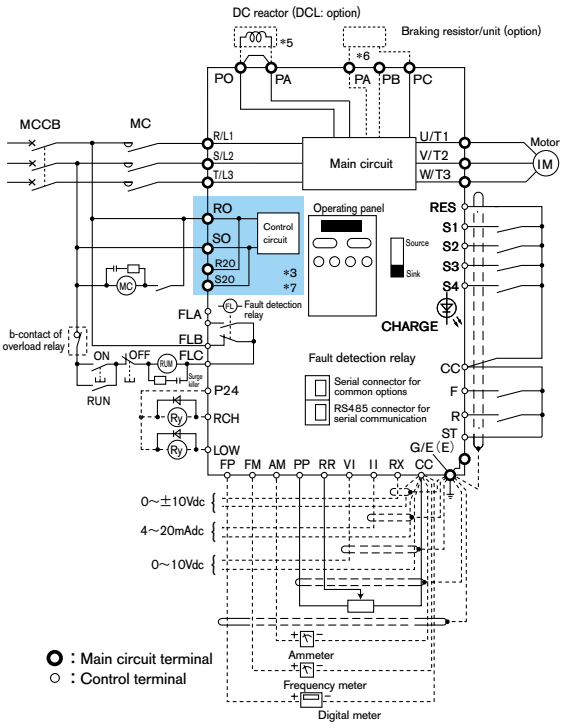
400V models,
0.75 to 22kW: 3-phase 380 to 460V - 50/60Hz

*1. Control power input terminal
Optional for 200/400V 22kW and smaller models
Control power input terminals are provided but they are not connected inside.

*5: The circuit between PO and PA is shorted by default.
Before insert a DC reactor (DCL), remove the copper bar used for shorting the circuit.

(Note) Noise filter is installed in 200V 0.4~7.5kW, 400V 0.75~15kW

●Standard connection diagram for 30 (30) kW to 90 (280) kW models

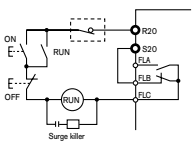


200V models,
30 to 55kW: 3-phase 200 to 220V - 50Hz
3-phase 200 to 230V - 60Hz
75, 90kW: 3-phase 200 to 230V - 50/60Hz

400V models,
30 to 75kW: 3-phase 380 to 440V - 50Hz
3-phase 380 to 460V - 60Hz
110 to 280kW: 3-phase 380 to 460V - 50/60Hz

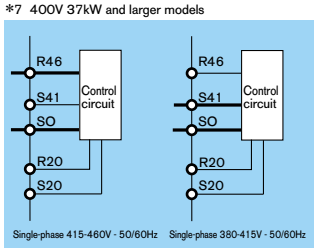
*3: Only for 400V 37kW and larger models
*4: For maintenance and inspection purposes, the RD and SO terminals of thecontrol power supply unit should be connected to the primary side of the main circuit so that the control panel can be checked only when the power supply unit is on.
*5: The circuit between PO and PA is shorted by default.
Before use, however, be sure to insert a DC reactor (DCL) for 200V 75kW or more and 400V 110kW or more and remove the copper bar used for shorting the circuit.

※Connection of a run relay in 400V model



*6: 200V 75kW or more:
400V 110kW or more:
The braking resistor connection terminals PA and PB are not provided for the standard models.
These connecters are necessary only for models with an optional built-in braking resistor circuit.

*7 400V 37kW and larger models



Noise filter inside
200V class 0.4 to 7.5kW models
400V class 0.75 to 15kW models

Description of terminal functions

■Main circuit terminals

Terminal symbol	Terminal function
G/E	Inverter grounding terminal
R/L1、S/L2、T/L3	For: 200V ～7.5kW, 75kW, 90kW, connect to a three-phase 200 to 230V-50/60Hz, 11kW～55kW, three-phase 200 to 220V-50Hz 200 to 230V-60Hz For: 400V ～22kW, 110kW～280kW, connect to a three-phase 380 to 460V-50/60Hz, 30kW～75kW, three-phase 380 to 440V-50Hz 380 to 460V-60Hz
U/T1、V/T2、W/T3	Connect to a motor (three-phase induction motor).
PA、PB	Connect to the braking resistor or a braking resistor unit (optional). Set the braking resistor operation parameters.
PC	Minus potential terminal for internal DC main circuit DC common power can be supplied with this terminal and the PA terminal (pluspotential). Note) 200V 11,15kW models need to reconstruct for DC supply input at the works. Incase of 200V/400V 18.5,22kW models, please contact us. Be sure to insert a DC reactor(DCL) for 200V 75kW or more and 400V 110kW or more.
PO、PA	Terminals for connecting a DC reactor (DCL:optional external unit). Every inverter is shipped with these terminals short-circuited with a copper bar. Be sure to remove the bar connecting the PO and the PA, when a DC reactoris used.
RO、SO （R46、R41）	Control power input terminals For: 200V ～7.5kW, 75kW, 90kW, connect to a single-phase 200 to 230V-50/60Hz, 11kW～55kW, single-phase 200 to 220V-50Hz 200 to 230V-60Hz For: 400V ～22kW, 110kW～280kW, connect to a single-phase 380 to 460V-50/60Hz, 30kW～75kW, single-phase 380 to 440V-50Hz 380 to 460V-60Hz (Between R46 and SO, connect to a single-phase 415 to 460V-50/60Hz) (Between R41 and SO, connect to a single-phase 380 to 415V-50/60Hz) Options for 200V 0.4-22kW models and 400V 0.75-22kW models
（PR1）、（PB1）	Connected to the built-in braking resistor. When no built-in braking resistor is used, change the connection from (PB1) to (PR1) and change the braking resistor operation parameters. These terminals are provided only for 3.7kW and smaller models.
（PA1）	This terminal is intended for connection of an internal unit, so it should not be used for connection of an external unit. This terminal is provided only for 3.7kW and smaller models to connect the built-in braking resistor.
（E）	This terminal is intended for connection of an internal unit, so it should not be used for connection of an external unit. This terminal is provided only for 3.7kW and smaller models to connect the inverter chassis.
R20、S20	Power supply output terminals (single-phase 207 to 230V-50/60Hz) These terminals are provided for 400V 37kW and larger models. (10VA)

■Control circuit terminals

The functions of each terminal can be changed according to its application.

Terminal symbol		Terminal function
FLA、FLB、FLC		Multifunciton programmable relay output contacts Contact ratings: 250Vac -2A ($\cos\phi$ =1), 30Vdc-1A, 250Vac-1A ($\cos\phi$=0.4) By default, these are set to the function of detecting the activation of the inverter's protective circuit. If the protective circuit is activated, the FLA and FLC circuit is closed, while the FLB and FLC circuit is opened.
P24		24Vdc power output (Max. 100mA), common at source logic
OUT1		Multifunciton programmable open-collector output (Max. 50mAdc) By default, these are set to the function of detecting a low speed and sending out a signal. Sink/source switchable
OUT2		Multifunciton programmable open-collector output (Max. 50mAdc) By default, these are set to the function of detecting the attainment of a command frequency and sending out a signal. Sink/source switchable
PF		Multifunciton programmable open-collector output (Max. 50mAdc) This produces pulses can be changed according to the parameter setting.(1.00～43.2kHz) Default setting is 3.84kHz.
FM		Multifunciton programmable analog signal output. This terminal sends out signals converted from the actual values. By default, it is set to frequency before compensated. When connecting a meter, use a 1mAdc full-scale ammeter or a 7.5Vdc-1mA full-scale voltmeter.
AM		Multifunciton programmable analog signal output. This terminal sends out signals converted from the actual values. By default, it is set to output current. When connecting a meter, use a 1mAdc full-scale ammeter or a 7.5Vdc-1mA full-scale voltmeter.
PP		Power output terminal for reference frequency setting (10Vdc). Connect a 3kΩ volume. (Connectable volume: 1 to 10kΩ-rated volumes).
RR		Multifunciton programmable analog signal input. By default, this terminal is set to frequencies of 0 to 80Hz at 0 to 10Vdc.
VI		Multifunciton programmable analog signal input. By default, this terminal is set to frequencies of 0 to 80Hz at 0 to 10Vdc.
II		Multifunciton programmable analog signal input. Default setting: frequencies of 0 to 80Hz at 4 to 20mAdc
RX		Multifunction programmable +/- analog signal input, switchable between 0 to +/-10Vdc. or 0 to +/-5Vdc. Default setting: 0 to 80Hz at 0 to +/-10Vdc for forward/reverse switching
CC		Common terminal for control circuit at sink logic.
ST	Multifunction programmable contact input (sink/source switchable)	Default setting: ready for start if ST and CC are short-circuited and stop of free-run if the circuit is opened. This terminal can be used for interlock. (Ready for start/coasting terminal)
F		Default setting: forward run if F and CC is short-circuited and slowdown stop if this circuit is opened. (ST and CC are short-circuited.)
R		Default setting: reverse run if R and CC are short-circuited and slowdown stop if this circuit is opened. (ST and CC are short-circuited.) If F-CC circuit and R-CC circuit are shorted simultaneously, then reverse run is selected. (This setting can be changed.)
S1		Default setting: Preset-speed operation if S1 and CC are short-circuited
S2		Default setting: Preset-speed operation if S2 and CC are short-circuited
S3		Default setting: Preset-speed operation if S3 and CC are short-circuited
S4		Default setting: Preset-speed operation if S4 and CC are short-circuited
RES		Default setting: Holding of the status conditions when the inverter's protective function was triggered, is reset if RES and CC are short-circuited.

Basic and extended parameters

Basic parameters

Basic parameters refer to parameters which need to be set before the first use after purchasing the inverter. Among these parameters are the parameters of acceleration/deceleration times, preset-speed operation, motor control selection.

Title	Function	Adjustment range	Default setting
AU 1	Automatic acceleration/deceleration	0: Manual acceleration/deceleration 1: Automatic acceleration/deceleration	0
AU2	Automatic V/f mode setting	0: - 1: Automatic torque boost + auto-tuning 2: Sensorless vector control (speed) + auto-tuning 3: Automatic energy-saving + auto-tuning	0
CMOd	Operation command mode selection	0: Terminal block enabled 1: Operating panel enabled 2: Common serial communication option 3: Serial communication RS485 4: Communication add-on option enabled	0
FMOd	Speed setting mode selection	1: VI (voltage input)/II (current input) 2: RR (Potentiometer/voltage input) 3: RX (voltage input) 4: RX2 (voltage input) (optional) 5: Operating panel input enabled 6: Binary/BCD input 7: Common serial communication option 8: Serial communication RS485 9: Communication add-on module option 10: Up-down frequency 11: Pulse input 1 (PG feed back option)	2
FMSL	Selection of meter connected to FM terminal	0 to 31	0
FM	Connected meter adjustment of FM terminal	—	—
tYP	Standard setting mode selection	0: - 1: 50Hz standard setting 2: 60Hz standard setting 3: Factory default setting 4: Trip clear 5: Clearing accumlating operation time 6: Initialization of type form 7: Memorization of user-defined parameters 8: Reset of user-defined parameters	0
Fr	Forward/reverse selection (At panel control only)	0: Forward, 1: Reverse	0
ACC	Acceleration time #1	0.1(0.01)～6000 [sec]	Model dependent
dEC	Deceleration time #1	0.1(0.01)～6000 [sec]	Model dependent
FH	Maximum frequency	30.0～400 [Hz]	80
UL	Upper limit frequency	0.0～FH [Hz]	80
LL	Lower limit frequency	0.0～UL [Hz]	0.0
uL	Base frequency #1	25～400 [Hz]	60
Pt	Motor control mode selection	0: Constant torque 1: Variable torque mode 2: Automatic torque boost 3: Sensorless vector control (speed) 4: Automatic torque boost + automatic energy-saving 5: Sensorless vector control (speed) + automatic energy-saving 6: V/f 5-points setting 7: Sensorless vector control (speed/torque switching) 8: PG feedback vector control (speed/torque switching) 9: PG feedback vector control (speed/position switching)	0
ub 0	Manual torque boost #1	0～30 [%]	Model dependent
OLn	Selection of electronic thermal protection characteristics	Setting / Overload protection / OL stall: 0 Standard motor: valid / invalid 1 Standard motor: valid / valid 2 Standard motor: invalid / invalid 3 Standard motor: invalid / valid 4 VF motor (special motor): valid / invalid 5 VF motor (special motor): valid / valid 6 VF motor (special motor): invalid / invalid 7 VF motor (special motor): invalid / valid	0
Sr 1 0	Preset-speed #1	LL～UL [Hz]	0.0
Sr2 0	Preset-speed #2	LL～UL [Hz]	0.0
Sr3 0	Preset-speed #3	LL～UL [Hz]	0.0
Sr4 0	Preset-speed #4	LL～UL [Hz]	0.0
Sr5 0	Preset-speed #5	LL～UL [Hz]	0.0
Sr6 0	Preset-speed #6	LL～UL [Hz]	0.0
Sr7 0	Preset-speed #7	LL～UL [Hz]	0.0
F1—— ～ F9——	Extended parameter	Setting of extended parameters listed on the following pages	—
Gr. U	Automatic edit function	Displays parameters differ from the standard setting values.	—

Extended parameters

Extended parameters are used to for detailed setting.

	Title	Function	Adjustment range	Default setting
Freguency Signal	F100	Low-speed signal output frequency	0.0～UL [Hz]	0.0
	F101	Speed reach setting frequency	0.0～UL [Hz]	0.0
	F102	Speed reach detection band	0.0～UL [Hz]	2.5
Selection of input signals	F103	ST (standby) signal selection	0: standard, 1: Always ON, 2: Linked with F/R terminals	0
	F105	Priority selection (both F-CC, R-CC is ON)	1: Reverse, 1: Stop	0
	F106	Priority setting of input terminal	0: Disabled, 1: Enabled	0
	F107	Binary/BCD signal selection (Extended terminal add-on cassette option)	0: None 5: Reverse12-bit binary input 1: 12-bit binary code 6: Reverse16-bit binary input 2: 16-bit binary code 7: Reverse3-digit BCD input 3: 3-digit BCD code 8: Reverse4-digit BCD input 4: 4-digit BCD code	0
	F108	Up-down frequency	0～7	0

	Title	Function	Adjustment range	Default setting
Selection of terminal function	F110	Always active function selection	0～135	0
	F111	Input terminal selection #1 (F)	0～135	2(F)
	F112	Input terminal selection #2 (R)	0～135	4(R)
	F113	Input terminal selection #3 (ST)	0～135	6(ST)
	F114	Input terminal selection #4 (RES)	0～135	8(RES)
	F115	Input terminal selection #5 (S1)	0～135	10(S1)
	F116	Input terminal selection #6 (S2)	0～135	12(S2)
	F117	Input terminal selection #7 (S3)	0～135	14(S3)
	F118	Input terminal selection #8 (S4)	0～135	16(S4)
	F119	Input terminal selection #9	0～135	0
	F120	Input terminal selection #10	0～135	0
	F121	Input terminal selection #11	0～135	0

Extended parameters

	Title	Function	Adjustment range	Default setting
Selection of terminal function	F122	Input terminal selection #12	0~135	0
	F123	Input terminal selection #13	0~135	0
	F124	Input terminal selection #14	0~135	0
	F125	Input terminal selection #15	0~135	0
	F126	Input terminal selection #16	0~135	0
	F130	Output terminal selection #1 (OUT1)	0~119	4(LOW)
	F131	Output terminal selection #2 (OUT2)	0~119	6(RCH)
	F132	Output terminal selection #3 (FL)	0~119	10(FL)
	F133	Output terminal selection #4	0~119	0
	F134	Output terminal selection #5	0~119	2
	F135	Output terminal selection #6	0~119	8
	F136	Output terminal selection #7	0~119	14
Terminal response time setting	F140	Input terminal #1 response time Selection(F)	2 to 200 [msec.] (in steps of 2.5 ms)	8
	F141	Input terminal #2 response time Selection(R)	2 to 200 [msec.] (in steps of 2.5 ms)	8
	F142	Input terminal #3 response time Selection(ST)	2 to 200 [msec.] (in steps of 2.5 ms)	8
	F143	Input terminal #4 response time Selection(RES)	2 to 200 [msec.] (in steps of 2.5 ms)	8
	F144	Input terminal #5-8 response time Selection	2 to 200 [msec.] (in steps of 2.5 ms)	8
	F145	Input terminal #9-16 response time Selection	2 to 200 [msec.] (in steps of 2.5 ms)	8
	F150	Output terminal #1 delay time (OUT1)	2 to 200 [msec.] (in steps of 2.5 ms)	2
	F151	Output terminal #2 delay time (OUT2)		
	F152	Output terminal #3 delay time (FL)		
	F153	Output terminal #4delay time		
	F154	Output terminal #5 delay time		
	F155	Output terminal #6 delay time		
	F156	Output terminal #7 delay time		
	F160	Output terminal #1 holding time (OUT1)	2 to 200 [msec.] (in steps of 2.5 ms)	2
	F161	Output terminal #2 holding time (OUT2)		
	F162	Output terminal #3 holding time (FL)		
	F163	Output terminal #4holding time		
	F164	Output terminal #5 holding time		
	F165	Output terminal #6 holding time		
	F166	Output terminal #7 holding time		
Basic parameters 2	F170	Base frequency 2	25~400 [Hz]	60
	F171	Base frequency voltage 2	0~600[V]	Model dependent
	F172	Manual torque boost 2	0~30[%]	Model dependent
	F173	Motor overload protection level 2	10~100[%]	100
	F174	Base frequency 3	25~400 [Hz]	60
	F175	Base frequency voltage 3	0~600[V]	Model dependent
	F176	Manual torque boost 3	0~30[%]	Model dependent
	F177	Motor overload protection level 3	10~100[%]	100
	F178	Base frequency 4	25~400 [Hz]	60
	F179	Base frequency voltage 4	0~600[V]	Model dependent
	F180	Manual torque boost 4	0~30[%]	Model dependent
	F181	Motor overload protection level 4	10~100[%]	100
	F182	Motor switching mode selection	0: Standard,1: Customizd	0
	F183	V/f adjustment coefficient	0~255	32
V/f 5-point setting	F190	V/f 5-point setting VF1 frequency	0.0~400[Hz]	0
	F191	V/f 5-point setting VF1 voltage	0~100[%]	0
	F192	V/f 5-point setting VF2 frequency	0.0~400[Hz]	0
	F193	V/f 5-point setting VF2 voltage	0~100[%]	0
	F194	V/f 5-point setting VF3 frequency	0.0~400[Hz]	0
	F195	V/f 5-point setting VF3 voltage	0~100[%]	0
	F196	V/f 5-point setting VF4 frequency	0.0~400[Hz]	0
	F197	V/f 5-point setting VF4voltage	0~100[%]	0
	F198	V/f 5-point setting VF5 frequency	0.0~400[Hz]	0
	F199	V/f 5-point setting VF5 voltage	0~100[%]	0
Speed / torque reference gain/bias settings	F200	Reference priority selection	0:FMOd,1:F207, 2: FMOd priority, 3:F207 priority, 4: FMOd/F207 switding	0
	F201	VI/II reference point #1	0~100[%]	20
	F202	VI/II reference point #1 frequency	0~FH [Hz]	0
	F203	VI/II reference point #2	0~100[%]	100
	F204	VI/II reference point #2 frequency	0~FH [Hz]	80.0
	F205	VI/II reference point #1 %	0~250[%] (For torque control)	0
	F206	VI/II reference point #2 %	0~250[%] (For torque control)	100
	F207	Speed setting mode selection #2	Same as FMOd (1 to 11)	1
	F208	FMOd/F207 switching frequncy	0.1~ FH [Hz]	1.0
	F209	Analog input filter	0 (disabled) to 3 (max. filter capacity)	0
Speed and torque command gain/bias settings	F210	RR reference point #1	0~100[%]	0
	F211	RR point #1 frequency	0~FH [Hz]	0.0
	F212	RR reference point #2	0~100[%]	100
	F213	RR point #2 frequency	0~FH [Hz]	80.0
	F214	RR point #1 rate	0~250[%] (For torque control)	0
	F215	RR point #2 rate	0~250[%] (For torque control)	100
	F216	RX reference point #1	-100~100[%]	0.0
	F217	RX point #1 frequency	-FH~FH [Hz]	0.0
	F218	RX reference point #2	-100~100[%]	100
	F219	RX point #2 frequency	-FH~FH [Hz]	80.0
	F220	RX reference point #1 rate	-250~250[%] (For torque control)	0
	F221	RX reference point #2 rate	-250~250[%] (For torque control)	100
	F222	RX 2 reference point #1	-100~100[%]	0.0
	F223	RX 2 point #1 frequency	-FH~FH [Hz]	0
	F224	RX 2 reference point #2	-100~100[%]	100
	F225	RX 2 point #2 frequency	-FH~FH [Hz]	80.0
	F226	RX 2 reference point #1 rate	-250~250[%] (For torque control)	0
	F227	RX 2 reference point #2 rate	-250~250[%] (For torque control)	100
	F228	BIN 2 reference point #1	0~100[%]	0.0
	F229	BIN point #1 frequency	-FH~FH [Hz]	0.0
	F230	BIN reference point #2	0~100[%]	100
	F231	BIN point #2 frequency	-FH~FH [Hz]	80.0
	F232	BIN reference point #1 rate	-250~250[%] (For torque control)	0
	F233	BIN reference point #2 rate	-250~250[%] (For torque control)	100

	Title	Function	Adjustment range	Default setting
Speed and torque command gain/bias settings	F234	Pulse reference point #1	-100~100[%]	0.0
	F235	Pulse point #1 frequency	-FH~FH [Hz]	0.0
	F236	Pulse reference point #2	-100~100[%]	100
	F237	Pulse point #2 frequency	-FH~FH [Hz]	80.0
Start/end frequencies	F240	Start-up frequency setting	0.0~10[%]	0.1
	F241	Run frequency setting	0.0~FH [Hz]	0.0
	F242	Run frequency hysteresis	0.0~30[Hz]	0.0
	F243	End frequency setting	0.0~30[Hz]	0.0
	F244	Dead band of 0Hz frequency setting signal	0~5[Hz]	0
DC injection braking	F250	DC injection braking start frequency	0.0~120[Hz]	0.0
	F251	DC injection braking current	0~100[%]	50
	F252	DC injection braking time	0.0~10.0[sec.]	1.0
	F253	Forward/reverse DC braking priority control	0:OFF, 1:ON	0.0
	F254	Motor shaft fixing control	0:Disabled 1:Enabled	0.0
	F255	Output function of 0Hz command for stop	0:Standard(DC injection braking) 1:0[Hz] command	0
Jog	F260	Jog run frequency	0.0~20[Hz]	0
	F261	Jog stop control	0: Deceleration stop, 1: Coast stop, 2: DC injection braking stop	0.0
Jump frequency	F270	Jump frequency #1	0.0~FH [Hz]	0.0
	F271	Jump frequency band #1	0.0~30[Hz]	0.0
	F272	Jump frequency #2	0.0~FH [Hz]	0.0
	F273	Jump frequency band #2	0.0~30[Hz]	0.0
	F274	Jump frequency #3	0.0~FH [Hz]	0.0
	F275	Jump frequency band #3	0.0~30[Hz]	0.0
	F276	Object of jump frequency process	0: process amount, 1: output frequency	1
Preset-speed frequencies	F287	Preset-speed frequency #8	LL~UL [Hz]	0.0
	F288	Preset-speed frequency #9	LL~UL [Hz]	0.0
	F289	Preset-speed frequency #10	LL~UL [Hz]	0.0
	F290	Preset-speed frequency #11	LL~UL [Hz]	0.0
	F291	Preset-speed frequency #12	LL~UL [Hz]	0.0
	F292	Preset-speed frequency #13	LL~UL [Hz]	0.0
	F293	Preset-speed frequency #14	LL~UL [Hz]	0.0
	F294	Preset-speed frequency #15	LL~UL [Hz]	
PWM Carrier frequency	F300	PWM carrier frequency	0.5~15.0(8.0, 5.0)[kHz] Model dependent	Model dependent
Tripless enhancement settings	F301	Auto-restart (motor speed search)	0: Disabled, 1: Available at power failure, 2: ST ON/OFF, 3: 1+2	0
	F302	Regenerative power ride-through control/Deceleration time	0: OFF, 1: ON, 2: ON(Deceleration stop)	0
	F303	Retry selection	0: Disabled, 1 to 10 times	0
	F304	Dynamic braking mode selection	0: Disabled, 1: Enabled/overload detection enabled	Model dependent
	F305	Over voltage stall protection	0: Disabled, 1: Enabled, 2: Enabled (Forced shorted deceleration)	0
	F306	Voltage of base frequency (output voltage adjustment)	0~600[V]	Model dependent
	F307	Selection of base frequency voltage (Voltage compensation)	0: without voltage compensation (output voltage not limited) 1: with voltage compensation (output voltage not limited) 2: without voltage compensation (output voltage limited) 3: with voltage compensation (output voltage limited)	1
	F308	PBR resistance	1.0~1000[Ω]	Model dependent
	F309	PBR resistor capacity	0.01~600[kW]	Model dependent
	F310	Ride-through time/Deceleration time	0.0~320 [sec.]	2.0
	F311	Reverse-run prohibition selection	0: All directions permitted 1: Reverse run prohibited 2: Forward run prohibited 3: Direction designated by command permitted	0
	F312	Auto-restart adjustment parameter 1	0.5~2.5	Model dependent
	F313	Auto-restart adjustment paarmeter 2	0.5~2.5	Model dependent
	F314	Auto-restart mode selection	0~4	Model dependent
	F315	Auto-restart adjustment parameter 3	0~9	1
Drooping control	F320	Drooping gain	0.00~100[%] (Enabled if Pt = 7, 8 or 9)	0
	F321	Speed at drooping gain 0%	0.0~320[Hz] (Enabled if Pt = 7, 8 or 9)	60
	F322	Speed at drooping gain F320	0.0~320[Hz] (Enabled if Pt = 7, 8 or 9)	60
	F323	Drooping insensitive torque band	0.00~100[%] (Enabled if Pt = 7, 8 or 9)	10
	F324	Output filter for drooping	0.1~200 [sec.]	100
	F325	Load inertia(Acc/Dec torque)	0~100	1.0
	F326	Load torque filter(Acc/Dec torque)	0.0~199.9, 200.0: without filter	200.0
	F327	Drooping reference selection	0: Standard, 1: Acc/dec torque removal	0
Functions for crane/noise	F330	Selection of high-speed operation at low-load	0~5	0
	F331	Lower limit frequency for low-load high-speed operation switching	30~UL [Hz]	40
	F332	Load detection delay time during low-load high-speed operation	0.0~10.0 [sec.]	1.0
	F333	Load detection time during low-load high-speed operation	0.0~10.0 [sec.]	1.0
	F334	Heavy load detection time during low-load high-speed operation	0.0~10.0 [sec.]	5.0
	F335	Switching load torque during forward run	0.00~250[%]	50
	F336	Heavy load torque during acceleration in forward direction	0.00~250[%]	150
	F337	Heavy load torque during deceleration in forward direction	0.00~250[%]	100
	F338	Switching load torque during reverse run	0.00~250[%]	50
	F339	Heavy load torque during acceleration in reverse direction	0.00~250[%]	150
	F340	Heavy load torque during deceleration in reverse direction	0.00~250[%]	100
	F341	Fregeency for automatic high-speed operayion at low-load	30.0~UL [Hz]	80
Commercial power/ inverter switching	F354	Output signal selection of commercial power/ inverter switching	0: OFF 1: Automatic switching in case of trip 2: Commercial power switching frequency setting enabled 3: Commercial power switching frequency setting enabled Automatic switching in case of trip	0
	F355	Commercial power/inverter switching frequency	0.0~FH[Hz]	60.0
	F356	Inverter-side switching waiting time	Model dependent~10.0 [sec.]	Model dependent
	F357	Commercial power-side switching waiting time	0.1~10.0 [sec.]	0.62
	F358	Commercial power switching frequency holding time	0.1~10.0 [sec.]	2.0

Extended parameters

	Title	Function	Adjustment range	Default setting
PID control	F360	Signal selection of PID control	0: PID control disabled, 1: VI/II, 2: RR, 3: RX, 4: RX2	0
	F361	Delay filter	0～255	0
	F362	Proportional (P) gain	0.01～100	0.1
	F363	Integral (I) gain	0.01～100	0.1
	F364	PID deviation upper limit	0～50[%]	50
	F365	PID deviation lower limit	0～50[%]	50
	F366	Differential (D) gain	0.0～25.5	0.0
Speed feedback/positioning control	F367	Number of PG input pulses	1 to 9999 [pulse/revolution]	500
	F368	Selection of number of PG input phases	1: Single-phase input, 2: Two-phase input	2
	F369	PG disconnection detection selection	0: Disabled, 1: Enabled	0
	F370	Electronic gear	100～4000 Pulses/Rotation	1000
	F371	Position loop gain	0.0～100.0	4.0
	F372	Positioning completion range	1～4000	100
	F373	Frequency limit at position control	1～8000, 8001: Disabled	800
	F374	Current control proportional gain	100～1000	209.1
	F375	Current control integral gain	100～1250	Model dependent
	F376	Speed loop proportional gain	3.2～1000	Model dependent
	F377	Speed loop integral gain	0.1～200.0[rad/sec.]	Model dependent
	F378	Motor counter data selection	0～5	0
	F379	Speed loop parameter ratio	0.01～10.00[s]	1.00
Preset-speed operation mode	F380	Selection of preset-speed operation mode	0: Non-mode preset speed, 1: Preset speed by mode	0
	F381	Preset-speed operation frequency #1 control mode	0: Forward run +1: Reverse run +2: Selection of acceleration/deceleration 1 +4: Selection of acceleration/deceleration 2 +8: Selection of V/f 1 +16: Selection of V/f 2 +32: Selection of torque limit 1 +63: Selection of torque limit 2	0
	F382	Preset-speed operation frequency #2 control mode	Ditto	0
	F383	Preset-speed operation frequency #3 control mode	Ditto	0
	F384	Preset-speed operation frequency #4 control mode	Ditto	0
	F385	Preset-speed operation frequency #5 control mode	Ditto	0
	F386	Preset-speed operation frequency #6 control mode	Ditto	0
	F387	Preset-speed operation frequency #7 control mode	Ditto	0
	F388	Preset-speed operation frequency #8 control mode	Ditto	0
	F389	Preset-speed operation frequency #9 control mode	Ditto	0
	F390	Preset-speed operation frequency #10 control mode	Ditto	0
	F391	Preset-speed operation frequency #11control mode	Ditto	0
	F392	Preset-speed operation frequency #12 control mode	Ditto	0
	F393	Preset-speed operation frequency #13 control mode	Ditto	0
	F394	Preset-speed operation frequency #14 control mode	Ditto	0
	F395	Preset-speed operation frequency #15 control mode	Ditto	0
	F396	Torque command filter2	0～100	0
	F397	Speed loop proportional gain2	3.2～Model dependent	Model dependent
	F398	Speed loop integral gain2	0.1～Model dependent	Model dependent
Motor constant	F400	Auto-tuning selection	0: Without auto-tuning (internal table) 1: Motor constant initialization 2: Auto-tuning execution (0 after executed)	0
	F401	Slip frequency gain	0.0～2.55	0.6
	F402	Motor constant 1 (primary resistance)	0.0～100000[mΩ]	Model dependent
	F403	Motor constant 2 (secondary resistance)	0.0～100000[mΩ]	Model dependent
	F404	Motor constant 3 (exciting inductance)	0.0～6500[mH]	Model dependent
	F405	Motor constant 4 (load inertia moment)	0.0～100.0	1.0
	F410	Motor constant 5 (leak inductance)	0.0～650.0[mH]	Model dependent
	F411	Number of poles of motor	2、4、6、8、10、12、14、16[pole]	4
	F412	Rated capacity of motor	0.1～Model dependent [kW]	Model dependent
	F413	Motor type	0: Toshiba standard motor #1 1. Toshiba VF motor 2: Toshiba V3 motor 3: Toshiba standard moter #2 4: Other motors	0
	F414	Selection of auto-tuning 2	0: Disabled, 1: Executed if F400= 2	1
Torque control	F420	Torque command selection	1: VI/II 7: Common communication Cserial option 2: RR 3: RX 8: Serial communication RS485 4: RX2 5: Panel parameter 9: Communication add-on cassette option 6: Binary/BCD input	3
	F421	Torque command filter	10～199.9, 200 (no filter)	200
	F422	Selection of synchronieed torque bias input	0: Disabled, 1 to 9 (Same as F420)	0
	F423	Selection of tension torque bias input	0: Disabled, 1 to 9 (Same as F420)	0
	F424	Load sharing gain input selection	0: Disabled, 1 to 9 (Same as F420)	0
	F425	Forward speed limit input selection	0: Disabled、1: VI/II、2:RR、3:RX、4:RX2、5: F426	0
	F426	Forward speed limit lievel	0.0～UL	80.0
	F427	Reverse speed limit input selection	0: Disabled、1: VI/II、2:RR、3:RX、4:RX2、5: F428	0
	F428	Reverse speed limit level	0.0～UL [Hz]	80.0
	F429	Torque command mode selection	0:Fixed direction, 1:F/R permited	0
	F430	Selection of speed limit (torque=0) center reference	0: Disabled、1: VI/II、2: RR、3: RX、4: RX2、5: F431	5
	F431	Speed limit(torqu=0) level	0～FH[Hz]	0
	F432	Speed limit(torqu=0) band	0～FH[Hz]	0
	F433	Speed limit(torqu=0) recovery time	0～2.5[sec]	0.2
Torque limit	F442	Selection of regenerative torque limit #1	0: Disabled、1: VI/II、2:RR、3:RX、4:RX2、5: F443	5
	F443	Regenerative torque limit #1	0～249[%]、250: Disabled	250
	F444	Power running torque limit #2	0～249[%]、250: Disabled	250
	F445	Regenerative torque limit #2	0～249[%]、250: Disabled	250
	F446	Power running torque limit #3	0～249[%]、250: Disabled	250
	F447	Regenerative torque limit #3	0～249[%]、250: Disabled	250
	F448	Power running torque limit #4	0～249[%]、250: Disabled	250
	F449	Regenerative torque limit #4	0～249[%]、250: Disabled	250

	Title	Function	Adjustment range	Default setting
Torque limit	F450	Torque limit mode selection	0: Power-running/regenerative torque limit, 1: Positive/negative torque limit	
	F451	Torque limit mode	0: Standard, 1: no speed cooperation	0
	F452	Continuous stall trip detection time during power running	0.0～1.0[s]	0.0
	F453	Stall prevention during regeneration	0: Stall, 1: Stall is prevented	0
	F454	Current differential gain	0.00～327.6	123.0
	F470	VI/II reference bias	0～255	99
	F471	VI/II reference gain	0～255	142
	F472	RR reference bias	0～255	100
	F473	RR reference gain	0～255	164
	F474	RX reference bias	0～255	67
	F475	RX reference gain	0～255	128
	F476	RX2 reference bias	0～255	67
	F477	RX2 reference gain	0～255	128
	F480	Exciting strengthening coefficient	0～255	64
	F481	Over -excitation cooperation	0: Enabled, 1: Applied by F480setting	0
	F482	Modulation rate control margin(current control)	80.0～300.0[%]	90.0
	F483	Modulation rate control margin(voltage control)	80.0～300.0[%]	105.0
	F484	Modulation rate control margin(V/f control)	80.0～300.0[%]	105.0
	F485	Stall cooperation gain at field weakening zone	0～255	128
	F486	Exciting starting rate	1.64～327.6	163.8
	F487	Compensation coefficient for iron loss	0～255	10
	F488	Voltage compensation coefficient for dead time	0.00～327.6	3.90
	F489	Dead time Compensation	0: Enabled, 1: Disabled	0
	F490	Dead time Compensation(bias time)	-3.27～3.27	0.00
	F491	Current / voltage control switching frequency	10.0～60.0[Hz]	40.0
Acceleration/deceleration 2	F500	Acceleration time #2	F508～6000[sec.]	Model dependent
	F501	Deceleration time #2	F508～6000[sec.]	Model dependent
	F502	Acceleration/deceleration #1pattern	0: Linear, 1: S-pattern 1, 2: S-pattern 2	0
	F503	Acceleration/deceleration #2pattern	0: Linear, 1: S-pattern 1, 2: S-pattern 2	0
	F504	Panel acceleration/deceleration #1, 2, 3, 4 selection	1: Acceleration/deceleration #1 2: Acceleration/deceleration #2 3: Acceleration/deceleration #3 4: Acceleration/deceleration #4	1
	F505	ACC/Dec switching frequency #1	0.0～FH [Hz]	0
	F506	S-pattern lower-limit adjustment amount	0～50[%]	25
	F507	S-pattern upper-limit adjustment amount	0～50[%]	25
	F508	ACC/Dec time lower limit	0.01～10[sec.]	0.1
	F510	Acceleration time #3	F508～6000[sec.]	Model dependent
	F511	Deceleration time #3	F508～6000[sec.]	Model dependent
	F512	ACC/Dec #3 pattern	0: Linear, 1: S-pattern 1, 2: S-pattern 2	0
	F513	ACC/Dec switching frequency #2	0.0～FH [Hz]	0.0
	F514	Acceleration time #4	F508～6000[sec.]	Model dependent
	F515	Deceleration time #4	F508～6000[sec.]	Model dependent
	F516	Pattern #4	0: Linear, 1: S-pattern 1, 2: S-pattern 2	0
	F517	ACC/Dec switching frequency #3	0.0～FH [Hz]	0.0
Patterned operation	F520	Pattern run selection	0: No, 1: Yes	0
	F521	Pattern run mode	0: Patterned operation canceled during stop 1: Patterned operation continued during stop	0
	F530	Number of cycles of pattern group #1	1～254, 255:∞	1
	F531	Selection 1 of pattern group #1	0: Skip, 1 to 15	1
	F532	Selection 2 of pattern group #1	0: Skip, 1 to 15	2
	F533	Selection 3 of pattern group #1	0: Skip, 1 to 15	3
	F534	Selection 4 of pattern group #1	0: Skip, 1 to 15	4
	F535	Selection 5 of pattern group #1	0: Skip, 1 to 15	5
	F536	Selection 6 of pattern group #1	0: Skip, 1 to 15	6
	F537	Selection 7 of pattern group #1	0: Skip, 1 to 15	7
	F538	Selection 8 of pattern group #1	0: Skip, 1 to 15	8
	F540	Number of cycles of pattern group #2	1～254, 255:∞	1
	F541	Selection 1 of pattern group #2	0: Skip, 1 to 15	9
	F542	Selection 2 of pattern group #2	0: Skip, 1 to 15	10
	F543	Selection 3 of pattern group #2	0: Skip, 1 to 15	11
	F544	Selection 4 of pattern group #2	0: Skip, 1 to 15	12
	F545	Selection 5 of pattern group #2	0: Skip, 1 to 15	13
	F546	Selection 6 of pattern group #2	0: Skip, 1 to 15	14
	F547	Selection 7 of pattern group #2	0: Skip, 1 to 15	15
	F548	Selection 8 of pattern group #2	0: Skip, 1 to 15	0
	F550	Number of cycles of pattern group #3	1～254, 255:∞	1
	F551	Selection 1 of pattern group #3	0: Skip, 1 to 15	1
	F552	Selection 2 of pattern group #3	0: Skip, 1 to 15	2
	F553	Selection 3 of pattern group #3	0: Skip, 1 to 15	3
	F554	Selection 4 of pattern group #3	0: Skip, 1 to 15	4
	F555	Selection 5 of pattern group #3	0: Skip, 1 to 15	5
	F556	Selection 6 of pattern group #3	0: Skip, 1 to 15	6
	F557	Selection 7 of pattern group #3	0: Skip, 1 to 15	7
	F558	Selection 8 of pattern group #3	0: Skip, 1 to 15	8
	F560	Number of cycles of pattern group #4	1～254, 255:∞	1
	F561	Selection 1 of pattern group #4	0: Skip, 1 to 15	9
	F562	Selection 2 of pattern group #4	0: Skip, 1 to 15	10
	F563	Selection 3 of pattern group #4	0: Skip, 1 to 15	11
	F564	Selection 4 of pattern group #4	0: Skip, 1 to 15	12
	F565	Selection 5 of pattern group #4	0: Skip, 1 to 15	13
	F566	Selection 6 of pattern group #4	0: Skip, 1 to 15	14
	F567	Selection 7 of pattern group #4	0: Skip, 1 to 15	15
	F568	Selection 8 of pattern group #4	0: Skip, 1 to 15	
	F570	Speed #1 operation continuation mode	0: Operation time in sec. after start of operation 1: Operation time in min. after start of operation 2: Operation time in sec. after attainment of frequency 3: Operation time in min. after attainment of frequency 4: Infinite (continued until stop command is entered) 5: Continued until time step command is entered	0

Extended parameters

	Title	Function	Adjustment range	Default setting
Patterned operation	F571	Speed #2 operation continuation mode	Ditto	0
	F572	Speed #3operation continuation mode	Ditto	0
	F573	Speed #4 operation continuation mode	Ditto	0
	F574	Speed #5 operation continuation mode	Ditto	0
	F575	Speed #6 operation continuation mode	Ditto	0
	F576	Speed #7 operation continuation mode	Ditto	0
	F577	Speed #8operation continuation mode	Ditto	0
	F578	Speed #9operation continuation mode	Ditto	0
	F579	Speed #10 operation continuation mode	Ditto	0
	F580	Speed #11operation continuation mode	Ditto	0
	F581	Speed #12 operation continuation mode	Ditto	0
	F582	Speed #13operation continuation mode	Ditto	0
	F583	Speed #14 operation continuation mode	Ditto	0
	F584	Speed #15 operation continuation mode	Ditto	0
	F585	Speed #1 operation time	1 to 8000 [sec./min.]	5
	F586	Speed #2 operation time	1 to 8000 [sec./min.]	5
	F587	Speed #3 operation time	1 to 8000 [sec./min.]	5
	F588	Speed #4 operation time	1 to 8000 [sec./min.]	5
	F589	Speed #5 operation time	1 to 8000 [sec./min.]	5
	F590	Speed #6 operation time	1 to 8000 [sec./min.]	5
	F591	Speed #7 operation time	1 to 8000 [sec./min.]	5
	F592	Speed #8 operation time	1 to 8000 [sec./min.]	5
	F593	Speed #9 operation time	1 to 8000 [sec./min.]	5
	F594	Speed #10 operation time	1 to 8000 [sec./min.]	5
	F595	Speed #11 operation time	1 to 8000 [sec./min.]	5
	F596	Speed #12 operation time	1 to 8000 [sec./min.]	5
	F597	Speed #13 operation time	1 to 8000 [sec./min.]	5
	F598	Speed #14 operation time	1 to 8000 [sec./min.]	5
	P599	Speed #15 operation time	1 to 8000 [sec./min.]	5
Protective functions	F600	Motor overload protection level 1	10～100 [%]	100
	F601	Stall prevention level 1	0～199[%],200: Disabled	150
	F602	Selection of inverter trip holding	0: Cleared if power is turned off 1: Held even if power if turned off	0
	F603	Emergency stop mode selection	0: Coast stop 1: Deceleration stop 2: Emergency DC injection braking stop 3: Coast stop without FL output 4: Deceleration stop without FL output 5: Emergency DC injection braking without FL output	0
	F604	Emergency DC injection braking stop control time	0.0～10.0[sec.]	0.1
	F605	Output phase failure detection parameter	0: Not selected, 1: Selected	0
	F606	OL reduction starting frequency	0～30[Hz]	6.0
	F607	Motor 150%-overload time limit	10～2400[sec.]	600
	F608	Timing of relay for suppressing rushed current	0.3～2.5[sec.]	0.3
	F609	Mode selection of relay for suppressing rushed current	0: Standard, 1: Gearing of ST	0
	F610	Low current trip mode selection	0: Not selected 1: Selected	0
	F611	Low current (trip/alarm) detection current	0～100 [%]	0
	F612	Low current (trip/alarm) detection time	0～255[sec.]	0
	F613	Selection of output short-circuit pulse during start-up	0: Default setting,1: Only one time when power is turned on or at first start after reset	0
	F614	Adjustment of output short-circuit pulse during start-up	1 to 100 [msec.]	50
	F615	Over-torque trip selection	0: Trip disabled 1: Trip enabled	0
	F616	Over-torque (trip/alarm) level during power operation	0～250 [%]	150
	F617	Over-torque (trip/alarm) level during regeneration	0～250 [%]	150
	F618	Over-torque detection time	0.0～10.0 [sec.]	0.5
	F620	Cooling fan control mode selection	0: Automatic, 1: Always ON	0
	F621	Cumulative run timer alarm setting	0.1～999.9 [×100h]	175.0
	F622	Abnormal speed detection filter	0.01～100 [sec.]	10
	F623	Over-speed detection frequency range	0: Disabled,0.1～30.0[Hz]	0
	F624	Speed drop detection frequency range	0: Disabled,0.1～30.0[Hz]	0
	F625	Overvoltage limit operation level (high response)	50～250 [%]	135
	F626	Overvoltage limit operation level	50～250 [%]	130
	F627	Undervoltage trip mode selection	0: Trip disabled 1: Trip (during run)	0
	F628	Undervoltage (trip/alarm) detection time	0～10 [sec.]	0.03
	F629	UV stall level	50～100 [%]	75
	F630	Braking trouble internal timer	0: Disabled, 0.1～10.0	0
	F631	Position deviation limit	0.1～6553	16
	F632	Brake release time after run	0.00～2.50	0.00
	F633	VIA low level input trip selection	0～100	0
Special analog input	F650	ACC/Dec base frequency adjustment	0: Disabled、1:VI/II、2:RR	0
	F651	Upper-limit frequency adjustment	0: Disabled、1:VI/II、2:RR	0
	F652	Acceleration time adjustment	0: Disabled、1:VI/II、2:RR	0
	F653	Deceleration time adjustment	0: Disabled、1:VI/II、2:RR	0
	F654	Torque boost adjustment	0: Disabled、1:VI/II、2:RR	0
Override	F660	Override addition input selection	0: Disabled 1: VI (voltage input)/II (current input) 2: RR (volume/voltage input) 3: RX (voltage input) 4: RX2 (voltage input) (optional) 5: Panel input enabled 6: Binary/BCD input 7: Common communication serial option 8: Serial communication RS485 9: Communication add-on option 10: Up-down frequency 11: Pulse input 1 (vector control-compatible circuit board)	0
	F661	Override multiplication input selection	0: Disabled、1:VI/II、2:RR、3:RX、4:RX2、5:F729	0
Meter output	F670	AM terminal meter selection	0～31	2 output current
	F671	AM-terminal meter adjustment	—	—
	F672	Optional analog terminal 1 meter selection	0～31	4
	F673	Optional analog terminal1 meter adjustment	—	—

	Title	Function	Adjustment range	Default setting
Meter output	F674	Optional analog terminal 2 meter selection	0～31	5
	F675	Optional analog terminal 2 meter adjustment	—	—
	F676	FP terminal meter selection	0～31	0
	F677	FP terminal meter adjustment	1.00～43.20[Hz]	3.84
	F678	Optional analog terminal 1 meter offset	−10.0～60.0	0
	F679	Optional analog terminal 2 meter offset	−10.0～60.0	0
	F680	Selection of optional analog terminal mark	0～3	0
Control panel parameters	F700	Selection of prohibition of parameter setting	0: Allowed, 1: Prohibited	0
	F701	Selection of current/voltage display mode	0: %, 1: A (ampere)/V (volt)	0
	F702	Frequency free unit magnification	0: OFF、0.01～200	0
	F703	Selection of decimal place number of frequency	0: 1Hz、1: 0.1Hz、2: 0.01Hz	1
	F704	Decimal place number of acc/dec time	0: 1[s], 1: 0.1[s], 2: 0.1[s]	1
	F709	Prohibition of user parameter initialization at type from initialization	0: Allowed 1: Prohibited	0
	F710	Selection of monitor display mode	0～29	0
	F711	Selection of status monitor #1 display mode	0～29	1
	F712	Selection of status monitor #2 display mode	0～29	2
	F713	Selection of status monitor #3 display mode	0～29	3
	F714	Selection of status monitor#4 display mode	0～29	4
	F720	Selection of panel V/f 1, 2, 3 or 4	1、2、3、4	1
	F721	Selection of panel stop pattern	0: Deceleration stop, 1: Free run	0
	F722	Panel reset function selection	0: Disabled, 1: Enabled	1
	F723	Panel torque limit selection	1、2、3、4	1
	F724	Panel PID control OFF	0 : ON 1 : OFF	0
	F725	Panel torque command	0～250[%]	0
	F726	Panel external torque rivise	−250～250[%]	0
	F727	Panel tension torque reference	−250～250[%]	0
	F728	Panel load sharing gain	0～250[%]	100
	F729	Panel override multiplication gain	−100～100[%]	0
	F730	Panel operation inhibit	0: All key operations disabled +1: Panel frequency setting enabled +2: Parameter reading enabled +4: Monitor display operation enabled +8: Motor stop operation enabled +16: Free-run stop operation enabled +32: Emergency stop operation enabled 63: Default mode (all key operation enabled)	63
Communication function	F800	Communication band rate (logic)	0: 1200, 1: 2400, 2: 4800, 3: 9600	3
	F801	Parity (RS485)	0: No parity, 1: Even parity, 2: Odd parity	1
	F802	Inverter number	0～255	0
	F803	Communication time-out (logic/RS485)	0: OFF, 1～100[s]	0
	F804	Communication time-out activation (logic/RS485)	0～8	8
	F805	Communication internal (logic)	0.00: Normal, 0.01～2.00[s]	0
	F806	Inter-drive communication (common serial)	0: Normal, 1: Frequency reference, 2: Output frequency 3: Torque reference, 4: Output torque	0
	F810	Frequency point selection	0: Disabled, 1: Common serial, 2: RS485, 3: Communication add-on option	0
	F811	Point #1 setting	0～100[%]	0
	F812	Point #1 frequency	0～FH [Hz]	0
	F813	Point #2 setting	0～100[%]	100
	F814	Point #2 frequency	0～FH [Hz]	80
	F820	Communication baud rate (RS485)	0: 1200, 1: 2400, 2: 4800, 3: 9600, 4: 19200, 5: 38400	3
	F821	RS-485 connection system	0: 2-line system, 1: 4-line system	1
	F825	RS-485 transmission wating time	0: Normal, 0.01～2.00[s]	0
	F826	Inter-drive communication setup (RS-485)	0: Normal, 1: Frequency, 2: Output frequency, 3: Torque reference, 4: Output torque	0
	F830	Data type selection	0: Command request cleared, 1: Command request held	0
	F831	Input reference setting 1	0～16	0
	F832	Input reference setting 2	0～16	0
	F833	Input reference setting 3	0～16	0
	F834	Input reference setting 4	0～16	0
	F835	Input reference setting 5	0～16	0
	F836	Input reference setting 6	0～16	0
	F840	Monitor output setting 1	0～16	0
	F841	Monitor output setting 2	0～16	0
	F842	Monitor output setting 3	0～16	0
	F843	Monitor output setting 4	0～16	0
	F844	Monitor output setting 5	0～16	0
	F845	Monitor output setting 6	0～16	0
	F850	com. error selection	0～4	0
	F851	com. error detecting time	0～1000	200
	F860	Send data address	0～1023	0
	F861	Receive data address	0～1023	0
	F862	Inter-drive communication (speed ref.) station number	0～64	0
	F863	Inter-drive communication (speed ref.) address	0～1023	0
	F865	Inter-drive communication (torque ref.) station number	0～64	0
	F866	Inter-drive communication (torque ref.) address	0～1023	0
	F868	S20 fault detection station number	0～64	0
	F869	Station mode selection	0～4	0
	F890 F89Y	Optional parameter 1～5	Dependent on a connection option	0
	F899	Reset function	0: Disabled, 1: Resed	0

Protections

Trip display
Alarm display

■List of trips

When a trip occurs, the panel LED immediately displays trip in formation. The cause of the trip is retained in memory even when the power is turned off.

Messages	Problems	Remedies
OC 1/OC 1P	Overcurrent during acceleration (DC section)	●Extend the acceleration time ACC. ●Check the V/f parameter setting.
OC2/OC2P	Overcurrent during deceleration (DC section)	●Extend the deceleration time dEC.
OC3/OC3P	Overcurrent during constant speed run (DC section)	●Reduce the load fluctuation. ●Check the driven load.
Note) OC 1P OC2P OC3P The above messages may also be displayed for reasons other than the above.		●There may be a faulty element in the main circuit. Repair is required. ●Check the operation of the cooling fan. ●Check the cooling fan setting F620.
OCL	Overcurrent (load-side overcurrent during start-up)	●Check the wiring and the insulation of the motor. ●Set the output short circuit detection F613 and F614. .
OCA1	U-phase armature short circuit	●There may be a faulty element (U-phase) in the main circuit. Repair is required.
OCA2	V-phase armature short circuit	●There may be a faulty element (V-phase) in the main circuit. Repair is required.
OCA3	W-phase armature short circuit	●There may be a faulty element (W-phase) in the main circuit. Repair is required.
EPH1	Input phase failure	●Check input-side circuits, including the input main circuit wiring, etc., for open phase.
*EPHO	Output phase failure	●Check output-side circuits, including the output main circuit wiring, the motor, etc., for open phase. You can make a selection with the output open phase detection parameter F605
OP1	Overvoltage during acceleration	●Check the input supply voltage.
OP2	Overvoltage during deceleration	●Extend the deceleration time dEC. ●Install a dynamic braking resistor. ●Set the dynamic braking operation F304. ●Set the overvoltage limit operation F305.
OP3	Overvoltage during constant speed run	●Check the input supply voltage.
OL 1/OL2	Inverter overload trip motor overload trip	●Replace the inverter with a higher-rated one because the load is too heavy. ●Extend the acceleration time ACC. ●Reduce the DC braking level F251 and shorten the DC braking time F252. ●The V/f characteristic or the torque boost is inadequate. Check the V/f parameter setting. ●Check the motor and the driven load to see whether the motor is bound. ●Adjust the F606 according to the low-speed overload withstanding capacity of the motor.
OLr	Dynamic braking resistor overload trip	●Extend the deceleration time dEC. ●Use a braking resistor with a larger capacity (W) and adjust the PBR capacity parameter F309.
OH	Overheat	●Reset and restart the inverter after the inverter has cooled down enough. ●Replace the fan if it does not run during operation. Repair is required. ●Secure a space enough for installation of the inverter.
EFU	DC fuse broken	●DC fuse of the main circuit is broken, repair is required.
E	Emergency stop	●The inverter tripped because the emergency stop command was issued. Track down and remove the cause of the emergency stop, and then press the reset button.
EEP1	EEPROM error	●A data writing error occurred. Restart the inverter by turning on the power. If you fails to restore the inverter to a normal condition, Repair is required.
EEP2	Initial read error	●Data recorded in the inverter is defective. Repair is required.
EEP3	Initial read error	●An error occurred while data was being read from the main circuit EEPROM. Repair is required.
Err2	Main unit RAM fault	●The RAM in the microcomputer of the main unit is faulty. Repair is required.
Err3	Main unit ROM fault	●The ROM in the microcomputer of the main unit is faulty. Repair is required.
Err4	CPU fault	●The CPU in the microcomputer of the main unit is faulty. Repair is required.
Err5	Communication interruption error	●A communication error occurred. Check the communication devices, wiring, etc.
Err6	Gate array fault	●The gate array of the main unit is faulty. Repair is required.
Err7	Output current detector error	●The output current detector of the main unit is faulty. Repair is required.
Err8	Optional unit fault	●An optional device is faulty. Repair is required. ●For details, refer to the instruction manual for the device.
Err9	Flash memory fault	●The flash memory is faulty. Repair is required.
*UC	Trip during low-curvent run	●The output current went down to the small current detection level. ●Check whether the small current detection level (F611) is set properly to match the system.
*UP1	Undervoltage trip (main circuit)	●The input voltage (main circuit) is too low for operation. ●There was a power failure which lasted for a time longer than the undervoltage detection time F628 . ●Check the input voltage.
*UP2	Undervoltage trip (control circuit)	●The input voltage (control circuit) is too low for operation. ●There was a power failure which lasted for a time longer than the undervoltage detection time F628 . ●Check the input voltage.
*Ot	Overtorque trip	●During operation, the load torque went down to the over-torque detection level. Check whether the system is in a normal condition.
EF 1/EF2	Grounding fault trip	●A ground fault occurred in an output cable or the motor. Check the wiring and the motor for ground fault.
Etn	Auto-tuning error	●Check the motor parameter settings F400 through F414. ●Initialize the motor constants and restart the system. (For details, refer to the instruction manual for the motor.)
EtyP	Inverter type error	●When replacing the control circuit board (or main circuit board/drive circuit board), set tyP 6 as the default value.
E-10	Sink/source switching error	●The sink and the source are switched unexpectedly from one to another. Check the sequence before restarting the system.
E-11	Sequence error	●The singnal from a sytem is not inputted into input terminals. ●The input terminal function(130 or 131) is not set up. ●For not using the system -supporting sequence F630 function it is set up except 0.0 at F630 .
E-12	Encoder error	●Wiring is broken, check the wiring. ●Motor is locked under the condition that the motor torque is limited by the torque limit function. Check the motor condition.
E-13	Speed error (over speed)	●Encoder is broken, check the wiring.
E-14	To much potential deviation	●Potential deviation exceeded the F631 set value during position control. ●Check connection of encoder.
E-17	Key fault	●The RUN key or the STOP key is pressed and held down for more than 5 seconds.

* A selection can be made between "parameter trip enabled" and "parameter trip disabled.

■Alarm display

Messages	Problems	Remedies
OFF	ST-CC opened	●The ST-CC circuit (standby signal) is opened. Close the circuit.
POFF	Control circuit under voltage	●The control voltage is too low between RO and SO. (Normally, the voltage in the main circuit goes down to an insufficient level when an 22kW and smaller inverter is used together with an optional unit.) ●Measure the control circuit supply voltage.
nOFF	Main circuit under voltage	●The main circuit voltage is too low between R, S and T. ●Measure the main circuit supply voltage.
rtry	Display during retry	●The inverter is in process of retry; it automatically restarts on completion of retry. After restart, the message rtry disappears, indicating that the inverter is in a normal condition. Take care when restarting the system; the motor abruptly starts rotating.
P-Er	Frequency point setting error alarm	●The frequency setting signals point 1 and point 2 are set too close. ●Set the frequency setting signals point 1 and point 2 apart from each other.
CLr	Clear acceptance display	●This message appears if the STOP key is pressed, while the trip is being displayed. ● Press the STOP key once again while CLr is being displayed to reset.
EOFF	Emergency stop acceptance display	●This message appears if the STOP key on the control panel is pressed during terminal or communication operation. ●For an emergency stop, press the STOP key while EOFF is being displayed. To cancel the emergency stop, press any other key.
HI/LO	Setting error alarm (The error detected and data are alternately displayed twice each.)	●A setting error occurred during data reading or writing. ●Check the settings.
db dbon	DC braking in process	●DC braking is in process. This message disappears within tens of seconds, indicating that the inverter has returned to its normal condition. Note) ●Motor shaft fixing operation is in process. This message disappears if the stop command is entered, indicating that the inverter has returned to its normal condition.
E1～E2	Digits over flow	●The number of digits of an item to be displayed, e.g., frequency, exceeds that of the display panel (4 digits). ●Reduce the frequency magnification.
Init	During intialization	●All parameters are setled at default setting.
E	Communication error	●At computer link, transmission error is occured. ●Or at inverter communication, time over or trip of master inverter is occured.
Atn	In auto-tuning	●Under auto-tuning

Note) When the ON/OFF function is selected from the input terminal menu for DC braking (DB), if breaking the circuit formed by the terminal selected and the CC terminal causes the message db to disappear, then the inverter is in a normal condition.

[Messages displayed during operation]

Messages	Problems	Remedies
L	Overload	Same as for OL 1 and OL2
P	Overvoltage	Same as for OP
C	Overcurrent	Same as for OC
H	Overheat	Same as for OH

If more than one problem arises at a time, the following messages blink.
The blinking messages LC PC CH LPC ... LPCH are displayed with their L P C and H arranged in this order from the left.

■Resetting the inverter

If the inverter trips because of a fault or abnormal use, do not reset the inverter before removing the cause of the trip.
Note that the inverter trips again if the cause of the trip has not yet been removed.

A tripped inverter can be reset by any of the following operations:

(1) Turn off the power (Make sure that the LED indicator goes out.)
If the inverter cannot be reset, check the inverter trip holding setting.
(2) External signal (control terminal board RES-CC circuit short-circuited -> opened)
(3) Control panel operation

To reset the inverter from the control panel, follow the steps below.

1. Press the [STOP/Reset] key and make sure that CLr is displayed.
2. After removing the cause of tripping, press the [STOP/Reset] key Aagain to reset the inverter.

★Note that the overload protective functions (OL 1 OL2 OLr) cannot Nbe reset during a virtual cooling time either by external signals or by control panel operation.

Approx. virtual cooling time ...

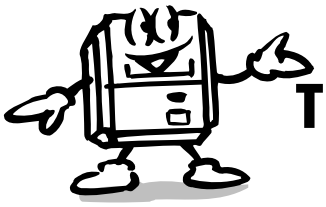
OL 1 : about 30 seconds after the occurrence of tripping
OL2 : about 2 minute after the occurrence of tripping
OLr : about 20 seconds after the occurrence of tripping

★The overvoltage protective functions (OP1 OP3) cannot be reset until the DC voltage goes down below the overvoltage alarm level.

★When the overheat message (OH) is displayed, do not reset the inverter until it cools down enough. The inverter monitors the temperature in it.

⚠Caution

The inverter can be restarted immediately by turning the power switch on after turning off temporarily. Note, however, that repeating this operation frequently may damage the inverter and the motor.



To users of our inverters

When wiring the inverter

Wiring precautions

Installing a molded-case circuit breaker [MCCB]

(1) Install a molded-case circuit breaker (MCCB) on the inverter's power supply input to protect the wiring.
(2) Avoid turning the MCCB breaker on and off frequently to turn on/off the motor.
(3) To turn on/off the motor frequently, close/break the control terminals F (or R)-CC.

Installing a magnetic contactor [MC] [primary side]

(1) To prevent an automatic restart after the power interruption or overload relay has tripped, or actuation of the protective circuit, install an electro-magnetic contact in the power supply.
(2) Because the VF-A7 inverter has a built-in fault detection relay [FL], the primary end magnetic contactor (MC) can be configured to trip on activation of the inverter's protective functions by connecting the contact points of the FL to the operation circuit of the MC.
(3) The inverter can be used without a magnetic contactor. In this case, use an MCCB (equipped with a voltage tripping device) for opening the primary circuit when the inverter protective circuit is activated.
(4) Avoid turning the magnetic contactor on and off frequently to turn on/off the motor.
(5) To turn of/off the motor frequently, close/break the control terminals F (or R)-CC.
(6) Install a surge suppressor on the excitation coil of the magnetic contactor (MC).

Installing a magnetic contactor [MC] [secondary side]

(1) As a rule, if a magnetic contactor is installed between the inverter and the motor, do not turn of ON/OFF while running. (If the secondary-side contactor is turned of ON/OFF while running, a large current may flow in the inverter, causing inverter damage and failure.)
(2) A magnetic contactor may be installed to chang the motor or chang to the commercial power source when the inverter is stopped. Always use an interlock with the magnetic contactor in this situation so that the commercial power supply is nt applied to the inverter's output terminals.

External signal

(1) Use a relay rated for low currents. Mount a surge suppressor on the excitation coil of the relay.
(2) When wiring the control circuit, use shielded wires or twisted pair cables.
(3) Because all of the control terminals except FLA, FLB and FLC are connected to electronic circuits, insulate these terminals to prevent them from coming into contact with the main circuit.

Installing an overload relay

(1) The VF-A7 inverter has a built-in overload protection function by means of a thermal relay. However, in the following cases, the thermal relay operation level must be adjusted or an overload relay matching the motor's characteristics must be installed between the inverter and the motor.
  (a) When using a motor having a rated current value different from that of the equivalent.
  (b) When driving several motors simultaneously.
(2) When you want to use a constant-torque Toshiba VF motor together with the VF-A7 inverter, change the inverter's electronic thermal protection characteristics to match those of the VF motor.
(3) In order to adequately protect a motor used for low-speed operation, we recommend the use of a motor equipped with a embedded thermal relay.

When changing the motor speed

Application to standard motors

Vibration

When a motor is operated with an industrial inverter, it experiences more vibrations than when it is operated by the commercial power supply. The vibration can be reduced to a negligibly level by fixing the motor and machine to the base firmly.
If the base is weak, however, the vibration may increase at a light load due to resonance with the mechanical system.

Reduction gear, belt, chain

Note that the lubrication capability of a reducer or a converter used as the interface of the motor and the load machine may affected at low speeds.
When operating at a frequencies exceeding 60 Hz or higher, power transmission mechanisms such as reduction gear, belts and chains, may cause problems such as production of noise, a reduction in strength, or shortening of service life.

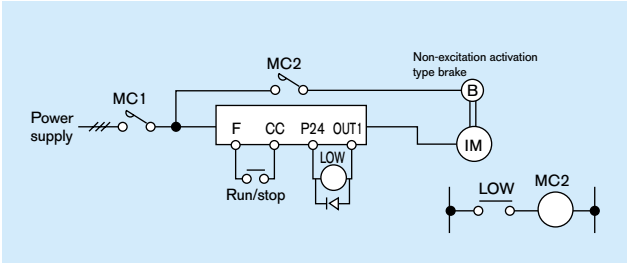
Frequency

Before setting the maximum frequency to 60 Hz or higher, confirm that this operating range is acceptable for the motor.

Application to special motors

Braking motor

When using a braking motor, if the braking circuit is directly connected to the inverters's output terminals, the brake cannot be released because of the lowered starting voltage. Therefore, when using a braking motor, connect the braking circuit to the inverter's power supply side, as shown in the figure below. Usually, braking motors produce larger noise in low speed ranges.



Gear motor

When using an industrial inverter to drive a gear motor, inquire of the motor manufacturer about its continuous operation range, since low-speed operation of a gear motor may cause insufficient lubrication.

Toshiba Gold Motor (High-efficiency power-saving motor)

Inverter-driven operation of Toshiba Gold Motors is the best solution for saving energy. This is because these motors have improved efficiency, power factor, and noise/vibration reduction characteristics when compared to standard motors.

Pole-changing motor

Pole-changing motors can be driven by the VF-A7 inverter. Before changing poles, however, be sure to let the motor come to a complete stop.

Hight-pole-count motors

Note that hight-pole count motors(8 or more poles), which may be used for fans,etc., have higher rated current than 4-pole moters.
The current ratings of multipole motors are relatively high. So, when selecting an inverter, you must pay special attention to its current rating so that the current rating of the motor is below that of the inverter.

Single-phase motor

Because single-phase motors are equipped with a centrifugal switch and capacitors for starting, they cannot be driven by an inverter. If only a single-phase, a 3-phase motor can be driven by using a single-phase input interter to convert it into a 3-phase 200V output. (A special inverter and a 3-phase motor are required.)

■Selection of wiring equipment

Voltage class	Applicable motor (kW)	Inverter	Molded-case circuit breaker (MCCB)		Magnetic contactor (MC)		Overload relay (THRy)		Earth leakage circuit breaker (ELCB)		Wire size Notes 3, 4 and 5			Screw size of Inverter terminal		
			Rated current (A)	Toshiba Schneider Electric model	Rated current (A)	Toshiba Schneider Electric model	Adjusted current value (A) (Reference Value)	Toshiba Schneider Electric model	Rated current (A)	Toshiba Schneider Electric model	Main circuit (mm^2)	DC rector (mm^2)	Dynamic braking resistor (mm^2)	Main circuit terminal Note 10	Control terminal	Grounding terminal
200V class	0.4	VFA7-2004PL	5	NJ30N	11	C11J	2.3	T13J	5	NJV50E	2.0	1.25	2.0	M4	M3	M4
	0.75	VFA7-2007PL	10	NJ30N	11	C11J	3.6	T13J	10	NJV50E	2.0	1.25				
	1.5	VFA7-2015PL	15	NJ30N	11	C11J	6.8	T13J	15	NJV50E	2.0	2.0				
	2.2	VFA7-2022PL	20	NJ30N	13	C13J	9.3	T13J	20	NJV50E	2.0	2.0				
	3.7	VFA7-2037PL	30	NJ30N	26	C25J	15	T20J	30	NJV50E	3.5	5.5				
	5.5	VFA7-2055PL	50	NJ50E	35	C35J	22	T35J	50	NJV50E	8.0	5.5	5.5	M5		M5
	7.5	VFA7-2075PL	60	NJ100F	50	C50J	28	T35J	60	NJV60F	14	14				
	11	VFA7-2110P	100	NJ100F	65	C65J	44	T65J	100	NJV100F	14	14		M6		M6
	15	VFA7-2150P	125	NJ225F	80	C80J	57	T65J	125	NJV225F	22	38				
	18.5	VFA7-2185P	125	NJ225F	93	C100J	70	T100J	125	NJV225F	22	38	8.0	M8		
	22	VFA7-2220P	150	NJ225F	125	LCI-D150	85	T115J	150	NJV225F	22	38	1.4			
	30	VFA7-2300P	200	NJ225F	180	LCI-F185	108	T115J	200	NJV225F	60	60				
	37	VFA7-2370P1	225	NJ225F	180	LCI-F185	138	T150J	225	NJV225F	60	100	38	M10		M8
	45	VFA7-2450P1	300	EH400	220	LCI-F225	162	T180J	300	LEH400	100	150				
	55	VFA7-2550P1	350	EH400	300	LCI-F330	2.5	LR9-F53 Note 7	350	LEH400	150	150				
	75	VFA7-2750P1	400	EH400	300	LCI-F330	3.2	LR9-F73 Note 7	400	LEH400	150	150				
	90	VFA7-2900P1	600	EH600	400	LCI-F400	4.0		600	LEH600	150	200		M12		M10
400V class	0.75	VFA7-4007PL	5	NJ30N	9	C11J	2.3	T13J	5	NJV50E	2.0	1.25	2.0	M4	M3	M4
	1.5	VFA7-4015PL	10	NJ30N	9	C11J	3.6	T13J	10	NJV50E	2.0	1.25				
	2.2	VFA7-4022PL	15	NJ30N	9	C11J	5.0	T13J	15	NJV50E	2.0	2.0				
	3.7	VFA7-4037PL	20	NJ30N	13	C13J	6.8	T13J	20	NJV50E	2.0	2.0				
	5.5	VFA7-4055PL	30	NJ30N	17	C20J	11	T13J	30	NJV50E	2.0	2.0	2.0	M5		M5
	7.5	VFA7-4075PL	30	NJ30N	25	C25J	15	T20J	30	NJV50E	2.0	3.5				
	11	VFA7-4110PL	50	NJ50E	32	C35J	22	T35J	50	NJV50E	3.5	5.5		M6		M6
	15	VFA7-4150PL	60	NJ100F	48	C50J	28	T35J	60	NJV100F	5.5	8.0				
	18.5	VFA7-4185P	75	NJ100F	48	C50J	35	T65J	75	NJV100F	8.0	14	5.5	M8		
	22	VFA7-4220P	100	NJ100F	65	C65J	44	T65J	100	NJV100F	14	14				
	30	VFA7-4300P	125	NJ225F	80	C80J	57	T65J	125	NJV225F	14	22				
	37	VFA7-4370P1	125	NJ225F	110	LCI-D150	65	T100J	125	NJV225F	22	38				
	45	VFA7-4450P1	150	NJ225F	180	LCI-F185	85	T115J	150	NJV225F	38		14			M8
	55	VFA7-4550P1	175				100		175		38	60				
	75	VFA7-4750P1	250	EH400	220	LCI-F225	138	T150J	250	LEH400	100	100	22	M10		
	90 /110	VFA7-4110KP1	300	EH400	265	LCI-F330	2.7	LR9-F73 Note 7	350	LEH400	100	150	38			M10
	132	VFA7-4132KP1	400		400	LCI-F400	3.6		400							
	160	VFA7-4160KP1	500	EH600			4.2		500	LEH600	150					
	220	VFA7-4220KP1	600	EH800	600	LCI-F630	3.6	T13J +CT Note 8	600	LEH600	200	150×2	100(38×2)	M12		M12
	280	VFA7-4280KP1	800				4.2		800	EH800 +LRE +ZCT	150×2	200×2	100 (60×2)			

Note 1). Attach a surge killer to the exciting coil of every magnetic contactor and relay. Selection of surge killers for Toshiba Schneider Electric magnetic contactors
200V class: surge absorbing unit (optional) for the Toshiba Schneider Electric C11J to C65J or SS-2 surge killer for the Toshiba Schneider Electric C50J and C65J
400V class: The voltages of the operation and control circuits should be reduced below 200V with a step-down transformer.

Note 2). When using a magnetic contactor MC with auxiliary 2a contacts for the control circuit, connect the 2a contacts in parallel to improve their reliability.

Note 3). The above table provides a listing of wires of the type IV 600V (50∞C) and of the sizes R, S and T for the input-side of the main circuit, and U, V and W for the output-side. The above type and sizes of wires are applicable only when the wiring distance between the inverter and the motor is not more than 30m. When it exceeds 30m and if using optional external devices (input reactor, radio noise filter with a high damping capacity, braking resistor/braking unit or surge voltage limit filter), select wires the sizes of which are given between parentheses.

Note 4). Use a 0.75mm2 or larger shielded wire for the control circuit.

Note 5). Use a 3.5mm2 or larger wire for grounding.

Note 6). For an inverter with a capacity of 400V, be sure to reduce the voltage of the operation and control circuits below 200V with a step-down transformer.

Note 7). Rated current of the overload relay as combined with a 400/5A CT

Note 8). Used in combination with an external 600/5A CT

Note 9). Connect the wires so that their length after finished does not exceed 4m. Install the wires 10cm or so apart from each other, with the exception of wires used for the control and operation circuits, which should be installed 20cm or more apart from each other.

Note10). R, S, T, U, V and W terminals. M4 for the control power input terminals R0, R41, R46, S0, R20 and S20. M8 for the terminals PA and PB of braking resistors of 200V 75kW, 400V 110kw and 400V 132kW, or M10 for those of braking resistors of 200V 90kW and 400V 160-280kW.

When studying how to use our inverters

Notes

Leakage current

The VF-A7 series of inverters uses high-speed switching deuices for PWM control. When a relatively long cable is used for power supply to an inverter, current may leak from the cable or the motor to the ground because of its capacitance, adversely affecting the peripheral equipment. The intensity of such a leakage current depends on the PWM carrier frequency, the lengths of the input and output cables, etc., of the inverter. To prevent current leakage, it is recommended to take the following measures.

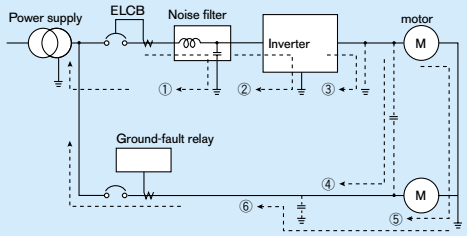
【Effects of leakage current】

Leakage current which increases when an inverter is used may pass through the following routes:

Route (1) ... Leakage due to the capacitance between the ground and the noise filter
Route (2) ... Leakage due to the capacitance between the ground and the inverter
Route (3) ... Leakage due to the capacitance between ground and the cable connecting the inverter and the motor
Route (4) ... Leakage due to the capacitance of the cable connecting the motor and an inverter in another power distribution line
Route (5) ... Leakage through the grounding line common to motors
Route (6) ... Leakage to another line because of the capacitance of the ground

Leakage current which passes through the above routes may cause the following trouble.

- Malfunction of a leakage circuit breaker in the same or another power distribution line
- Malfunction of a ground-relay installed in the same or another power distribution line
- Noise produced at the output of an electronic device in another power distribution line
- Activation of an external thermal relay installed between the inverter and the motor, at a current below the rate current



Leakage current flow routes

【Measures against effects of leakage current】

The measures against the effects of leakage current are as follows:

1) Measures to prevent the malfunction of leakage circuit breakers
   (1) Decrease the PWM carrier frequency of the inverter. In the case of the VF-A7, the frequency can be decreased up to 0.5kHz. (*)
   (2) Install leakage circuit breakers (ELCB) with a high-frequency protective function (e.g., Toshiba Mighty series of breakers) in both the same and the other power distribution lines. This make it possible to operate the VF-A7 with its PWM carrier frequency set high.
2) Measures against malfunction of ground-fault relay
   (1) WDecrease the PWM carrier frequency of the inverter. In the case of the VF-A7, the frequency can be decreased up to 0.5kHz. (*)
   (2) Install ground-fault relays with a high-frequency protective function (e.g., Toshiba CCR12 type of relays) in both the same and other lines. This makes it possible to operate the VF-A7 with its PWM carrier frequency set high.
3) Measures against noise produced by other electric and electronic systems
   (1) Separate the grounding line of the inverter from that of the affected electric and electronic systems.
   (2) Decrease the PWM carrier frequency of the inverter. In the case of the VF-A7, the frequency can be decreased up to 0.5kHz. (*)
4) Measures against malfunction of external thermal relays
   (1) Remove the external thermal relay and use the electronic thermal function of the inverter instead of it. (Unapplicable to cases where a single inverter is used to drive more than one motor. Refer to the instruction manual for measures to be taken when thermal relays cannot be removed.)
   (2) Decrease the PWM carrier frequency of the inverter. In the case of the VF-A7, the frequency can be decreased up to 0.5kHz.

(Note) Reducing the carrier frequency causes an increase in the magnetic noise caused by the motor.

5) Measures by means of wiring and grounding
   (1) Use a grounding wire as large as possible.
   (2) Separate the inverter's grounding wire from that of other systems or install the grounding wire of each system separately to the grounding point.
   (3) Ground (shield) the main circuit wires with metallic conduits.

(*): The PWM carried frequency should not be decreased below 2.2kHz in the vector control mode.

Ground fault

Before begining operation, thoroughly check the wiring between the motor and the inverter for incorrect wiring or short circuits. Do not ground the neutral point of any star-connected motor.

Radio interference

[Noise produced by inverters]

Since the VF-A7 series of inverters performs PWM control, it produces noise and sometimes affects nearby instrumental devices, electrical and electronic systems, etc. The effects of noise greatly vary with the noise resistance of each individual device, its wiring condition, the distance between it and the inverter, etc.

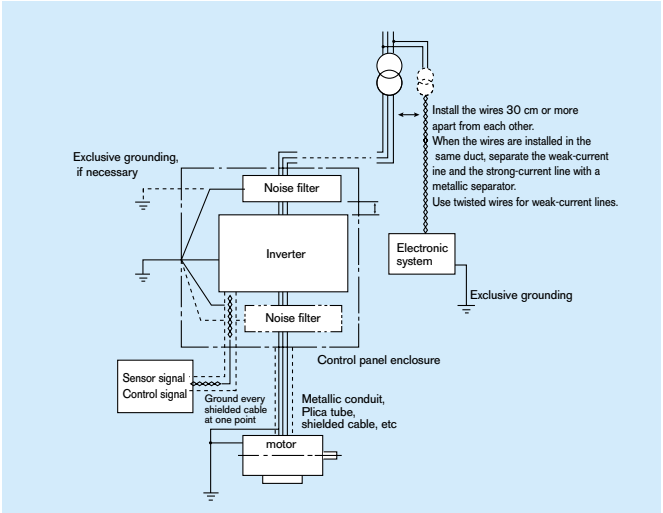
[Measures against noises]

According to the route through which noise is transmitted, the noises produced by an inverter are classified into transmission noise, induction noise and radiation noise.

[Examples of protective measures]

- Separate the power line from other lines, such as weak-current lines and signal lines, and install them apart from each other.
- Install a noise filter in each inverter. It is effective for noise prevention to install noise filters in other devices and systems, as well.
- Shield cables and wires with grounded metallic conduits, and cover electronic systems with grounded metallic cases.
- Separate the power distribution line of the inverter from that of other devices and systems.
- Install the input and output cables of the inverter apart from each other.
- Use shielded twisted pair wires for wiring of the weak-current and signal circuits, and always ground one of each pair of wires.
- Ground the inverter with grounding wires as large and short as possible, separately from other devices and systems.

The 200V 0.4-7.5kW and 400V 0.75-15kW models have built-in noise filters which significantly reduce noise.



Power factor improvement capacitors

Do not install a power factor improvement capacitors on the input or output side of the inverter.

Installing a power factor improvement capacitor on the input or output side causes current containing harmonic components to flow into the capacitor, adversely affecting the capacitor itself or causing the inverter to trip. To improve the power factor, install an input AC reactor or a DC reactor (optional) on the primary side of the inverter.

Installation of input AC rectors

These devices are used to improve the input power factor and suppress high harmonic currents and surges. Install an input AC reactor when using a VF-A7 inverter under the following conditions:

(1) When the power source capacity is 500kVA or more, and when it is 10 times or more greater than the inverter capacity.
(2) When the inverter is connected the same power distribution system as a thyristor-committed control equipment.
(3) When the inverter is connected to the same power distribution system as that of distorted wave-producing systems, such as arc furnaces and large-capacity inverters.

Standard replacement intervals of main parts

The table below lists standard component replacement intervals under normal operating conditions (i.e., average year round ambient temperature of 30∞C, load ratio of 80% or less, average operation time of 12 hours/day). The replacement intervals do not indicates the service life of each component, but the number of years beyond which the failure rate of a component used without being replaced increases shapely because of deterioration and wear.

Component name	Standard replacement intervals	Replacement method, etc.
Cooling fan	2 to 3 years	Replaced with a new one
Smoothing capacitor	5 years	Replaced with a new one (upon examination)
Circuit breaker, relay	———	Decided upon examination
Timer	———	Decided upon examination of the cumulative operation time
Fuse	10 years	Replaced with a new one
Aluminum capacitors on the	5 years	Replaced with a new circuit board (upon examination)

Extract from "Periodic Inspection of General-purpose Inverters" published by the Japan Electrical Manufacturers' Association
Note: The service life of each component greatly varies with its usage environment.

Selecting the capacity (model) of the inverter

Selection

Capacity

Refer to the applicable motor capacities listed in the standard specifications.
When driving a high-pole motor, special motor, or multiple motors in parallel, select such an inverter that the sum of the motor rated current multiplied by 1.05 to 1.1 is less than the inverter's rated output current value.

Acceleration/deceleration times

The actual acceleration and deceleration times of a motor driven by an inverter are determined by the torque and GD^2 of the load, and can be calculated by the following equations.
The acceleration and deceleration times of an inverter can be set individually. In any case, however, they should be set longer than their respective values determined by the following equations.

	SI unit system	Conventional unit system (for reference)
Acceleration time	$ta = \frac{(J_M + J_L) \times \triangle N}{9.56 \times (T_M - T_L)}$ (sec.)	$ta = \frac{(GD^2_M + D^2_L) \times \triangle N}{375 \times (T_M - T_L)}$ (sec.)
Deceleration time	$ta = \frac{(J_M + J_L) \times \triangle N}{9.56 \times (T_B + T_L)}$ (sec.)	$ta = \frac{(GD^2_M + D^2_L) \times \triangle N}{375 \times (T_B + T_L)}$ (sec.)
Conditions	J_M : Moment of inertia of motor (kge.m²) J_L : Moment of inertia of load (kge.m²) (converted into value on motor shaft) $\triangle N$: Difference in rotating speed between before and after acc. or dce. (min.⁻¹) T_L : Load torque (Ne.m) T_M : Motor rated torque x 1.2-1.3 (Ne.m) ... V/f control : Motor rated torque x 1.5 (Ne.m) ... Vector operation control T_B : Motor rated torque x 0.2 (Ne.m) (When a braking resistor or a braking resistor unit is used: Motor rated torque x 0.8-1.0 (Ne.m))	GD^2_M : Motor GD2 (kg.m²) (converted into value on motor shaft) GD^2_B : Load GD2 (kg.m²) $\triangle N$: Difference in rotating speed between before and after acc. and dec. (rpm) T_L : Load torque (kg.m) T_M : Motor rated torque x 1.2-1.3 (N.m) ... V/f control : Motor rated torque x 1.5 (kg.m) ... Vector operation control T_B : Motor rated torque x 0.2 (kg.m) (When a braking resistor or a braking resistor unit is used: Motor rated torque x 0.8-1.0 (kg.m))

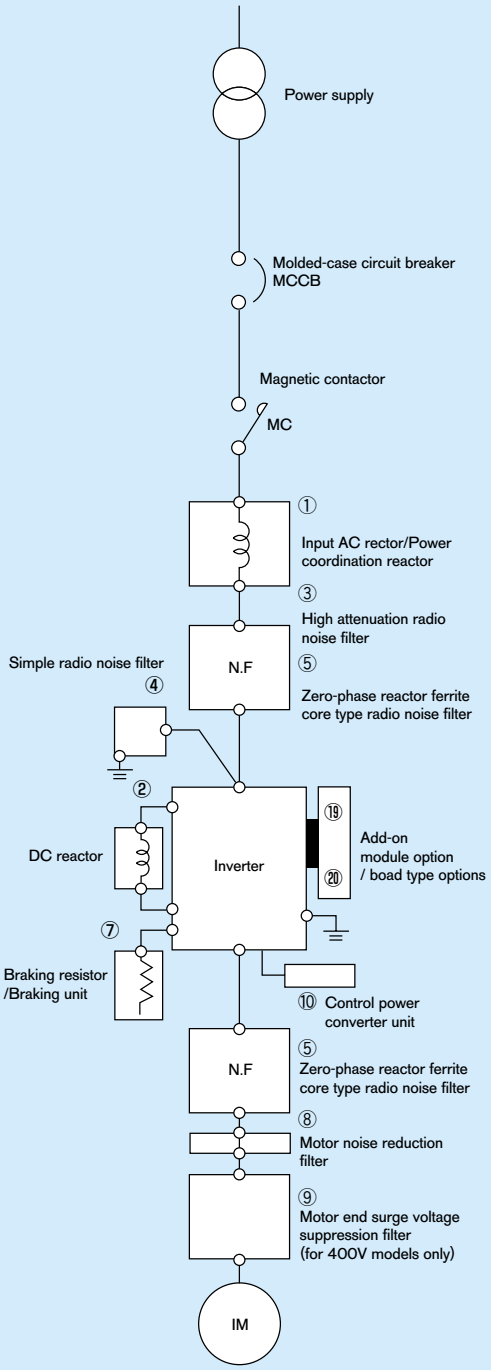
Allowable torque characteristics

When a standard motor is combined with an inverter to perform variable speed operation, the motor temperature rises slightly higher than it normally does during commercial power supply operation. This is because the inverter output voltage has a sinusoidal (approximate) PWM waveform. In addition, the cooling beccmes less effective at low speed, so the torque must be reduced according to the frequency.
When constant-torque operation must be performed at low speeds, use a Toshiba VF motor designed specifically for use with inverters.

Starting characteristics

When a motor is driven by an inverter, its operation is restricted by the inverter's overload current rating, so the starting characteristic is different from those obtained from commercial power supply operation.
Although the starting torque is smaller with an inverter than with the commercial power supply, a high starting torque can be produced at low speeds by adjusting the V/f pattern torque boost amount or by employing vector control. (200% in sensorless control mode, though this rate varies with the motor characteristics.) When a larger starting torque is necessary, select an inverter with a larger capacity and examine the possibility of increasing the motor capacity.

Application and functions of options



	Name		Function, purpose
①	Input AC reactor		Improves the input power factor, reduces higher harmonics, and suppress external surge on the inverter power supply. Install when the power supply capacity is 500kVA or more and exceeds 10 times the inverter capacity, or when distorted wave-producing systems, such as thyristors and large inverters, are connected to the same power distribution line. To ensure the reactance is effective, contact us because it varies with the impedance.
②	DC reactor		DC reactors improve the power factor more efficiently than input AC reactors. When an inverter is used for a system for which high reliability is required, you should preferably use a DC reactor together with an input AC reactor, because input AC reactors are effective for suppression of external surge.
③	Radio noise reduction filter	High-attenuation filter (LC filter)NF type, manufacturedby Soshin Denki Co., Ltd.	●Effective in preventing radio interference noise to audio equipment installed near the inverter ●Installed on the input side of the inverter. ●Attenvation charactoristic is avairable in a wide range from AM band to 10 MHz ●Use this type when equipment vulnerable to noise is installed in the vicinity of the inverter
④		Simple filter (capacitive filter) Capacitor type, manufactured by Malcon Electronics, Co., Ltd.	●Effective in preventing radio interference noise to audio equipment installed ●Installed on the input side of the inverter. ●Attenuation charactoristic is available only in a specific frequency band. Effective in suppressing noise in a specific AM Radio station. (e.g., weak radio waves in mountainous regions). ●Increases leakage current because this is a capacitor-based filter. When the power supply is equipped with an ELCB, avoid using too many filters of this type.
⑤		Zero-phase reactor (inductive filter) Ferrite core type, manufactured by Soshin Denki Co., Ltd.	●Effective for preventing radio interference noise to audio equipment installed ●Effective for noise reduction on both the input and output sides of an inverter ●Attenuation charactoristic is avairable in several decibels in a frequency range of AM radio band to 10MHz
⑥	EMI filter for CE compliance		Can conform to CE marking, by using this filter and wiring properly.
⑦	Braking resistor Braking unit		Used to reduce the deceleration time, for example, when frequent rapid deceleration or stop is required or the load has a large moment of inertia. A resistor designed to consume energy during dynamic braking
⑧	Motor noise reduction filter (for large-capacity models only)		Can be used to suppress the magnetic noise from motor.
⑨	Motor end surge voltage suppression filter (for 400V models only)		When a voltage PWM control inverter with ultra-high-speed switching devices (e.g., IGBT) is used to drive a general-purpose motor with a rating of 400V or so, a surge voltage depending on the cable length, cable installation method, cable constant, etc., may damage the insulation of motor coils. In such a situation, it is necessary to use a motor with insulation-reinforced coils or install an AC reactor, a surge suppression filter, etc., on the output side of the inverter in order to reduce surge voltage.
⑩	Control power converter unit		When the control power want to be supplied separately, use this unit. (for 22kW snd less)
⑪	Parameter writer		Unit for reading, copying and writing parametors in batch processing (PWU001Z-0)
⑫	Extended panel		Extended panel with an LED display, an RUN/STOP key, an UP/DOWN key, a MONITOR key and an ENTER key
⑬	RS232C converter unit		This unit allows you to easily set parameters, store or write data, communicating with a PC via an interface cable. This unit is a very useful communication tool which can be connected with 2 inverters simultaneously.
⑭	RS485 converter unit		Computer link : with this unit, you can establish a network. Inverter link : with this unit, you can establish communication of a frequency data
⑮	Communication cable		Connection cable for options (⑪～⑭)type form : CAB0011(1m), CAB0013(3m), CAB0015(5m)
⑯	Rometo control panel		Equipped with a frequency meter, a frequency setter, and RUN/STOP switches (forward/reverse). (Model: CBVR-7B)
⑰	Application control unit		The AP series of control units are available for the VF-A7 to allow it to carry out various types of control.
⑱	Harmonic suppression converter Power regeneration converter		●Designed to suppress harmonics and improve the power factor ●Units suitable for loads which frequently undergo rapid acceleration and deceleration or loads which require minus torque Contact your Toshiba dealer for applicable models and details.

Reactor	Effect		
	Power factor improvement	Harmonic suppression	External surge suppression
Input AC rector	○	○	○
DC reactor	○ Very effective	○ Very effective	× Ineffective

■Add-on module options.

No.	name	Function, purpose
⑲	Sensor vector control unit (multiple functions)	Allows still more accurate control if used in combination with a sensor-equipped motor. (Speed control, torque control, and positioning control)
	Extended terminal	Useful in adding special functions to the inverter
	S20 communication	Designed for communication with a programmable controller over a field network. This unit allows high-speed communication (2 Mbps) via an optical fiber cable.
	F10M communication	Designed for communication with a programmable controller over a field network. Bus-type data transmission unit which uses shielded twisted pair cables for the data transmission line and is designed specifically for small industry-intended Toshiba inverters for motor drives
	RS485 converter unit (When connected to 8 inverters.)	This unit is capable of operating a maximum of 256 inverters via PLC or personal computer. (Depend on function of the inverter model.)

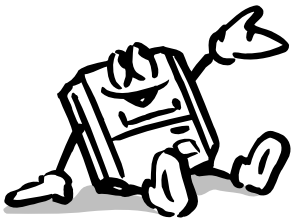
■Board type options.

No.	name	Function, purpose
⑳	PG feed back option#2	This unit is needed for the PG feed back control. Control modes are speed and torque
	PG feed back option#3	

■Protector options.(37kW or more)

name	Function, purpose
IP20*	Attached the IP20 box. Contact us for more information.
IP40*	Attached the IP40 box, and attached cover plate to ventilation slit of inverter, Contact us for more informaton.
IP54*	Installed the inverter in the IP54 box. contact us for more informaton.
Fin attaced externally option	Calory of the inverter reduction and dustproof effective.

* Soon to be released.



Add-on module/board type options

The following add-on module options and board type options are available for the VF-A7 series of inverters.

Table of add-on module/board type options

Table of add-on cassette options

Option		Function/purpose	Type	Remarks (Note 1)
①PG feedback option #1 (Multi-function)		This unit is needed for the PG feedback control. Control modes are speed, torque and positioning.	VEC001Z	Group A
②Extended terminal board option		Required for using the extended terminal function	ETB001Z	
Communication function	③RS485 option	Required for using RS485	RS4002Z	Group B
	④TOSLINE-S20 option	Required for using TOSLINE-S20	TLSOO1Z	
	⑤TOSLINE-F10M option	Required for using TOSLINE-F10M	TLFOO1Z	
	⑥Device Net option	Required for using Device Net	Planned	
	⑦ProfiBus option	Required or using ProfiBus	Planned	
⑧Add-on cassette option attachment		Attachment for mounting add-on cassette options For 75(132)kW and smaller models / For 90(160)kW and larger models	SBP001Z / SBP002Z	(Note 2)

Notes)
1. The options in group A can be used together. The options in groups A and B can also be used together, but the options in group B cannot be used together with any other option in the same group.
2. ( )means 400V class.

Table of board type options

Options	Function/purpose	Type	Remarks
PG feed back option#2 (Complimentary output)	This unit is needed for the PG feedback control. Control modes are speed and torque control.	VEC002Z / VEC003Z	Cannot use add-on cassette options together
PG feed back option#3 (Line-driver output)			

Functions of add-on module/board type options

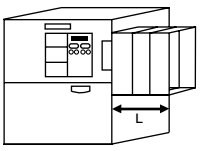
① PG feedback options

Function \ Type		VEC001Z	VEC002Z	VEC003Z
Characteristics(Speed/torque)		Speed control:150% torque at 0 speed, control range 1: 1000, precision ±0.02% Torque control:precision ±10%, control range −100% to +100%		
Speed control	Accuracy	Digital:±0.01% Analogue:±0.1%	Digital:±0.01% Analogue:±0.1%	Digital:±0.01% Analogue:±0.1%
	Reference	0 to ±10V, 0 to +10V, 4 to 20mA	0 to ±10V, 0 to +10V, 4 to 20mA	0 to ±10V, 0 to +10V, 4 to 20mA
Torque control	Reference	0 to ±10V, 0 to +10V, 4 to 20mA		
Positioning*	Input pulse	Forward/reverse pulse	Not available	Not available
	Max. pulse freq.	160kpps		
	Electrical gear	100 to 4000 ppr		
PG feed-back method		Line driver Complimentary Open-collector	Complimentary Open-collector	Line driver
Acceptable cable lenght		100m	100m	30m
PG power source		5/6/12/15V	12V(fixed)	5V(fixed)
Voltage compensation of PG output		Available	Not available	Not available
Breaking detection of sensor cable (during operation)		Available	Available	Available
Breaking detection of sensor cable (during stand-by)		Available	Not available	Not available
±10V analogue reference		Available	Not available	Not available
Programmable output terminal		2 terminal(Sink/source)	Not available	Not available
Alarm signal output	purpose	4 terminal(Sink/source)	Not available	Not available

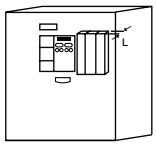
② Extended terminal add-on module options

Function		Description
Contact input	16-bit binary (12-bit binary)	・Sink logic ON: DC11V and 2.5 mA or more (Max. DC30V) OFF: DC5V or less or 1.4mA or less ・Source logic ON: DC5V or less (5mA type) OFF: DC11V or more or 0.5mA or less
	4-digit BCD (3-digits BCD code)	
	Multifunction programmable contact input (higher order 8 bits)	
Multifunction programmable analog output (current/voltage switchable)		・Current: DC4-20mA output (source output) Connectable largest resistor: 750Ω ・Voltage: DC+/-10V output
Multifunction programmable relay contact output		・1a-/1b-contact output (2 circuits) Contact ratings: 250Vdc-2A (cos φ =1) 250Vac-1A (cos φ =0.4) 30Vdc-1A

■Installation of Add-on module options (200V 75kW or less / 400V 132kW or less) Connect Add-on cassette option to the right side of VF-A7 via an atlachment (SBP001)
1 cassette : 48.5mm and more
2 cassettes : 73.5 〃
3 cassettes : 98.5 〃



■Installation of Add-on module options (200V 90kW or more / 400V 160kW or more)
Connect Add-on cassette option to the rightside of the operating panel via an attachment (SBP002Z)
L=50.0㎜ and more



Stand-alone options

Voltage class	Applicable motor (kW)	Inverter model	Input AC reactor model	DC reactor model	Radio noise reduction filter			Braking resistor/ braking resistor unit model	Filter for suppressing surge voltage on motor-side model	Motor noise reduction reactor
					High attenuation type	Simple type	Core type (Note 1)			
200V class	0.4	VFA7-2004PL	PFL-2005S	DCL-2007	Each type of inverter has a built-in noise filter.	—	RC9129	—	—	—
	0.75	VFA7-2007PL						—		
	1.5	VFA7-2015PL	PFL-2011S	DCL-2022				—		
	2.2	VFA7-2022PL						—		
	3.7	VFA7-2037PL	PFL-2018S	DCL-2037				—		
	5.5	VFA7-2055PL	PFL-2025S	DCL-2055				PBR3-2055		
	7.5	VFA7-2075PL	PFL-2050S	DCL-2110				PBR3-2075		
	11	VFA7-2110P			NF3050A-MJ	RCL-M2		PBR3-2110		
	15	VFA7-2150P	PFL-2100S	DCL-2220	NF3080A-MJ			PBR3-2150		
	18.5	VFA7-2185P								
	22	VFA7-2220P			NF3100A-MJ			PBR3-2220		
	30	VFA7-2300P	PFL-2150S	DCL-2370	NF3150A-MJ			PB3-2300		
	37	VFA7-2370P1						PB3-2550		
	45	VFA7-2450P1	PFL-2200S	DCL-2450	NF3200A-MJ					
	55	VFA7-2550P1	PFL-2300S	DCL-2550	NF3250A-MJ		RC9129×4-S (Note 3)			NRL2220
	75	VFA7-2750P1	PFL-2400S	DCL-2750	NF3250A-MJ x 2P			DPG600W-B1 [DGP600W-C1] (Note 2)		NRL2300
	90	VFA7-2900P1	PFL-2600S	DCL-2900						NRL2400
400V class	0.75	VFA7-4007PL	PFL-4012S	DCL-2007	Each type of inverter has a built-in noise filter.	—	RC9129	—	MSF-4015Z	—
	1.5	VFA7-4015PL						—		
	2.2	VFA7-4022PL		DCL-2022				—	MSF-4037Z	
	3.7	VFA7-4037PL						—		
	5.5	VFA7-4055PL	PFL-4025S	DCL-4110				PBR3-4055	MSF-4075Z	
	7.5	VFA7-4075PL						PBR3-4075		
	11	VFA7-4110PL						PBR3-4110	MSF-4150Z	
	15	VFA7-4150PL	PFL-4050S	DCL-4220				PBR3-4150		
	18.5	VFA7-4185P			NF3040C-MJ	RCL-M4			MSF-4220Z	
	22	VFA7-4220P			NF3050C-MJ			PBR3-4220		
	30	VFA7-4300P	PFL-4100S	DCL-4450	NF3060C-MJ			PBR3-4300	MSF-4370Z	
	37	VFA7-4370P1			NF3080C-MJ			PB3-4550		
	45	VFA7-4450P1			NF3100C-MJ				MSF-4550Z	
	55	VFA7-4550P1	PFL-4150S	DCL-4750	NF3150C-MJ					
	75	VFA7-4750P1					RC9129×4-S (Note 3)		MSF-4750Z	NRL4155
	90/110	VFA7-4110KP1	PFL-4300S	DCL-4110K	NF3200C-MJ x 2P			DGP600W-B2 [DGP600W-C2] (Note 2) (Note 4)	—	NRL4230
	132	VFA7-4132KP1	PFL-4400S	DCL-4160K						NRL4300
	160	VFA7-4160KP1			NF3250C-MJ x 2P					NRL4350
	220	VFA7-4220KP1	PFL-4600S	DCL-4220K	NF3200C-MJ x 3P			DGP600W-B3 [DGP600W-C3] (Note 2) (Note 4)		NRL4460
	280	VFA7-4280KP1	PFL-4800S	DCL-4280K	NF3250C-MJ x 3P			DGP600W-B4 [DGP600W-C4] (Note 2) (Note 4)		NRL4550

Notes)
1. This filter needs to be wound around the input side of the power line (number of turns: 4 turns or more). This filter can be used for the output side of the power line, as well. For filters with 22㎟ and larger wires, at least four filters should be installed in series. A round type (model: RC5078) is also available.
2. Each model between brackets is provided with a drip cover.
3. This type of filters cannot be used for certain sizes of cables.
4. As options, dynamicbraking circuit is needed.

■Useful information when ordering

Machine application	Type Manufacturer Application	Fan, blower, pump, other( )
Moter specifications	Rated capacity	kW(HP) No. of poles
	Rated voltage	V Rated frequency Hz
	Rated current	A Time rating
	Model	Manufacturer
	Existing or new	
Inverter specifications	Rated capacity	kVA Power supply Phase V Hz
	Output voltage	V Output frequency Hz
	Frequency range	Hz to Hz
	Motor speed range	min^{-1} to min^{-1}
	Options	
Driving conditions	Starting frequency	Hz Starting torque
	Acceleration, deceleration times	Specified
	Load GD^2	No・Yes (s.)
	Regenerative brake	Required (Injection brake unit used)・Not required
Other special items		

■EMI noise filter for CE marking

Can conform to CE marking, by using these filters and wiring properly.

Inverter model	Filter model
VFA7-2110P	FN258-75/34
VFA7-2150P	FN258-100/35
VFA7-2185P	FN258-100/35
VFA7-2220P	FN258-100/35
VFA7-2300P	FN258-130/35
VFA7-2370P1	FN258-180/07 FN3258-180/40
VFA7-2450P1	FN258-130/35X2P FN258-250/07 FN3359-250/28
VFA7-2550P1	FN258-130/35X2P FN258-250/07 FN3359-250/28
VFA7-2750P1	FN359-300/99 FN3359-320/99
VFA7-2900P1	FN359-400/99 FN3359-400/99

Inverter model	Filter model
VFA7-4185P	FN258-42/07
VFA7-4220P	FN258-55/07
VFA7-4300P	FN258-75/34
VFA7-4370P1	FN3258-75/52 FS5992-72/52
VFA7-4450P1	FN258-100/35 FN3258-100/35
VFA7-4550P1	FN3258-130/35 FS5992-130/35
VFA7-4750P1	FN258-180/07 FN3258-180/40
—	—
VFA7-4110KP1	FN359(H)-250/99 FN3359(HV)-250/28
VFA7-4132KP1	FN359(H)-300/99 FN3359(HV)-320/99
VFA7-4160KP1	FN359(H)-400/99 FN3359(HV)-400/99
VFA7-4220KP1	FN359(H)-500/99 FN3359(HV)-500/99
VFA7-4280KP1	FN359(H)-600/99 FN3359(HV)-600/99

Note) Input Voltage

FN258, FN3258	480V or less		
FN359	400V or less,	FN359H	520V or less
FN3359	500V or less,	FN3359HV	690V or less

These filters are not needed for 200V class. 0.4～7.5kW, 400V class 0.75～15kW. Because these units have EMI filter inside.

These filters are made by SCHAFFNER

To users of our inverters: Our inverters are designed to control the speeds of three-phase induction motors for general industry.

⚠ Precautions

* Read the instruction manual before installing or operating the inverter unit and store it in a safe place for reference.
* When using our inverters for equipment such as nuclear power control equipment, aviation and space flight control equipment, traffic equipment, and safety equipment, and there is a risk that any failure or malfunction of the inverter could directly endanger human life or cause injury, please contact our headquarters, branch, or office printed on the front and back covers of this catalogue. Such applications must be studied carefully.
* When using our inverters for critical equipment, even though the inverters are manufactured under strict quality control always fit your equipment with safety devices to prevent serious accident or loss should the inverter fail (such as failure to issue an inverter trouble signal).
* Do not use our inverters for any load other than three-phase induction motors.
* None of Toshiba, its subsidiaries, affiliates or agents, shall be liable for any physical damages, including, without limitation,malfunction, anomaly, breakdown or any other problem that may occur to any apparatus in which the Toshiba inverter is incorporated or to any equipment that is used in combination with the Toshiba inverter. Nor shall Toshiba, its subsidiaries, affiliates or agents be liable for any compensatory damages resulting from such utilization, including compensation for special,indirect, incidental, consequential, punitive or exemplary damages, or for loss of profit, income or data, even if the user has been advised or apprised of the likelihood of the occurrence of such loss or damages.

For further information, please contact your nearest Toshiba Representative or International Operations-Producer Goods.
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