E6581611 S

TOSHIBA

Industrial Inverter
(For 3-phase induction motors)

Instruction Manual

TOSVERT VF-S15

<Simplified manual>

3-phase 240V class	0.4 to 15kW
1-phase 240V class	0.2 to 2.2kW
3-phase 500V class	0.4 to 15kW

NOTICE

1. Make sure that this instruction manual is delivered to the end user of the inverter unit.
2. Read this manual before installing or operating the inverter unit, and store it in a safe place for reference.

I. Safety precautions

The items described in these instructions and on the inverter itself are very important so that you can use safely the inverter, prevent injury to yourself and other people around you as well as to prevent damage to property in the area. Thoroughly familiarize yourself with the symbols and indications shown below and then continue to read the manual. Make sure that you observe all warnings given.

Explanation of markings

Marking	Meaning of marking
⚠ Warning	Indicates that errors in operation may lead to death or serious injury.
⚠ Caution	Indicates that errors in operation may lead to injury (*1) to people or that these errors may cause damage to physical property. (*2)

(*1) Such things as injury, burns or shock that will not require hospitalization or long periods of outpatient treatment.

(*2) Physical property damage refers to wide-ranging damage to assets and materials.

Meanings of symbols

Marking	Meaning of marking
	Indicates prohibition (Don't do it). What is prohibited will be described in or near the symbol in either text or picture form.
	Indicates an instruction that must be followed. Detailed instructions are described in illustrations and text in or near the symbol.
	-Indicates warning. What is warned will be described in or near the symbol in either text or picture form. -Indicates caution. What the caution should be applied to will be described in or near the symbol in either text or picture form.

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■ Limits in purpose

This inverter is used for controlling speeds of three-phase induction motors in general industrial use.

Single-phase input model is output by the inverter as three-phase output and cannot drive a single-phase motor.

⚠ Safety precautions

▼ This product is intended for general purpose uses in industrial application. It cannot be used applications where may cause big impact on public uses, such as power plant and railway, and equipment which endanger human life or injury, such as nuclear power control, aviation, space flight control, traffic, safety device, amusement, or medical.
It may be considerable whether to apply, under the special condition or an application where strict quality control may not be required. Please contact your Toshiba distributor.

▼ Please use our product in applications where do not cause serious accidents or damages even if product is failure, or please use in environment where safety equipment is applicable or a backup circuit device is provided outside the system.

▼ Please do not use our product for any load other than three-phase induction motors in general industrial use. (Use in other than properly applied three-phase induction motors may cause an accident.)
Single-phase input model is output by the inverter as three-phase output and cannot drive a single-phase motor.

■ Handling

⚠ Warning		Reference section
 Disassembly prohibited	• Never disassemble, modify or repair. This can result in electric shock, fire and injury. Call your Toshiba distributor for repairs.	2.
 Prohibited	• Never remove the terminal block cover when power is on. The unit contains many high voltage parts and contact with them will result in electric shock. • Do not stick your fingers into openings such as cable wiring holes and cooling fan covers. This can result in electric shock or other injury. • Do not place or insert any kind of object (electrical wire cuttings, rods, wires etc.) into the inverter. This can result in electric shock or fire. • Do not allow water or any other fluid to come in contact with the inverter. This can result in electric shock or fire.	2.1 2. 2. 2.
 Mandatory action	• Turn the power on only after attaching the terminal block cover. If the power is turned on without the terminal block cover attached, this can result in electric shock or other injury. • If the inverter begins to emit smoke or an unusual odor, or unusual sounds, immediately turn the power off. Continuous use of the inverter in such a state may cause fire. Call your Toshiba distributor for repairs. • Always turn the power off if the inverter is not used for long periods of time since there is a possibility of malfunction caused by leaks, dust and other material. If power is left on with the inverter in that state, it may result in fire.	2.1 3. 3.

⚠ Caution		Reference section
Contact prohibited	• Do not touch heat radiating fins or discharge resistors. These devices are hot, and you'll get burned if you touch them.	3.
Mandatory action	• Use an inverter that conforms to the specifications of power supply and three-phase induction motor being used. If the inverter being used does not conform to those specifications, not only will the three-phase induction motor not rotate correctly, but it may also cause serious accidents through overheating and fire.	1.1 1.4.1

■ Transportation & installation

⚠ Warning		Reference section
Prohibited	• Do not install or operate the inverter if it is damaged or any component is missing. This can result in electric shock or fire. Call your Toshiba distributor for repairs.	1.4.4
	• Do not place any inflammable objects near the inverter. If an accident occurs in which flame is emitted, this could lead to fire.	1.4.4
	• Do not install in any location where the inverter could come into contact with water or other fluids. This can result in electric shock or fire.	1.4.4
Mandatory action	• Operate under the environmental conditions prescribed in the instruction manual. Operations under any other conditions may result in malfunction.	1.4.4
	• Mount the inverter on a metal plate. The rear panel gets very hot. Do not install in an inflammable object, this can result in fire.	1.4.4
	• Do not operate with the terminal block cover removed. This can result in electric shock. Failure to do so can lead to risk of electric shock and can result in death or serious injury.	1.4.4
	• An emergency stop device must be installed that fits with system specifications (e.g. shut off input power then engage mechanical brake). Operation cannot be stopped immediately by the inverter alone, thus resulting in an accident or injury.	1.4.4
	• All options used must be those specified by Toshiba. The use of any other option may result in an accident.	1.4.4
	• When using switchgear for the inverter, it must be installed in a cabinet. Failure to do so can lead to risk of electric shock.	10

⚠ Caution		Reference section
Prohibited	• When transporting or carrying, do not hold by the front panel covers. The covers may come off and the unit will drop, resulting in injury.	2.
	• Do not install in any area where the unit would be subject to large amounts of vibration. This could cause the unit to fall, resulting in bodily injury.	1.4.4

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⚠ Caution		Reference section
Mandatory action	• When removing and installing the terminal cover with a screwdriver, be sure not to scratch your hand as these results in injury.	1.3.2
	• Pressing too hard on the screwdriver may scratch the inverter.	1.3.2
	• Always turn the power off when removing the wiring cover.	1.3.2
	• After wiring is complete, be sure to replace the terminal cover.	1.3.2
	• The main unit must be installed on a base that can bear the unit's weight. If the unit is installed on a base that cannot withstand that weight, the unit may fall, resulting in injury.	1.4.4
	• If braking is necessary (to hold motor shaft), install a mechanical brake. The brake on the inverter will not function as a mechanical hold, and if used for that purpose, injury may result.	1.4.4

■ Wiring

⚠ Warning		Reference section
Prohibited	• Do not connect input power to the output (motor side) terminals (U/T1, V/T2, W/T3). Connecting input power to the output could destroy the inverter or cause a fire.	2.2
	• Do not insert a braking resistor between DC terminals (between PA/+ and PC/- or PO and PC/-). It could cause a fire.	2.2
	• First shut off input power and wait at least 15 minutes before touching terminals and wires on equipment (MCCB) that is connected to inverter power side. Touching the terminals and wires before that time could result in electric shock.	2.2
	• Do not shut down the external power supply on ahead when VIA terminal is used as logic input terminal by external power supply. It could cause unexpected result as VIA terminal is ON status.	2.2
Mandatory action	• Electrical construction work must be done by a qualified expert. Connection of input power by someone who does not have that expert knowledge may result in fire or electric shock.	2.1
	• Connect output terminals (motor side) correctly. If the phase sequence is incorrect, the motor will operate in reverse and that may result in injury.	2.1
	• Wiring must be done after installation. If wiring is done prior to installation, that may result in injury or electric shock.	2.1
	• The following steps must be performed before wiring. (1) Turn off all input power. (2) Wait at least 15 minutes and check to make sure that the charge lamp is no longer lit. (3) Use a tester that can measure DC voltage (400VDC or 800VDC or more), and check to make sure that the voltage to the DC main circuits (across PA/+ - PC/-) is 45V or less. If these steps are not properly performed, the wiring will cause electric shock.	2.1
	• Tighten the screws on the terminal block to specified torque. If the screws are not tightened to the specified torque, it may lead to fire.	2.1
	• Check to make sure that the input power voltage is +10%, -15% of the rated power voltage (±10% when the load is 100% in continuous operation) written on the name plate. If the input power voltage is not +10%, -15% of the rated power voltage (±10% when the load is 100% in continuous operation), this may result in fire.	1.4.4
	• Set a parameter F109 when VIA or VIB terminals are used as logic input terminal. If it is not set, it could result in malfunction.	2.2
	• Set a parameter F147 when S3 terminal is used as PTC input terminal. If it is not set, it could result in malfunction.	2.2

⚠ Warning		Reference section
Be Grounded	• Ground must be connected securely. If the ground is not securely connected, it could lead to electric shock or fire.	2.1 2.2 10.

⚠ Caution		Reference section
Prohibited	• Do not attach devices with built-in capacitors (such as noise filters or surge absorbers) to the output (motor side) terminals. This could cause a fire.	2.1

■ Operations

⚠ Warning		Reference section
Prohibited	• Never touch the internal connector while the upper terminal cover of control panel is opened. There is a risk of electrical shock because it carries a high voltage.	1.3.2
	• Do not touch inverter terminals when electrical power is going to the inverter even if the motor is stopped. Touching the inverter terminals while power is connected to it may result in electric shock.	3.
	• Do not touch switches when the hands are wet and do not try to clean the inverter with a damp cloth. Such practices may result in electric shock.	3.
	• Do not go near the motor in alarm-stop status when the retry function is selected. The motor may suddenly restart and that could result in injury. Take measures for safety, e.g. attaching a cover to the motor, against accidents when the motor unexpectedly restarts.	3.
Mandatory action	• Turn the input power on only after attaching the terminal block cover. When enclosed inside a cabinet and used with the terminal block cover removed, always close the cabinet doors first and then turn the power on. If the power is turned on with the terminal block cover or cabinet doors open may result in electric shock.	3.
	• Make sure that operation signals are off before resetting the inverter after malfunction. If the inverter is reset before turning off the operating signal, the motor may restart suddenly, resulting in injury.	3.
	• If incorrect setting, the drive may has some damage or unexpected movement. Be sure to set the setup menu correctly.	3.1

⚠ Caution		Reference section
Prohibited	• Observe all permissible operating ranges of motors and mechanical equipment. (Refer to the motor's instruction manual.) Not observing these ranges may result in injury.	3.
	• Do not set the stall prevention level (F601) extremely low. If the stall prevention level parameter (F601) is set at or below the no-load current of the motor, the stall preventive function will be always active and increase the frequency when it judges that regenerative braking is taking place. Do not set the stall prevention level parameter (F601) below 30% under normal use conditions.	6.29.2

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Caution		Reference section
Mandatory action	• Use an inverter that conforms to the specifications of power supply and three-phase induction motor being operated. If the inverter being used does not conform to those specifications, not only will the three-phase induction motor not rotate correctly, but it may cause serious accidents through overheating and fire.	1.4.1
	• The leakage current through the input/output power cables of inverter and capacitance of motor may affect to peripheral devices. The value of leakage current is increased under the condition of the PWM carrier frequency and the length of the input/output power cables. In case the total cable length (total of length between an inverter and motors) is more than 100m, overcurrent trip may occur even the motor no-load current. Make enough space among each phase cable or install the filter (MSF) as countermeasure.	1.4.3

■ When operation by using remote keypad is selected

Warning		Reference section
Mandatory action	• Set the parameter Communication time-out time (F803), Communication time-out action (F804) and Disconnection detection of extension panel (F731). If these are not properly set, the inverter can not be stopped immediately in breaking communication and this could result in injury and accidents.	6.38.1
	• An emergency stop device and the interlock that fit with system specifications must be installed. If these are not properly installed, the inverter can not be stopped immediately and this could result in injury and accidents.	6.38.1

■ When sequence for restart after a momentary failure is selected (inverter)

Caution		Reference section
Mandatory action	• Stand clear of motors and mechanical equipment. If the motor stops due to a momentary power failure, the equipment will start suddenly after power is restored. This could result in unexpected injury.	5.9
	• Attach caution label about sudden restart after a momentary power failure on inverters, motors and equipment for prevention of accidents in advance.	5.9

■ When retry function is selected (inverter)

Caution		Reference section
Mandatory action	• Stand clear of motors and equipment. If the motor and equipment stop when the alarm is given, selection of the retry function will restart them suddenly after the specified time has elapsed. This could result in unexpected injury.	6.19.3
	• Attach caution label about sudden restart in retry function on inverters, motors and equipment for prevention of accidents in advance.	6.19.3

■ Maintenance and inspection

⚠ Warning		Reference section
Prohibited	• Do not replace parts. This could be a cause of electric shock, fire and bodily injury. To replace parts, call your Toshiba distributor.	14.2
Mandatory action	• The equipment must be inspected daily. If the equipment is not inspected and maintained, errors and malfunctions may not be discovered and that could result in accidents. • Before inspection, perform the following steps. (1) Turn off all input power to the inverter. (2) Wait at least 15 minutes and check to make sure that the charge lamp is no longer lit. (3) Use a tester that can measure DC voltages (400V/800V DC or more), and check that the voltage to the DC main circuits (across PA/+ - PC/-) is 45V or less. Performing an inspection without carrying out these steps first could lead to electric shock.	14. 14. 14.2

■ Disposal

⚠ Caution		Reference section
Mandatory action	• If you dispose of the inverter, have it done by a specialist in industry waste disposal (*). If you dispose of the inverter by yourself, this can result in explosion of capacitor or produce noxious gases, resulting in injury. (*) Persons who specialize in the processing of waste and known as "industrial waste product collectors and transporters" or "industrial waste disposal persons". Please observe any applicable law, regulation, rule or ordinance for industrial waste disposal.	16.

■ Attach caution labels

Shown here are examples of caution labels to prevent, in advance, accidents in relation to inverters, motors and other equipment. Be sure to affix the caution label where it is easily visible when selecting the auto-restart function (5.9) or the retry function (6.19.3).

If the inverter has been programmed for restart sequence of momentary power failure, place warning labels in a place where they can be easily seen and read.
(Example of caution label)

⚠ Caution (Functions programmed for restart)

Do not go near motors and equipment.
Motors and equipment that have stopped temporarily after momentary power failure will restart suddenly after recovery.

If the retry function has been selected, place warning labels in a location where they can be easily seen and read.

(Example of caution label)

⚠ Caution (Functions programmed for retry)

Do not go near motors and equipment.
Motors and equipment that have stopped temporarily after an alarm will restart suddenly after the specified time has elapsed.

—— Contents ——

1. Read first

1.1 Check product purchase

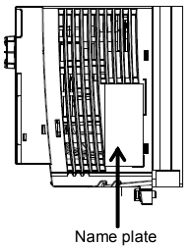
Before using the product you have purchased, check to make sure that it is exactly what you ordered.

Caution	
Mandatory action	Use an inverter that conforms to the specifications of power supply and three-phase induction motor being used. If the inverter being used does not conform to those specifications, not only will the three-phase induction motor not rotate correctly, but it may also cause serious accidents through overheating and fire.

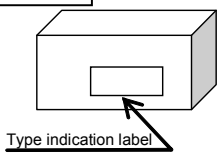
Rating label

Model
Power supply
Motor capacity

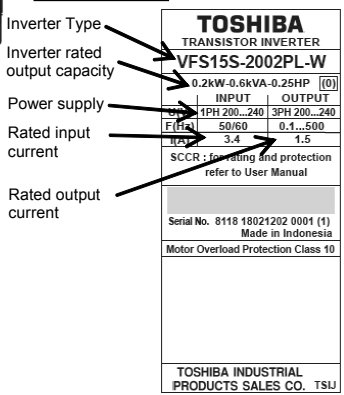
Inverter main unit



Carton box



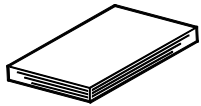
Name plate



Setup sheet

Danger label

Quick start manual



CD-ROM

Contains the instruction manual in digital form

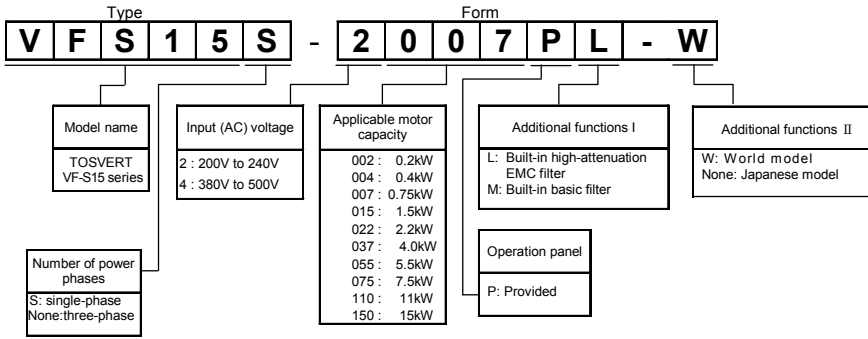
Danger label kit

Danger labels for sticking in 6 languages.

- English
- Germany / English
- Italian / English
- Spanish / English
- Chinese / English
- France / English

1.2 Contents of the product

Explanation of the name plate label



Note 1) Always shut power off first then check the ratings label of inverter held in a cabinet.
Note 2) ID label is stuck for special specification product.

1.3 Names and functions

1.3.1 Outside view

STATUS lamp

Lights and blinks when using CANopen® communication option.

Charge lamp

Indicates there is a high voltage still in the inverter. Do not open the terminal block cover when this lamp is lit because it is dangerous.

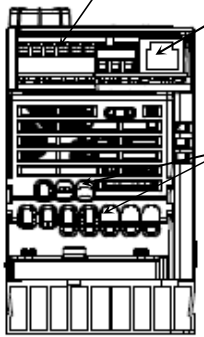
Cover

This is the body and terminal block cover.
Always close this cover before operation to avoid accidentally touching the terminal block.
The serial number is recorded on the back side.

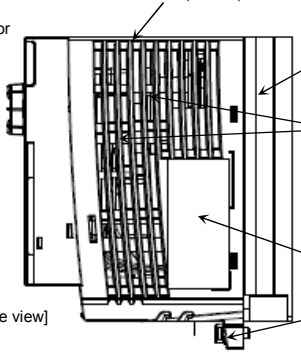
Door lock

Slide the door lock to upside for unlock.

[Front view]



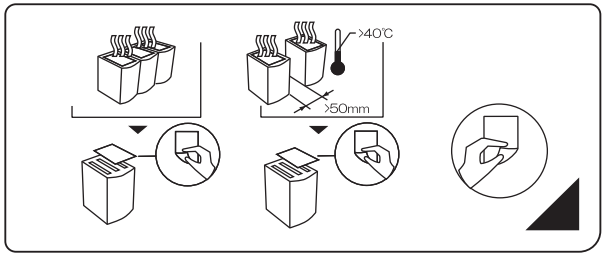
[Bottom view]



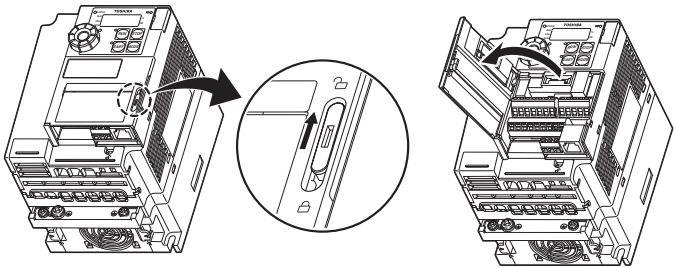
[Side view]

Note 1) Remove the protective label as shown on the next page when installing the inverter side by side with other inverters and using the inverter in locations with temperatures above 40℃.

Example of the protective label on the top of the inverter



[Opening the cover]



Insert a small screw driver
and slide the door lock to
upside for unlock.
(Slide it to downside for lock.)

★About the monitor display

The LED on the operation panel uses the following symbols to indicate parameters and operations.

LED display (numbers)

0	1	2	3	4	5	6	7	8	9	-
0	1	2	3	4	5	6	7	8	9	-

LED display (letters)

Aa	Bb	C	c	Dd	Ee	Ff	Gg	H	h	I	i	Jj	Kk	Ll
A	b	C	c	d	E	F	G	H	h	I	,	J		L

Mm	Nn	O	o	Pp	Qq	Rr	Ss	Tt	Uu	Vv	Ww	Xx	Yy	Zz
M	n	O	o	P	q	r	S	t	U	u			Y	

[Operation panel]

RUN lamp

Lit when a frequency is not output with the ON run command. This lamp blinks when operation starts.

% lamp

Displayed numbers are in %.

Hz lamp

Displayed numbers are in Hertz.

RUN key

Pressing this key while the RUN key lamp is on starts operation.

PRG lamp

When lit, the inverter is in parameter setting mode. When blinking, the inverter is in RUN.

RUN key lamp

Lights when the RUN key is enabled.

MON lamp

While this is lit, the inverter is in monitor mode. While blinking, the inverter is in "Past Trip History Details Monitor Display".

STOP key

While the RUN lamp is blinking, pressing this key once to slow down and stop the inverter. During the terminal block operation, pressing this key twice for emergency stop. During trip, pressing this key twice for reset.

Setting dial

Turning the dial left and right changes the operation frequency, parameters and etc.

Center of the setting dial

Pressing the center of the setting dial is used for determining values.

EASY key

Switches between easy and standard setting modes.

MODE key

Switches between run, settings, and status monitor modes.

Setting dial lamp

Setting the operation frequency while this lamp is lit.

EASY key lamp

Lights when the EASY key is enabled.

1.3.2 Opening terminal cover and terminal block

Warning	
Prohibited	• Never touch the internal connector while the upper cover of control panel is opened. There is a risk of electrical shock because it carries a high voltage.

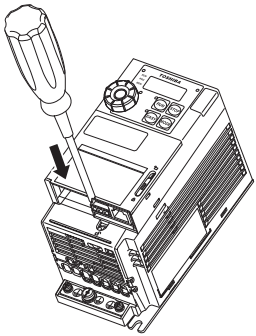
Caution	
Mandatory action	• When removing and mounting the terminal cover or the terminal block with a screwdriver, be sure not to scratch your hand as these results in injury. • Pressing too hard on the screwdriver may scratch the inverter. • Always turn the power off when removing the wiring cover. • After wiring is complete, be sure to replace the terminal cover.

Use the following procedure to open the terminal cover and pull the power terminal block.

Inverter type	Procedure	Reference number
VFS15-2004PM-W to 2007PM-W VFS15S-2002PL-W to 2007PL-W	In the beginning, remove the outside terminal block cover.	(1)
	Next, remove the inside terminal block cover.	(2)
VFS15-2015PM-W to 2037PM-W VFS15S-2015PL-W, 2022PL-W VFS15-4004PL-W to 4015PL-W	In the beginning, remove the outside terminal block cover.	(3)
	Next, remove the inside terminal block cover.	(4)
VFS15-4022PL-W, 4037PL-W	In the beginning, remove the outside terminal block cover.	(3)
	Next, remove the inside terminal block cover.	(5)
VFS15-2055PM-W to 2150PM-W VFS15-4055PL-W to 4150PL-W	Follow a procedure and remove the power terminal cover.	(6)

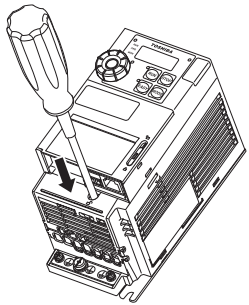
(1) Removing the outside terminal block cover (VFS15-2004PM-W to 2007PM-W, VFS15S-2002PL-W to 2007PL-W)

1)



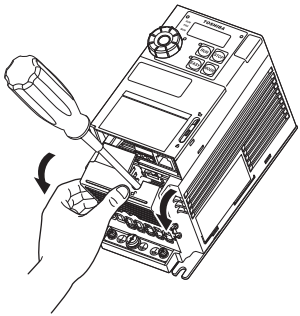
Insert a screwdriver or other thin object into the hole indicated with the ⏍ mark.

2)



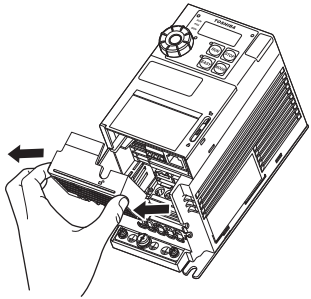
Press in on the screwdriver.

3)



While pressing on the screwdriver, rotate the terminal cover downward to remove it.

4)

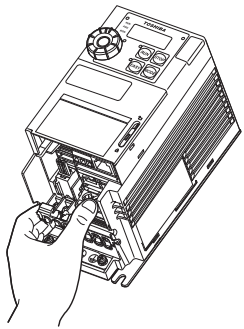


Pull the terminal cover up at an angle.

★ After wiring is complete, be sure to restore the terminal cover to its original position.

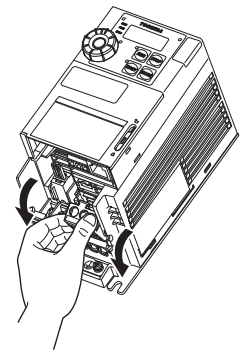
(2) Removing the inside terminal block cover (VFS15-2004PM-W to 2007PM-W, VFS15S-2002PL-W to 2007PL-W)

1)



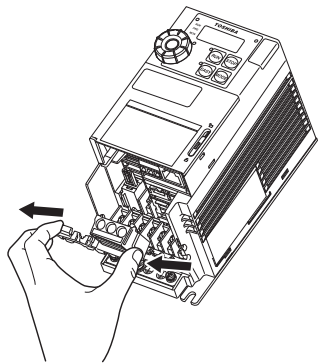
The finger is put on to the tab part of the terminal block cover.

2)



While pressing on the screwdriver, rotate the terminal cover downward to remove it.

3)

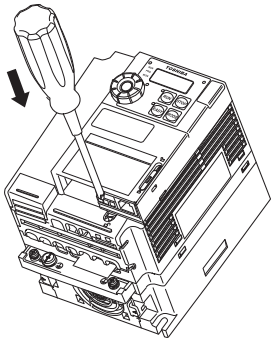


Pull the terminal cover up at an angle.

★ After wiring is complete, be sure to restore the terminal cover to its original position.

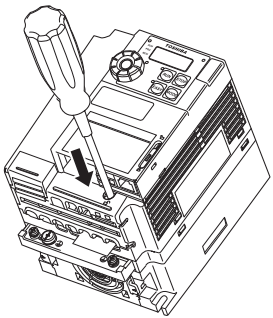
(3) Removing the outside terminal block cover (VFS15-2015PM-W to 2037PM-W, VFS15S-2015PL-W, 2022PL-W, VFS15-4004PL-W to 4037PL-W)

1)



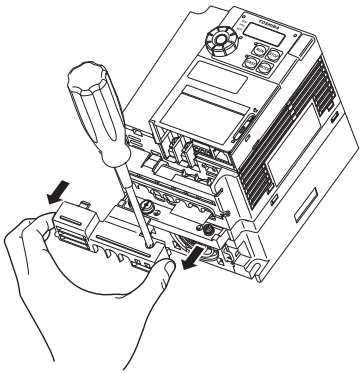
Insert a screwdriver or other thin object into the hole indicated with the ⏍ mark.

2)



Press in on the screwdriver.

3)

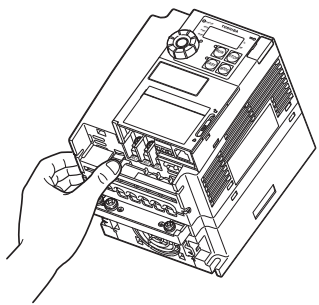


While pressing on the screwdriver, sidles the terminal cover downward to remove it.

★ After wiring is complete, be sure to restore the terminal cover to its original position.

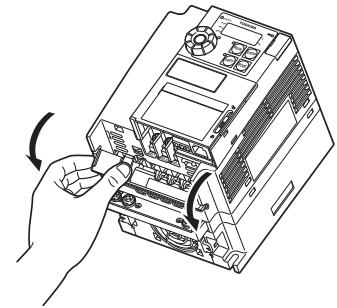
(4) Removing the inside terminal block cover (VFS15-2015PM-W to 2037PM-W, VFS15S-2015PL-W, 2022PL-W, VFS15-4004PL-W to 4015PL-W)

1)



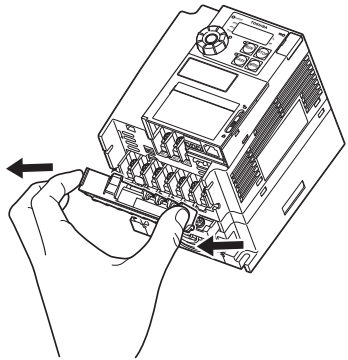
The finger is put on to the tab part of the terminal block cover.

2)



While pressing on the screwdriver, rotate the terminal cover downward to remove it.

3)

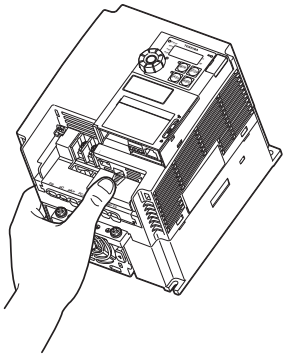


Pull the terminal cover up at an angle.

★ After wiring is complete, be sure to restore the terminal cover to its original position.

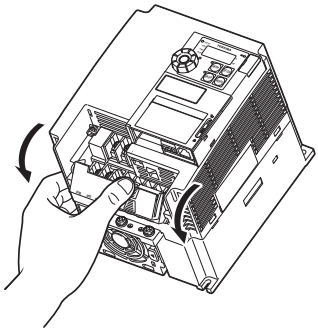
(5) Removing the inside terminal block cover (VFS15-4022PL-W, 4037PL-W)

1)



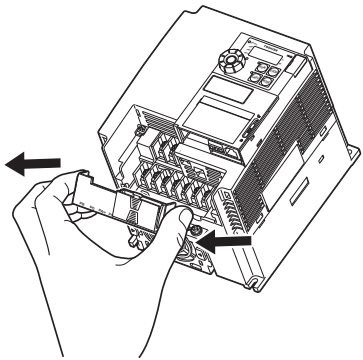
The finger is put on to the tab part of the terminal block cover.

2)



While pressing on the screwdriver, rotate the terminal cover downward to remove it.

3)

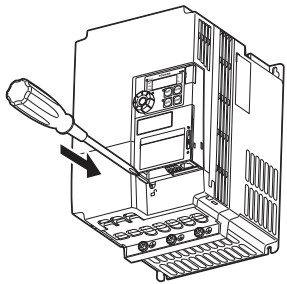


Pull the terminal cover up at an angle.

★ After wiring is complete, be sure to restore the terminal cover to its original position.

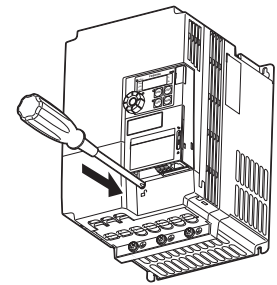
(6) Removing the power terminal cover (VFS15-2055PM-W to 2150PM-W, VFS15-4055PL-W to 4150PL-W)

1)



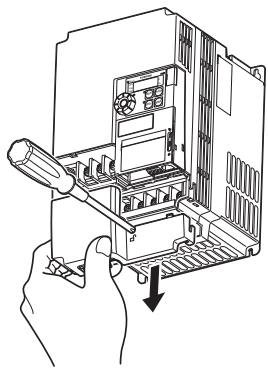
Insert a screwdriver or other thin object into the hole indicated with the ⏍ mark.

2)



Press in on the screwdriver.

3)



While pressing on the screwdriver, slide the terminal cover downward to remove it.

★ After wiring is complete, be sure to restore the terminal cover to its original position.

1.3.3 Power circuit and control circuit terminal blocks

1) Power circuit terminal

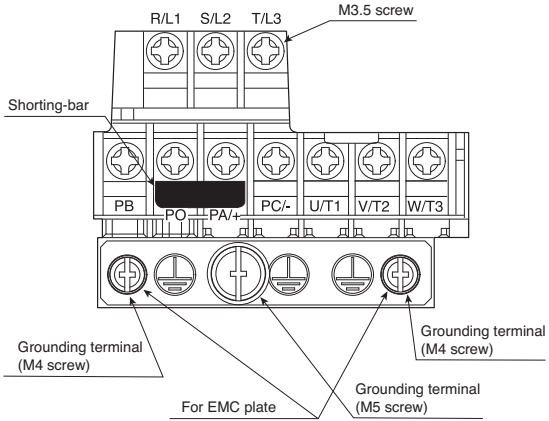
In case of the lug connector, cover the lug connector with insulated tube, or use the insulated lug connector.

Use a plus or minus screwdriver to loose or tighten screws.

Screw size	Tightening torque	
M3.5 screw	1.0 N·m	8.9 lb·in
M4 screw	1.4 N·m	12.4 lb·in
M5 screw	2.4 N·m	20.8 lb·in
M6 screw	4.5 N·m	40.0 lb·in
M4 screw (grounding terminal)	1.4 N·m	12.4 lb·in
M5 screw (grounding terminal)	2.8 N·m	24.8 lb·in

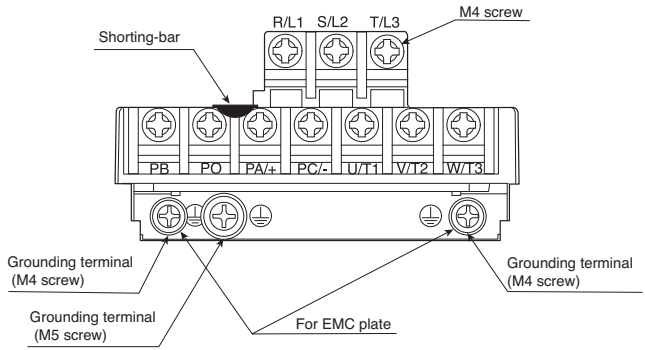
Refer to section 2.3.1 for details about terminal functions.

VFS15-2004PM-W to 2007PM-W

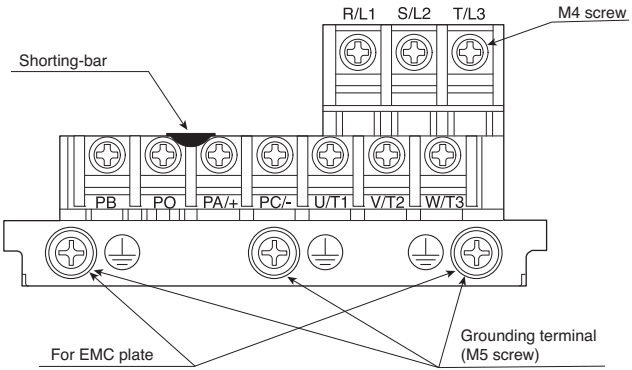


Note1) Bend the clips on the wiring port of the terminal cover to connect the PB, PO, PA/+, and PC/- terminals.
Note2) Be careful to insert all wires into the cage of terminal block.

VFS15-2015PM-W, 2022PM-W

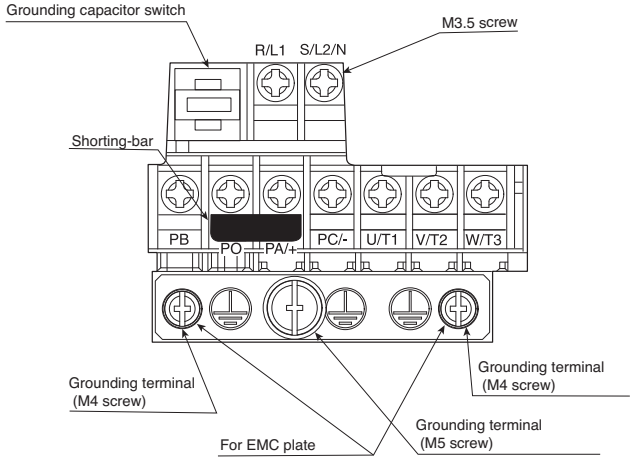


VFS15-2037PM-W

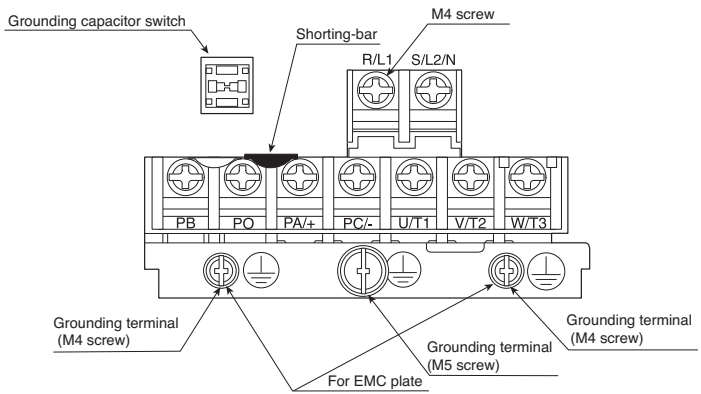


Note1) Bend the clips on the wiring port of the terminal cover to connect the PB, PO, PA/+, and PC/- terminals.
Note2) Be careful to insert all wires into the cage of terminal block.

VFS15S-2002PL-W to 2007PL-W

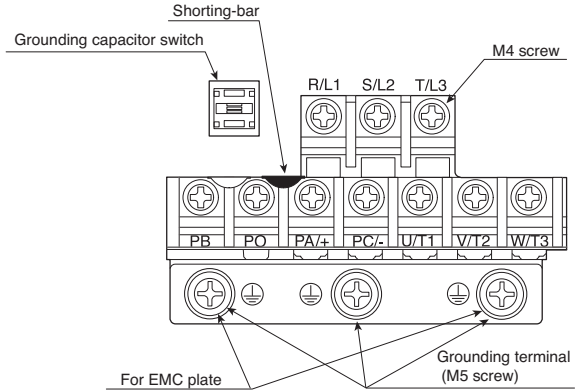


VFS15S-2015PL-W, 2022PL-W

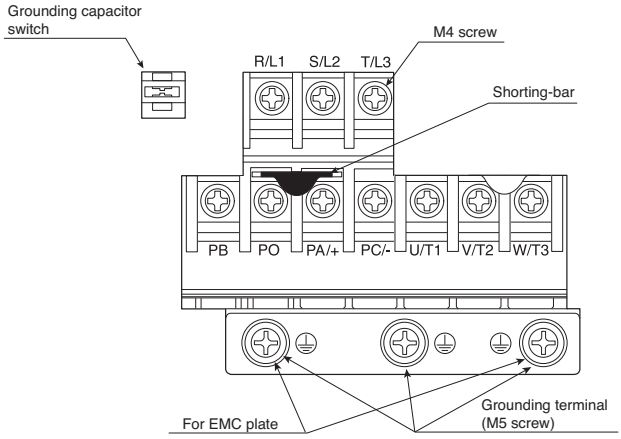


Note1) Bend the clips on the wiring port of the terminal cover to connect the PB, PO, PA/+, and PC/- terminals.
Note2) Be careful to insert all wires into the cage of terminal block.

VFS15-4004PL-W to 4015PL-W

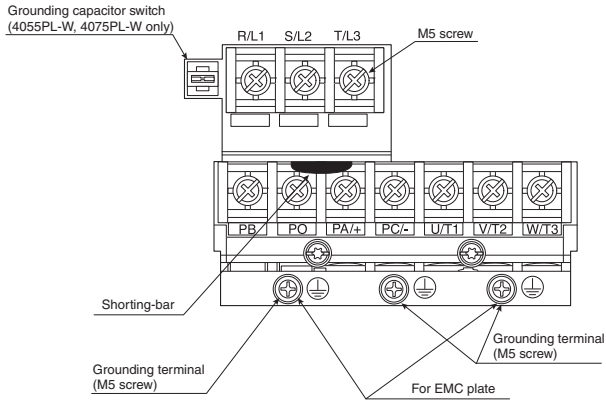


VFS15-4022PL-W, 4037PL-W

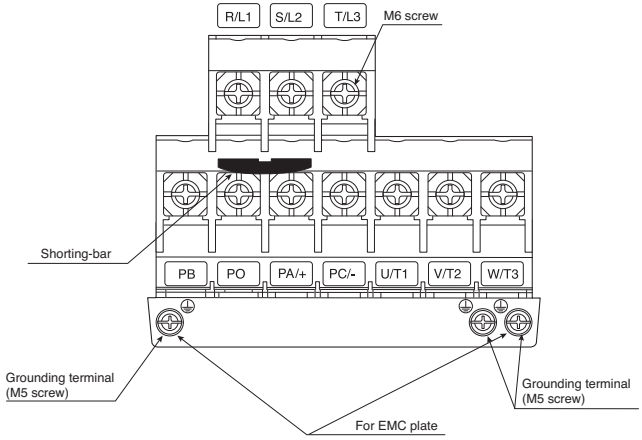


Note1) Bend the clips on the wiring port of the terminal cover to connect the PB, PO, PA/+, and PC/- terminals.
Note2) Be careful to insert all wires into the cage of terminal block.

VFS15-2055PM-W, 2075PM-W
VFS15-4055PL-W, 4075PL-W

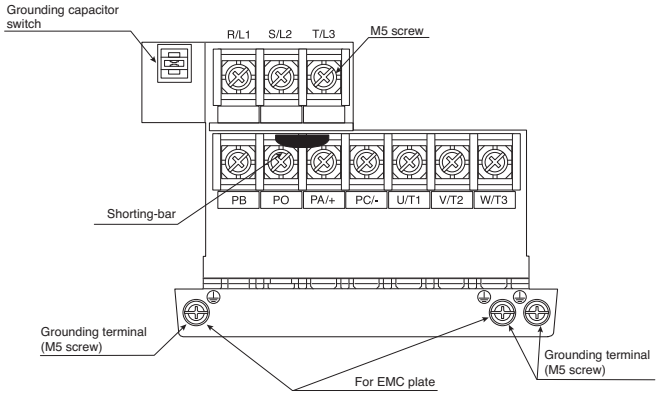


VFS15-2110PM-W, 2150PM-W



Note1) Bend the clips on the wiring port of the terminal cover to connect the PB, PO, PA/+, and PC/- terminals.
Note2) Be careful to insert all wires into the cage of terminal block.

VFS15-4110PL-W, 4150PL-W



Note1) Bend the clips on the wiring port of the terminal cover to connect the PB, PO, PA/+, and PC/- terminals.
Note2) Be careful to insert all wires into the cage of terminal block.

2) Grounding capacitor switch

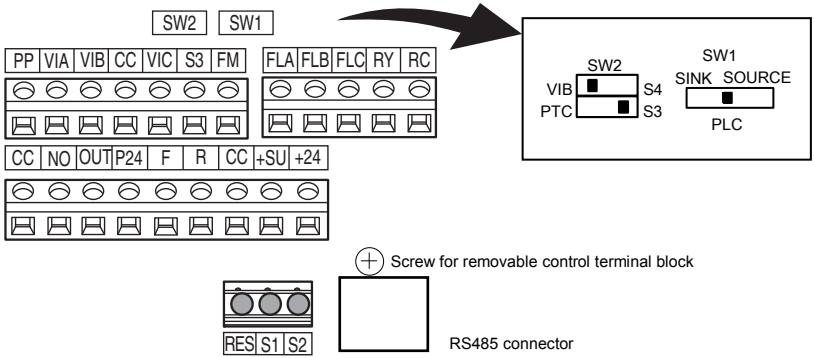
Single-phase 240V model and three-phase 500V model have a built-in high-attenuation noise filter and is grounded via a capacitor.
A switch makes for easy switching to reduce leakage current from the inverter and the load on the capacitor. However, be careful, as reducing the load means non-conformity with the EMC standard on the inverter itself. Always do switching with the power off.

Pressing this switches the grounding capacitor's capacity from small to large. (Default setting)

Pulling this switches the grounding capacitor's capacity from large to small. This reduces the leakage current.
When this inverter is connected to the IT system (insulated ground of power supply or the system has Impedance), the switch has to be pulled as the figure shows.

3) Control circuit terminal block

The control circuit terminal block is common to all equipment.



Screw size	Recommended tightening torque
M3 screw	0.5 N·m
	4.4 lb·in

Stripping length: 6 (mm)
Screwdriver: Small-sized flat-blade screwdriver
(Blade thickness: 0.5 mm, blade width: 3.5 mm)

Refer to section 2.3.2 for details about all terminal functions.

Wire size

Conductor	1 wire	2 wires of same size
Solid	0.3-1.5mm^2 (AWG 22-16)	0.3-0.75mm^2 (AWG 22-18)
Stranded		

Recommended ferrule

Using ferrule to be improved efficiency and reliability of wiring is recommended.

	Wire size mm^2 (AWG)	Type	
		PHOENIX CONTACT	Dinkle International.,Ltd
	0.34 (22)	AI 0.34-6TQ	DN00306
	0.5 (20)	AI 0.5-6WH	DN00506
	0.75 (18)	AI 0.75-6GY	DN00706
	1 (18)	AI 1-6RD	DN01006
	1.5 (16)	AI 1.5-8BK	DN01508
*2	2 X 0.5 (-)	AI TWIN2 X 0.5-8WH	DTE00508
*2	2 X0.75 (-)	AI TWIN2 X 0.75-8GY	DTE00708

*1: Crimping pliers CRIMPFOX ZA3 (PHOENIX CONTACT)
CT1 (Dinkle International.,Ltd)

*2: These ferrules enable practical crimping of two wires in a ferrule.

1.4 Notes on the application

1.4.1 Motors

When this inverter and the motor are used in conjunction, pay attention to the following items.

⚠ Caution	
Mandatory action	Use an inverter that conforms to the specifications of power supply and three-phase induction motor being operated. If the inverter being used does not conform to those specifications, not only will the three-phase induction motor not rotate correctly, but it may cause serious accidents through overheating and fire.

Comparisons with commercial power operation

This inverter employs the sinusoidal PWM system. However, the output voltage and output current are not perfect sine waves, they have a distorted wave that is close to sinusoidal waveform. This is why compared to operation with a commercial power there will be a slight increase in motor temperature, noise and vibration.

Operation in the low-speed area

When running continuously at low speed in conjunction with a general purpose motor, there may be a decline in that motor's cooling effect. If this happens, operate with the output decreased from rated load. To carry out low-speed operation continuously at the rated torque, we recommend to use a inverter rated motor or a forced cooled motor designed for use with an inverter. When operating in conjunction with an inverter rated motor, you must change the inverter's motor overload protection level $0L\,n$ to VF motor use.

Adjusting the overload protection level

This inverter protects against overloads with its overload detection circuits (electronic thermal). The electronic thermal's reference current is set to the inverter's rated current, so it must be adjusted in line with the rated current of the motor being used in combination.

High speed operation at and above 60Hz

Operating at frequencies greater than 60Hz will increase noise and vibration. There is also a possibility this will exceed the motor's mechanical strength limits and the bearing limits so you should inquire to the motor's manufacturer about such operation.

Method of lubricating load mechanisms

Operating an oil-lubricated reduction gear and gear motor in the low-speed areas will worsen the lubricating effect. Check with the manufacturer of the reduction gear to find out about operable gearing area.

Low loads and low inertia loads

The motor may demonstrate instability such as abnormal vibrations or overcurrent trips at light loads of 5% or under of the load percentage, or when the load's inertia moment is extremely small. If that happens reduce the carrier frequency.

Occurrence of instability

Unstable phenomena may occur with the load and motor combinations shown below.

- Combined with a motor that exceeds applicable motor ratings for the inverter
- Combine with a much smaller motor according to the applicable motor rating of the inverter.
- Combined with special motors

To deal with the above lower the settings of inverter carrier frequency.

- Combined with couplings between load devices and motors with high backlash

When using the inverter in the above combination, use the S-pattern acceleration/deceleration function, or when vector control is selected, adjust the load inertia moment ratio or switch to V/f control mode.

- Combined with loads that have sharp fluctuations in rotation such as piston movements

In this case, adjust the load inertia moment ratio during vector control or switch to V/f control.

Braking a motor when cutting off power supply

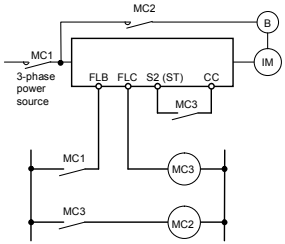
A motor with its power cut off goes into free-run, and does not stop immediately. To stop the motor quickly as soon as the power is cut off install an auxiliary brake. There are different kinds of brake devices, both electrical and mechanical. Select the brake that is best for the system.

Load that produces regenerative torque

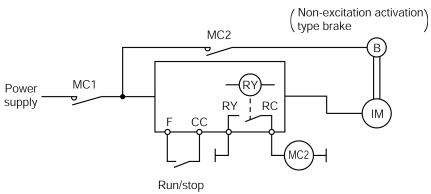
When combined with a load that produces regenerative torque, the overvoltage or overcurrent protection function may be activated to trip the inverter.

Motors with a brake

When motors with a brake are directly connected to the inverter's output, the brake cannot be released at startup because of low voltage. Wire the brake circuit separately from the main circuit.



Circuit diagram 1



In circuit diagram 1, the brake is turned on and off through MC2 and MC3. If you do not wire it as shown in diagram 1, an over-current trip may occur because of a bound current during brake operation. (Example of standby ST assigned to terminal S2.)
In circuit diagram 2, the brake is turned on and off by using low-speed signal RY-RC.
In some situations, such as with elevators, turning the brake on and off with a low-speed signal may be appropriate. Be sure to contact us before designing your system.

Measures to protect motors against surge voltages

In a system in which a 500V-class inverter is used to control the operation of a motor, very high surge voltages may be produced. When applied to the motor coils repeatedly for a long time, may cause deterioration of their insulation, depending on the cable length, cable routing and types of cables used. Here are some examples of measures against surge voltages.

(1) Lower the inverter's carrier frequency.
(2) Set the parameter F316 (Carrier frequency control mode selection) to 2 or 3.
(3) Use a motor with high insulation strength.
(4) Insert an AC reactor or a surge voltage suppression filter between the inverter and the motor.

1.4.2 Inverters

Protecting inverters from overcurrent

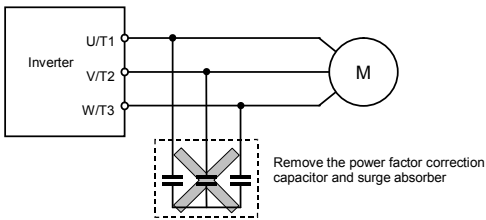
The inverter has an overcurrent protection function. The programmed current level is set to the inverter's maximum applicable motor. If the motor used has a small capacity, the overcurrent level and the electronic thermal protection must be readjusted. If adjustment is necessary, refer to section 5.6, and make adjustments as directed.

Inverter capacity

Do not use a small-capacity (kVA) inverter to control the operation of a large-capacity motor (two-class or more larger motor), no matter how light the load is. Current ripple will raise the output peak current making it easier to set off the overcurrent trip.

Power factor correction capacitor

Power factor correction capacitors cannot be installed on the output side of the inverter. When a motor is run that has a power factor correction capacitor attached to it, remove the capacitors. This can cause inverter malfunction and capacitor destruction.

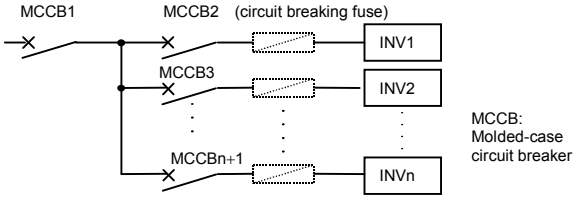


Power factor correction capacitor

Operating at other than rated voltage

Connections to voltages other than the rated voltage described in the rating label cannot be made. If a connection must be made to a power supply other than one with rated voltage, use a transformer to raise or lower the voltage to the rated voltage.

Circuit breaking when two or more inverters are used on the same power line



Breaking of selected inverter

There is no fuse in the inverter's main circuit. Thus, as the diagram above shows, when more than one inverter is used on the same power line, you must select interrupting characteristics so that only MCCB2 to MCCBn+1 will trip and the MCCB1 will not trip when a short occurs in the inverter (INV1). When you cannot select the proper characteristics install a circuit interrupting fuse behind MCCB2 to MCCBn+1.

If power supply distortion is not negligible

If the power supply distortion is not negligible because the inverter shares a power distribution line with other systems causing distorted waves, such as systems with thyristors or large-capacity inverters, install an input AC reactor to improve the input power factor, to reduce higher harmonics, or to suppress external surges.

If multiple inverters are connected with common DC bus link

When inverters are fed by AC power supply and connected with common DC bus link, ground fault trip protection may operate. In that case, set ground fault detection selection (F6 14) to 0 "Disabled".

■ Disposal

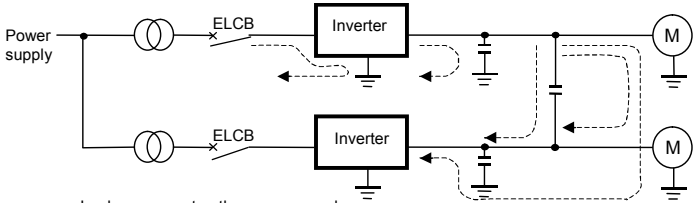
Refer to chapter 16.

1.4.3 What to do about the leakage current

⚠ Caution	
Mandatory action	• The leakage current through the input/output power cables of inverter and capacitance of motor may affect to peripheral devices. The value of leakage current is increased under the condition of the PWM carrier frequency and the length of the input/output power cables. In case the total cable length (total of length between an inverter and motors) is more than 100m, overcurrent trip may occur even the motor no-load current. Make enough space among each phase cable or install the filter (MSF) as countermeasure.

(1) Influence of leakage current across ground

Leakage current may flow not just through the inverter system but also through ground wires to other systems. Leakage current will cause earth leakage breakers, leakage current relays, ground relays, fire alarms and sensors to operate improperly, and it will cause superimposed noise on the TV screen or display of incorrect current detection with the CT.

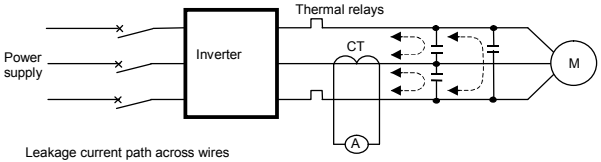


Leakage current path across ground

Remedies:

1. If there is no radio-frequency interference or similar problem, detach the built-in noise filter capacitor, using the grounding capacitor switch.
2. Reduce PWM carrier frequency.
   The setting of PWM carrier frequency is done with the parameter F300.
   Although the electromagnetic noise level is reduced, the motor acoustic noise is increased.
3. Use high frequency remedial products for earth leakage breakers

(2) Influence of leakage current across lines

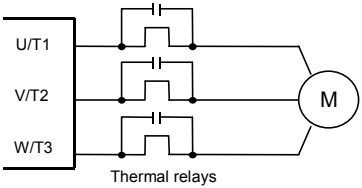


(1) Thermal relays

The high frequency component of current leaking into electrostatic capacity between inverter output wires will increase the effective current values and make externally connected thermal relays operate improperly. If the wires are more than 50 meters long, it will be easy for the external thermal relay to operate improperly with models having motors of low rated current (several A(ampere) or less), because the leakage current will increase in proportion to the motor rating.

Remedies:

1. Use the electronic thermal built into the inverter. (Refer to section 5.6)
   The setting of the electronic thermal is done using parameter OLn, tHr.
2. Reduce the inverter's PWM carrier frequency. However, that will increase the motor's magnetic noise.
   The setting of PWM carrier frequency is done with the parameter F300. (Refer to section 6.18)
3. This can be improved by installing 0.1μ to 0.5μF - 1000V film capacitor to the input/output terminals of each phase in the thermal relay.



(2) CT and ammeter

If a CT and ammeter are connected externally to detect inverter output current, the leak current's high frequency component may destroy the ammeter. If the wires are more than 50 meters long, it will be easy for the high frequency component to pass through the externally connected CT and be superimposed on and burn the ammeter with models having motors of low rated current (several A (ampere) or less), especially the 500V class low capacity (4.0kW or less) models, because the leakage current will increase in proportion to the motor's rated current.

Remedies:

1. Use a meter output terminal in the inverter control circuit.
   The load current can be output on the meter output terminal (FM). If the meter is connected, use an ammeter of 1mAdc full scale or a voltmeter of 10V full scale.
   0-20mAdc (4-20mAdc) can be also output. (Refer to section 5.1)
2. Use the monitor functions built into the inverter.
   Use the monitor functions on the panel built into the inverter to check current values. (Refer to section 8.2.1)

1.4.4 Installation

■ Installation environment

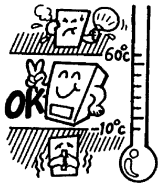
This inverter is an electronic control instrument. Take full consideration to installing it in the proper operating environment.

⚠ Warning	
Prohibited	• Do not place any inflammable substances near the inverter. If an accident occurs in which flame is emitted, this could lead to fire. • Do not install in any location where the inverter could come into contact with water or other fluids. This can result in electric shock or fire.
Mandatory action	• Operate under the environmental conditions prescribed in the instruction manual. Operations under any other conditions may result in malfunction. • Check to make sure that the input power voltage is +10%, -15% of the rated power voltage (±10% when the load is 100% in continuous operation) written on the name plate. If the input power voltage is not +10%, -15% of the rated power voltage (±10% when the load is 100% in continuous operation), this may result in fire.

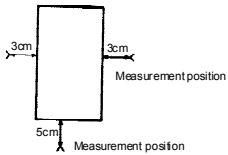
⚠ Caution	
Prohibited	• Do not install the inverter in any location subject to large amounts of vibration. This could cause the unit to fall, resulting in bodily injury.

- Do not install in any location of high temperature, high humidity, moisture condensation and freezing and avoid locations where there is exposure to water and/or where there may be large amounts of dust, metallic fragments and oil mist.
- Do not install in any location where corrosive gases or grinding fluids are present.

- Operate in areas where ambient temperature ranges from -10°C to 60°C.
  When using the inverter in locations with temperatures above 40°C, remove the protective label on the top of the inverter and use the inverter with the output current reduced according to section 6.18.



[Position for measuring ambient temperature]



Note: The inverter is a heat-emitting body. Make sure proper space and ventilation is provided when installing in the cabinet.

- Do not install in any location that is subject to large amounts of vibration.

Note: If the inverter is installed in a location that is subject to vibration, anti-vibration measures are required. Please consult with Toshiba about these measures.

- If the inverter is installed near any of the equipment listed below, provide measures to insure against errors in operation.

Solenoids:	Attach surge suppressor on coil.
Brakes:	Attach surge suppressor on coil.
Magnetic contactors:	Attach surge suppressor on coil.
Fluorescent lights:	Attach surge suppressor on coil.
Resistors:	Place far away from the inverter.

■ How to install

⚠ Warning	
Prohibited	• Do not install or operate the inverter if it is damaged or any component is missing. This can result in electric shock or fire. Call your Toshiba distributor for repairs.
Mandatory action	• Mount the inverter on a metal plate. The rear panel gets very hot. Do not install in an inflammable object, this can result in fire. • Do not operate with the terminal block cover removed. This can result in electric shock. • An emergency stop device must be installed that fits with system specifications (e.g. shut off input power then engage mechanical brake). Operation cannot be stopped immediately by the inverter alone, thus, resulting in an accident or injury. • All options used must be those specified by Toshiba. The use of any other option may result in an accident.

⚠ Caution	
Mandatory action	• The main unit must be installed on a base that can bear the unit's weight. If the unit is installed on a base that cannot withstand that weight, the unit may fall, resulting in injury. • If braking is necessary (to hold motor shaft), install a mechanical brake. The brake on the inverter will not function as a mechanical hold, and if used for that purpose, injury may result.

(1) Normal installation

Select an indoor location with good ventilation, and then install it upright on a flat metal plate.

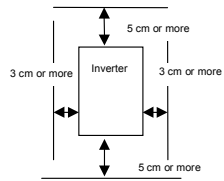
When installing multiple inverters, leave at least 3 cm of space between each inverter and install them aligned horizontally.

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

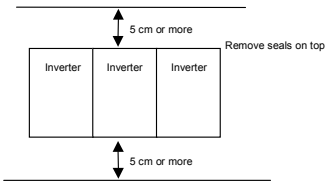
(2) Side-by-side installation

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

If the door is opened 90° or more, please open the door with the left side inverter's door open when the same capacity inverters are installed with side-by-side.



Normal installation



Side-by-side installation

The space shown in the diagram is the minimum allowable space. Because air cooled equipment has cooling fans built in on the top or bottom surfaces, make the space on top and bottom as large as possible to allow for air passage.

Note: Do not install in any location where there is high humidity or high temperatures and where there are large amounts of dust, metallic fragments and oil mist.

■ Calorific values of the inverter and the required ventilation

About 5% of the rated power of the inverter will be lost as a result of conversion from AC to DC or from DC to AC. In order to suppress the rise in temperature inside the cabinet when this loss becomes heat loss, the interior of the cabinet must be ventilated and cooled.

The amount of forcible air-cooling ventilation required and the necessary heat discharge surface quantity when operating in a sealed cabinet according to motor capacity are as follows.

Voltage class	Inverter type		Calorific values (W) Note 1)		Amount of forcible air cooling ventilation required (m^3/min)		Heat discharge surface area required for sealed storage cabinet (m^3)		Standby power requirement (W) Note 2)
			4kHz	12kHz	4kHz	12kHz	4kHz	12kHz	
Three-phase 240V class	VFS15-	2004PM-W	35	40	0.20	0.23	0.70	0.80	6
		2007PM-W	45.6	50	0.26	0.28	0.91	0.99	6
		2015PM-W	81	92	0.46	0.52	1.61	1.85	10
		2022PM-W	94.9	104	0.54	0.59	1.90	2.07	10
		2037PM-W	139	154	0.79	0.87	2.77	3.08	11
		2055PM-W	256	283	1.45	1.61	5.12	5.66	22
		2075PM-W	305	367	1.73	2.08	6.10	7.34	22
		2110PM-W	475	538	2.70	3.05	9.50	10.76	31
		2150PM-W	557	628	3.16	3.56	11.14	12.56	31
Single-phase 240V class	VFS15S-	2002PL-W	23	24.8	0.13	0.14	0.46	0.50	5
		2004PL-W	37	42.2	0.21	0.24	0.74	0.84	5
		2007PL-W	46	50	0.26	0.28	0.92	1.00	5
		2015PL-W	79	90	0.45	0.51	1.57	1.80	8
		2022PL-W	101	110	0.58	0.62	2.03	2.20	8
Three-phase 500V class	VFS15-	4004PL-W	30	39	0.17	0.22	0.61	0.78	12
		4007PL-W	39	50	0.22	0.28	0.78	1.00	12
		4015PL-W	58	76	0.33	0.43	1.15	1.53	12
		4022PL-W	77	102	0.44	0.58	1.53	2.04	13
		4037PL-W	131	156	0.75	0.88	2.63	3.12	13
		4055PL-W	211	263	1.20	1.49	4.22	5.26	22
		4075PL-W	254	346	1.44	1.96	5.08	6.92	22
		4110PL-W	387	470	2.20	2.67	7.74	9.40	31
		4150PL-W	466	572	2.65	3.25	9.32	11.44	31

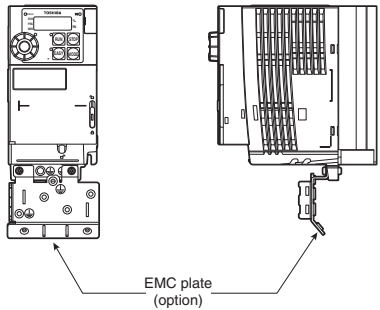
Note 1) Case of 100% Load Continuation operation. The heat loss for the optional external devices (input AC reactor, radio noise reduction filters, etc.) is not included in the calorific values in the table

Note 2) It is power consumption when power is on but is not output (0Hz), and cooling fan is activated (model with cooling fan).

■ Panel designing taking into consideration the effects of noise

The inverter generates high frequency noise. When designing the control panel setup, consideration must be given to that noise. Examples of measures are given below.

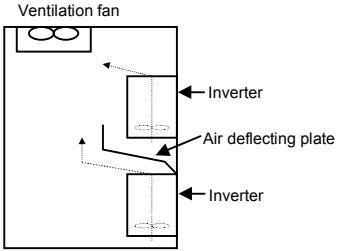
- Wire so that the main circuit wires and the control circuit wires are separated. Do not place them in the same conduit, do not run them parallel, and do not bundle them.
- Provide shielding and twisted wire for control circuit wiring.
- Separate the input (power) and output (motor) wires of the main circuit. Do not place them in the same conduit, do not run them parallel, and do not bundle them.
- Ground the inverter grounding terminals (⏚).
- Install surge suppressor on any magnetic contactor and relay coils used around the inverter.
- Install noise filters if necessary.
- To comply with the EMC directives, install the optional EMC plate and fix the shield to it.
- Install EMC plate and use shielded wires.



■ Installing more than one unit in a cabinet

When two or more inverters are installed in one cabinet, pay attention to the followings.

- Inverters may be installed side by side with each other with no space left between them.
  When installing inverters side by side, remove the protective label on the top of the inverter.
  When using the inverter in locations with temperatures above 40°C, use the inverter with the output current reduced.
- Ensure a space of at least 20 centimeters on the top and bottom of the inverters.
- Install an air deflecting plate so that the heat rising up from the inverter on the bottom does not affect the inverter on the top.



2. Connection

⚠ Warning	
Disassembly prohibited	• Never disassemble, modify or repair. This can result in electric shock, fire and injury. Call your Toshiba distributor for repairs.
Prohibited	• Do not stick your fingers into openings such as cable wiring holes and cooling fan covers. This can result in electric shock or other injury. • Do not place or insert any kind of object (electrical wire cuttings, rods, wires) into the inverter. This can result in electric shock or fire. • Do not allow water or any other fluid to come in contact with the inverter. That may result in electric shock or fire.

⚠ Caution	
Prohibited	• When transporting or carrying, do not hold by the front panel covers. The covers may come off and the unit will drop, resulting in injury.

2.1 Cautions on wiring

⚠ Warning	
Prohibited	• Never remove the terminal cover when power is on. The unit contains many high voltage parts and contact with them will result in electric shock.
Mandatory action	• Turn the power on only after attaching the terminal block cover. If the power is turned on without the terminal block cover attached, this can result in electric shock or other injury. • Electrical construction work must be done by a qualified expert. Connection of input power by someone who does not have that expert knowledge may result in fire or electric shock. • Connect output terminals (motor side) correctly. If the phase sequence is incorrect, the motor will operate in reverse and that may result in injury. • Wiring must be done after installation. If wiring is done prior to installation, that may result in injury or electric shock. • The following steps must be performed before wiring. (1) Shut off all input power. (2) Wait at least 15 minutes and check to make sure that the charge lamp is no longer lit. (3) Use a tester that can measure DC voltage (400VDC or 800VDC or more), and check to make sure that the voltage to the DC main circuits (across PA/+ - PC/-) is 45V or less. If these steps are not properly performed, the wiring will cause electric shock. • Tighten the screws on the terminal block to specified torque. If the screws are not tightened to the specified torque, it may lead to fire.

⚠ Warning	
Be Grounded	• Ground must be connected securely. If the ground is not securely connected, it could lead to electric shock or fire.

⚠ Caution	
Prohibited	• Do not attach devices with built-in capacitors (such as noise filters or surge absorber) to the output (motor side) terminal. This could cause a fire.

■ Preventing radio noise

To prevent electrical interference such as radio noise, separately bundle wires to the main circuit's power terminals (3-phase models: R/L1, S/L2, T/L3, single-phase models: R/L1, S/L2/N) and wires to the motor terminals (U/T1, V/T2, W/T3).

■ Control and main power supply

The control power supply and the main circuit power supply for this inverter are the same.
If a malfunction or trip causes the main circuit to be shut off, control power will also be shut off. When checking the cause of the malfunction or the trip, use the trip holding retention selection parameter.
In addition, please use an optional control power supply backup unit when only control power supply operates, even if the main circuit is shut off due to trouble or tripping.

■ Wiring

- Because the space between the main circuit terminals is small, use sleeved crimp-style terminals for the connections. Connect the terminals so that adjacent terminals do not touch each other.
- For grounding terminal ⏚ use wires of the size that is equivalent to or larger than those given in table 10.1 and always ground the inverter (240V voltage class: D type ground, 500V voltage class: C type ground).
  Use as large and short a grounding wire as possible and wire it as close as possible to the inverter.
- For the sizes of electric wires used in the main circuit, refer to the table in section 10.1.
- The length of each wire does not exceed 30 meters. If the wire is longer than 30 meters, the wire size (diameter) must be increased.

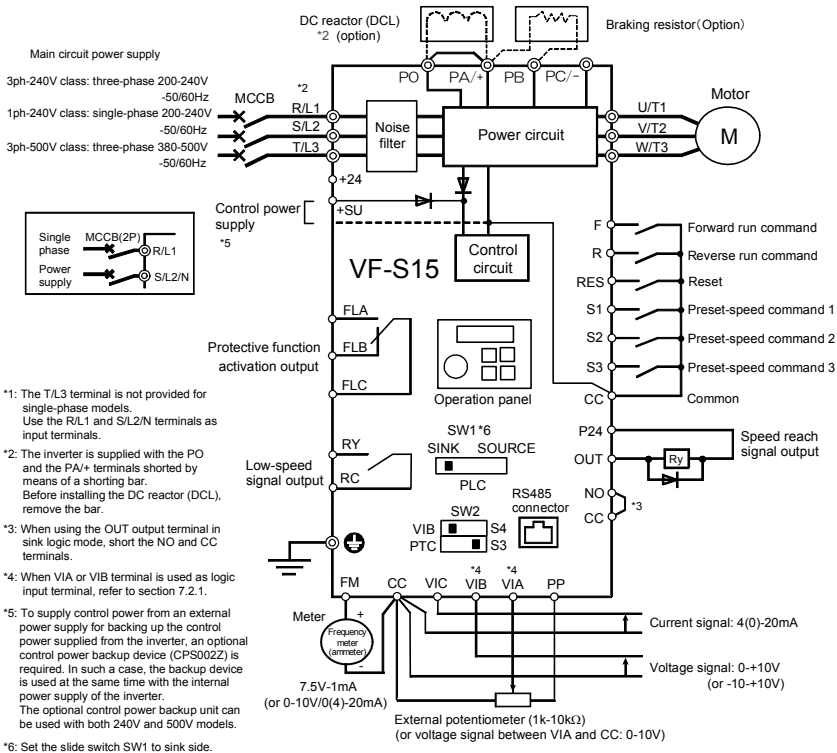
2.2 Standard connections

⚠ Warning	
 Prohibited	• Do not connect input power to the output (motor side) terminals (U/T1, V/T2, W/T3). Connecting input power to the output could destroy the inverter or cause a fire. • Do not insert a braking resistor between DC terminals (between PA/+ and PC/- or PO and PC/-). It could cause a fire. • First shut off input power and wait at least 15 minutes before touching terminals and wires on equipment (MCCB) that is connected to inverter power side. Touching the terminals and wires before that time could result in electric shock. • Do not shut down the external power supply on ahead when VIA terminal is used as logic input terminal by external power supply. It could cause unexpected result as VIA terminal is ON status.
 Mandatory action	• Set a parameter F109 when VIA or VIB terminals are used as logic input terminal. If it is not set, it could result in malfunction. • Set a parameter F147 when S3 terminal is used as PTC input terminal. If it is not set, it could result in malfunction.
 Be Grounded	• Ground must be connected securely. If the ground is not securely connected, it could lead to electric shock or fire.

2.2.1 Standard connection diagram 1

This diagram shows a standard wiring of the main circuit.

Standard connection diagram - SINK (Negative) (common:CC)



*1: The T/L3 terminal is not provided for single-phase models. Use the R/L1 and S/L2/N terminals as input terminals.

*2: The inverter is supplied with the PO and the PA/+ terminals shorted by means of a shorting bar. Before installing the DC reactor (DCL), remove the bar.

*3: When using the OUT output terminal in sink logic mode, short the NO and CC terminals.

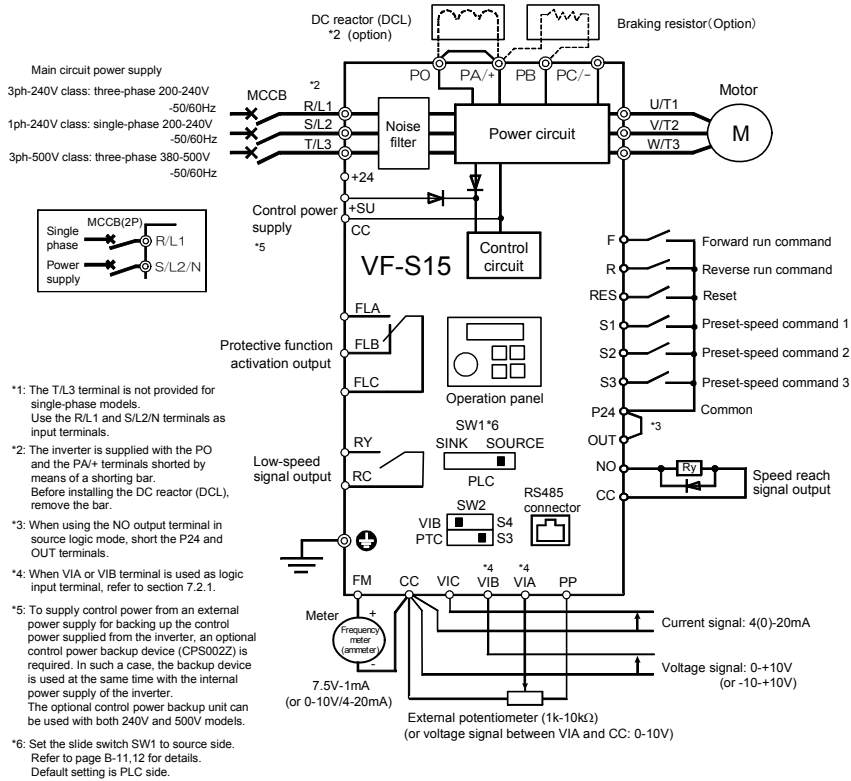
*4: When VIA or VIB terminal is used as logic input terminal, refer to section 7.2.1.

*5: To supply control power from an external power supply for backing up the control power supplied from the inverter, an optional control power backup device (CPS002Z) is required. In such a case, the backup device is used at the same time with the internal power supply of the inverter. The optional control power backup unit can be used with both 240V and 500V models.

*6: Set the slide switch SW1 to sink side. Refer to page B-11,12 for details. Default setting is PLC side.

2.2.2 Standard connection diagram 2

Standard connection diagram - SOURCE (Positive) (common:P24)



*1: The T/L3 terminal is not provided for single-phase models. Use the R/L1 and S/L2/N terminals as input terminals.

*2: The inverter is supplied with the PO and the PA/+ terminals shorted by means of a shorting bar. Before installing the DC reactor (DCL), remove the bar.

*3: When using the NO output terminal in source logic mode, short the P24 and OUT terminals.

*4: When VIA or VIB terminal is used as logic input terminal, refer to section 7.2.1.

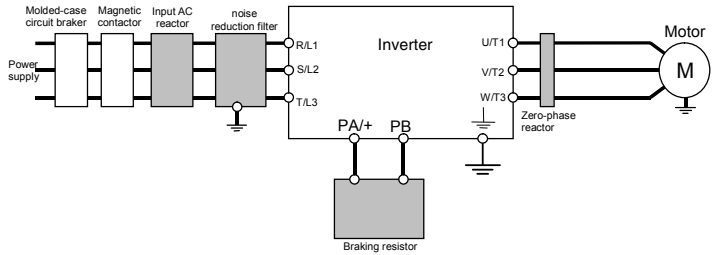
*5: To supply control power from an external power supply for backing up the control power supplied from the inverter, an optional control power backup device (CPS002Z) is required. In such a case, the backup device is used at the same time with the internal power supply of the inverter. The optional control power backup unit can be used with both 240V and 500V models.

*6: Set the slide switch SW1 to source side. Refer to page B-11,12 for details. Default setting is PLC side.

2.3 Description of terminals

2.3.1 Power circuit terminals

■ Connections with peripheral equipment



Note 1: The T/L3 terminal is not provided for any single-phase models. So if you are using single-phase models, use the R/L1 and S/L2/N terminals to connect power cables.

■ Power circuit

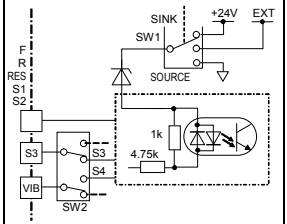
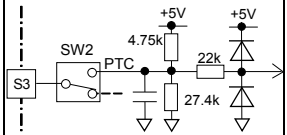
Terminal symbol	Terminal function
⏚	Grounding terminal for connecting inverter. There are 3 terminals in cooling fin or mounting part of EMC plate.
R/L1,S/L2,T/L3	240V class : Three-phase 200 to 240V-50/60Hz : Single-phase 200 to 240V-50/60Hz 500V class : Three-phase 380 to 500V-50/60Hz * Single-phase inputs are R/L1 and S/L2/N terminals.
U/T1,V/T2,W/T3	Connect to three-phase motor.
PA/+, PB	Connect to braking resistors. Change parameters F304, F305, F308, F309 if necessary.
PA/+	This is a positive potential terminal in the internal DC main circuit. DC common power can be input with PC/- terminal.
PC/-	This is a negative potential terminal in the internal DC main circuit. DC common power can be input with PA/+ terminal.
PO, PA/+	Terminals for connecting a DC reactor (DCL: optional external device). Shorted by a short bar when shipped from the factory. Before installing DCL, remove the short bar.

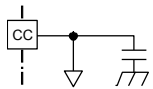
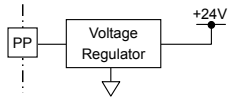
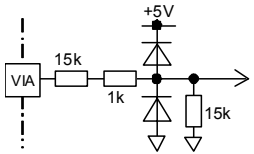
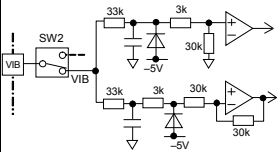
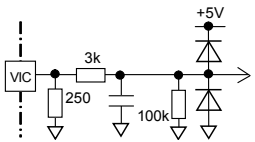
The arrangements of power circuit terminals are different from each range.
Refer to section 1.3.3.1) for details.

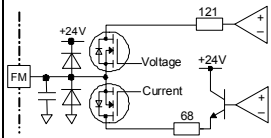
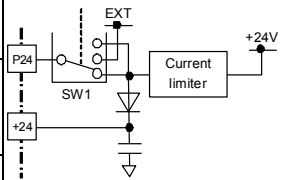
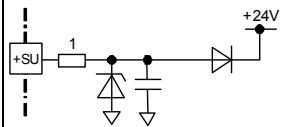
2.3.2 Control circuit terminals

The control circuit terminal block is common to all equipment.
Regarding to the function and specification of each terminal, please refer to the following table.
Refer to section 1.3.3.3) about the arrangement of control circuit terminals.

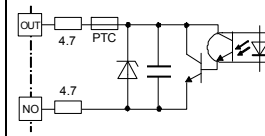
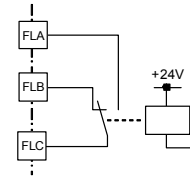
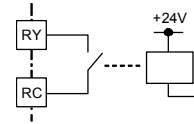
■ Control circuit terminals

Terminal symbol	Input / output	Function		Electrical specifications	Inverter internal circuits
F	Input	Multifunction programmable logic input	Shorting across F-CC or P24-F causes forward rotation; open causes deceleration stop. (When Standby ST is always ON) 3 different functions can be assigned.	No voltage logic input 24Vdc-5mA or less	
R	Input		Shorting across R-CC or P24-R causes reverse rotation; open causes deceleration stop. (When Standby ST is always ON) 3 different functions can be assigned.		
RES	Input		This inverter protective function is reset if RES-CC or P24-RES is connected. Shorting RES-CC or P24-RES has no effect when the inverter is in a normal condition. 2 different functions can be assigned.	Sink/Source and PLC selectable using slide switch SW1 (Default setting is PLC side)	
S1	Input		Shorting across S1-CC or P24-S1 causes preset speed operation. 2 different functions can be assigned.	Pulse train input (S2 terminal) Pulse frequency range: 10pps～2kpps	
S2	Input		Shorting across S2-CC or P24-S2 causes preset speed operation. By changing parameter F 145 setting, this terminal can also be used as a pulse train input terminal.		
S3	Input		Shorting across S3-CC or P24-S3 causes preset speed operation. By changing slide switch SW2 and parameter F 147 setting, this terminal can also be used as a PTC input terminal.	PTC input (S3 terminal)	

Terminal symbol	Input / output	Function	Electrical specifications	Inverter internal circuits
CC	Common to Input / output	Control circuit's equipotential terminal (3 terminals)		
PP	Output	Analog power supply output	10Vdc (permissible load current: 10mAdc)	
V I A Note 1)	Input	Multifunction programmable analog input. Default setting: 0-10Vdc (1/1000 resolution) and 0-60Hz (0-50Hz) frequency input (1/2000 resolution). By changing parameter F 109, this terminal can also be used as a multifunction programmable logic input terminal.	10Vdc (internal impedance: 30kΩ)	
V I B Note 1)	Input	Multifunction programmable analog input. Default setting: 0-10Vdc (1/1000 resolution) and 0-60Hz (0-50Hz) frequency input. The function can be changed to -10-+10V input by parameter F 107 = 1 setting. By switching slide switch SW2 and changing parameter F 109 setting, this terminal can also be used as a multifunction programmable logic input terminal.	10Vdc (internal impedance: 30kΩ)	
V I C	Input	Multifunction programmable analog input. 4-20mA (0-20mA) input.	4-20mA (internal impedance: 250Ω)	

Terminal symbol	Input / output	Function	Electrical specifications	Inverter internal circuits
FM	Output	Multifunction programmable analog output. Default setting: output frequency. The function can be changed to ammeter, 0-10Vdc voltage or 0-20mAdc (4-20mA) current output by parameter F681 setting. Resolution Max. 1/1000.	1mAdc full-scale ammeter or QS60T(option) 0-20mA (4-20mA) DC ammeter Permissible load resistance: 600Ω or less 0-10V DC volt meter Permissible load resistance: 1kΩ or more	
P24	Output	24Vdc power output	24Vdc-100mA Note 2)	
	Input	This terminal can be used as a common terminal when an external power supply is used by changing SW1 to PLC side.	-	
+24	Output	24Vdc power output	24Vdc-100mA Note 2)	
+SU	Input	DC power input terminal for operating the control circuit. Connect a control power backup device (option or 24Vdc power supply) between +SU and CC.	Voltage: 24Vdc± 10% Current: 1A or more	

2

Terminal symbol	Input / output	Function	Electrical specifications	Inverter internal circuits
OUT NO	Output	Multifunction programmable open collector output. Default setting detect and output speed reach signal. Multifunction output terminals to which two different functions can be assigned. The NO terminal is an equipotential terminal. It is isolated from the CC terminal. By changing parameter F669 settings, these terminals can also be used as multifunction programmable pulse train output terminals.	Open collector output 24Vdc-100mA To output pulse trains, a current of 10mA or more needs to be passed. Pulse frequency range: 10～2kpps	
FLA FLB FLC Note 3)	Output	Multifunction programmable relay contact output. Detects the operation of the inverter's protection function. (Default setting) Contact across FLA-FLC is closed and FLB-FLC is opened during protection function operation.	Max. switching capacity 250Vac-2A 30Vdc-2A (cosϕ=1) : at resistive load 250Vac-1A (cosϕ=0.4) 30Vdc-1A (L/R=7ms) Min. permissible load 5Vdc-100mA 24Vdc-5mA	
RY RC Note 3)	Output	Multifunction programmable relay contact output. Default settings detect and output low-speed signal output frequencies. Multifunction output terminals to which two different functions can be assigned.	Max. switching capacity 250Vac-2A (cosϕ=1) : at resistive load 30Vdc-1A 250Vac-1A (cosϕ=0.4) Min. permissible load 5Vdc-100mA 24Vdc-5mA	

Note 1) When VIA terminal is used as logic input terminal, be sure to connect a resistor between P24 and VIA in case of sink logic, between VIA and CC in case of source logic. (Recommended resistance: 4.7kΩ-1/2W)
It is not needed for VIB terminal.

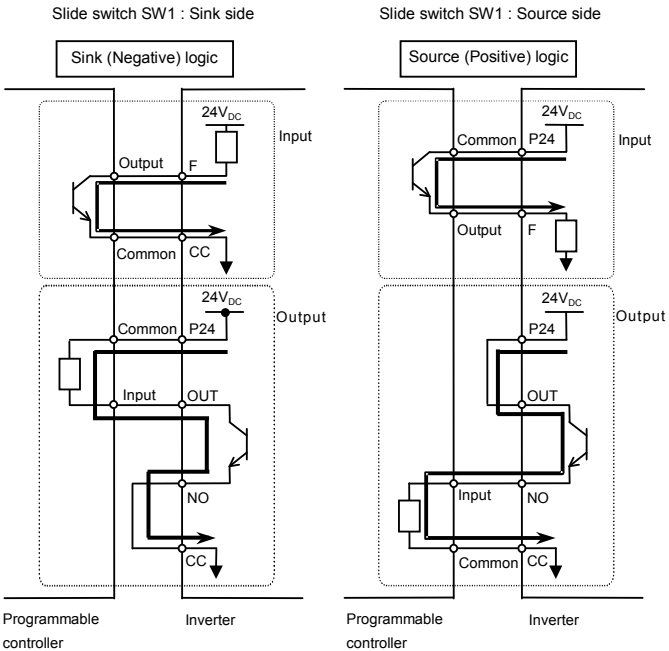
Note 2) 100mA is the sum of P24 and +24.

Note 3) A chattering (momentary ON/OFF of contact) is generated by external factors of the vibration and the impact, etc. In particular, please set the filter of 10ms or more, or timer for measures when connecting it directly with input unit terminal of programmable controller. Please use the OUT terminal as much as possible when the programmable controller is connected.

■ SINK (Negative) logic/SOURCE (Positive) logic (When the inverter's internal power supply is used)

Current flowing out turns control input terminals on. These are called sink logic terminals.
The general used method in Europe is source logic in which current flowing into the input terminal turns it on.
Sink logic is sometimes referred to as negative logic, and source logic is referred to as positive logic.
Each logic is supplied with electricity from either the inverter's internal power supply or an external power supply, and its connections vary depending on the power supply used.
Sink/source logic can be switched by slide switch SW1.

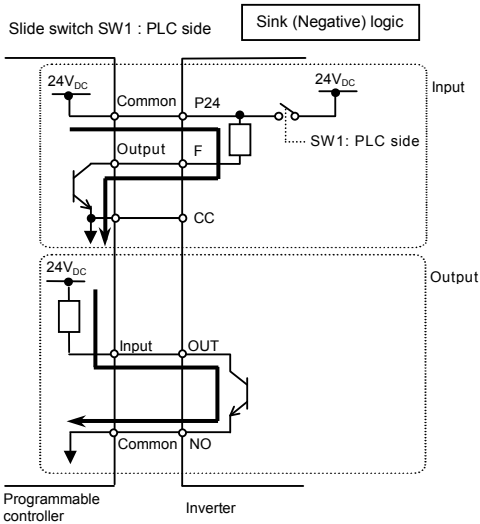
<Examples of connections when the inverter's internal power supply is used>



■ SINK (Negative) logic (When an external power supply is used)

The P24 terminal is used to connect to an external power supply or to separate a terminal from other input or output terminals.

<Examples of connections when an external power supply is used>



Note) Do not shut down the external power supply on ahead when VIA terminal is used as logic input terminal by external power supply.
It could cause unexpected result as VIA terminal is ON status.

■ Switching of slide switch

Refer to section 1.3.3 3) about location of slide switch.

(1) Switching of sink/source logic: SW1 (Default setting : PLC side)
Setting of sink/source logic for F, R, RES, S1, S2, and S3 terminals are switched by slide switch SW1.
When an external power supply is used for sink logic, set the slide switch SW1 to PLC side.
Set the sink/source logic switching before turn on power supply.
After confirming the right for sink/source setting, turn on power supply.

(2) Switching of VIB terminal function: Upper SW2 (Default setting: VIB side)
Setting of analog input/ logic input for VIB terminal is switched by upper slide switch SW2 and parameter F109.
When using VIB terminal as an analog input terminal, set the slide switch to VIB side and set the parameter F109=0.
When using VIB terminal as a logic input terminal, set the slide switch to S4 side and set the parameter any value to F109= 1, 3,or 4. Sink/ source logic depends on the slide switch SW1.
Match the setting of upper slide switch SW2 and parameter F109 surely.
If it is not, this can result in malfunction.

(3) Switching of S3 terminal function: Lower SW2 (Default setting: S3 side)
Setting of logic input/ PTC input for S3 terminal is switched by lower slide switch SW2 and parameter F147.
When using S3 terminal as a logic input terminal, set the slide switch to S3 side and set the parameter F147=0.
When using S3 terminal as a PTC input terminal, set the slide switch to PTC side and set the parameter F147= 1.
Match the setting of lower slide switch SW2 and parameter F147 surely.
If it is not, this can result in malfunction.

3. Operations

⚠ Warning	
 Prohibited	• Do not touch inverter terminals when electrical power is going to the inverter even if the motor is stopped. Touching the inverter terminals while power is connected to it may result in electric shock. • Do not touch switches when the hands are wet and do not try to clean the inverter with a damp cloth. Such practices may result in electric shock. • Do not go near the motor in alarm-stop status when the retry function is selected. The motor may suddenly restart and that could result in injury. Take measures for safety, e.g. attaching a cover to the motor, against accidents when the motor unexpectedly restarts.
 Mandatory action	• If the inverter begins to emit smoke or an unusual odor, or unusual sounds, immediately turn the power off. Continuous use of the inverter in such a state may cause fire. Call your Toshiba distributor for repairs. • Always turn the power off if the inverter is not used for long periods of time since there is a possibility of malfunction caused by leaks, dust and other material. If power is left on with the inverter in that state, it may result in fire. • Turn the input power on only after attaching the terminal block cover. When enclosed inside a cabinet and used with the terminal block cover removed, always close the cabinet doors first and then turn the power on. If the power is turned on with the terminal block cover or the cabinet doors open, this may result in electric shock. • Make sure that operation signals are off before resetting the inverter after malfunction. If the inverter is reset before turning off the operating signal, the motor may restart suddenly, resulting in injury.

⚠ Caution	
 Contact prohibited	• Do not touch heat radiating fins or discharge resistors. These devices are hot, and you'll get burned if you touch them.
 Prohibited	• Observe all permissible operating ranges of motors and mechanical equipment. (Refer to the motor's instruction manual.) Not observing these ranges may result in injury.

3.1 How to Set the Setup Menu

⚠ Warning	
Mandatory action	• If incorrect setting, the drive may has some damage or unexpected movement. Be sure to set the setup menu correctly.

3

Set the setup menu according to the base frequency and the base frequency voltage of the motor connected. (If you are not sure which region code of setup menu should be selected and what values should be specified, consult your Toshiba distributer.)
Each setup menu automatically sets all parameters relating to the base frequency and the base frequency voltage of the motor connected. (See the table on the following page.)

Follow these steps to change the setup menu [Example: Selecting a region code to EU]

Panel operated	LED display	Operation
	SEt	SEt is blinking
	EU / JP / ASIA / USA 	Turn the setting dial, and select region code "EU" (Europe).
	EU⇔ In It	Press the center of the setting dial to determine the region.
	0.0	The operation frequency is displayed (Standby).

☆ If you want to change the selected region by the setup menu, the setup menu will appear by the following settings. Please note, however, that all setting parameters return to status of default setting.
- Set parameter SEt to "0".
- Set parameter SEt to "13".

☆ The parameter settings in the table on the following page can be changed individually even after they are selected in the setup menu.

■ Values set by each setup parameter

Title	Function		EU (Mainly in Europe)	USA (Mainly in North America)	ASIA (Mainly in Asia, Oceania) Note 1)	JP (Mainly in Japan)
UL/uL/1170/ F204/F213/ F219/F330/ F367/F814	Frequency		50.0(Hz)	60.0(Hz)	50.0(Hz)	60.0(Hz)
uLu/ F171	Base frequency voltage 1, 2	240V class	230(V)	230(V)	230(V)	200(V)
		500V class	400(V)	460(V)	400(V)	400(V)
Pt	V/F control mode selection		0	0	0	2
F307	Supply voltage correction (output voltage limitation)		2	2	2	3
F319	Regenerative over-excitation upper limit		120	120	120	140
F417	Motor rated speed		1410(min^{-1})	1710(min^{-1})	1410(min^{-1})	1710(min^{-1})

Note 1) Excludes Japan.

Note 2) Slide switch SW1 is set to PLC side at default setting. Set it appropriately according to the logic used.
Refer to page B-11 and 13 for details.

3.2 Simplified Operation of the VF-S15

Operation command and Operation frequency command are necessary to operate the inverter.
Operation method and operation frequency setting can be selected from the following.
At default setting, the inverter runs and stops with RUN/STOP key on the panel keypad, and frequency can be set with the setting dial.

Run / Stop : (1) Run and stop using the panel keypad
(2) Run and stop using external signals

Setting the frequency : (1) Setting using setting dial
(2) Setting using external signals
(0-10Vdc, 4-20mAdc, -10-+10Vdc)

Use the basic parameters CMOd (command mode selection) and FMOd (frequency setting mode selection) for selection.

[Parameter setting]

Title	Function	Adjustment range	Default setting
CMOd	Command mode selection	0: Terminal block 1: Panel keypad (including extension panel) 2: RS485 communication 3: CANopen communication 4: Communication option	1
FMOd	Frequency setting mode selection 1	0: Setting dial 1(save even if power is off) 1: Terminal VIA 2: Terminal VIB 3: Setting dial 2(press in center to save) 4: RS485 communication 5: UP/DOWN from external logic input 6: CANopen communication 7: Communication option 8: Terminal VIC 9, 10: - 11: Pulse train input 12, 13: - 14: Sr0	0

☆ FMOd=0 (setting dial 1) is the mode that after the frequency is set by the setting dial, the frequency is saved even if the power is turned off. The usage of this setting dial is similar to that of potentiometer.

☆ Refer to section 5.6 for details about FMOd=4 to 7, 11, and 14.

3.2.1 How to run and stop

[Example of CMOd setting procedure]

Panel operation	LED display	Operation
	0.0	Displays the output frequency (operation stopped). (When standard monitor display selection F710=0 [output frequency])
MODE	RUN	Displays the first basic parameter [History (RUN)].
	CMOd	Turn the setting dial, and select "CMOd".
	1	Press the center of the setting dial to read the parameter value. (Standard default: 1).
	0	Turn the setting dial to change the parameter value to 0 (terminal block).
	0⇔CMOd	Press the center of the setting dial to save the changed parameter. CMOd and the parameter set value are displayed alternately.

3

(1) Run and stop using the panel keypad (CMOd= 1)

Use the RUN and STOP keys on the panel keypad to start and stop the motor.

RUN : Motor runs. STOP : Motor stops.

☆The direction of rotation is determined by the setting of parameter Fr (forward run, reverse run selection). (0: forward run, 1: reverse run)

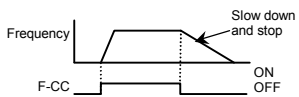
☆Forward run and reverse run are switchable with the extension panel (option). Set the parameter Fr (forward run, reverse run selection) to 2 or 3. (Refer to section 5.8)

(2) RUN and STOP using external signals (CMOd=0): Sink (Negative) logic

Use external signals to the inverter terminal block to start and stop the motor.

Short F and CC terminals: run forward

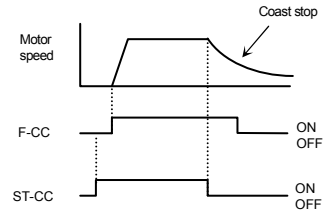
Open F and CC terminals: slow down and stop



(3) Coast stop

Assign parameters as described below in case of Coast stop. Inverter will display OFF at Coast stop.

1) Assign "6 (ST)" to an input terminal. Set parameter F110=0. Open the ST-CC for coast stop(see the status described on the right).
2) Assign "96 (FRR)" to an input terminal.
Coast stop is done by shorting FRR and CC.



3.2.2 How to set the frequency

[Example of FNOd setting procedure] FNOd= 1: Setting the frequency by the terminal VIA

Panel operation	LED display	Operation
	0.0	Displays the output frequency (operation stopped). (When standard monitor display selection F710=0 [output frequency])
MODE	AUH	Displays the first basic parameter [History (AUH)].
	FNOd	Turn the setting dial, and select "FNOd".
	0	Press the center of the setting dial to read the parameter value. (Standard default: 0).
	1	Turn the setting dial to change the parameter value to 1 (terminal block VIA).
	1⇔FNOd	The parameter value is written. FNOd and the parameter value are displayed alternately several times.

* Pressing the MODE key twice returns the display to standard monitor mode (displaying output frequency).

(1) Setting using the keypad (FNOd=0 or 3)

 : Moves the frequency up  : Moves the frequency down

■ Example of operating from the panel (FNOd=3: press in center to save)

Panel operation	LED display	Operation
	0.0	Displays the output frequency. (When standard monitor display selection F710=0 [output frequency])
	50.0	Set the output frequency. (The frequency will not be saved if the power is turned off in this state.)
	50.0⇔FC	Save the output frequency. FC and the frequency are displayed alternately.

■ Example of operating from the panel (FNOd=0: save even if power is off)

Panel operation	LED display	Operation
	0.0	Display the output frequency. (When standard monitor display selection is set as F710=0 [output frequency])
	60.0	Set the output frequency.
-	60.0	The frequency will be saved when the power is turned off in this state.

(2) Setting of frequency using external signals to terminal block (FMOd= 1, 2 or 8)
⇒ Refer to section 7.3 for details.

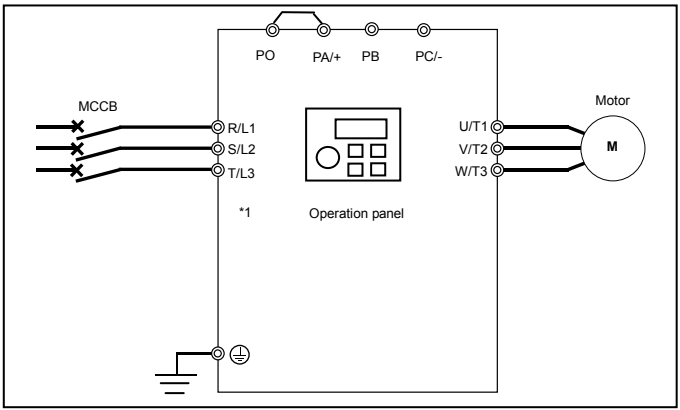
(3) Switching two frequency commands ⇒ Refer to section 5.8 for details.

3.3 How to operate the VF-S15

Overview of how to operate the inverter with simple examples

Ex.1 Operation Command: Panel Operation
Frequency Command: Setting Dial 1

(1) Wiring



(2) Parameter setting (default setting)

Title	Function	Setting value
CMOd	Command mode selection	1
FMOd	Frequency setting mode selection 1	0

(3) Operation

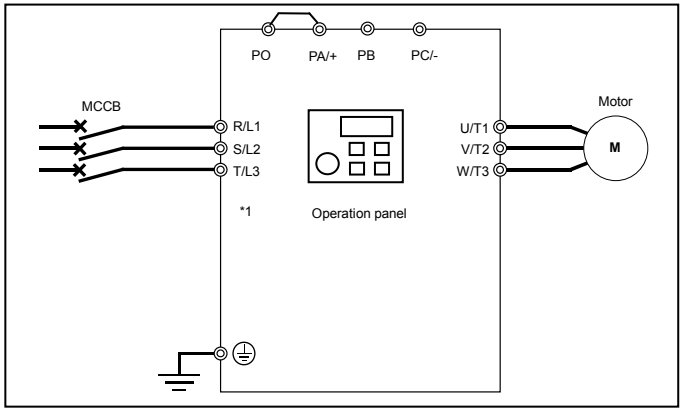
Run/stop: Press the RUN and STOP keys on the panel.

Frequency setting: Turn the setting dial to set the frequency. The frequency setting is saved just by turning the setting dial.

*1: Single-phase models are R/L1 and S/L2/N.

Ex.2 Operation Command : Panel Operation
Frequency Command: Setting Dial 2

(1) Wiring



(2) Parameter setting

Title	Function	Setting value
CMOd	Command mode selection	1
FMOd	Frequency setting mode selection 1	3

(3) Operation

Run/stop: Press the RUN and STOP keys on the panel.

Frequency setting: Turn the setting dial to set the frequency.

To save the frequency setting, press the center of the setting dial.

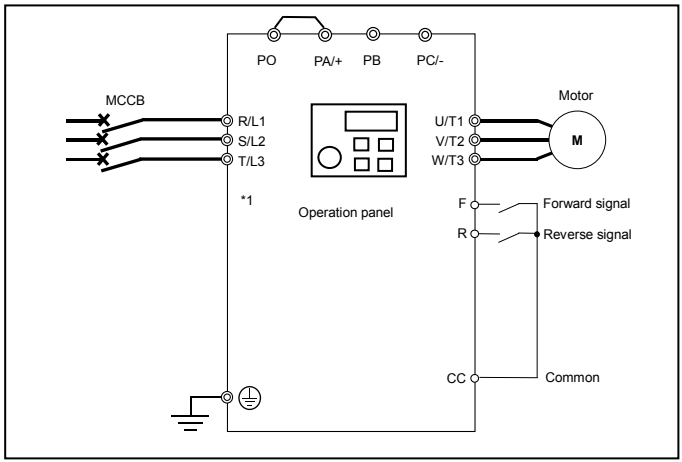
FC and the set frequency will flash on and off alternately, then set frequency will be retained.

The set frequency will be retained even if power supply is cut.

*1: Single-phase models are R/L1 and S/L2/N.

Ex.3 Operation Command: External Signal
Frequency Command: Setting Dial

(1) Wiring



(2) Parameter setting

Title	Function	Setting value
CMOd	Command mode selection	0
FMOd	Frequency setting mode selection 1	0 or 3

(3) Operation

Run/stop: ON/OFF input to F-CC, R-CC. (with sink logic)

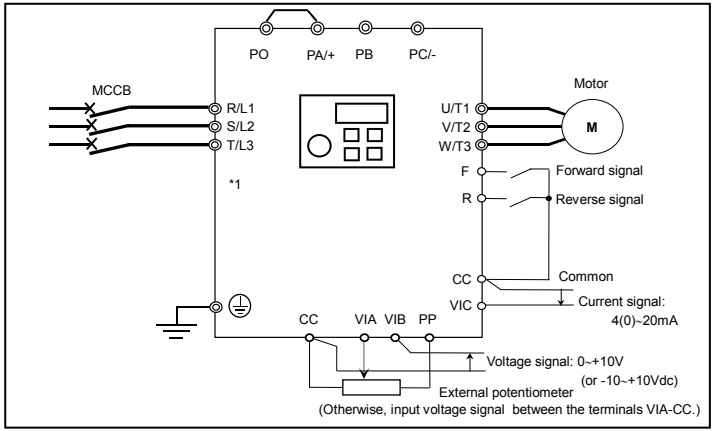
F is for forward run signal and R is for reverse run signal (default setting)

Frequency setting: Turn the setting dial to set the frequency.

*1: Single-phase models are R/L1 and S/L2/N.

Ex.4 Operation Command: External Signal / Frequency Command: External Analog Signal

(1) Wiring



(2) Parameter setting

Title	Function	Setting value
CMOd	Command mode selection	0
FMOd	Frequency setting mode selection 1	1, 2 or 8

(3) Operation

Run/stop: ON/OFF input to F-CC, R-CC. (with sink logic)

F is for forward run signal and R is for reverse run signal (default setting)

Frequency setting: VIA: Input 0~+10V (external potentiometer), VIB: Input 0~+10V (or -10~+10Vdc) or VIC: 4(0)~20mA to set the frequency.

Set the selection of VIA, VIB or VIC in parameter FMOd.

VIA : FMOd = 1

VIB : FMOd = 2

VIC : FMOd = 8

Refer to Chapter 7 for the setting of analog input characteristics.

*1: Single-phase models are R/L1 and S/L2/N.

4. Setting parameters

4.1 Setting and Display Modes

This inverter has the following three display modes.

Standard monitor mode **The standard inverter mode. This mode is enabled when inverter power goes on.**

This mode is for monitoring the output frequency and setting the frequency reference value. If also displays information about status alarms during running and trips.

- Display of output frequency, etc.
  - F710 Initial panel display selection
  - (F720 Initial extension panel display selection)
  - F702 Free unit display scale
- Setting frequency reference values.
- Status alarm

  If there is an error in the inverter, the alarm signal and the frequency will flash alternately in the LED display.
  - C: When a current flows at or higher than the overcurrent stall prevention level.
  - P: When a voltage is generated at or higher than the over voltage stall prevention level.
  - L: When the cumulative amount of overload reaches 50% or more of the overload trip value, or when the main circuit element temperature reaches the overload alarm level
  - H: When the overheat protection alarm level is reached

Setting monitor mode **The mode for setting inverter parameters.**

⇒ How to set parameters, refer to section 4. 2.

There are two parameter read modes. Refer to section 4. 2 for details about selection and switching of modes.

Easy setting mode : Only the ten most frequently used parameters are displayed. Parameters can be registered as necessary. (max. 32 parameters)

Standard setting mode : Both basic and extended all parameters are displayed.

☆ Each press of the EASY key switches between the Easy setting mode and the Standard setting mode.

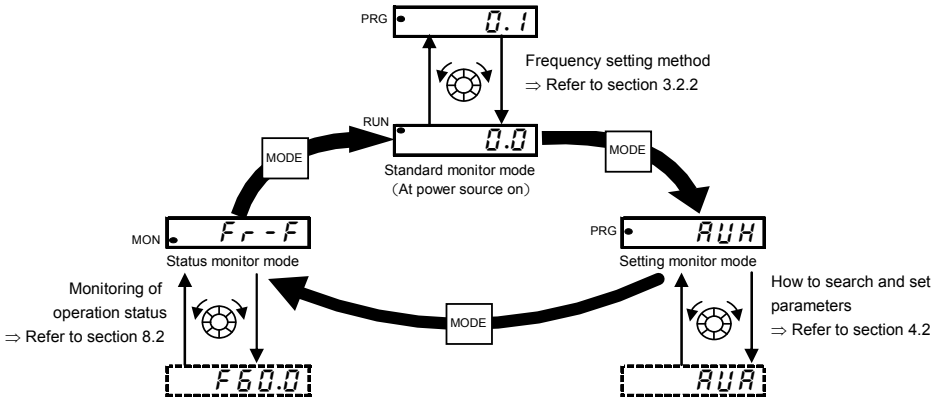
Status monitor mode

The mode for monitoring all inverter status.

Allows monitoring of frequency command value, output current/voltage and terminal information.

⇒ Refer to chapter 8.

The inverter can be moved through each of the modes by pressing the MODE key.



4.2 How to set parameters

There are two types of setting monitor modes: Easy mode and Standard setting mode. The mode active when power is turned on can be selected at PSEL (EASY key mode selection), and the mode can be switched by the EASY key. Note, however, that the switching method differs when only the Easy mode is selected. Refer to section 4.5 for details.

Setting dial and panel key operations are as follows:

Turning the setting dial
Used to select items and changing setting values. Note)

Pressing the center of the setting dial
Used for executing operations and determining setting values. Note)

MODE — Used to select the mode and return to the previous menu

EASY — Used to switch between the Easy and Standard setting modes.

Easy setting mode

: The mode changes to the Easy setting mode when the EASY key is pressed at the standard monitor mode and "EASY" is displayed. In the Easy setting mode, the EASY lamp lights.
Only the most frequently used 10 basic parameters are displayed at default setting.

Easy setting mode

Title	Function
CMOd	Command mode selection
FMOd	Frequency setting mode selection 1
ACC	Acceleration time 1
dEC	Deceleration time 1
UL	Upper limit frequency
LL	Lower limit frequency
tHr	Motor electronic-thermal protection level 1
FM	Meter adjustment gain
F701	Current/voltage unit selection
PSEL	EASY key mode selection

☆ If the EASY key is pressed while the setting dial is being turned, values continue to be incremented or decremented even if you release your finger from the setting dial. This feature is handy when setting large values.

Note) Of the available parameters, number value parameters (ACC etc.) are reflected in actual operation when the setting dial is turned. Note, however, that the center of the setting dial must be pressed to save values even when the power is turned off.
Note, also, that item selection parameters (FMOd etc.) are not reflected in actual operation by just turning the setting dial. To reflect these parameters, press the center of the setting dial.

Standard setting mode : The mode changes to the Standard setting mode when the EASY key is pressed and "Std" is displayed. Both basic and extended all parameters are displayed.

- Basic parameters : This parameter is a basic parameter for the operation of the inverter.
  - ⇒ Refer to chapter 5 for details.
  - ⇒ Refer to section 11.2 for parameter tables.
- Extended parameters : The parameters for detailed and special setting.
  - ⇒ Refer to chapter 6 for details.
  - ⇒ Refer to section 11.3 for parameter tables.

4

Note) There are the parameters that cannot be changed during inverter running for reasons of safety. Refer to section 11.9.

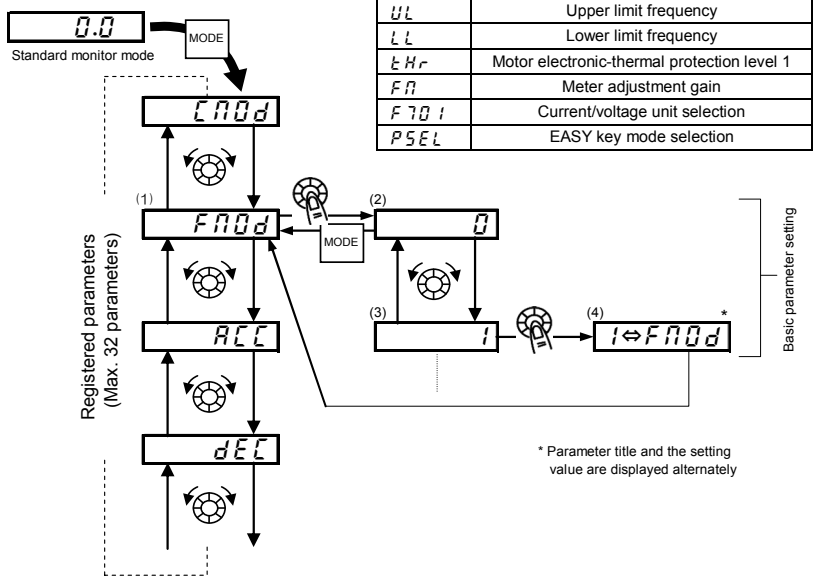
4.2.1 Settings in the Easy setting mode

The inverter enters this mode by pressing the MODE key when the Easy setting mode is selected

When you are unsure of something during operation:
You can return to the Standard monitor mode by pressing the MODE key several times.

Easy setting mode (Registered parameters at default setting)

Title	Function
CMOd	Command mode selection
FMOd	Frequency setting mode selection 1
ACC	Acceleration time 1
dEC	Deceleration time 1
UL	Upper limit frequency
LL	Lower limit frequency
tHr	Motor electronic-thermal protection level 1
FM	Meter adjustment gain
F701	Current/voltage unit selection
PSEL	EASY key mode selection



■ Setting parameters in the Easy setting mode

(1) Select parameter to be changed. (Turn the setting dial.)

(2) Read the programmed parameter setting. (Press the center of the setting dial.)

(3) Change the parameter value. (Turn the setting dial.)

(4) Press this key to save the parameter value. (Press the center of the setting dial.)

☆ To switch to the Standard setting mode, press the EASY key in the Standard monitor mode. "Std" is displayed, and the mode is switched.

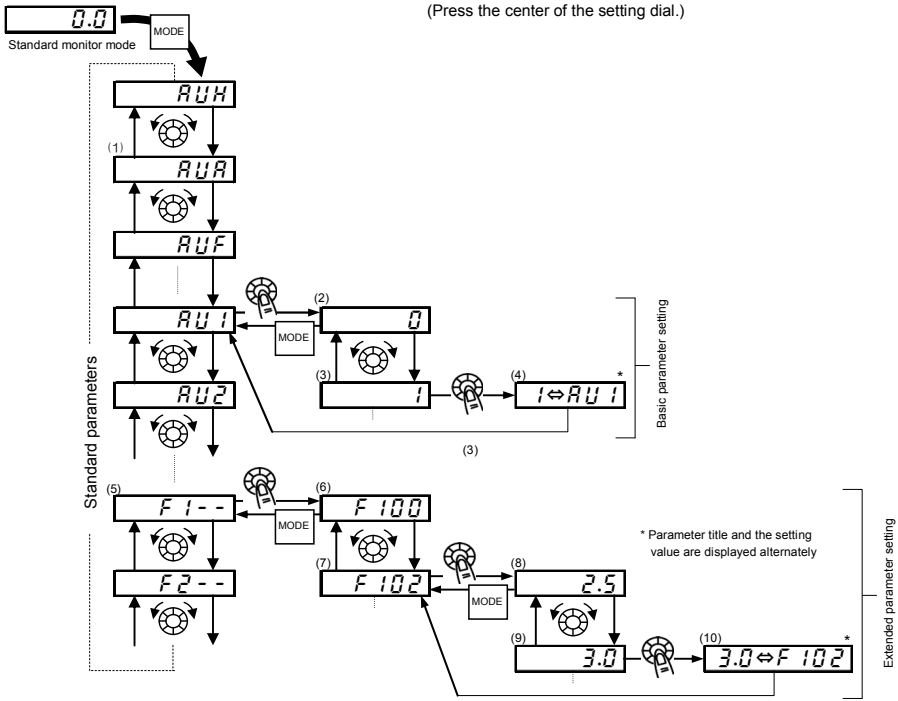
4.2.2 Settings in the Standard setting mode

The inverter enters this mode by pressing the MODE key when the Standard setting mode is selected.

When you are unsure of something during operation:
You can return to the Standard monitor mode by pressing the MODE key several times.

■ How to set basic parameters

(1) Select parameter to be changed. (Turn the setting dial.)
(2) Read the programmed parameter setting. (Press the center of the setting dial.)
(3) Change the parameter value. (Turn the setting dial.)
(4) Press this key to save the parameter value. (Press the center of the setting dial.)



☆ To switch to the Easy setting mode, press the EASY key in the Standard monitor mode. EASY is displayed, and the mode is switched.

■ How to set extended parameters

Each extended parameter is composed of an "F, A or C "suffixed with a 3-digit figure, so first select and read out the heading of the parameter you want "F 1- -" to "F 9- -", "A- - -", "C- - -" ("F 1- -": Parameter starting point is 100, "A- - -": Parameter starting point is A.)

(5) Select the title of the parameter you want to change. (Turn the setting dial.)

(6) Read the extended parameter. (Press the center of the setting dial.)

(7) Select parameter to be changed. (Turn the setting dial.)

(8) Read the programmed parameter setting. (Press the center of the setting dial.)

(9) Change the parameter value. (Turn the setting dial.)

(10) Press this key to save the parameter value. (Press the center of the setting dial.)

■ Adjustment range and display of parameter setting value

H 1: An attempt has been made to assign a value that is higher than the programmable range.

L 0: An attempt has been made to assign a value that is lower than the programmable range.

If the above alarm is flashing on and off, values that exceed H 1 or are equal or lower than L 0 cannot be set.

* A setting value of the presently-selected parameter might exceed the upper limit or the lower limit by changing other parameters.

4.3 Functions useful in searching for a parameter or changing a parameter setting

This section explains functions useful in searching for a parameter or changing a parameter setting.

Changed parameters history search (History function) AUH

This function automatically searches for the last five parameters whose settings have been changed. To use this function, select the AUH parameter. (The changed parameters are displayed regardless of difference with the default settings.)

⇒ Refer to section 5.1 for details.

Easy setting parameters according to application (Application easy setting) AUA

The necessary parameter for your machine can be easily set.

Select the machine by parameter AUA and set by using the easy setting mode.

⇒ Refer to section 5.2 for details.

Set parameters by purpose (Guidance function) AUF

Only parameters required for a special purpose can be called up and set.

To use this function, select parameter AUF.

⇒ Refer to section 5.3 for details.

Reset parameters to default settings tYP

Use the tYP parameter to reset all parameters back to the default settings. To use this function, set parameter tYP =3 or 13.

⇒ Refer to section 4.3.2 for details.

4

Call saved customer settings tYP

Customer settings can be batch-saved and batch-called.

These settings can be used as customer-exclusive default settings.

To use this function, set parameter tYP = 7 or 8.

⇒ Refer to section 4.3.2 for details.

Search changed parameters GrU

Automatically searches for only those parameters that are programmed with values different from the default setting.

To use this function, select the GrU parameter.

⇒ Refer to section 4.3.1 for details.

4.3.1 Searching for and resetting changed parameters

GrU: Automatic edit function

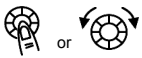
• **Function**
Automatically searches for only those parameters that are programmed with values different from the default setting and displays them in the GrU. Parameter setting value can also be changed while searching.

Note 1: If you reset a parameter to its factory default, the parameter will no longer appear in GrU.

Note 2: It may take several seconds to display changed parameters because all data stored in GrU is checked against the default settings. To cancel a parameter search, press the MODE key.

Note 3: Parameters which cannot be reset to the default setting after setting tYP to 3 are not displayed.
⇒ Refer to section 4.3.2 for details.

■ How to search and reprogram parameters

Panel operation	LED display	Operation
	0.0	Displays the output frequency (operation stopped). (When standard monitor display selection is set as F710=0 [output frequency])
MODE	AUH	Displays the first basic parameter "History function (AUH)."
	GrU	Turn the setting dial, and select GrU.
	U---	Press the center of the setting dial to enter the user parameter setting change search mode.
	ACC	Searches for and displays parameters different to the default settings. Parameters are changed by either pressing the center of the setting dial or turning it to the right. (Turning the setting dial to the left searches for parameter in the reverse direction.)
	8.0	Press the center of the setting dial to display set values.
	5.0	Turn the setting dial, and change set values.
	5.0⇔ ACC	Press the center of the setting dial to set values. The parameter name and set value light alternately and are written.
	U--F (U--r)	Use the same steps as those above and turn the setting dial to display parameters to search for or whose settings must be changed, and check or change the parameter settings.
	GrU	When GrU appears again, the search is ended.
MODE MODE MODE	Parameter display ↓ GrU ↓ Fr-F ↓ 0.0	A search can be canceled by pressing the MODE key. Press the key once while the search is underway to return to the display of parameter setting mode. Returns to the GrU display. After that press the MODE key and return to the status monitor mode or the standard monitor mode (display of output frequency).

4

4.3.2 Return to default settings

[tYP]: Default setting

- Function
  It is possible to return groups of parameters to their defaults, clear run times, and record/recall set parameters.

[Parameter setting]

Title	Function	Adjustment range	Default setting
tYP	Default setting	0: - 1: 50Hz default setting 2: 60Hz default setting 3: Default setting 1 (Initialization) 4: Trip record clear 5: Cumulative operation time clear 6: Initialization of type information 7: Save user setting parameters 8. Load user setting parameters 9. Cumulative fan operation time record clears 10, 11: - 12: Number of starting clear 13: Default setting 2 (complete initialization)	0

★ This function will be displayed as 0 during reading on the right. This previous setting is displayed.
Example: [3 0]

★ tYP cannot be set during the inverter operating. Always stop the inverter first and then program.

Programmed value

50 Hz default setting (tYP= 1)

Setting tYP to 1 sets the following parameters for base frequency 50 Hz use.
(The setting values of other parameters are not changed.)

- Maximum frequency (FH) : 50Hz
- Base frequency 1 (uL) : 50Hz
- VIA input point 2 frequency (F204) : 50Hz
- VIC input point 2 frequency (F219) : 50Hz
- Process upper limit (F367) : 50Hz
- Motor rated speed (F417) : 1410 min^{-1}
- Upper limit frequency (UL) : 50Hz
- Base frequency 2 (F170) : 50Hz
- VIB input point 2 frequency (F213) : 50Hz
- Automatic light-load high-speed operation frequency (F330) : 50Hz
- Communication command point 2 frequency (F814) : 50Hz

60 Hz default setting (tYP=2)

Setting tYP to 2 sets the following parameters for base frequency 60 Hz use.
(The setting values of other parameters are not changed.)

- Maximum frequency (FH) : 60Hz
- Base frequency 1 (UL) : 60Hz
- VIA input point 2 frequency (F204) : 60Hz
- VIC input point 2 frequency (F219) : 60Hz
- Process upper limit (F367) : 60Hz
- Motor rated speed (F417) : 1710 min^{-1}
- Upper limit frequency (UL) : 60Hz
- Base frequency 2 (F170) : 60Hz
- VIB input point 2 frequency (F213) : 60Hz
- Automatic light-load high-speed operation frequency (F330) : 60Hz
- Communication command point 2 frequency (F814) : 60Hz

Default setting 1 (tYP = 3)

Setting tYP to 3 will return parameters to the default settings (exclusive of some parameters).

☆ When 3 is set, InIt is displayed for a short time after the settings are configured, and then disappears. Then the inverter is in standard motor mode. In this case, the trip history data is cleared.

Be aware that the following parameters do not return to the default settings even if tYP=3 is set for maintainability. (To initialize all parameters, set tYP= 13)

- AUL : Overload characteristic selection
- FMSL : Meter selection
- FM : Meter adjustment gain
- SEt : Checking the region setting
- F107 : Analog input terminal selection
- F109 : Analog/logic input selection (VIA/VIB)
- F470～F475 : VIA/VIB/VIC input bias / gain
- F669 : Logic output/pulse train output selection
- F681 : Analog output signal selection
- F691 : Inclination characteristic of analog output
- F692 : Analog output bias
- F880 : Free notes

* Refer to “Communication manual” about parameter C xxx.

Trip record clear (tYP = 4)

Setting tYP to 4 initializes the past eight sets of recorded error history data.

☆ The parameter does not change.

Cumulative operation time clear (tYP = 5)

Setting tYP to 5 resets the cumulative operation time to the initial value (zero).

Initialization of type information (tYP = 6)

Setting tYP to 6 clears the trips when an EtYP format error occurs. But if the EtYP displayed, contact your Toshiba distributor.

Save user setting parameters (tYP = 7)

Setting tYP to 7 saves the current settings of all parameters.

Load user setting parameters (tYP = 8)

Setting tYP to 8 loads parameter settings to (calls up) those saved by setting tYP to 7.

☆ By setting tYP to 7 or 8, you can use parameters as your own default parameters.

Cumulative fan operation time record clear (tYP = 9)

Setting tYP to 9 resets the cumulative operation time to the initial value (zero).
Set this parameter when replacing the cooling fan, and so on

4

Number of starting clear (tYP = 12)

Setting tYP to 12 resets the number of starting to the initial value (zero).

Default setting 2 (tYP = 13)

Set tYP to 13 to return all parameters to their default settings.
When 13 is set,  is displayed for a short time after the settings are configured, and then disappears. Then setup menu SEt is displayed. After reviewing the setup menu items, make a setup menu selection. In this case, all parameters are returned to their defaults, and the trip history data is cleared. (Refer to section 3.1)

4.4 Checking the region settings selection

SET: Checking the region setting

- Function
  The region selected on the setup menu can be checked.
  Also, the setup menu starts and can be changed to a different region.

[Parameter setting]

Title	Function	Adjustment range	Default setting
SET	Checking the region setting	0: Start setup menu 1: Japan (read only) 2: North America (read only) 3: Asia (read only) 4: Europe (read only)	1 *

* Default setting values vary depending on the setup menu setting. 1 to 4 are displayed.

■ Content of region settings

The number displayed when parameter SET is read indicates which of the following regions was selected on the setup menu.

4: EU (Europe) is selected on the setup menu.
3: ASIA (Asia, Oceania) is selected on the setup menu.
2: USA (North America) is selected on the setup menu.
1: JP (Japan) is selected on the setup menu.

The setup menu is started by setting SET=0.
Refer to section 3.1 for details.

Note: 1 to 4set to parameter SET are read-only. They cannot be written.

4.5 EASY key function

PSEL : EASY key mode selection

F750 : EASY key function selection

F751 to F782 : Easy setting mode parameter 1 to 32

• Function

It is possible to switch between standard mode and easy setting mode using the EASY key. (default setting)
Up to 32 arbitrary parameters can be registered to easy setting mode.
The EASY key can select following four functions.

- Easy / Standard setting mode switching function
- Shortcut key function
- Local / Remote switching function
- Peak hold function

4

[Parameter setting]

Title	Function	Adjustment range	Default setting
PSEL	EASY key mode selection	0: Standard setting mode at power on 1: Easy setting mode at power on 2: Easy setting mode only	0
F750	EASY key function selection	0: Easy / standard setting mode switching function 1: Shortcut key 2: Local / remote key 3: Monitor peak / minimum hold trigger	0

■ Easy / Standard setting mode switching function (F750=0): Default setting

It is possible to switch between standard mode and easy setting mode when you push the EASY key while the inverter is stopping.
Standard setting mode is selected when the power is turned on at default setting.
The way parameters are read out and displayed varies according to the mode selected.

Easy setting mode

Allows pre-registration (easy setting mode parameters) of frequently changed parameters and reading of only registered parameters (maximum of 32 types).
In the Easy setting mode, the EASY key lamp lights.

Standard setting mode

Standard setting mode in which all parameters are read out.

[How to read out parameters]

Use the EASY key to change between Easy setting mode and Standard setting mode, and then press the MODE key to enter the setting monitor mode.
Turn the setting dial to read the parameter.
The relation between the parameter and the mode selected is shown below.

PSEL=0

* When the power is turned on, the inverter is in standard mode. Press the EASY key to switch to easy setting mode.

PSEL=1

* When the power is turned on, the inverter is in easy setting mode. Press the EASY key to switch to standard mode.

PSEL=2

* Always in easy setting mode.
  However, it can be switched to standard setting mode by EASY key if it is set to PSEL=0, 1. When PSEL is not displayed in Easy setting mode, Und0 is displayed and it can be temporarily switched to standard setting mode by EASY key after center of the setting dial is pushed for five seconds or more.

[How to select parameters]

Select the desired parameters as easy setting mode parameters 1 to 32 (F751 to F782). Note that parameters should be specified by communication number. For communication numbers, refer to Table of parameters.

In easy setting mode, only parameters registered to parameters 1 to 32 are displayed in order of registration.

The values of the default settings are shown in the table below.

[Parameter setting]

Title	Function	Adjustment range	Default setting
F751	Easy setting mode parameter 1	0-2999	3 (CMOd)
F752	Easy setting mode parameter 2	0-2999	4 (FMOd)
F753	Easy setting mode parameter 3	0-2999	9 (ACC)
F754	Easy setting mode parameter 4	0-2999	10 (dEC)
F755	Easy setting mode parameter 5	0-2999	12 (UL)
F756	Easy setting mode parameter 6	0-2999	13 (LL)
F757	Easy setting mode parameter 7	0-2999	600 (tHr)
F758	Easy setting mode parameter 8	0-2999	6 (FM)
F759	Easy setting mode parameter 9	0-2999 (Set by communication number)	999 (No function)
F760	Easy setting mode parameter 10		
F761	Easy setting mode parameter 11		
F762	Easy setting mode parameter 12		
F763	Easy setting mode parameter 13		
F764	Easy setting mode parameter 14		
F765	Easy setting mode parameter 15		
F766	Easy setting mode parameter 16		
F767	Easy setting mode parameter 17		
F768	Easy setting mode parameter 18		
F769	Easy setting mode parameter 19		
F770	Easy setting mode parameter 20		
F771	Easy setting mode parameter 21		
F772	Easy setting mode parameter 22		
F773	Easy setting mode parameter 23		
F774	Easy setting mode parameter 24		
F775	Easy setting mode parameter 25		
F776	Easy setting mode parameter 26		
F777	Easy setting mode parameter 27		
F778	Easy setting mode parameter 28		
F779	Easy setting mode parameter 29		
F780	Easy setting mode parameter 30		
F781	Easy setting mode parameter 31	0-2999	701 (F701)
F782	Easy setting mode parameter 32	0-2999	50 (PSEL)

Note: If any number other than communication numbers is specified, it is regarded as 999 (no function assigned).

■ **Shortcut key function (F750= 1)**

This function allows you to register, in a shortcut list, parameters whose settings need to be changed frequently so that you can read them out easily in a single operation.
The shortcut is usable in the frequency monitor mode only.

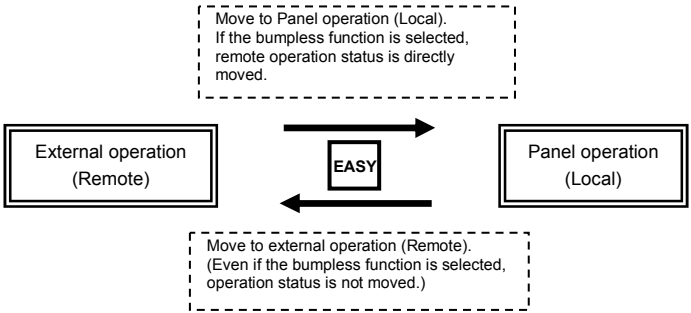
[Operation]
Set F750 to 1, read out the setting of the parameter you want to register, and press and hold down the EASY key for 2 seconds or more. The registration of the parameter in a shortcut list has been completed.
To read out the parameter, just press the EASY key.

■ **Local / Remote switching (F750=2)**

This function allows you to easily switch between panel operation and external operation.
To switch between control device, set F750 to 2, and then select the desired control device, using the EASY key.

If bumpless operation selection F295 is set to 1 (Enabled), it can be switched during operation.

Local means panel operation.
Remote means the operation that is selected by command mode selection: CMOd and frequency setting mode selection: FMOd (F207).
In the Local mode, the EASY key lamp lights.



Note) Please note that if set the parameter F750 to 0 in local mode, the panel operation state holds and it becomes different from setting of CMOd.

■ **Peak hold function (F750=3)**

This function allows you to set peak hold and minimum hold triggers for parameters F709, using the EASY key.
The measurement of the minimum and maximum values set for F709 starts the instant when you press the EASY key after setting F750 to 3.
The peak hold and minimum hold values are displayed in absolute values.

5. Main parameters

Here are described main parameters you set before use according to the section 11. Tables of parameters and data.

5.1 Meter setting and adjustment

FMSL: Meter selection FM: Meter adjustment gain

- Function
  Output of 0 - 1mAdc, 0 (4) - 20mAdc, 0 - 10vdc can be selected for the output signal from the FM terminal, depending on the F681 setting. Adjust the scale at FM.
  Use an ammeter with a full-scale 0 - 1mAdc meter.
  The F692 (analog output bias) needs to be adjusted if output is 4 - 20mAdc.

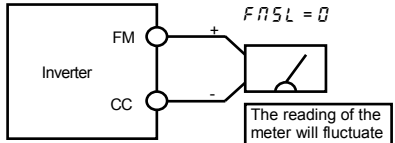
[Parameter setting]

Title	Function	Adjustment range	Supposition output at FMSL = 17	Default setting
FMSL	Meter selection	0: Output frequency 1: Output current 2: Frequency command value 3: Input voltage (DC detection) 4: Output voltage (command value) 5: Input power 6: Output power 7: Torque 8: - 9: Motor cumulative load factor 10: Inverter cumulative load factor 11: PBR (Braking resistor) cumulative load factor 12:Stator frequency 13:VIA input value 14:VIB input value 15:Fixed output 1 (output current 100% equivalent) 16:Fixed output 2 (output current 50% equivalent) 17:Fixed output 3 (Other than the output current) 18:RS485 communication data 19:For adjustments (FM set value is displayed.) 20: VIC input value 21: Pulse train input value 22: - 23: PID feedback value 24: Integral input power 25: Integral output power	Maximum frequency (FH) - Maximum frequency (FH) 1.5x rated voltage 1.5x rated voltage 1.85x rated power 1.85x rated power 2.5x rated torque - Rated load factor Rated load factor Rated load factor Maximum frequency (FH) Maximum input value Maximum input value - - - Maximum value (100.0%) - Maximum input value Maximum input value - Maximum frequency (FH) 1000x F749 1000x F749	0
FM	Meter adjustment gain	-	-	-

■ Resolution: All FM terminals have a maximum of 1/1000.

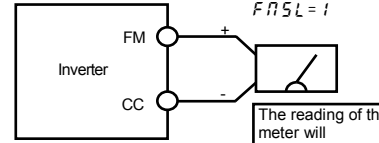
■ Adjustment scale with parameter FM (Meter adjustment)
Connect meters as shown below.

<Displaying output frequency>



* Optional QS-60T frequency meter is available.

<Displaying output current>



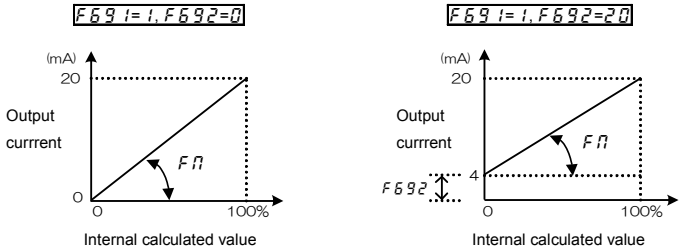
*Meter with a maximum scale of 1.5x the inverter's rated output current is recommended.

[Example of how to adjust the FM terminal frequency meter]

* Use the meter's adjustment screw to pre-adjust zero-point.
* Adjust F691 and F692 in advance in case of 4-20mA output.

Operation panel action	LED display	Operation
-	60.0	Displays the output frequency. (When standard monitor display selection F710 is set to 0)
MODE	AUH	The first basic parameter "AUH" (history function) is displayed.
	FM	Turn the setting dial to select FM.
	60.0	Output frequency can be displayed by pressing the center of the setting dial.
	60.0	Turn the setting dial to adjust the meter. The meter's indicator will change by turning setting dial. (The inverter displays output frequency and it will not change with the setting dial)
	60.0 ⇔ FM	Press the center of the setting dial to save the meter's adjustments. FM and the frequency are displayed alternately.
MODE + MODE	60.0	The display returns to displaying output frequency. (When standard monitor display selection F710 is set to 0 [output frequency])

■ Example of 4-20mA output adjustment (Refer to section 6.17.2 for details)



Note 1) When using the FM terminal for current output, be sure that the external load resistance is less than 600Ω. Use over 1kΩ external load resistance for voltage output.

Note 2) FMSL = 12 is the motor drive frequency.

■ Adjusting the meter in inverter stop state

- Adjustment of the meter for output current (FMSL = 1)
  Adjustment of the meter for output current can be done in inverter stop state.
  When setting FMSL to 15 for fixed output 1 (output current 100% equivalent), a signal assuming that inverter rated current (output current 100% equivalent) passes will be output from the FM terminal.
  Adjust the meter with the FM (Meter adjustment) parameter in this state.
  Similarly, if you set FMSL to 16 for fixed output 2 (output current 50% equivalent), a signal assuming that 50% of inverter rated current (output current 50% equivalent) passes will be output from the FM terminal.
  After meter adjustment is ended, set FMSL to 1 (output current).

- Other adjustments (FMSL = 0, 2 to 7, 9 to 14, 18, 20, 21, 23 to 25)
  FMSL = 17: When fixed output 3 (other than the output current) is set, a signal of the value for other monitors is fixed at the following values and output through the FM terminal.
  100% standard value for each item is the following:

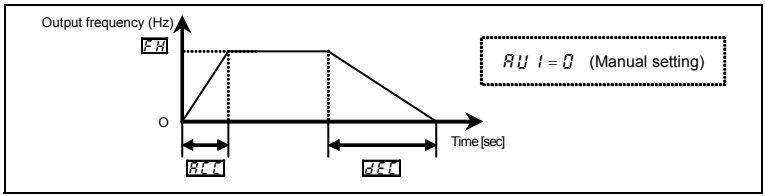
FMSL=0, 2, 12, 23	: Maximum frequency (FH)
FMSL=3, 4	: 1.5 times of rated voltage
FMSL=7	: 2.5 times of rated torque
FMSL=9 to 11	: Rated load factor
FMSL=13, 14, 20, 21	: Maximum input value (10V, or 20mA)
FMSL=18	: Maximum value (100.0%)
FMSL=24, 25	: 1000x F749

5.2 Setting acceleration/deceleration time

ACC : Acceleration time 1 FS19 : Setting of acceleration/deceleration time unit

dEC : Deceleration time 1 AU1 : Automatic acceleration/deceleration

- Function
  1) For acceleration time 1 ACC programs the time that it takes for the inverter output frequency to go from 0.0Hz to maximum frequency FH.
  2) For deceleration time 1 dEC programs the time that it takes for the inverter output frequency to go from maximum frequency FH to 0.0Hz.



[Parameter setting]

Title	Function	Adjustment range	Default setting
ACC	Acceleration time 1	0.0-3600 (360.0) (s)	10.0
dEC	Deceleration time 1	0.0-3600 (360.0) (s)	10.0
FS19	Setting of acceleration/deceleration time unit	0: - 1: 0.01s unit (after execution: 0) 2: 0.1s unit (after execution: 0)	0

Note1): Setting increment unit can be changed to 0.01 seconds by parameter FS19.

Note2): FS19=2: When the acceleration/deceleration time is set to 0.0 seconds, the inverter accelerates and decelerates 0.05 seconds.

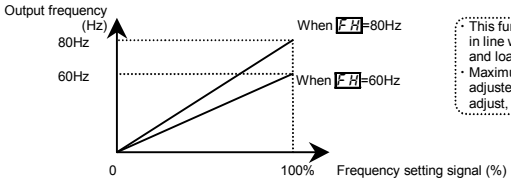
FS19=1: When the acceleration/deceleration time is set to 0.00 seconds, the inverter accelerates and decelerates 0.01 seconds.

☆ If the programmed value is shorter than the optimum acceleration/deceleration time determined by load conditions, overcurrent stall or overvoltage stall function may make the acceleration/deceleration time longer than the programmed time. If an even shorter acceleration/deceleration time is programmed, there may be an overcurrent trip or overvoltage trip for inverter protection. (Refer to section 13.1 for details)

5.3 Maximum frequency

FH : Maximum frequency

- Function
  1) Programs the range of frequencies output by the inverter (maximum output values).
  2) This frequency is used as the reference for acceleration/deceleration time.



- This function determines the value in line with the ratings of the motor and load.
- Maximum frequency cannot be adjusted during operation.To adjust, first stop the inverter.

★ If FH is increased, adjust the upper limit frequency UL as necessary.

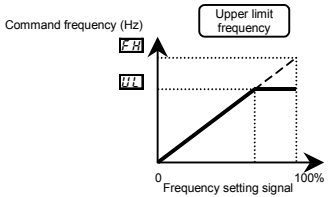
[Parameter setting]

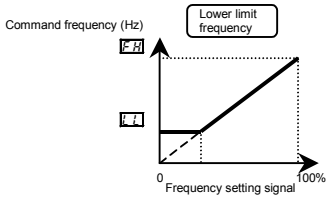
Title	Function	Adjustment range	Default setting
FH	Maximum frequency	30.0-500.0 (Hz)	80.0

5.4 Upper limit and lower limit frequencies

UL : Upper limit frequency LL : Lower limit frequency

- Function
  Programs the lower limit frequency that determines the lower limit of the output frequency and the upper limit frequency that determines the upper limit of that frequency.





5

[Parameter setting]

Title	Function	Adjustment range	Default setting
UL	Upper limit frequency	0.5 - FH (Hz)	*1
LL	Lower limit frequency	0.0 - UL (Hz)	0.0

* 1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

Note1) Do not set a value 10 times larger than uL (base frequency 1) and F170 (base frequency 2) for UL. If a large number is set, the output frequency can only be output at 10 times of minimum value uL and F170 and A-05 alarm is displayed.

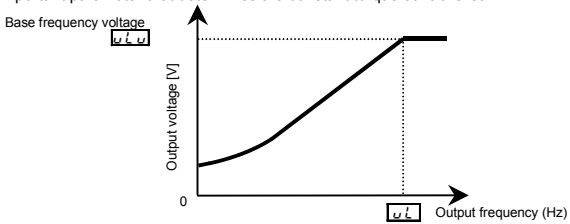
Note2) Output frequency lower than parameter F240 (Starting frequency) is not output. Parameter F240 setting is needed.

5.5 Base frequency

[UL]: Base frequency 1 [ULV]: Base frequency voltage 1

- Function
  Set the base frequency and the base frequency voltage in conformance with load specifications or the base frequency.

Note: This is an important parameter that determines the constant torque control area.



[Parameter setting]

Title	Function	Adjustment range	Default setting
UL	Base frequency 1	20.0-500.0 (Hz)	∗1
ULV	Base frequency voltage1	50-330 (240V class) 50-660 (500V class)	∗1

* 1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

5.6 Setting the electronic thermal

AUL : Overload characteristic selection

tHr : Motor electronic-thermal protection level 1

OLM : Electronic-thermal protection characteristic selection

F173 : Motor electronic-thermal protection level 2

F607 : Motor 150% overload detection time

F631 : Inverter overload detection method

F632 : Electronic-thermal memory

F657 : Overload alarm level

5

• Function

This parameter allows selection of the appropriate electronic thermal protection characteristics according to the particular rating and characteristics of the motor.

[Parameter setting]

Title	Function	Adjustment range	Default setting
AUL	Overload characteristic selection	0: - *4 1: Constant torque characteristic（150%-60s） 2: Variable torque characteristic（120%-60s）	0
tHr	Motor electronic-thermal protection level 1	10 – 100 (%) / (A) *1	100
OLM	Electronic-thermal protection characteristic selection	Setting value / Overload protection / Overload 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
F173	Motor electronic-thermal protection level 2	10 – 100 (%) / (A) *1	100
F607	Motor 150% overload detection time	10 – 2400 (s)	300
F631	Inverter overload detection method	0: 150%-60s (120%-60s) 1: Temperature estimation	0

[Parameter setting]

Title	Function	Adjustment range	Default setting
F632	Electronic-thermal memory	0: Disabled (tHr, F173) 1: Enabled (tHr, F173) 2: Disabled (tHr) 3: Enabled (tHr)	0
F657	Overload alarm level	10-100	50

*1: The inverter's rated current is 100%. When F701 (current/voltage unit selection) = 1 (A (amps)/V (volts)) is selected, it can be set at A (amps).

*2: F632=1: Electronic-thermal statuses (cumulative overload value) of motor and inverter are saved when power supply is OFF. It is calculated from the saved value when power supply is ON again.

*3: Parameter AUL is displayed as "0" during reading after this is set.
Present setting of inverter overload characteristic can be confirmed by status monitor.
Refer to monitor "Overload and region setting" of section 8.2.1.

1) Setting the electronic thermal protection characteristics selection OLM and motor electronic thermal protection level 1 tHr, 2 F173

5

The electronic thermal protection characteristics selection (OLM) is used to enable or disable the motor overload trip function (OL2) and the overload stall function.
While the inverter overload trip (OL1) will be in constantly detective operation, the motor overload trip (OL2) can be selected using the parameter OLM.

Explanation of terms
Overload stall: This is an optimum function for equipment such as fans, pumps and blowers with variable torque characteristics that the load current decreases as the operating speed decreases.
When the inverter detects an overload, this function automatically lowers the output frequency before the motor overload trip (OL2) is activated. With this function, operation can be continued, without tripping, by operating using a frequency balanced by load current.
Note: Do not use the overload stall function with loads having constant torque characteristics (such as conveyor belts in which load current is fixed with no relation to speed).

[Using standard motors (other than motors intended for use with inverters)]

When a motor is used in the lower frequency range than the rated frequency, that will decrease the cooling effects for the motor. This speeds up the start of overload detection operations when a standard motor is used in order to prevent overheating.

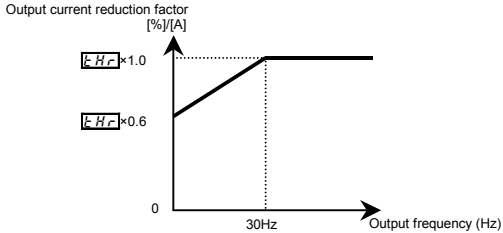
■ Setting of electronic thermal protection characteristics selection OLn

Setting value	Overload protection	Overload stall
0	valid	invalid
1	valid	valid
2	invalid	invalid
3	invalid	valid

■ Setting of motor electronic thermal protection level 1 tHr (Same as F173)

When the capacity of the motor in use is smaller than the capacity of the inverter, or the rated current of the motor is smaller than the rated current of the inverter, adjust thermal protection level 1 tHr for the motor in accordance with the motor's rated current.

* When displaying as a percentage, 100% = rated output current (A) of the inverter is displayed.



Note: The motor overload protection start level is fixed at 30Hz.

[Example of setting: When the VFS15-2007PM-W is running with a 0.4kW motor having 2A rated current]

Operation panel action	LED display	Operation
	0.0	Displays the output frequency. (Perform during operation stopped.) (When standard monitor display selection F710 is set to 0 [output frequency])
MODE	AUH	The first basic parameter "AUH" (history function) is displayed.
	tHr	Turn the setting dial to change the parameter to tHr.
	100	Parameter values can be read by pressing the center of the setting dial (default setting is 100%).
	42	Turn the setting dial to change the parameter to 42% (= motor rated current/inverter rated output current ×100=2.0/4.8×100)
	42 ⇔ tHr	Press the center of the setting dial to save the changed parameter. tHr and the parameter are displayed alternately.

Note: The rated output current of the inverter should be calculated from the rated output current for frequencies below 4kHz, regardless of the setting of the PWM carrier frequency parameter (F300).

[Using a VF motor (motor for use with inverter)]

■ Setting of electronic thermal protection characteristics selection OLN

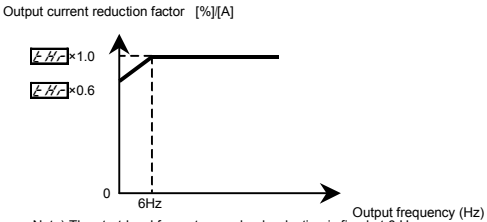
Setting value	Overload protection	Overload stall
4	valid	invalid
5	valid	valid
6	invalid	invalid
7	invalid	valid

VF motors (motors designed for use with inverters) can be used in frequency ranges lower than those for standard motors, but their cooling efficiency decreases at frequencies below 6Hz.

■ Setting of motor electronic thermal protection level 1 thr (Same as F173)

If the capacity of the motor is smaller than the capacity of the inverter, or the rated current of the motor is smaller than the rated current of the inverter, adjust the electronic thermal protection level 1 thr so that it fits the motor's rated current.

* If the indications are in percentages (%), then 100% equals the inverter's rated output current (A).



Note) The start level for motor overload reduction is fixed at 6 Hz.

2) Motor 150%-overload detection time F607

Parameter F607 is used to set the time elapsed before the motor trips under a load of 150% (overload trip OL2) within a range of 10 to 2400 seconds.

3) Inverter overload detection method F631

As this function is set to protect the inverter unit, this function cannot be turned off by parameter setting. The inverter overload detection method can be selected using parameter F631 (Inverter overload detection method).

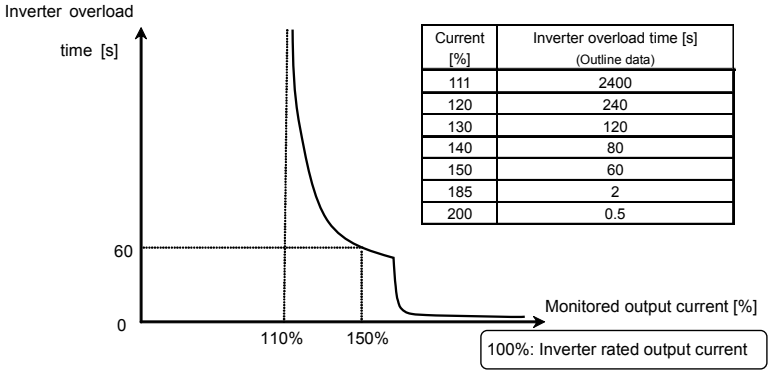
[Parameter setting]

Title	Function	Adjustment range	Default setting
F631	Inverter overload detection method	0: 150%-60s (120%-60s) 1: Temperature estimation	0

If the inverter overload trip function (OL1) is activated frequently, this can be improved by adjusting the stall operation level F601 downward or increasing the acceleration time ACC or deceleration time dEC.

■ F63 1=0 (150%-60s), AUL = 1 (Constant torque characteristic)

Protection is given uniformly regardless of temperature, as shown by the 150%-60 sec overload curve in the figure below.

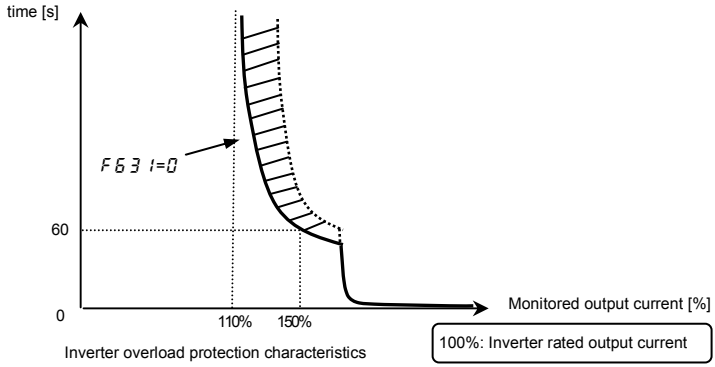


Current [%]	Inverter overload time [s] (Outline data)
111	2400
120	240
130	120
140	80
150	60
185	2
200	0.5

Inverter overload protection characteristics

■ F63 1= 1 (Temperature estimation), AUL = 1 (Constant torque characteristic)

This parameter adjusts automatically overload protection, predicting the inverter internal temperature rise. (diagonally shaded area in the figure below)



Inverter overload protection characteristics

Note 1: If the load applied to the inverter exceeds 150% of its rated load or the operation frequency is less than 0.1Hz, the inverter may trip (OL 1 or OC 1 to OC 3) in a shorter time.

Note 2: The inverter is default setting so that, if the inverter becomes overloaded, it will automatically reduce the carrier frequency to avoid an overload trip (OL 1 or OC 1 to OC 3). A reduction in carrier frequency causes an increase in noise from the motor, but this does not affect the performance of the inverter. If you do not want the inverter to reduce the carrier frequency automatically, set the parameter F316=0.

Note 3: Overload detection level is variable by condition of output frequency and carrier frequency.

Note 4: Regarding to characteristic for AUL=2 setting, refer to section 3.5.5).

4) Electronic thermal memory F632

When the power is OFF, it is possible to reset or maintain the overload totaling level.

This parameter's settings are applied both to the motor's electronic thermal memory and the electronic thermal memory for inverter protection.

[Parameters settings]

Title	Function	Adjustment range	Default setting
F632	Electronic thermal memory	0: Disabled (tHr, F173) 1: Enabled (tHr, F173) 2: Disabled (tHr) 3: Enabled (tHr)	0

☆ F632=1 is a function for complying with the U.S. NEC standards.

5) Overload characteristic selection AUL

Overload characteristic of inverter can be selected to 150%-60s or 120%-60s.

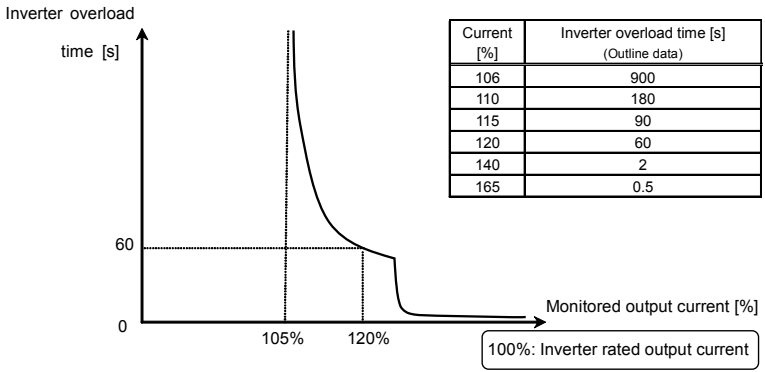
[Parameters settings]

Title	Function	Adjustment range	Default setting
AUL	Overload characteristic selection	0: - 1: Constant torque characteristic（150%-60s） 2: Variable torque characteristic（120%-60s）	0

☆ Regarding to characteristic for AUL = 1 setting, refer to section 3.5.3).

Note 1) In case of AUL =2 setting, be sure to install the input AC reactor (ACL) between power supply and inverter.

■ AUL =2 (Variable torque characteristic), F63 1=0 (120%-60s)

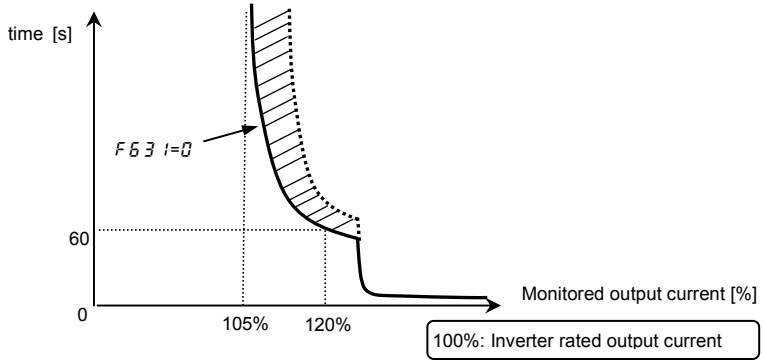


Current [%]	Inverter overload time [s] (Outline data)
106	900
110	180
115	90
120	60
140	2
165	0.5

Inverter overload protection characteristic

■ AUL=2 (Variable torque characteristic), F631=1 (Temperature estimation)

This parameter adjusts automatically overload protection, predicting the inverter internal temperature rise. (diagonally shaded area in the figure below)



Note 1: The rated output current of inverter is changed by setting of AUL = 1 or 2.
Refer to page L-1 about each rated output current.

Note 2: Parameter AUL is displayed as "0" during reading after this is set.

Note 3: Present setting of inverter overload characteristic can be confirmed by status monitor.
Refer to monitor "Overload and region setting" of section 8.2.1.

6) Overload alarm level F657

When the motor overload level reaches to F657 setting value (%) of overload trip (OL2) level, "L" will be displayed on the left side digit and the "L" and output frequency monitor will be blinking alternately on overload alarm status.

Overload alarm signal can be output from output terminal.

[Parameters settings]

Title	Function	Adjustment range	Default setting
F657	Overload alarm level	10-100 (%)	50

[Example of setting]: Assigning the overload alarm to the OUT terminal.

Title	Function	Adjustment range	Setting
F131	Output terminal selection 2A (OUT)	0-255	16: POL

17 is reverse signal.

5.7 Preset-speed operation (speeds in 15 steps)

SR0 to SR7 : Preset-speed frequency 0 to 7

F287 to F294 : Preset-speed frequency 8 to15

F724 : Operation frequency setting target by setting dial

- Function
  A maximum of 15 speed steps can be selected just by switching an external logic signal. Multi-speed frequencies can be programmed anywhere from the lower limit frequency LL to the upper limit frequency UL.

[Setting method]

1) Run/stop

The starting and stopping control is done from the terminal block.

Title	Function	Adjustment range	Setting
CMOd	Command mode selection	0: Terminal block 1: Panel keypad (including extension panel) 2: RS485 communication 3: CANopen communication 4: Communication option	0

2) Preset-speed frequency setting

a) Set the speed (frequency) of the number of steps necessary.

[Parameter setting]

Preset-speed 0

Title	Function	Adjustment range	Default setting
SR0	Preset-speed frequency 0	LL - UL (Hz)	0.0
FMOd	Frequency setting mode selection 1	0-13 14: SR0	0

Frequency command set with SR0 is valid when FMOd= 14 (SR0).
(SR0 is valid even when the command mode selection is not CMOd=0.)

Setting from speed 1 to speed 15

Title	Function	Adjustment range	Default setting
SR1- SR7	Preset-speed frequency 1-7	LL - UL (Hz)	0.0
F287- F294	Preset-speed frequency 8-15	LL - UL (Hz)	0.0

b) Speed (frequency) can be changed during operation.

Title	Function	Adjustment range	Setting
F724	Operation frequency setting target by setting dial	0: Panel frequency (FC) 1: Panel frequency (FC) + Preset speed frequency	1

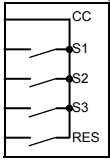
When F724= 1, speed (frequency) can be changed with the setting dial during operation. Set value of the Preset-speed frequency will change by pressing the center.

Note) When the other preset-speed command is input while adjusting frequency with the setting dial, operation frequency will change but not the inverter display and the subject of adjustment.

Ex) If Sr2 is input when operating under Sr1 and changing frequency with the setting dial, operation frequency will change to Sr2 but inverter display and the subject of adjustment continue to be Sr1. Press the center or MODE key to display Sr2.

Preset-speed logic input signal example: Slide switch SW1 = SINK side

O: ON -: OFF (Speed commands other than preset-speed commands are valid when all are OFF)



Terminal	Preset-speed														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
S1-CC	O	-	O	-	O	-	O	-	O	-	O	-	O	-	O
S2-CC	-	O	O	-	-	O	O	-	-	O	O	-	-	O	O
S3-CC	-	-	-	O	O	O	O	-	-	-	-	O	O	O	O
RES-CC	-	-	-	-	-	-	-	O	O	O	O	O	O	O	O

☆ Terminal functions are as follows.

Terminal S1..... Input terminal function selection 4A (S1)
F114= 10 (Preset-speed command 1: SS1)

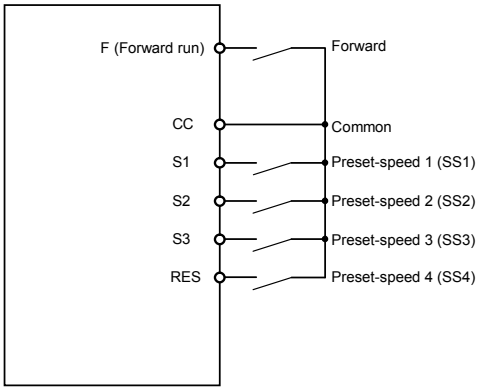
Terminal S2..... Input terminal function selection 5 (S2)
F115= 12 (Preset-speed command 2: SS2)

Terminal S3..... Input terminal function selection 6 (S3)
F116= 14 (Preset-speed command 3: SS3)

Terminal RES..... Input terminal function selection 3A (RES)
F113= 16 (preset-speed command 4: SS4)

☆ In the default settings, SS4 is not assigned. Assign SS4 to RES with input terminal function selection.

[Example of a connection diagram]
(with sink logic settings)

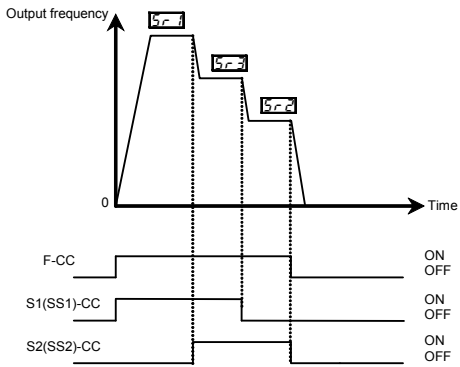


3) Using other speed commands with preset-speed command

Command mode selection CMOd		0: Terminal block	1: Panel keypad (including extension panel) 2: RS485 communication 3: CANopen communication 4: Communication option
Frequency setting mode selection FMOd		0:Setting dial 1 (save even if power is off) 1: Terminal VIA 2: Terminal VIB 3: Setting dial 2 (press in center to save) 4: RS485 communication 5: UP/DOWN from external logic input 6: CANopen communication 7: Communication option 8: Terminal VIC 9, 10: - 11: Pulse train input 12, 13: - 14: Sr0	0:Setting dial 1 (save even if power is off) 1: Terminal VIA 2: Terminal VIB 3: Setting dial 2 (press in center to save) 4: RS485 communication 5: UP/DOWN from external logic input 6: CANopen communication 7: Communication option 8: Terminal VIC 9, 10: - 11: Pulse train input 12, 13: - 14: Sr0
Preset-speed command	Active	**Preset-speed command valid** Note)	**(The inverter doesn't accept Preset-speed command.)**
	Inactive	Command set with FMOd is valid	

Note) The preset-speed command is always given priority when other speed commands are input at the same time.

An example of three-speed operation with the default settings is shown below.
(Frequency settings are required for Sr 1 to 3.)



5.8 Switching between two frequency commands

F N O d : Frequency setting mode selection1

F 2 0 0 : Frequency priority selection

F 2 0 7 : Frequency setting mode selection2

- Function
  These parameters are used to switch between two frequency commands automatically or with input terminal signals.

Parameter setting

Title	Function	Adjustment range	Default setting
F N O d	Frequency setting mode selection 1	0: Setting dial 1(save even if power is off) 1: Terminal VIA 2: Terminal VIB 3: Setting dial 2(press in center to save) 4: RS485 communication 5: UP/DOWN from external logic input 6: CANopen communication 7: Communication option 8: Terminal VIC 9, 10: - 11: Pulse train input 12, 13: - 14: 5 r 0	0
F 2 0 7	Frequency setting mode selection 2		1
F 2 0 0	Frequency priority selection	0: F N O d (Switchable to F 2 0 7 by terminal input) 1: F N O d (Switchable to F 2 0 7 at 1.0 Hz or less of designated frequency)	0

1) Switching with input terminal signals (Input terminal function 104/105: FCHG)

Frequency priority selection parameter F 2 0 0 = 0

Switch frequency command set with F N O d and F 2 0 7 by the input terminal signals.
Assign frequency setting mode forced switching function (input terminal function selection: 104) to an input terminal.
If an OFF command is entered to the input terminal block: The frequency command set with F N O d.
If an ON command is entered to the input terminal block: The frequency command set with F 2 0 7.

Note) Input terminal function 105 is the inverse signal of the above.

2) Automatic switching by frequency command

Frequency priority selection parameter F200 = 1

Switch frequency command set with FN0d and F207 automatically according to the frequency command entered.

If the frequency set with FN0d is above 1Hz: The frequency command set with FN0d

If the frequency set with FN0d is 1Hz or less: The frequency command set with F207

5.9 Auto-restart (Restart of coasting motor)

F301: Auto-restart control selection

Caution	
Mandatory action	• Stand clear of motors and mechanical equipment If the motor stops due to a momentary power failure, the equipment will start suddenly when power is restored. This could result in unexpected injury. • Attach caution label about sudden restart after a momentary power failure on inverters, motors and equipment for prevention of accidents in advance.

• Function

The F301 parameter detects the rotating speed and rotational direction of the motor during coasting at the event of momentary power failure, and then after power has been restored, restarts the motor smoothly (motor speed search function). This parameter also allows switching from commercial power operation to inverter operation without stopping the motor.

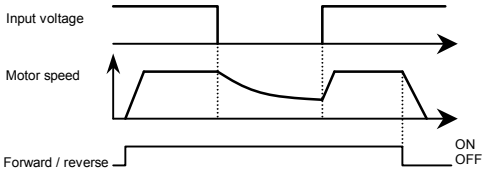
During operation, "rtry" is displayed.

[Parameter setting]

Title	Function	Adjustment range	Default setting
F301	Auto-restart control selection	0: Disabled 1: At auto-restart after momentary stop 2: At ST terminal off and on 3: 1 + 2 4: At start-up	0

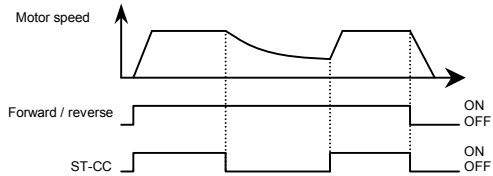
* If the motor is restarted in retry mode, this function will operate, regardless of the setting of this parameter.

1) Auto-restart after momentary power failure (Auto-restart function)



Setting F301 to 1 or 3: This function operates after power has been restored following detection of an undervoltage by the main circuits and control power.

2) Restarting motor during coasting (Motor speed search function)



★ Setting F301 to 2or 3: This function operates after the ST-CC terminal connection has been opened first and then connected again.

Note 1: As the default setting for ST (Standby) is Always ON, change the following settings.

・F110= 1 (no function)

・Assign 6: ST (Standby) to an open input terminal.

5

3) Motor speed search at starting

When F301 is set to 4, a motor speed search is performed each time operation is started.

This function is useful especially when the motor is not operated by the inverter but by the external factor.

Warning!!

- At restart, it takes about 1 second for the inverter to check the number of revolutions of the motor. For this reason, the start-up takes more time than usual.
- Use this function when operating a system with one motor connected to one inverter. This function may not operate properly in a system configuration when multiple motors are connected to one inverter.
- In case of using this function, do not set the output phase failure detection selection (F605= 1, 2, 4).

Application to a crane or hoist

The crane or hoist may have its load to be moved downward during the above waiting time. To apply the inverter to such machines, therefore, set the auto-restart control mode selection parameter to "F301=0" (Disabled), Do not use the retry function, either.

Note 2: It is not malfunction that abnormal noise might be heard from the motor during the motor speed search at the auto-restart.

5.10 Changing operation panel display

5.10.1 Changing the unit (A/V) from a percentage of current and voltage

F701 :Current/voltage unit selection

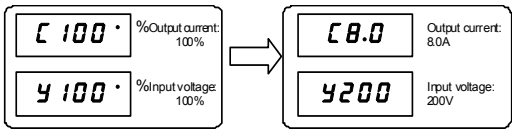
- Function
  These parameters are used to change the unit of monitor display.
  % ⇔ A (ampere)/V (volt)

Current 100% = Rated current of inverter
Input/output voltage 100% = 200Vac (240V class), 400Vac (500V class)

■ Example of setting

During the operation of the VFS15-2015PM-W (rated current: 8.0A) at the rated load (100% load), units are displayed as follows:

1) Display in percentage terms



2) Display in amperes/volts

[Parameter setting]

Title	Function	Adjustment range	Default setting
F701	Current/voltage unit selection	0: % 1: A (ampere) / V (volt)	0

* The F701 converts the following parameter settings:

- A display : Current monitor display: Load current, torque current
  Motor electronic-thermal protection level 1 & 2 tHr, F173
  DC braking current F251
  Stall prevention level 1 & 2 F601, F185
  Small current detection current F611
- V display : Input voltage, output voltage

Note) Base frequency voltage 1 & 2(uLu, F171) always displayed in the unit of V.

5.10.2 Displaying the motor or the line speed

F702: Frequency free unit display magnification

F703: Frequency free unit coverage selection

F705: Inclination characteristic of free unit display

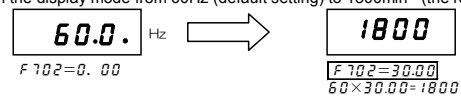
F706: Free unit display bias

• Function
The frequency or any other item displayed on the monitor can be converted into the rotational speed of the motor or load device. The unit of the amount of processing or that of feedback can be changed at PID control.

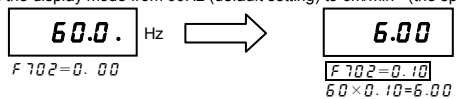
The value obtained by multiplying the displayed frequency by the F702-set value will be displayed as follows:

Value displayed = Monitor-displayed or parameter-set frequency × F702

1) Displaying the motor speed
To switch the display mode from 60Hz (default setting) to 1800min^{-1} (the rotating speed of the 4P motor)



2) Displaying the speed of the loading unit
To switch the display mode from 60Hz (default setting) to 6m/min^{-1} (the speed of the conveyer)



Note: This parameter displays the inverter output frequency as the value obtained by multiplying it by a positive number. This does not mean that the actual motor speed or line speed are indicated with accuracy.

[Parameter setting]

Title	Function	Adjustment range	Default setting
F702	Frequency free unit display magnification	0.00: Disabled (display of frequency) 0.01-200.0 (times)	0.00
F703	Frequency free unit coverage selection	0: All frequencies display 1: PID frequencies display	0
F705	Inclination characteristic of free unit display	0: Negative inclination (downward slope) 1: Positive inclination (upward slope)	1
F706	Free unit display bias	0.00-FH (Hz)	0.00

* The F702 converts the following parameter settings:
In case of F703=0

•Free unit	Frequency monitor display	Output frequency, Frequency command value, PID feedback value, Stator frequency, During stop: Frequency command value (During operation: Output frequency)
	Frequency-related parameters	FC, FH, UL, LL, Sr1~Sr7, F100, F101, F102, F167, F190, F192, F194, F196, F198, F202, F204, F211, F213, F217, F219 F240, F241, F242, F250, F260, F265, F267, F268, F270 to F275, F287~F294, F330, F331, F346, F350, F367, F368, F383, F390 to F393, F505, F513, F649, F812, F814, A923 to A927

In case of F703=1
• Free unit PID control -related parameters FP1d, F367, F368
Note) The unit of the Base frequency 1 and 2 are always Hz.

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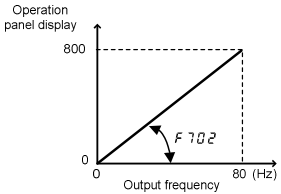
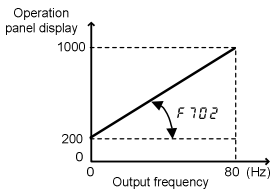
■ An example of setting when FH is 80 and F702 is 10.00

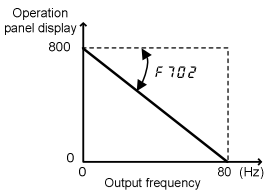
F705=1, F706=0.00



F705=1, F706=20.00



F705=0, F706=80.00



6. Other parameters

Extended parameters are provided for sophisticated operation, fine adjustment and other special purposes. Modify parameter settings as required. Refer to section 11 tables of parameters.

You will find detailed information concerning this subject in chapter 6 of the manual E6581611 (Detailed manual).

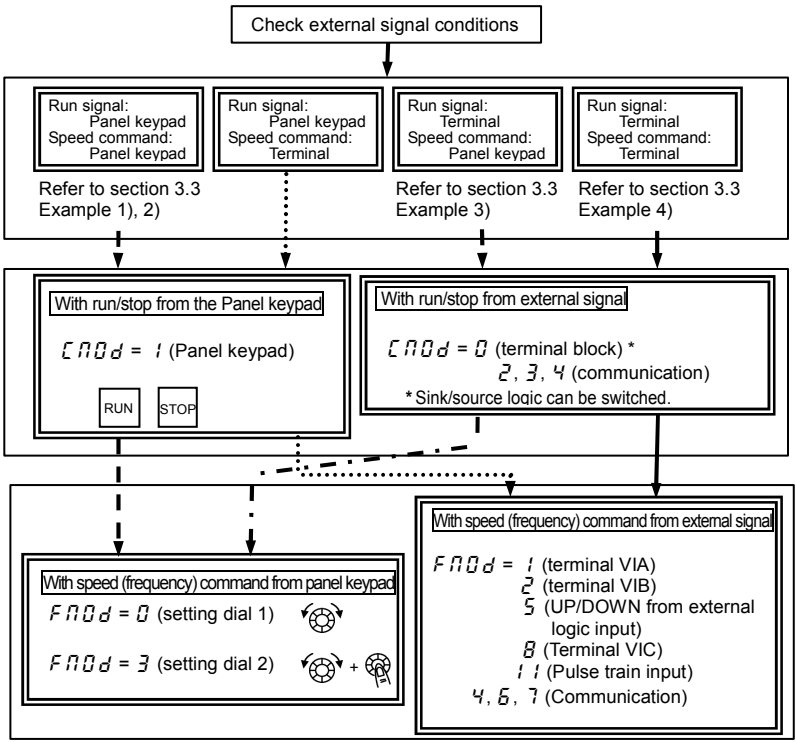
An electronic version of the manual E6581611 is on the CD-ROM attached to the product.

7. Operations with external signal

7.1 Operating external signals

You can control the inverter externally.
The parameter settings differ depending upon your method of operation. Determine your method of operation (the operational signal input method, speed (frequency) command input method) before using the procedure below to set the parameters.

[Procedure for setting parameters]



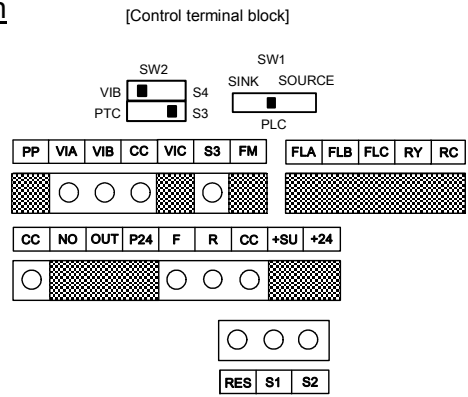
* For settings based on communication, refer to the Communication Manual (E6581913) or section 6.33.

7.2 Applied operations by an I/O signal (operation from the terminal block)

Input terminal sink and source logic are set by using slide switch SW1.

7.2.1 Input terminal function (sink logic)

This function is used to send a signal to the input terminal from an external programmable controller to operate or configure the inverter. The ability to select from a variety of functions allows for flexible system design.
Default settings of slide switch SW1and SW2 are as follows;
SW1: PLC side, SW2: VIB side and S3 side.
Refer to page B-11 to 13 for details.



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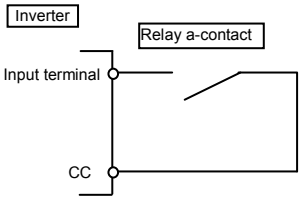
■ Settings for the logic input terminal function

Terminal symbol	Title	Function	Adjustment range	Default setting
F	F111	Input terminal selection 1A (F)	0-203 Note 1)	2 (F)
	F151	Input terminal selection 1B (F)		0 (No function)
	F155	Input terminal selection 1C (F)		0 (No function)
R	F112	Input terminal selection 2A (R)	0-203 Note 1)	4 (R)
	F152	Input terminal selection 2B (R)		0 (No function)
	F156	Input terminal selection 2C (R)		0 (No function)
RES	F113	Input terminal selection 3A (RES)	0-203 Note 1)	8 (RES)
	F153	Input terminal selection 3B (RES)		0 (No function)
S1	F114	Input terminal selection 4A (S1)	0-203 Note 1)	10 (SS1)
	F154	Input terminal selection 4B (S1)		0 (No function)
S2	F115	Input terminal selection 5 (S2)	0-203 Note 3)	12 (SS2)
	F146	Logic input / pulse train input selection (S2)	0: Logic input 1: Pulse train input	0
S3	F116	Input terminal selection 6 (S3)	0-203 Note 4)	14 (SS3)
	F147	Logic input / PTC input selection (S3)	0: Logic input 1: PTC input	0
VIB	F117	Input terminal selection 7 (VIB)	8-55 Note 5)	16 (SS4)
VIA	F118	Input terminal selection 8 (VIA)	8-55 Note 6)	24 (AD2)
VIA VIB	F109	Analog/logic input selection (VIA/VIB)	0-4	0
F to VIB	F144	Input terminal response time	1-1000 (ms) Note 7)	1

Note 1) Multiple functions assigned to a single terminal operate simultaneously.
Note 2) In case of setting always active function, assign the menu number to F 104, F 108 and F 110 (always active function selection).
Note 3) In case of using terminal S2 as a logic input, set the parameter F 146=0 (logic input).
Note 4) In case of using terminal S3 as a logic input, set the slide switch SW2 (lower) to S3 side and the parameter F 146=0 (logic input).
Note 5) In case of using terminal VIB as a logic input, set the side switch SW2 (upper) to S4 side and set the parameter F 109= 1, 3, or 4 (logic input). Since/ source logic depends on the slide switch SW1.
Note 6) In case of using terminal VIA as a logic input, set the parameter F 109=3 or 4 (logic input).
Note 7) When stable operation cannot be attained because of frequency setting circuit noise, increase the value of F 144.

■ Connecting

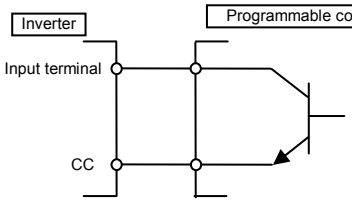
1) For logic input



With sink settings

★Operates by short circuiting between the input terminal and CC (common). Use for forward run, reverse run, preset-speed and so on.

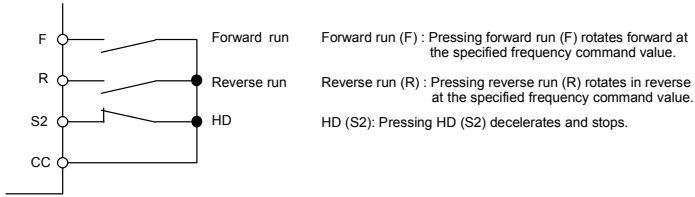
2) For connection (sink logic) via transistor output

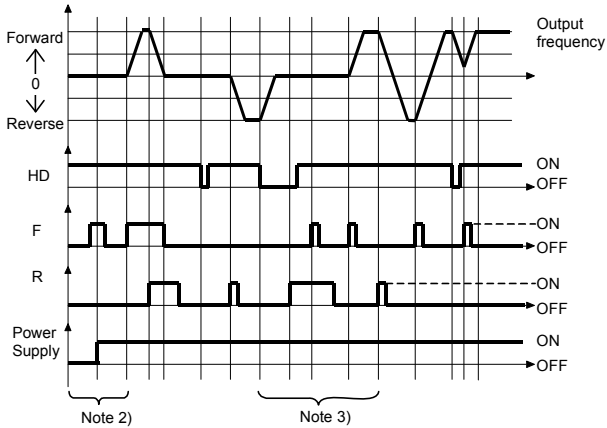


★Control by connecting the input terminal and CC (common) to the output (non-logic switch) of the programmable controller. Use for forward run, reverse run, preset-speed and so on. Use a 5 mA transistor that operates at 24 V dc.

■ Usage example ··· 3-wire operation (one-push operation)

Use the 3-wire operation function to operate the inverter, maintaining operation without using the sequence circuit by inputting an external signal (reset logic signal).





Note 1) Set F110 = 6 (ST: standby) and CNOd = 0 (terminal block) for 3 wire operation. Assign HD (operation hold) to any input terminal at input terminal selection. When assigning the S2 terminal as shown above, set F115 = 50 (HD: Operation hold).

Note 2) If the terminals are ON before turning on the power, terminal input is ignored when the power is turned ON. (Prevents sudden movements.) After turning the power ON, turn terminal input ON again.

Note 3) When HD is OFF, F and R are ignored even when ON. R does not operate even if it's ON when HD is ON. Likewise in this state, F does not operate even if it's ON. Turn F and R OFF and then turn them ON.

Note 4) During 3 wire operation, sending the jog run mode command stops operation.

Note 5) Be aware that DC braking continues even if a startup signal is input during DC braking.

Note 6) Only F and R maintain HD (operation hold). When using F or R in combination with other functions, be aware that the other functions do not hold. For example, when F and SS1 are assigned, F holds, but SS1 does not.

[Parameter settings]

Terminal symbol	Title	Function	Adjustment range	Setting example
S2	F115	Input terminal selection 5 (S2)	0-203	50: HD (Operation hold)

■ List of logic input terminal function settings

Parameter programmed value		Function	Parameter programmed value		Function
Positive logic	Negative logic		Positive logic	Negative logic	
0	1	No function	74	75	Integrating wattmeter (kWh) display clear
2	3	Forward run command	76	77	Trace back trigger signal
4	5	Reverse run command	78	79	Light-load high-speed operation prohibitive signal
6	7	Standby	80	81	Holding of RY-RC terminal output
8	9	Reset command	82	83	Holding of OUT-NO terminal output
10	11	Preset-speed command 1	88	89	Frequency UP *2
12	13	Preset-speed command 2	90	91	Frequency DOWN *2
14	15	Preset-speed command 3	92	93	Clear frequency UP/DOWN *2
16	17	Preset-speed command 4	96	97	Coast stop command
18	19	Jog run mode	98	99	Forward/reverse selection
20	21	Emergency stop by external signal	100	101	Run/Stop command
22	23	DC braking command	104	105	Frequency reference command forced switching
24	25	2nd acceleration/deceleration	106	107	Frequency setting mode terminal block
26	27	3rd acceleration/deceleration	108	109	Command mode terminal block
28	29	2nd V/F control mode switching	110	111	Parameter editing permission
32	33	2nd stall prevention level	120	121	Fast stop command 1
36	37	PID control prohibition	122	123	Fast stop command 2
46	47	External thermal error input	134	135	Traverse permission signal
48	49	Forced local from communication	136	137	Low voltage operation
50	51	Operation hold (hold of 3-wire operation)	140	141	Forward deceleration
52	53	PID integral/differential clear	142	143	Forward stop
54	55	PID characteristics switching	144	145	Reverse deceleration
56	57	Forced run operation	146	147	Reverse stop
58	59	Fire speed operation	148 to 151		Factory specific coefficient *1
60	61	Acceleration/deceleration suspend signal	152	153	No.2 motor switching
62	63	Power failure synchronized signal	200	201	Parameter editing prohibition
64	65	Factory specific coefficient *1	202	203	Parameter reading prohibition
70	71	Factory specific coefficient *1			

*1: Factory specific coefficients are manufacturer setting menus. Do not change the value of these parameters.

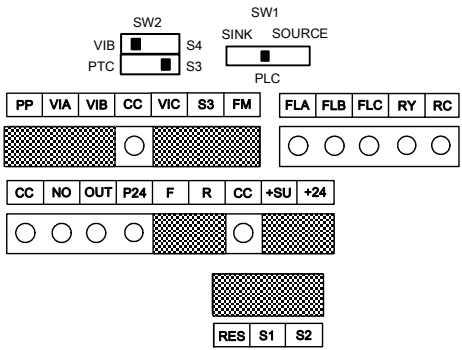
*2: Active when FMOd (frequency setting mode selection) = 5 (UP/DOWN from external logic input) is set. The frequency setup range is from 0.0 to FH (maximum frequency). The acceleration/deceleration time relative to the set frequency is ACC/dEC while the acceleration/deceleration speed is not switched.

☆ Refer to section 11.6 for details about the input terminal function.

7.2.2 Output terminal function (sink logic)

This function is used to output a variety of signals to external devices from the inverter. With the logic output terminal function, you can select from multiple output terminal functions. Set two types of functions for the RY-RC, OUT terminal and then you can output when either one or both of them is ON.
Default settings of slide switch SW1and SW2 are as follows;
SW1: PLC side, SW2: VIB side and S3 side.
Refer to page B-11 to 13 for details.

[Control terminal block]



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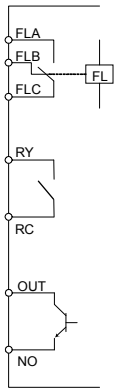
■ Usage

Function of FLA, B, C terminals:
Set at parameter F 132 Note 1)

Function of RY terminal:
Set at parameter F 130 and 137 Note 1)

Function of OUT terminal:
Set at parameter F 131 and 138



Note1) A chattering (momentary ON/OFF of contact) is generated by external factors of the vibration and the impact, etc. In particular, please set the filter of 10ms or more, or timer for measures when connecting it directly with input unit terminal of programmable controller. Please use the OUT terminal as much as possible when the programmable controller is connected.

■ Assign one type of function to an output terminal

Terminal symbol	Title	Function	Adjustment range	Default setting
RY-RC	F130	Output terminal selection 1A	0 - 255	4 (Low-speed detection signal)
OUT	F131	Output terminal selection 2A		6 (Output frequency attainment signal)
FL (A, B, C)	F132	Output terminal selection 3		10 (Fault signal)

Note 2) When assigning 1 type of function to the RY-RC terminal, set only F130.
Leave parameter F137 as the default setting (F137 = 255).

Note 3) When assigning 1 type of function to the OUT terminal, set only F131.
Leave parameter F138 as the default setting (F138 = 255).

■ Assign two types of functions to the output terminal (RY-RC, OUT)

Terminal symbol	Title	Function	Adjustment range	Default setting
RY-RC	F130	Output terminal selection 1A	0 - 255	4 (Low-speed detection signal)
	F137	Output terminal selection 1B		255 (Always ON)
OUT	F131	Output terminal selection 2A		6 (Output frequency attainment signal)
	F138	Output terminal selection 2B		255 (Always ON)
RY-RC, OUT	F139	Output terminal logic selection	0: F130 and F137 F131 and F138	0
			1: F130 or F137 F131 and F138	
			2: F130 and F137 F131 or F138	
			3: F130 or F137 F131 or F138	

Note 4) F131 and F138 are active only when F669 = 0: Logic output (default).
Function is inactive when F669 = 1: Pulse train output is set.

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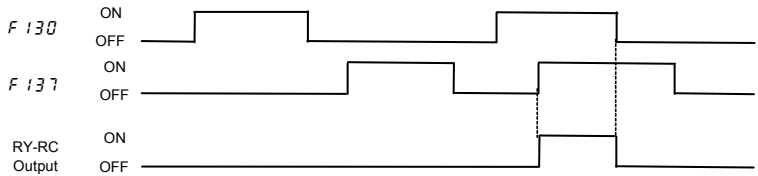
(1) Output signals when two types of functions are simultaneously turned ON. <AND>

In case of RY-RC terminal, signals are output when parameter F139 = 0 or 2, and the functions set at parameters F130 and F137 are simultaneously turned on.

☆ Timing chart



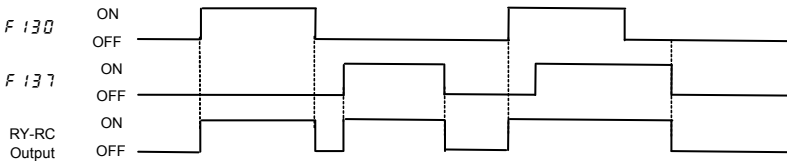
∗ OUT terminal outputs signals when parameter F139 = 0 or 2, and the functions set at parameters F131 and F138 are simultaneously turned on.

7

(2) Output signals when either one of two types of functions is turned ON. <OR>

In case of RY-RC terminal, signals are output when parameter F139 = 1 or 3, and either of the functions set at parameters F130 and F137 is turned on.

☆ Timing chart



*OUT terminal outputs signals when parameter F139 =2 or 3, and either of the functions set at parameters F131 and F138 is turned on.

(3) Holding the output of signals in ON status

☆ If the conditions for activating the functions assigned to RY-RC terminal and OUT terminal agree with and as a result the output of signals is put in ON status, the output of signals is held ON, even if the conditions change. (Output terminal holding function)

Assign function 80 to 83 to an input terminal.
Once RY-RC terminal or OUT terminal is turned on when the assigned input terminal is ON, RY-RC terminal or OUT terminal is held ON.

Function No.	Code	Function	Action
80	HDRY	Holding of RY-RC terminal output	ON : Once turned on, RY-RC are held on. OFF: The status of RY-RC changes in real time according to conditions.
82	HDOUT	Holding of OUT-NO terminal output	ON : Once turned on, OUT-NO are held on. OFF: The status of OUT-NO changes in real time according to conditions.

Each one of the following numbers (81, 83) is an inverse signal.

■ Usage example ···operational signal, brake signal

Low-speed detection signal outputs the signal when the output frequency exceeds the setting of F100.
This signal can be used as an operation signal by setting F100 to 0.0Hz. (Default setting)
This signal can also be used as an electromagnetic brake excitation/release signal.

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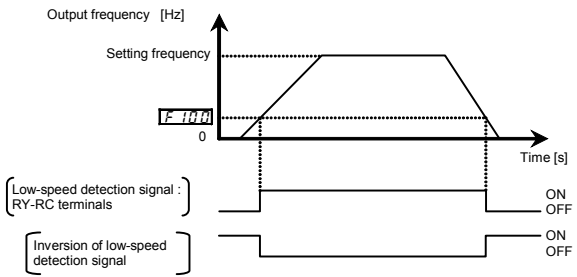
Setting example) When outputting the brake signal from RY-RC terminal

Title	Function	Adjustment range	Example of setting
F100	Low-speed signal output frequency	0.0 - FH (Hz)	2.5
F130	Output terminal selection 1A (RY-RC)	0-255	4: LOW (Low-speed detection signal)



■ List of output terminal function settings

<Explanation of terminology>
• Alarm ..... Alarm output when a setting has been exceeded.
• Pre-alarm ..... Alarm output when the inverter may cause a trip during continued operation.

List of detection levels for output terminal selection

Parameter programmed value		Function	Parameter programmed value		Function
Positive logic	Negative logic		Positive logic	Negative logic	
0	1	Frequency lower limit	108	109	Heavy load output
2	3	Frequency upper limit	120	121	Lower limit frequency stop
4	5	Low-speed detection signal	122	123	Power failure synchronized operation
6	7	Output frequency attainment signal (acceleration/deceleration completed)	124	125	Traverse in progress
8	9	Set frequency attainment signal	126	127	Traverse deceleration in progress
10	11	Fault signal (trip output)	128	129	Parts replacement alarm
14	15	Over-current detection pre-alarm	130	131	Over-torque detection pre-alarm
16	17	Overload detection pre-alarm	132	133	Frequency setting mode selection 1/2
20	21	Overheat detection pre-alarm	136	137	Panel / remote selection
22	23	Overvoltage detection pre-alarm	138	139	Forced continuous operation in progress
24	25	Power circuit undervoltage detection	140	141	Specified frequency operation in progress
26	27	Small current detection	144	145	Signal in accordance of frequency command
28	29	Over-torque detection	146	147	Fault signal (output also at a retry waiting)
30	31	Braking resistor overload pre-alarm	150	151	PTC input alarm signal
40	41	Run/Stop	152	153	Factory specific coefficient *1
42	43	Serious failure	154	155	Analog input break detection alarm
44	45	Light failure	156	157	F terminal status
50	51	Cooling fan ON/OFF	158	159	R terminal status
52	53	In jogging operation	160	161	Cooling fan replacement alarm
54	55	Operation panel / terminal block operation	162	163	Number of starting alarm
56	57	Cumulative operation time alarm	166	167	Acceleration operation in progress
58	59	Communication option communication error	168	169	Deceleration operation in progress
60	61	Forward/reverse run	170	171	Constant speed operation in progress
62	63	Ready for operation 1	172	173	DC braking in progress
64	65	Ready for operation 2	174 to 179		Factory specific coefficient *1
68	69	Brake release	180	181	Integral input power pulse output signal
70	71	Pre-alarm	182	183	Shock monitoring pre-alarm signal
78	79	RS485 communication error	222 to 253		Factory specific coefficient *1
92	93	Designated data output 1	254		Always OFF
94	95	Designated data output 2	255		Always ON
106	107	Light load output			

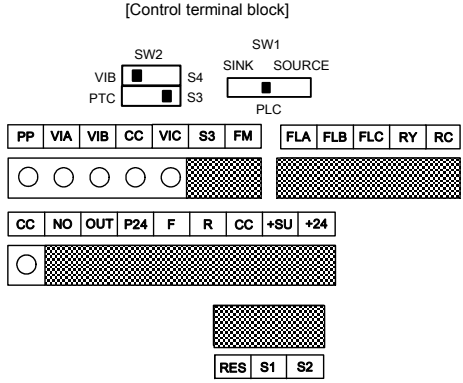
*1: Factory specific coefficients are manufacturer setting menus. Do not change the value of these parameters.

Note 1) ON with positive logic : Open collector output transistor or relay turned ON.
OFF with positive logic : Open collector output transistor or relay turned OFF.
ON with negative logic : Open collector output transistor or relay turned OFF.
OFF with negative logic: Open collector output transistor or relay turned ON.

☆ Refer to section 11.7 for details about the output terminal functions or levels.

7.3 Speed instruction (analog signal) settings from external devices

Function of analog input terminals can be selected from four functions (external potentiometer, 0 to 10Vdc, 4 (0) to 20mAdc, -10 to +10Vdc).
The selective function of analog input terminals gives system design flexibility.
The maximum resolution is 1/1000.
Default settings of slide switch SW1and SW2 are as follows;
SW1: PLC side, SW2: VIB side and S3 side.
Refer to page B-11 to 13 for details.



■ Analog input terminal function settings

Terminal symbol	Title	Function	Adjustment range	Default setting
VIA	F201	VIA input point 1 setting	0 - 100%	0
	F202	VIA input point 1 frequency	0.0 - 500.0Hz	0.0
	F203	VIA input point 2 setting	0 - 100%	100
	F204	VIA input point 2 frequency	0.0 - 500.0Hz	*1
VIB	F210	VIB input point 1 setting	-100 - +100%	0
	F211	VIB input point 1 frequency	0.0 - 500.0Hz	0.0
	F212	VIB input point 2 setting	-100 - +100%	100
	F213	VIB input point 2 frequency	0.0 - 500.0Hz	*1
VIC	F216	VIC input point 1 setting	0 - 100%	20
	F217	VIC input point 1 frequency	0.0 - 500.0Hz	0.0
	F218	VIC input point 2 setting	0 - 100%	100
	F219	VIC input point 2 frequency	0.0 - 500.0Hz	*1
VIA to VIC	F209	Analog input filter	2 - 1000 ms Note 1)	64

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

Note1) When stable operation cannot be attained because of frequency setting circuit noise, increase the value of F209.

Note 2) Refer to section 5.8 when switching between two types of analog signals.

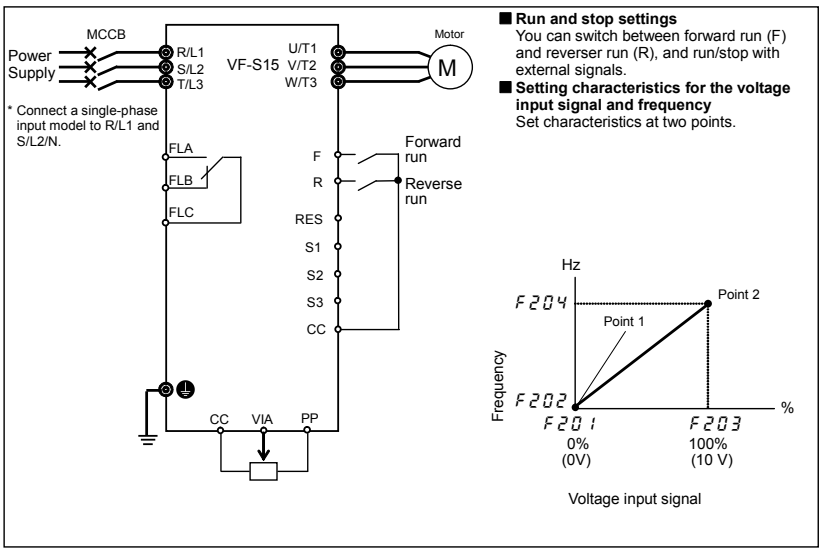
7.3.1 Settings depending on voltage (0 to 10 V) input <external potentiometer>

You can set the frequency settings by connecting the external potentiometer (1k to 10kΩ) between PP, VIA, and CC terminals.
You can also set by inputting an analog voltage signal of 0 to 10Vdc between the VIA and CC terminals.

The following shows examples when the run command is input from the terminal.

Title	Function	Adjustment range	Default setting	Setting example
CMOd	Command mode selection	0 - 4	1 (panel keypad)	0 (terminal block)
FMOd	Frequency setting mode selection 1	0 - 14	0 (setting dial 1)	1 (terminal VIA)
F109	Analog/logic input selection (VIA/VIB)	0 - 4	0	0 or 1 (Analog input)
F201	VIA input point 1 setting	0 - 100%	0	0
F202	VIA input point 1 frequency	0.0 - 500.0Hz	0.0	0.0
F203	VIA input point 2 setting	0 - 100%	100	100
F204	VIA input point 2 frequency	0.0 - 500.0Hz	*1	50.0/60.0
F209	Analog input filter	2 - 1000 ms	64	64

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.



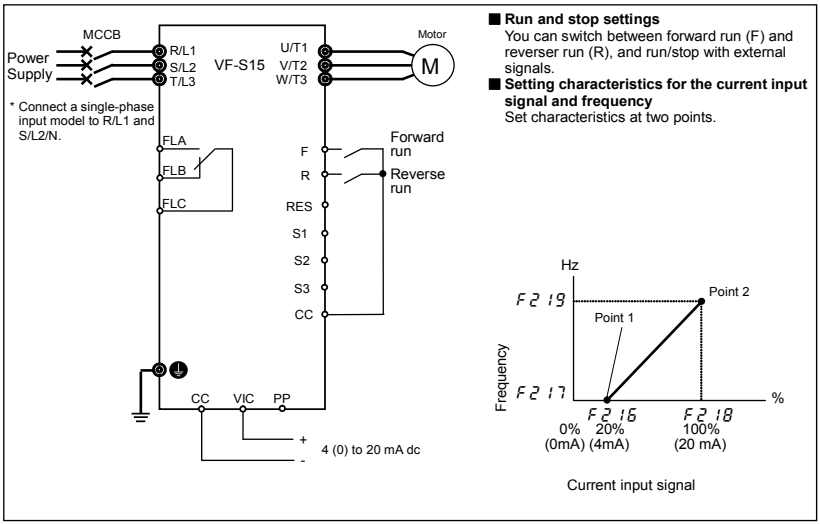
7.3.2 Settings depending on current (4 to 20 mA) input

You can set the frequency settings by inputting an analog current signal of 4 (0) to 20mA dc between the VIC and CC terminals.

The following shows examples when the run command is input from the terminal.

Title	Function	Adjustment range	Default setting	Setting example
CMOd	Command mode selection	0 – 4	1 (panel keypad)	0 (terminal block)
FMOd	Frequency setting mode selection 1	0 – 14	0 (setting dial 1)	8 (terminal VIC)
F216	VIC input point 1 setting	0 – 100%	20	20 (or 0)
F217	VIC input point 1 frequency	0.0 - 500.0Hz	0.0	0.0
F218	VIC input point 2 setting	0 – 100%	100	100
F219	VIC input point 2 frequency	0.0 - 500.0Hz	*1	50.0/60.0
F209	Analog input filter	2 - 1000 ms	64	64

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.



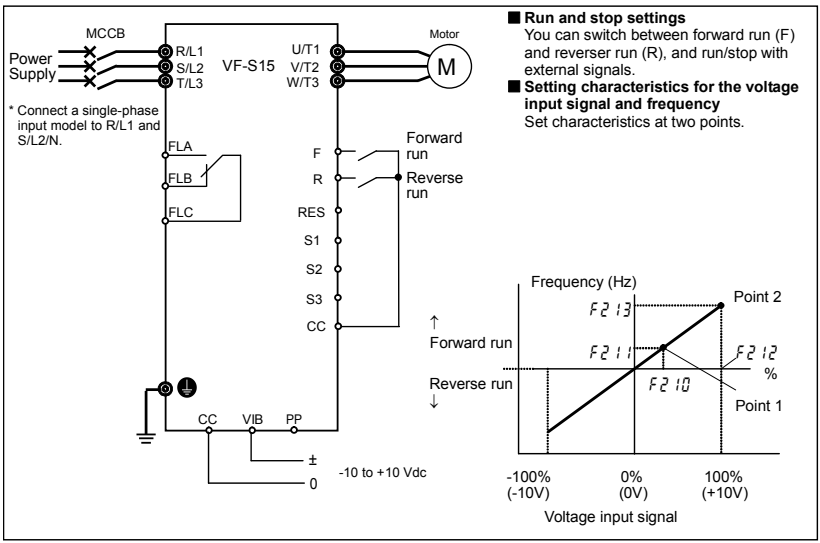
7.3.3 Settings depending on voltage (-10 to +10 V) input

You can set the frequency settings by inputting an analog voltage signal of -10 to +10Vdc between the VIB and CC terminals.

The following shows examples when the run command is input from the terminal.

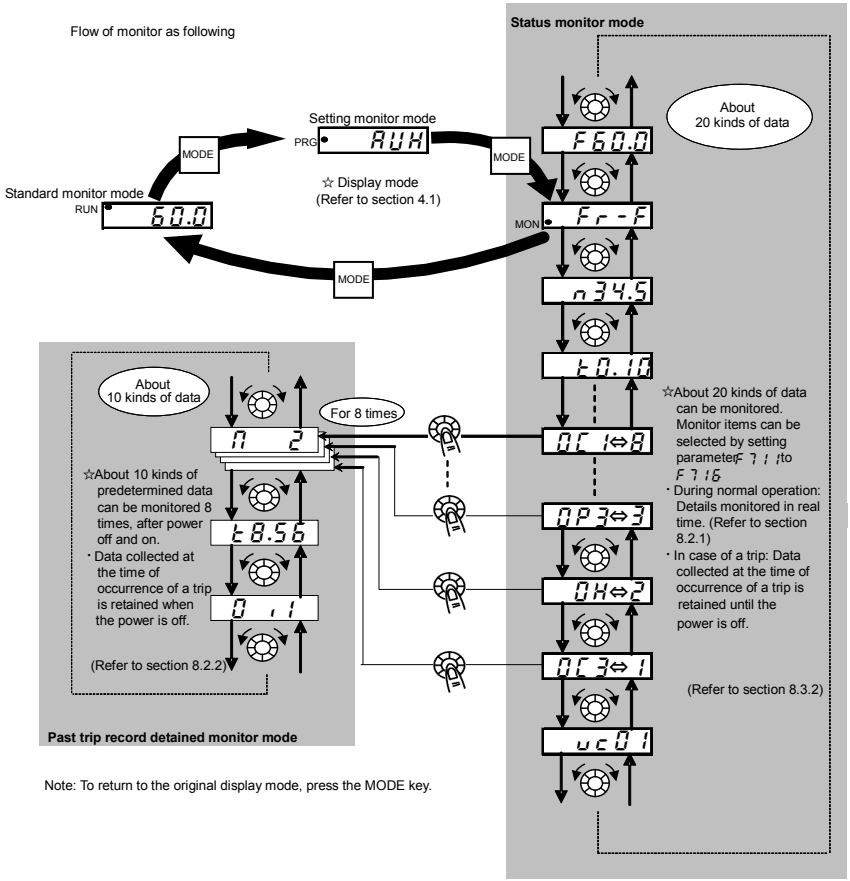
Title	Function	Adjustment range	Default setting	Setting example
CMOd	Command mode selection	0 – 4	1 (panel keypad)	0 (terminal block)
FMOd	Frequency setting mode selection	0 – 14	0 (setting dial 1)	2 (terminal VIB)
F107	Analog input terminal selection (VIB)	0: 0-+10V 1: -10-+10V	0	1 (-10 - +10V)
F109	Analog/logic input selection (VIA/VIB)	0 – 4	0	0 (Analog input)
F210	VIB input point 1 setting	-100 - +100%	0	0
F211	VIB input point 1 frequency	0.0 - 500.0Hz	0.0	0.0
F212	VIB input point 2 setting	-100 - +100%	100	100
F213	VIB input point 2 frequency	0.0 - 500.0Hz	*1	50.0/60.0
F209	Analog input filter	2 - 1000 ms	64	64

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.



8. Monitoring the operation status

8.1 Flow of status monitor mode



Note: To return to the original display mode, press the MODE key.

8.2 Status monitor mode

8.2.1 Status monitor under normal conditions

In this mode, you can monitor the operation status of the inverter.

To display the operation status during normal operation:

Press the MODE key twice.

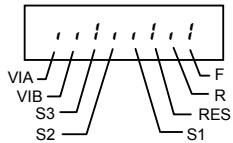
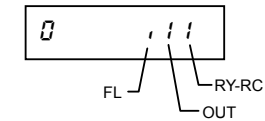
Setting procedure (eg. operation at 60Hz)

	Item displayed	Panel operated	LED display	Communication No.	Description
	Output frequency *		60.0		The output frequency is displayed (Operation at 60Hz). (When standard monitor display selection F710 is set at 0 [output frequency])
	Parameter setting mode	MODE	AUH		The first basic parameter "AUH" (history function) is displayed.
	Direction of rotation	MODE	Fr-F	FE01	The direction of rotation is displayed. (Fr-F: forward run, Fr-r: reverse run)
Note 1	Frequency command value *		F60.0	FE02	The frequency command value (Hz/free unit) is displayed. (In case of F711=2)
Note 2	Output current *		C 80	FC02	The inverter output current (load current) (%/A) is displayed. (In case of F712=1)
Note 2 Note 3	Input voltage *		U100	FC05	The inverter Input voltage (DC detection) (%/V) is displayed. (In case of F713=3)
Note 2	Output voltage *		P100	FC08	The inverter output voltage (%/V) is displayed. (In case of F714=4)
	Input power *		h12.3	FC06	The inverter input power (kW) is displayed. (In case of F715=5)
	Output power *		H11.8	FC07	The inverter output power (kW) is displayed. (In case of F716=6)
	Inverter load factor *		L 70	FE27	The inverter load factor (%) is displayed. (In case of F717=27)
	Output frequency *		o60.0	FE00	The output frequency (Hz/free unit) is displayed. (In case of F718=0)

* Monitor items can be selected by setting parameters F710 to F718, (F720). Refer to Note 12.

Refer to page H-8 and 9 for notes. (Continued overleaf)

(Continued)

	Item displayed	Panel operated	LED display	Communication No.	Description
Note 4	Input terminal		0 0 1 0 0 1 1	FE06	The ON/OFF status of each of the control signal input terminals (F, R, RES, S1, S2, S3, VIB, VIA) are displayed in bits. ON: 1 OFF: 0 
Note 5	Output terminal		0 0 11	FE07	The ON/OFF status of each of the control signal output terminals (RY-RC, OUT, FL) are displayed in bits. ON: 1 OFF: 0 
	CPU1 version		u 101	FE08	The version of the CPU1 is displayed.
	CPU2 version		uc01	FE73	The version of the CPU2 is displayed.
	Inverter rated current		R33.0	FE70	The inverter rated current (A) is displayed.
Note 6	Overload and region setting		C-EU	0998 0099	The inverter overload characteristic and region setting is displayed.
Note 7	Past trip 1		OP2⇔1	FE10	Past trip 1 (displayed alternately)
Note 7	Past trip 2		OH⇔2	FE11	Past trip 2 (displayed alternately)
Note 7	Past trip 3		OP3⇔3	FE12	Past trip 3 (displayed alternately)
Note 7	Past trip 4		OL1⇔4	FE13	Past trip 4 (displayed alternately)
Note 7	Past trip 5		OLr⇔5	FD10	Past trip 5 (displayed alternately)
Note 7	Past trip 6		OC1⇔6	FD11	Past trip 6 (displayed alternately)
Note 7	Past trip 7		OC2⇔7	FD12	Past trip 7 (displayed alternately)
Note 7	Past trip 8		nErr⇔8	FD13	Past trip 8 (displayed alternately)

Refer to page H-8 and 9 for notes.

(Continued overleaf)

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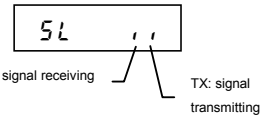
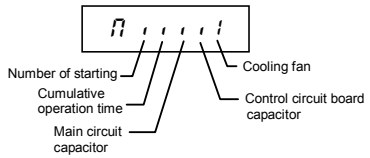
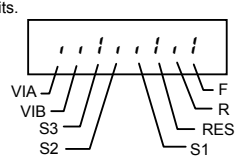
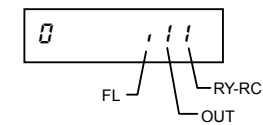
(Continued)

	Item displayed	Panel operated	LED display	Communication No.	Description
	Communication Status		SL , ,	FD57	The status of signal transmission and reception of communication are displayed in bits.  receiving or transmitting : 1 not receiving or not transmitting: ,
Note 8	Parts replacement alarm information		n , , , , 1	FE79	The ON/OFF status of each of the cooling fan, circuit board capacitor, main circuit capacitor of parts replacement alarm, cumulative operation time or number of starting are displayed in bits. 
Note 9	Cumulative operation time		t 10.1	FE14	The cumulative operation time is displayed. (0.10=10 hours, 1.00=100 hours)
	Number of starting		n34.5	FD32	Number of starting (10000 times)
	Default display mode	MODE	60.0		The output frequency is displayed (Operation at 60Hz).

8.2.2 Display of detailed information on a past trip

Details on a past trip (of trips 1 to 8) can be displayed, as shown in the table below, by pressing the center of the setting dial when the trip record is selected in the status monitor mode.
Unlike the "Display of trip information at the occurrence of a trip" in 8.3.2, details on a past trip can be displayed, even after the inverter is turned off or reset.

	Item displayed	Panel operated	LED display	Description
Note 10	Past trip 1		OC 1 ⇔ 1	Past trip 1 (displayed alternately)
	Continuous trips		n 2	For OCA, OCL and Err5 the number of times (maximum of 31) the same trip occurred in succession is displayed (unit: times). Detailed information is recorded at the latest value.

	Item displayed	Panel operated	LED display	Description
	Output frequency		o60.0	The output frequency when the trip occurred is displayed.
	Direction of rotation		Fr-F	The direction of rotation when the trip occurred is displayed. (Fr-F: Forward run, Fr-r: Reverse run)
Note 1	Frequency command value *		F80.0	The frequency command value when the trip occurred is displayed.
Note 2	Output current		C150	The inverter output current when the trip occurred is displayed. (%/A)
Note 2 Note 3	Input voltage		V120	The inverter input voltage (DC detection) when the trip occurred is displayed. (%/V).
Note 2	Output voltage		P100	The inverter output voltage when the trip occurred is displayed. (%/V)
Note 4	Input terminal		0 0 1 0 1 1 1	The ON/OFF status of each of the control signal input terminals (F, R, RES, S1, S2, S3, VIB, VIA) are displayed in bits. ON: 1 OFF: 0 
Note 5	Output terminal		0 0 1 1	The ON/OFF status of each of the control signal output terminals (RY-RC, OUT, FL) are displayed in bits. ON: 1 OFF: 0 
Note 9	Cumulative operation time		t8.56	The cumulative operation time when the trip occurred is displayed. (0.10=10 hours, 1.00=100 hours)
	Past trip 1	MODE	OC1 ⇔ 1	Press this key to return to past trip 1.

*The monitor value of a trip is not always recorded as the maximum value because of the time required for detection.

Refer to page H-8 and 9 for notes.

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8.3 Display of trip information

8.3.1 Trip code display

If the inverter trips, an error code is displayed to suggest the cause. Since trip records are retained, information on each trip can be displayed anytime in the status monitor mode.

Refer to section 13.1 for details about trip code display.

☆ The monitor value of a trip is not always recorded as the maximum value because of the time required for detection.

8.3.2 Display of trip information at the occurrence of a trip

At the occurrence of a trip, the same information as that displayed in the mode described in "8.2.1 Status monitor under normal conditions ", can be displayed, as shown in the table below, if the inverter is not turned off or reset. To display trip information after turning off or resetting the inverter, follow the steps described in "8.2.2 Display of detailed information on a past trip ".

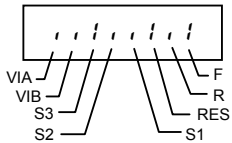
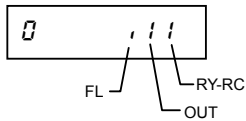
■ Example of call-up of trip information

	Item displayed	Panel operated	LED display	Communication No.	Description
	Cause of trip		OP2		Status monitor mode (The code blinks if a trip occurs.) The motor coasts and comes to a stop (coast stop).
	Parameter setting mode	MODE	RUH		The first basic parameter "RUH" (history function) is displayed.
	Direction of rotation	MODE	Fr-F	FE01	The direction of rotation at the occurrence of a trip is displayed. (Fr-F: forward run, Fr-r: reverse run).
Note 1	Frequency command value *		F60.0	FE02	The frequency command value (Hz/free unit) at the occurrence of a trip is displayed. (In case of F711=2)
Note 2	Output current *		C130	FC02	The output power of the inverter at the occurrence of a trip (%/A) is displayed. (In case of F712=1)
Note 2 Note 3	Input voltage *		U141	FC05	The inverter input voltage (DC detection) (%/V) at the occurrence of a trip is displayed. (In case of F713=3)
Note 2	Output voltage *		P100	FC08	The output voltage of the inverter at the occurrence of a trip (%/V) is displayed. (In case of F714=4)
	Input power *		h12.3	FC06	The inverter input power (kW) is displayed. (In case of F715=5)
	Output power *		H11.8	FC07	The inverter output power (kW) is displayed. (In case of F716=6)
	Inverter load factor *		L 70	FE27	The inverter load factor (%) at the occurrence of a trip is displayed. (In case of F717=27)
	Output frequency *		o60.0	FE00	The inverter output frequency (Hz/free unit) at the occurrence of a trip is displayed. (In case of F718=0)

* Monitor items can be selected by settings parameters F710 to F718 (F720). Note 12

Refer to page H-8 and 9 for notes. (Continued overleaf)

(Continued)

	Item displayed	Panel operated	LED display	Communication No.	Description
Note 4	Input terminal		,,1,,1,1	FE06	The ON/OFF status of each of the control signal input terminals (F, R, RES, S1, S2, S3, VIB, VIA) are displayed in bits. ON: 1 OFF: , 
Note 5	Output terminal		0 ,11	FE07	The ON/OFF status of each of the control signal output terminals (RY-RC, OUT, FL) are displayed in bits. ON: 1 OFF: , 
	CPU1 version		u101	FE08	The version of the CPU1 is displayed.
	CPU2 version		uc01	FE73	The version of the CPU2 is displayed.
	Inverter rated current		A33.0	FE70	The inverter rated current (A) is displayed.
Note 6	Overload and region setting		C-EU	0998 0099	The inverter overload characteristic and region setting is displayed.
Note 7	Past trip 1		OP2⇔1	FE10	Past trip 1 (displayed alternately)
Note 7	Past trip 2		OH⇔2	FE11	Past trip 2 (displayed alternately)
Note 7	Past trip 3		OP3⇔3	FE12	Past trip 3 (displayed alternately)
Note 7	Past trip 4		OL 1⇔4	FE13	Past trip 4 (displayed alternately)
Note 7	Past trip 5		OLr⇔5	FD10	Past trip 5 (displayed alternately)
Note 7	Past trip 6		OC 1⇔6	FD11	Past trip 6 (displayed alternately)
Note 7	Past trip 7		OC2⇔7	FD12	Past trip 7 (displayed alternately)
Note 7	Past trip 8		nErr⇔8	FD13	Past trip 8 (displayed alternately)

Refer to page H-8 and 9 for notes.

(Continued overleaf)

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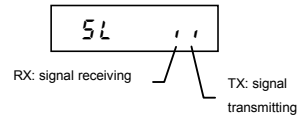
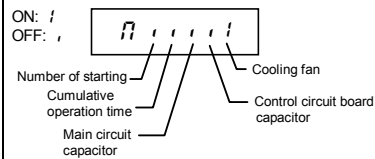
(Continued)

	Item displayed	Panel operated	LED display	Communication No.	Description
	Communication Status		SL , ,	FD57	The status of signal transmission and reception of communication are displayed in bits.  receiving or transmitting : 1 not receiving or not transmitting: ,
Note 8	Parts replacement alarm information		n , , , , 1	FE79	The ON/OFF status of each of the cooling fan, circuit board capacitor, main circuit capacitor of parts replacement alarm, cumulative operation time or number of starting are displayed in bits. 
Note 9	Cumulative operation time		t 10.1	FE14	The cumulative operation time is displayed. (0.10=10 hours, 1.00=100 hours)
	Number of starting		n34.5	FD32	Number of starting (10000 times)
	Default display mode	MODE	OP2		The cause of the trip is displayed.

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Note 1: The characters to the left disappear at 100 Hz or more. (Ex: 120 Hz is 120.0)

Note 2: You can switch between % and A (ampere)/V (volt), using the parameter F701 (current/voltage unit selection).

Note 3: The input (DC) voltage displayed is $1/\sqrt{2}$ times as large as the rectified d.c. input voltage.

Note 4: < VIA bar > F109 = 3, 4 (Contact input): activated ON/OFF depend on VIA terminal input.
F109 = 0 to 2 (Analog input): always OFF.
< VIB bar > F109 = 1 to 4 (Contact input): activated ON/OFF depend on VIB terminal input.
F109 = 0 (Analog input): always OFF.
< S2 bar > F146 = 0 (Contact input): activated ON/OFF depend on S2 terminal input.
F146 = 1 (Pulse train input): always OFF.
< S3 bar > F147 = 0 (Contact input): activated ON/OFF depend on S3 terminal input.
F147 = 1 (PTC input): always OFF.

Note 5: < OUT bar > F669 = 0 (Logic output): activated ON/OFF depend on OUT terminal output.
F669 = 1 (Pulse train output): always OFF.

Note 6: Overload characteristic of inverter and region setting are displayed on the monitor as follows;

C-xx : AUL = 1 (Constant torque characteristic) is selected.

U-xx : AUL =2 (Variable torque characteristic) is selected.

x-EU : Setup menu is selected to EU.

x-AS : Setup menu is selected to AS 1A.

x-US : Setup menu is selected to US A.

x-JP : Setup menu is selected to JP.

Note 7: Past trip records are displayed in the following sequence: 1 (latest trip record) ⇔2⇔3⇔4⇔5⇔6⇔7⇔8 (oldest trip record). If no trip occurred in the past, the message "nErr" will be displayed. Details on past trip record 1 to 8 can be displayed by pressing the center of the setting dial when past trip 1 to 8 is displayed. Refer to section 8.2.2 for details.

Note 8: Parts replacement alarm is displayed based on the value calculated from the annual average ambient temperature specified using F634, the ON time of the inverter, the operating time of the motor and the output current (load factor). Use this alarm as a guide only, since it is based on a rough estimation.

Note 9: The cumulative operation time increments only when the machine is in operation.

Note 10: If there is no trip record, nErr is displayed.

Note 11: Of the items displayed on the monitor, the reference values of items expressed in percent are listed below.

- Output current: The current monitored is displayed in percentage. The value indicated on the nameplate is 100%. The unit can be switched to A (amperes).
- Input voltage: The voltage displayed is the voltage determined by converting the voltage measured in the DC section into an AC voltage. The reference value (100% value) is 200V (240V class), 400V (500V class). The unit can be switched to V (volts).
- Output voltage: The voltage displayed is the output command voltage. The reference value (100% value) is 200V (240V class), 400V (500V class). This unit can be switched to V (volts).
- Load factor of inverter: Depending on the PWM carrier frequency (F300) setting and so on, the actual rated current may become smaller than the rated output current indicated on the nameplate. With the actual rated current at that time (after a reduction) as 100%, the proportion of the load current to the rated current is indicated in percent. The load factor is also used to calculate the conditions for overload trip (OL 1).

Note 12: Status monitor of * mark is displayed by F710 to F718 and F720 setting. The left side character is as following table by each parameter setting number.

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Parameter	Setting No.	LED display	Function	Unit	Communication No.
F710 to F718, F720	0	o60.0	Output frequency	Hz / free unit	FE00
	1	C 16.5	Output current *1	% / A	FC02
	2	F50.0	Frequency command value	Hz / free unit	FE02
	3	U 100	Input voltage (DC detection) *1	% / V	FC05
	4	P 90	Output voltage (command value) *1	% / V	FC08
	5	h 3.0	Input power *1	kW	FC06
	6	H 2.8	Output power *1	kW	FC07
	7	9 80	Torque *1, *2	%	FC04
	9	G 60	Motor cumulative load factor	%	FE23
	10	L 80	Inverter cumulative load factor	%	FE24
	11	r 80	PBR (Braking resistor) cumulative load factor	%	FE25
	12	50 1.0	Stator frequency	Hz / free unit	FE15
	13	A 65	VIA input value	%	FE35
	14	b 45	VIB input value *2	%	FE36
	18	*3	Arbitrary code from communication	*3	*3
	20	C 35	VIC input value	%	FE37
	21	P800	Pulse train input value	pps	FE56
	23	d40.0	PID feedback value	Hz / free unit	FE22
	24	h356	Integral input power	Depend on F749	FE76
	25	H348	Integral output power	Depend on F749	FE77
	26	G 75	Motor load factor	%	FE26
	27	L 70	Inverter load factor	%	FE27
	28	A33.0	Inverter rated current	A	FE70
	29	F 70	FM output value	%	FE40
	30	P800	Pulse train output value	pps	FD40
	31	P34.5	Cumulative power on time	100 hours	FE80
	32	F28.6	Cumulative fan operation time	100 hours	FD41
	33	t27.7	Cumulative operation time	100 hours	FD14
	34	n89.0	Number of starting times	10000 times	FD32
	35	F45.5	Forward number of starting times	10000 times	FD33
	36	r43.5	Reverse number of starting times	10000 times	FD34
	37	A 2	Number of trip	times	FD35
	40	A33.0	Inverter rated current (Carrier frequency corrected)	A	FD70
	52	c50.0	During stop : Frequency command value During operation : Output frequency	Hz / free unit	FE99

*1: These monitor values can be filtered by F746 setting.

*2: If a negative value of signed signal is specified, the negative sign "-" is displayed. When the negative sign "-" is displayed, do not display "9", "b".

*3: Data set with FA65-FA79 is displayed.

⇒ For details, refer to Communication Function Instruction Manual(E6581913).

9. Measures to satisfy the standards

9.1 How to cope with the CE Marking Directive

In Europe, the EMC Directive and the Low Voltage Directive, which took effect in 1996 and 1997, respectively, made it obligatory to put the CE mark on every applicable product to prove that it complies with the directives. Inverters do not work alone but are designed to be installed in a control panel and always used in combination with other machines or systems for the purpose of controlling them. So they themselves were not considered to be subject to the EMC Directive. However the component also became subject to law with the enforcement of the new EMC Directive in 2007. For this reason, we put CE mark on all inverters in accordance with the EMC Directive and the Low Voltage Directive.

The CE mark must be put on all machines and systems with built-in inverters because such machines and systems are subject to the above directives. If they are "final" products, they might also be subject to the Machinery Directive. It is the responsibility of the manufacturers of such final products to put the CE mark on each final product. In order to make machines and systems with built-in inverters comply with the EMC Directive and the Low Voltage Directive, this section explains how to install inverters and what measures should be taken to satisfy the EMC Directive.

We have tested representative models with them installed under the environment described later in this manual to check for conformity with the EMC Directive. However, we cannot check the inverters under your operating environment. EMC varies depending on the composition of the control panel with a built-in inverter(s), the relationship with other built-in electrical components, the wiring condition, the layout condition, and so on. Therefore, please verify yourself whether your machine or system conforms to the EMC Directive.

9.1.1 About the EMC Directive

The CE mark must be put on every final product that includes an inverter(s) and a motor(s). In this series of inverters are equipped with an EMC filter and complies with the EMC Directive if wiring is carried out correctly.

■ EMC Directive
2004/108/EC

The EMC standards are broadly divided into two categories; Emission and Immunity, each of which is further categorized according to the operating environment of each individual machine. Since inverters are intended for use with industrial systems under industrial environments, they fall within the EMC categories listed in Table 1 below. We consider that the tests required for machines and systems as final products are almost the same as those required for inverters.

Table 1 EMC standards

Category	Subcategory	Product standards	Test standard
Emission	Radiation noise	IEC 61800-3	CISPR11(EN55011)
	Conductive noise		CISPR11(EN55011)
Immunity	Static discharge		IEC61000-4-2
	Radioactive radio-frequency magnetic contactor field		IEC61000-4-3
	First transient burst		IEC61000-4-4
	Surge		IEC61000-4-5
	Radio-frequency induction/transmission interference		IEC61000-4-6
	Voltage dip/Interruption of power		IEC61000-4-11

9.1.2 Measures to satisfy the EMC Directive

This subsection explains what measures must be taken to satisfy the EMC Directive.

(1) Insert an EMC filter on the input side of the inverter to reduce transmission noise and radiation noise from input cables.
Single-phase 240V class and three-phase 500V class inverters are equipped with an EMC filter.

Table 2 Combinations of inverter and EMC filter

Three-phase 240 V class

Combination of inverter and filter		
Inverter type	Conductive noise IEC61800-3, category C2 (PWM carrier frequency of 4kHz and motor wiring length of 5m or less)	Conductive noise IEC61800-3, category C1 (PWM carrier frequency of 4kHz and motor wiring length of 1m or less)
VFS15-2004PM-W		
VFS15-2007PM-W		
VFS15-2015PM-W		
VFS15-2022PM-W		
VFS15-2037PM-W		
VFS15-2055PM-W		
VFS15-2075PM-W		
VFS15-2110PM-W		
VFS15-2150PM-W		

Contact your Toshiba distributor.

Single-phase 240 V class

Combination of inverter and filter	
Inverter type	Conductive noise IEC61800-3, category C2 (PWM carrier frequency of 12kHz and motor wiring length of 5m or less)
VFS15S-2002PL-W	Built-in filter
VFS15S-2004PL-W	
VFS15S-2007PL-W	
VFS15S-2015PL-W	
VFS15S-2022PL-W	

Three-phase 500 V class

Inverter type	Conductive noise IEC61800-3, category C2 (PWM carrier frequency of 12kHz and motor wiring length of 5m or less)	Conductive noise IEC61800-3,category C3 (PWM carrier frequency of 12kHz and motor wiring length of 25m or less)
VFS15-4004PL-W	Built-in filter	-
VFS15-4007PL-W		
VFS15-4015PL-W		
VFS15-4022PL-W		
VFS15-4037PL-W		
VFS15-4055PL-W	-	Built-in filter
VFS15-4075PL-W		
VFS15-4110PL-W		
VFS15-4150PL-W		

(2) Use shielded power cables, such as inverter output cables, and shielded control cables. Route the cables and wires so as to minimize their lengths. Keep a distance between the power cable and the control cable and between the input and output wires of the power cable. Do not route them in parallel or bind them together. Instead, if necessary, cross at right angle.

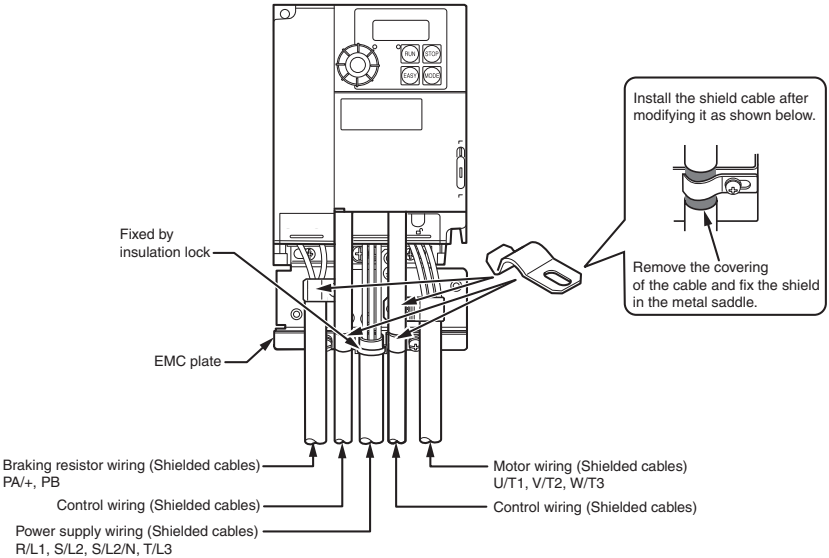
(3) It is more effective in limiting the radiation noise to install the inverter in a sealed steel cabinet. Using wires as thick and short as possible, earth the metal plate and the control panel securely with a distance kept between the earth cable and the power cable.

(4) Route the input and output wires apart as far as possible from each other.

(5) To suppress radiation noise from cables, ground all shielded cables through a noise cut plate.
It is effective to earth shielded cables in the vicinity of the inverter and cabinet (within a radius of 10cm from each of them). Inserting a ferrite core in a shielded cable is even more effective in limiting the radiation noise.

(6) To further limit the radiation noise, insert a zero-phase reactor in the inverter output line and insert ferrite cores in the earth cables of the metal plate and cabinet.

[Example of wiring]



9.1.3 About the Low Voltage Directive

The Low Voltage Directive provides for the safety of machines and systems. All Toshiba inverters are CE-marked in accordance with the standard EN 50178 specified by the Low Voltage Directive, and can therefore be installed in machines or systems and imported without problem to European countries.

Applicable standard: IEC61800-5-1
Pollution level: 2
Overvoltage category: 3

9.1.4 Measures to satisfy the Low Voltage Directive

When incorporating the inverter into a machine or system, it is necessary to take the following measures so that the inverter satisfies the Low Voltage Directive.

(1) Install the inverter in a cabinet and ground the inverter enclosure. When doing maintenance, be extremely careful not to put your fingers into the inverter through a wiring hole and touch a charged part, which may occur depending on the model and capacity of the inverter used.
(2) Connect earth wiring to the earth terminal on the EMC plate. Or install the EMC plate (attached as standard) and another cable connect to earth terminal on the EMC plate. Refer to the table in 10.1 for details about earth cable sizes. A minimum wire size of 10mm^2 may be required to meet standards limiting leakage current.
(3) Install a non-fuse circuit breaker or a fuse on the input side of the inverter. (Refer to section 10.1 and 9.2.3)

9.2 Compliance with UL Standard and CSA Standard

This inverter that conform to the UL Standard and CSA Standard based on the rated current of the nameplate have the UL/CSA mark on the nameplate.

9.2.1 Compliance with Installation

A UL certificate was granted on the assumption that the inverter would be installed in a cabinet. Therefore, install the inverter in a cabinet and if necessary, take measures to maintain the ambient temperature (temperature in the cabinet) within the specified temperature range. (Refer to section 1.4.4)

9.2.2 Compliance with Connection

Use the UL conformed cables (Rating 75 °C or more, Use the copper conductors only.) to the main circuit terminals (R/L1, S/L2, S/L2/N, T/L3, U/T1, V/T2, W/T3).
For instruction in the United States, Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

For instruction in the Canada, Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Canadian Electrical Code and any additional local codes.

9.2.3 Compliance with Peripheral devices

Use the UL listed fuses at connecting to power supply.
Short circuit test is performed under the condition of the power supply short-circuit currents in below.
These interrupting capacities and fuse rating currents depend on the applicable motor capacities.

■ AIC, Fuse and Wire sizes

Inverter model	Voltage (V)	Input withstand rating (kA)	Output Interrupt rating (kA)	Branch circuit protection	Rating (A)	Cable sizes of power circuit	Earth Cable
Markig	Y	(1)	X (2)	Z1	Z2	-	-
VFS15-2004PM-W	240	5	5	Class CC	7	AWG 14	AWG 14
VFS15-2007PM-W	240	5	5	Class J	15	AWG 14	AWG 14
VFS15-2015PM-W	240	5	5	Class J	25	AWG 14	AWG 14
VFS15-2022PM-W	240	5	5	Class J	25	AWG 12	AWG 14
VFS15-2037PM-W	240	5	5	Class J	45	AWG 10	AWG 10
VFS15-2055PM-W	240	22	5	Class J	60	AWG 8	AWG 10
VFS15-2075PM-W	240	22	5	Class J	70	AWG 6	AWG 10
VFS15-2110PM-W	240	22	5	Class J	100	AWG 6*2	AWG 8
VFS15-2150PM-W	240	22	5	Class J	110	AWG 6*2	AWG 8
VFS15S-2002PL-W	240	1	5	Class CC	7	AWG 14	AWG 14
VFS15S-2004PL-W	240	1	5	Class J	15	AWG 14	AWG 14
VFS15S-2007PL-W	240	1	5	Class J	25	AWG 14	AWG 14
VFS15S-2015PL-W	240	1	5	Class J	40	AWG 10	AWG 12
VFS15S-2022PL-W	240	1	5	Class J	45	AWG 10	AWG 10
VFS15-4004PL-W	500	5	5	Class CC	6	AWG 14	AWG 14
VFS15-4007PL-W	500	5	5	Class CC	6	AWG 14	AWG 14
VFS15-4015PL-W	500	5	5	Class CC	12	AWG 14	AWG 14
VFS15-4022PL-W	500	5	5	Class J	15	AWG 14	AWG 14
VFS15-4037PL-W	500	5	5	Class J	25	AWG 12	AWG 14
VFS15-4055PL-W	500	22	5	Class J	40	AWG 10	AWG 10
VFS15-4075PL-W	500	22	5	Class J	40	AWG 8	AWG 10
VFS15-4110PL-W	500	22	5	Class J	60	AWG 8	AWG 10
VFS15-4150PL-W	500	22	5	Class J	70	AWG 6	AWG 10

Suitable for use on a circuit capable of delivering not more than___X___rms symmetrical kilo Amperes,___Y___Volts maximum, when protected by___Z1___with a maximum rating of___Z2___.

(1) Input withstand rating is that for which the product has been designed thermally. Installation on a supply greater than this level will require additional inductance to satisfy this level.

(2) Output interrupt rating relies on Integral solid state short circuit protection. This does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes. This is dependant on the type of installation.

9.2.4 Motor thermal protection

Selects the electronic thermal protection characteristics that fit with the ratings and characteristics of the motor. (Refer to section 3.5)

In case of multi motor operation with one inverter, thermal relay should be connected to each motor.

10. Peripheral devices

⚠ Warning	
Mandatory action	• When using switchgear for the inverter, it must be installed in a cabinet. Failure to do so can lead to risk of electric shock.
Be Grounded	• Ground must be connected securely. If the ground is not securely connected, it could lead to electric shock or fire.

10.1 Selection of wiring materials and devices

■ Selection of wire size

Voltage class	Applicable motor (kW)	Wire size (mm²) Note 4)							
		Power circuit Note 1) Note 5)						DC Reactor (Optional)	
		Input				Output			
		without DCL		with DCL					
		IEC Compliant	For Japan *1	IEC Compliant	For Japan *1	IEC Compliant	For Japan *1	IEC Compliant	For Japan *1
3 phase 240V class	0.4	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	0.75	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	1.5	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	2.2	2.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	4.0	4.0	2.0	2.5	2.0	2.5	2.0	4.0	2.0
	5.5	10	5.5	4.0	2.0	6.0	3.5	6.0	3.5
	7.5	16	8.0	6.0	3.5	10	3.5	10	5.5
	11	25	14	10	5.5	16	8.0	16	8.0
	15	35	22	16	14	25	14	25	14
	18.5	50	22	25	14	35	14	35	22
1 phase 240V class	0.2	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	0.4	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	0.75	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	1.5	2.5	2.0	2.5	2.0	1.5	2.0	2.5	2.0
	2.2	4.0	2.0	4.0	2.0	1.5	2.0	4.0	2.0
	3.0	4.0	2.0	4.0	2.0	1.5	2.0	4.0	2.0
3 phase 500V class	0.4	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	0.75	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	1.5	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	2.2	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	4.0	2.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
	5.5	4.0	2.0	1.5	2.0	2.5	2.0	2.5	2.0
	7.5	6.0	3.5	2.5	2.0	2.5	2.0	4.0	2.0
	11	10	5.5	4.0	2.0	6.0	3.5	6.0	3.5
	15	16	8.0	6.0	3.5	10	3.5	10	5.5
	18.5	16	8.0	10	5.5	10	5.5	16	8.0

Voltage class	Applicable motor (kW)	Wire size (mm^2) Note 4)			
		Braking resistor (optional)		Grounding cable	
		IEC Compliant	For Japan *1	IEC Compliant	For Japan *1
3 phase 240V class	0.4	1.5	2.0	2.5	2.0
	0.75	1.5	2.0	2.5	2.0
	1.5	1.5	2.0	2.5	2.0
	2.2	1.5	2.0	2.5	2.0
	4.0	2.5	2.0	4.0	3.5
	5.5	4.0	2.0	10	5.5
	7.5	6.0	3.5	16	5.5
	11	16	5.5	16	8.0
	15	25	14	16	8.0
	18.5	25	14	25	8.0
1 phase 240V class	0.2	1.5	2.0	2.5	2.0
	0.4	1.5	2.0	2.5	2.0
	0.75	1.5	2.0	2.5	2.0
	1.5	1.5	2.0	2.5	2.0
	2.2	1.5	2.0	4.0	3.5
	3.0	1.5	2.0	4.0	3.5
3 phase 500V Class	0.4	1.5	2.0	2.5	2.0
	0.75	1.5	2.0	2.5	2.0
	1.5	1.5	2.0	2.5	2.0
	2.2	1.5	2.0	2.5	2.0
	4.0	1.5	2.0	2.5	2.0
	5.5	1.5	2.0	4.0	3.5
	7.5	2.5	2.0	6.0	3.5
	11	4.0	2.0	10	5.5
	15	6.0	3.5	16	5.5
	18.5	10	5.5	16	5.5

*1: For Japan: JEAC8001-2005 compliant

Note 1: Sizes of the wires connected to the input terminals R/L1, S/L2 and T/L3 (Single-phase models are R/L1 and S/L2/N) and the output terminals U/T1, V/T2 and W/T3 when the length of each wire does not exceed 30m. If there is a need to bring the inverter into UL compliance, use wires specified in chapter 9.

Note 2: For the control circuit, use shielded wires 0.75 mm^2 or more in diameter.

Note 3: For grounding, use wires with a size equal to or larger than the above.

Note 4: The wire sizes specified in the above table apply to HIV wires (copper wires shielded with an insulator with a maximum allowable temperature of 75°C) used at an ambient temperature of 50°C or less.

Note 5: In case of AUL =2 setting, contact your Toshiba distributor for wire size.

■ Selection of wiring devices

Voltage class	Applicable motor (kW)	Input current (A)		Molded case circuit breaker (MCCB) Earth leakage circuit breaker (ELCB)		Magnetic contactor (MC) Note 2) Note 3)	
		Without DCL	With DCL	Rated current (A)		Rated current (A)	
				Without DCL	With DCL	Without DCL	With DCL
3 phase 240V class	0.4	3.6	1.8	5	5	20	20
	0.75	6.3	3.4	10	5	20	20
	1.5	11.1	6.5	15	10	20	20
	2.2	14.9	9.2	20	15	20	20
	4.0	23.8	15.9	30	20	32	20
	5.5	35.6	21.5	50	30	50	32
	7.5	46.1	28.9	60	40	60	32
	11	63.1	41.5	100	60	80	50
	15	82.1	55.7	125	75	100	60
	18.5	89.1	70.0	125	100	100	80
1 phase 240V class	0.2	3.4	2.0	5	5	20	20
	0.4	5.9	4.0	10	5	20	20
	0.75	10.0	7.6	15	10	20	20
	1.5	17.8	14.6	30	20	32	20
	2.2	24.0	20.1	30	30	32	32
	3.0	24.0	23.6	30	30	32	32
3 phase 500V class Note 6)	0.4	2.1	0.9	5	5	20	20
	0.75	3.6	1.8	5	5	20	20
	1.5	6.4	3.4	10	5	20	20
	2.2	8.8	4.8	15	10	20	20
	4.0	13.7	8.3	20	15	20	20
	5.5	20.7	11.2	30	15	32	20
	7.5	26.6	15.1	40	20	32	20
	11	36.6	21.7	50	30	50	32
	15	47.7	29.0	60	40	60	32
	18.5	52.7	36.3	75	50	60	50

The recommended molded case circuit breaker (MCCB) must be connected to primary side of each inverter to protect the wiring system.

10

Note 1: Selections for use the Toshiba 4-pole standard motor with power supply voltage of 200V/ 400 - 50Hz.

Note 2: Be sure to attach a surge absorber to the exciting coil of the relay and the magnetic contactor.

Note 3: When using the auxiliary contacts 2a of the magnetic contactor MC for the control circuit, connect the contacts 2a in parallel to increase reliability.

Note 4: When a motor is driven by commercial power supply using commercial power supply / inverter switching circuit, use a magnetic contactor appropriated AC-3 class the motor rated current.

Note 5: Select an MCCB with a current breaking rating appropriate to the capacity of the power supply, because short-circuit currents vary greatly depending on the capacity of the power supply and the condition of the wiring system. The MCCB, MC and ELCB in this table were selected, on the assumption that a power supply with a normal capacity would be used.

Note 6: For the operation and control circuits, regulate the voltage at 200V to 240V with a step-down transformer for 500V class.

Note 7: In case of $AUL=2$ setting, be sure to select the wiring device for 1 rating up motor.

Note 8: Regarding influence of leakage current, refer to section 1.4.3.

10.2 Installation of a magnetic contactor

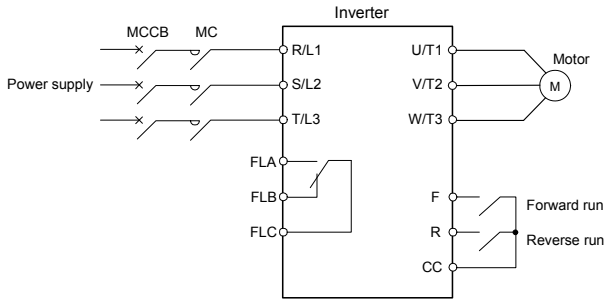
If using the inverter without installing a magnetic contactor (MC) in the primary circuit, use an MCCB (with a power cut off device) to open the primary circuit when the inverter protective circuit is activated.
When using an optional braking resistor, install a magnetic contactor (MC) or molded-case circuit breaker with a power cutoff device on the primary power supply of the inverter, so that the power circuit opens when the failure detection relay (FL) in the inverter or the externally installed overload relay is actuated.

■ Magnetic contactor in the primary circuit

To detach the inverter from the power supply in any of the following cases, insert a magnetic contactor (primary-side magnetic contactor) between the inverter and the power supply.

(1) If the motor overload relay is tripped
(2) If the protective detector (FL) built into the inverter is activated
(3) In the event of a power failure (for prevention of auto-restart)
(4) If the resistor protective relay is tripped when a braking resistor (option) is used

When using the inverter with no magnetic contactor (MC) on the primary side, install a molded-case circuit breaker with a voltage tripping coil instead of an MC and adjust the circuit breaker so that it will be tripped if the protective relay referred to above is activated. To detect a power failure, use an undervoltage relay or the like.



Example of connection of a magnetic contactor in the primary circuit

Notes on wiring

- When frequently switching between start and stop, do not use the magnetic contactor on the primary side as an on-off switch for the inverter.
  Instead, stop and start the inverter by using terminals F and CC (forward run) or R and CC (reverse run).
- Be sure to attach a surge absorber to the exciting coil of the magnetic contactor (MC).

■ Magnetic contactor in the secondary circuit

A magnetic contactor may be installed on the secondary side to switch controlled motors or supply commercial power to the load when the inverter is out of operation.

Notes on wiring

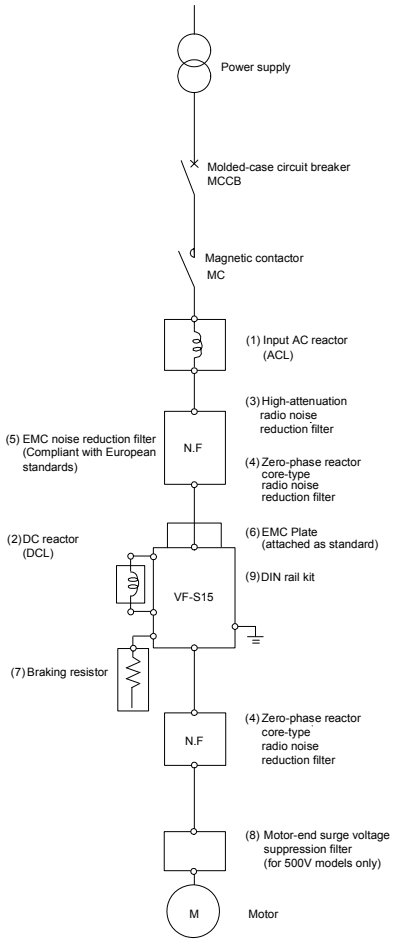
- Be sure to interlock the magnetic contactor on the secondary side with the power supply to prevent commercial power from being applied to the inverter output terminals.
- When installing a magnetic contactor (MC) between the inverter and the motor, avoid turning the magnetic contactor on or off during operation. Turning the magnetic contactor on or off during operation causes a current to rush into the inverter which could lead to malfunction.

10.3 Installation of an overload relay

1) This inverter has an electronic-thermal overload protective function.
   In the following cases, however, an overload relay suitable for the adjustment of the motor electronic thermal protection level (ETHr) and appropriate to the motor used should be installed between the inverter and the motor.
   - When using a motor with a current rating different to that of the corresponding Toshiba general-purpose motor
   - When operating a single motor with an output smaller than that of the applicable standard motor or more than one motor simultaneously.
2) When using this inverter to operate a constant-torque motor, such as the Toshiba VF motor, adjust the protection characteristic of the electronic thermal protection unit (OLM) to the VF motor use.
3) It is recommended to use a motor with a thermal relay embedded in the motor coil to give sufficient protection to the motor, especially when it runs in a low-speed range.

10.4 Optional external devices

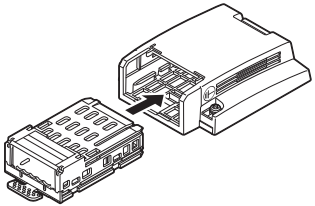
The following external devices are optionally available for this inverter series.



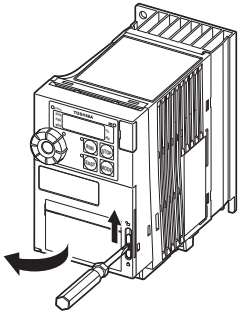
(10) Parameter writer	: RKP002Z
	PWU003Z
(11) Extension panel	: RKP007Z
(12) Remote control panel	: CBVR-7B1
(13) Frequency meter	: QS60T
(14) FRH kit	: FRH KIT
(15) USB communication converter	: USB001Z
(16) CC-Link communication option	: CCL003Z
(17) Profibus DP communication option	: PDP003Z
(18) DeviceNet communication option	: DEV003Z
(19) EtherNet / IP-Modbus TCP communication option	: IPE002Z
(20) EtherCAT communication option	: IPE003Z
(21) CANopen communication option	: CAN001Z
	: CAN002Z
	: CAN003Z

■ How to mount the option

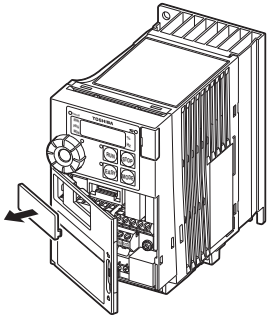
①Mount the option to the option adapter.



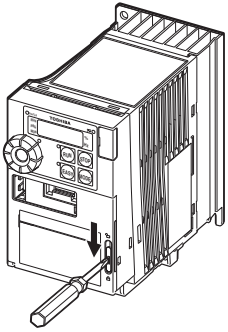
②Unlock the front cover and open it.



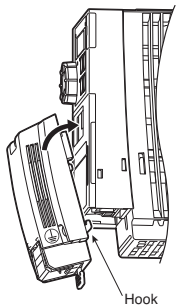
③Remove the option connector cover on the front cover from the back side.



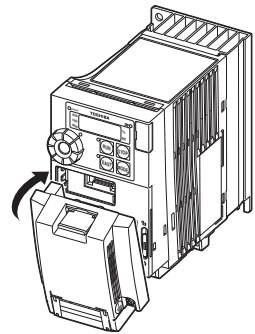
④Close the front cover and lock it.



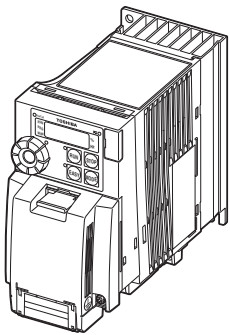
⑤Hang the hook of the option adapter on the bottom of the front cover and mount it to the inverter.



Side view



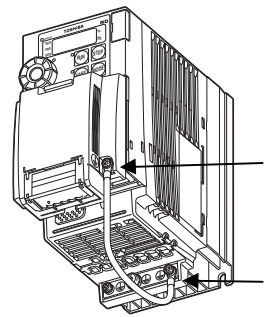
■ The option is mounted



After mounting the option adapter, the depth increases 25.5mm.

■ How to wire the grounding cable

Wire the attached grounding cable to grounding terminal of inverter.



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11. Table of parameters and data

11.1 Frequency setting parameter

Title	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
FC	Operation frequency of operation panel	Hz	0.1/0.01	LL-UL	0.0		3.2.2

11.2 Basic parameters

- Five navigation functions

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
AUH	-	History function	-	-	Displays parameters in groups of five in the reverse order to that in which their settings were changed. * (Possible to edit)	-		6.1.1
AUA	0090	Application easy setting *10	-	-	0: - 1: Initial easy setting 2: Conveyor 3: Material handling 4: Hoisting 5: Fan 6: Pump 7: Compressor	0		6.1.2
AUF	0093	Guidance function	-	-	0: - 1: - 2: Preset speed guidance 3: - 4: Motor 1 & 2 switching operation guidance 5: Motor constant setting guidance 6: -	0		6.1.3
AUL	0094	Overload characteristic selection	-	-	0: - 1: Constant torque characteristic (150%-60s) 2: Variable torque characteristic (120%-60s)	0		5.6 6.18
AU1	0000	Automatic acceleration/ deceleration	-	-	0: Disabled (manual setting) 1: Automatic 2: Automatic (only at acceleration)	0		5.2 6.1.4
AU2	0001	Torque boost setting macro function	-	-	0: - 1: Automatic torque boost + auto-tuning 2: Vector control + auto-tuning 3: Energy saving + auto-tuning	0		6.1.5

*10: Refer to section 11.8 about parameters that are set by this parameter.

- Basic parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
CMOd	0003	Command mode selection	-	-	0: Terminal block 1: Panel keypad (including extension panel) 2: RS485 communication 3: CANopen communication 4: Communication option	1		3.2 6.2.1 7.3
FMOd	0004	Frequency setting mode selection 1	-	-	0: Setting dial 1(save even if power is off) 1: Terminal VIA 2: Terminal VIB 3: Setting dial 2(press in center to save) 4: RS485 communication 5: UP/DOWN from external logic input 6: CANopen communication 7: Communication option 8: Terminal VIC 9, 10: - 11: Pulse train input 12, 13: - 14: Sr0	0		3.2 6.2.1 6.10.1 5.8 7.3
FMSL	0005	Meter selection	-	-	0: Output frequency 1: Output current 2: Frequency command value 3: Input voltage (DC detection) 4: Output voltage (command value) 5: Input power 6: Output power 7: Torque 8: - 9: Motor cumulative load factor 10: Inverter cumulative load factor 11: PBR (Braking resistor) cumulative load factor 12: Stator frequency 13: VIA input value 14: VIB input value 15: Fixed output 1 (output current 100% equivalent) 16: Fixed output 2 (output current 50% equivalent) 17: Fixed output 3 (Other than the output current) 18: RS485 communication data 19: For adjustments (FM set value is displayed.) 20: VIC input value 21: Pulse train input value 22: - 23: PID feedback value 24: Integral input power 25: Integral output power	0		5.1
FM	0006	Meter adjustment gain	-	-	-	-		
Fr	0008	Forward/reverse run selection (Panel keypad)	-	-	0: Forward run 1: Reverse run 2: Forward run (F/R switching on extension panel) 3: Reverse run (F/R switching on extension panel)	0		6.2.2

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
ACC	0009	Acceleration time 1	s	0.1/0.1	0.0-3600 (360.0) *8	10.0		5.2
dEC	0010	Deceleration time 1	s	0.1/0.1	0.0-3600 (360.0) *8	10.0		
FH	0011	Maximum frequency	Hz	0.1/0.01	30.0-500.0	80.0		5.3
UL	0012	Upper limit frequency	Hz	0.1/0.01	0.5-FH	*1		5.4
LL	0013	Lower limit frequency	Hz	0.1/0.01	0.0-UL	0.0		
uL	0014	Base frequency 1	Hz	0.1/0.01	20.0-500.0	*1		5.5
uLu	0409	Base frequency voltage 1	V	1/0.1	50-330 (240V class) 50-660 (500V class)	*1		5.5 6.19.6
Pt	0015	V/F control mode selection	-	-	0: V/F constant 1: Variable torque 2: Automatic torque boost control 3: Vector control 4: Energy-saving 5: Dynamic energy-saving (For fan and pump) 6: PM motor control 7: V/F 5-point setting 8: -	*1		6.3
ub	0016	Torque boost value 1	%	0.1/0.1	0.0-30.0	*2		6.4
tHr	0600	Motor electronic-thermal protection level 1	% (A)	1/1	10-100	100		5.6 6.29.1
OLn	0017	Electronic-thermal protection characteristic selection	-	-	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: valid / invalid 5 VF motor: valid / valid 6 VF motor: invalid / invalid 7 VF motor: invalid / valid	0		5.6
Sr0	0030	Preset-speed frequency 0	Hz	0.1/0.01	LL-UL	0.0		5.7
Sr1	0018	Preset-speed frequency 1	Hz	0.1/0.01	LL-UL	0.0		
Sr2	0019	Preset-speed frequency 2	Hz	0.1/0.01	LL-UL	0.0		
Sr3	0020	Preset-speed frequency 3	Hz	0.1/0.01	LL-UL	0.0		
Sr4	0021	Preset-speed frequency 4	Hz	0.1/0.01	LL-UL	0.0		
Sr5	0022	Preset-speed frequency 5	Hz	0.1/0.01	LL-UL	0.0		
Sr6	0023	Preset-speed frequency 6	Hz	0.1/0.01	LL-UL	0.0		
Sr7	0024	Preset-speed frequency 7	Hz	0.1/0.01	LL-UL	0.0		
FPId	0025	Process input value of PID control	Hz	0.1/0.01	F368 - F367	0.0		6.24

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*2: Default setting values vary depending on the capacity. Refer to section 11.4.

*8: These parameters can be changed to 0.01s unit by setting F519= 1.

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Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
tYP	0007	Default setting	-	-	0: - 1: 50Hz default setting 2: 60Hz default setting 3: Default setting 1 (Initialization) 4: Trip record clear 5: Cumulative operation time clear 6: Initialization of type information 7: Save user setting parameters 8. Load user setting parameters 9. Cumulative fan operation time record clears 10, 11: - 12: Number of starting clear 13: Default setting 2 (Complete initialization)	0		4.3.2
SEt	0099	Checking the region setting * 5	-	-	0: Start setup menu 1: Japan (read only) 2: North America (read only) 3: Asia (read only) 4: Europe (read only)	*1		4.4
PSEL	0050	EASY key mode selection	-	-	0: Standard setting mode at power on 1: Easy setting mode at power on 2: Easy setting mode only	0		4.5
F1--	-	Extended parameter starting at 100	-	-	-	-	-	4.2.2
F2--	-	Extended parameter starting at 200	-	-	-	-	-	
F3--	-	Extended parameter starting at 300	-	-	-	-	-	
F4--	-	Extended parameter starting at 400	-	-	-	-	-	
F5--	-	Extended parameter starting at 500	-	-	-	-	-	
F6--	-	Extended parameter starting at 600	-	-	-	-	-	
F7--	-	Extended parameter starting at 700	-	-	-	-	-	
F8--	-	Extended parameter starting at 800	-	-	-	-	-	
F9--	-	Extended parameter starting at 900	-	-	-	-	-	
A---	-	Extended parameter starting at A	-	-	-	-	-	
C---	-	Extended parameter starting at C	-	-	-	-	-	
GrU	-	Automatic edit function	-	-	-	-	-	4.3.1

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*5: Set “0” to activate the setup menu. Refer to section 11.5 about setting contents selected in setup menu.

11.3 Extended parameters

- Input/output parameters 1

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F100	0100	Low-speed signal output frequency	Hz	0.1/0.01	0.0-FH	0.0		6.5.1
F101	0101	Speed reach setting frequency	Hz	0.1/0.01	0.0-FH	0.0		6.5.3
F102	0102	Speed reach detection band	Hz	0.1/0.01	0.0-FH	2.5		6.5.2 6.5.3
F104	0104	Always active function selection 1	-	-	0-153 *6	0 (No function)		6.7.1
F105	0105	Priority selection (Both F and R are ON)	-	-	0: Reverse 1: Deceleration Stop	1		6.6.1
F107	0107	Analog input terminal selection (VIB)	-	-	0: 0-+10V 1: -10-+10V	0		6.6.2 6.10.2 7.3
F108	0108	Always active function selection 2	-	-	0-153 *6	0 (No function)		6.7.1
F109	0109	Analog/logic input selection (VIA/VIB)	-	-	0: VIA - analog input VIB - analog input 1: VIA - analog input VIB - contact input 2: - 3: VIA - contact input (Sink) VIB - contact input 4: VIA - contact input (Source) VIB - contact input	0		6.6.3 6.7.2 6.10.2 7.2.1 7.3
F110	0110	Always active function selection 3	-	-	0-153 *6	6 (ST)		6.7.1
F111	0111	Input terminal selection 1A (F)	-	-	0-203 *6	2 (F)		6.7.2 7.2.1
F112	0112	Input terminal selection 2A (R)	-	-		4 (R)		
F113	0113	Input terminal selection 3A (RES)	-	-		8 (RES)		
F114	0114	Input terminal selection 4A (S1)	-	-		10 (SS1)		
F115	0115	Input terminal selection 5 (S2)	-	-		12 (SS2)		
F116	0116	Input terminal selection 6 (S3)	-	-		14 (SS3)		
F117	0117	Input terminal selection 7 (VIB)	-	-		16 (SS4)		
F118	0118	Input terminal selection 8 (VIA)	-	-	8-55 *6	24 (AD2)		

*6: Refer to section 11.6 for details about input terminal function.

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F130	0130	Output terminal selection 1A (RY-RC)	-	-	0-255 *7	4 (LOW)		6.7.3 7.2.2
F131	0131	Output terminal selection 2A (OUT)	-	-		6 (RCH)		
F132	0132	Output terminal selection 3 (FL)	-	-		10 (FL)		
F137	0137	Output terminal selection 1B (RY-RC)	-	-		255 (always ON)		
F138	0138	Output terminal selection 2B (OUT)	-	-		255 (always ON)		
F139	0139	Output terminal logic selection (RY-RC, OUT)	-	-	0: F130 and F137 F131 and F138 1: F130 or F137 F131 and F138 2: F130 and F137 F131 or F138 3: F130 or F137 F131 or F138	0		
F144	0144	Input terminal response time	ms	1/1	1-1000	1		6.7.2 7.2.1
F146	0146	Logic input / pulse train input selection (S2)	-	-	0: Logic input 1: Pulse train input	0		6.7.2 6.10.5 7.2.1
F147	0147	Logic input / PTC input selection (S3)	-	-	0: Logic input 1: PTC input	0		2.3.2 6.7.2 6.29.16 7.2.1
F151	0151	Input terminal selection 1B (F)	-	-	0-203 *6	0		6.7.2 7.2.1
F152	0152	Input terminal selection 2B (R)	-	-		0		
F153	0153	Input terminal selection 3B (RES)	-	-		0		
F154	0154	Input terminal selection 4B (S1)	-	-		0		
F155	0155	Input terminal selection 1C (F)	-	-		0		
F156	0156	Input terminal selection 2C (R)	-	-		0		
F167	0167	Frequency command agreement detection range	Hz	0.1/0.01	0.0-FH	2.5		6.24

*6: Refer to section 11.6 for details about input terminal function.

*7: Refer to section 11.7 for details about output terminal function.

- Basic parameter 2

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F170	0170	Base frequency 2	Hz	0.1/0.01	20.0-500.0	*1		6.8.1
F171	0171	Base frequency voltage 2	V	1/0.1	50-330 (240V class) 50-660 (500V class)	*1		
F172	0172	Torque boost value 2	%	0.1/0.1	0.0-30.0	*2		
F173	0173	Motor electronic-thermal protection level 2	% (A)	1/1	10-100	100		5.6 6.8.1 6.29.1
F185	0185	Stall prevention level 2	% (A)	1/1	10-199, 200 (disabled)	150		6.8.1 6.29.2
F190	0190	V/f 5-point setting VF1 frequency	Hz	0.1/0.01	0.0-FH	0.0		6.3 6.9
F191	0191	V/f 5-point setting VF1 voltage	%	0.1/0.01	0.0-125.0	0.0		
F192	0192	V/f 5-point setting VF2 frequency	Hz	0.1/0.01	0.0-FH	0.0		
F193	0193	V/f 5-point setting VF2 voltage	%	0.1/0.01	0.0-125.0	0.0		
F194	0194	V/f 5-point setting VF3 frequency	Hz	0.1/0.01	0.0-FH	0.0		
F195	0195	V/f 5-point setting VF3 voltage	%	0.1/0.01	0.0-125.0	0.0		
F196	0196	V/f 5-point setting VF4 frequency	Hz	0.1/0.01	0.0-FH	0.0		
F197	0197	V/f 5-point setting VF4 voltage	%	0.1/0.01	0.0-125.0	0.0		
F198	0198	V/f 5-point setting VF5 frequency	Hz	0.1/0.01	0.0-FH	0.0		
F199	0199	V/f 5-point setting VF5 voltage	%	0.1/0.01	0.0-125.0	0.0		

- Frequency parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F200	0200	Frequency priority selection	-	-	0: FNOd (Switchable to F207 by terminal input) 1: FNOd (Switchable to F207 at 1.0Hz or less of designated frequency)	0		5.8 6.10.1
F201	0201	VIA input point 1 setting	%	1/1	0-100	0		6.10.2 7.3
F202	0202	VIA input point 1 frequency	Hz	0.1/0.01	0.0-500.0	0.0		
F203	0203	VIA input point 2 setting	%	1/1	0-100	100		
F204	0204	VIA input point 2 frequency	Hz	0.1/0.01	0.0-500.0	*1		
F205	0205	VIA input point 1 rate	%	1/0.01	0-250	0		6.31
F206	0206	VIA input point 2 rate	%	1/0.01	0-250	100		
F207	0207	Frequency setting mode selection 2	-	-	0-14 (Same as FNOd)	1		5.8 6.10.1

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*2: Default setting values vary depending on the capacity. Refer to section 11.4.

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F209	0209	Analog input filter	ms	1/1	2-1000	64		6.10.2
F210	0210	VIB input point 1 setting	%	1/1	-100-+100	0		7.3
F211	0211	VIB input point 1 frequency	Hz	0.1/0.01	0.0-500.0	0.0		
F212	0212	VIB input point 2 setting	%	1/1	-100-+100	100		
F213	0213	VIB input point 2 frequency	Hz	0.1/0.01	0.0-500.0	*1		
F214	0214	VIB input point 1 rate	%	1/0.01	-250-+250	0		6.31
F215	0215	VIB input point 2 rate	%	1/0.01	-250-+250	100		6.32
F216	0216	VIC input point 1 setting	%	1/1	0-100	20		6.10.2
F217	0217	VIC input point 1 frequency	Hz	0.1/0.01	0.0-500.0	0.0		7.3
F218	0218	VIC input point 2 setting	%	1/1	0-100	100		
F219	0219	VIC input point 2 frequency	Hz	0.1/0.01	0.0-500.0	*1		
F220	0220	VIC input point 1 rate	%	1/0.01	0-250	0		6.31
F221	0221	VIC input point 2 rate	%	1/0.01	0-250	100		
F239	0239	Factory specific coefficient 2A	-	-	-	-		* 3
F240	0240	Starting frequency	Hz	0.1/0.01	0.1-10.0	0.5		6.11.1
F241	0241	Operation starting frequency	Hz	0.1/0.01	0.0-FH	0.0		6.11.2
F242	0242	Operation starting frequency hysteresis	Hz	0.1/0.01	0.0-FH	0.0		
F243	0243	Stop frequency setting	Hz	0.1/0.01	0.0: Same as F240 0.1-30.0	0.0		6.11.1
F249	0249	PWM carrier frequency during DC braking	kHz	0.1/0.1	2.0-16.0	4.0		6.12.1
F250	0250	DC braking starting frequency	Hz	0.1/0.01	0.0-FH	0.0		
F251	0251	DC braking current	%(A)	1/1	0-100	50		
F252	0252	DC braking time	s	0.1/0.1	0.0-25.5	1.0		
F254	0254	Motor shaft fixing control	-	-	0: Disabled 1: Enabled (after DC braking)	0		6.12.2
F256	0256	Time limit for lower-limit frequency operation	s	0.1/0.1	0: Disabled 0.1-600.0	0.0		6.13
F257	0257	Factory specific coefficient 2B	-	-	-	-		* 3
F258	0258	Factory specific coefficient 2C	-	-	-	-		* 3
F259	0259	Lower limit frequency reach time limit at start-up	s	0.1/0.1	0.0: Disabled 0.1-600.0	0.0		6.13

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F260	0260	Jog run frequency	Hz	0.1/0.01	F240 – 20.0	5.0		6.14
F261	0261	Jog run stopping pattern	-	-	0: Deceleration stop 1: Coast stop 2: DC braking stop	0		
F262	0262	Panel jog run operation mode	-	-	0: Invalid 1: Valid	0		
F264	0264	External logic input - UP response time	s	0.1/0.1	0.0-10.0	0.1		6.10.4
F265	0265	External logic input - UP frequency steps	Hz	0.1/0.01	0.0-FH	0.1		
F266	0266	External logic input - DOWN response time	s	0.1/0.1	0.0-10.0	0.1		
F267	0267	External logic input - DOWN frequency steps	Hz	0.1/0.01	0.0-FH	0.1		
F268	0268	Initial value of UP/DOWN frequency	Hz	0.1/0.01	LL - UL	0.0		
F269	0269	Change of the initial value of UP/DOWN frequency	-	-	0: Not changed 1: Setting of F268 changed when power is turned off	1		
F270	0270	Jump frequency 1	Hz	0.1/0.01	0.0-FH	0.0		6.15
F271	0271	Jumping width 1	Hz	0.1/0.01	0.0-30.0	0.0		
F272	0272	Jump frequency 2	Hz	0.1/0.01	0.0-FH	0.0		
F273	0273	Jumping width 2	Hz	0.1/0.01	0.0-30.0	0.0		
F274	0274	Jump frequency 3	Hz	0.1/0.01	0.0-FH	0.0		
F275	0275	Jumping width 3	Hz	0.1/0.01	0.0-30.0	0.0		
F287	0287	Preset-speed frequency 8	Hz	0.1/0.01	LL-UL	0.0		5.7
F288	0288	Preset-speed frequency 9	Hz	0.1/0.01	LL-UL	0.0		
F289	0289	Preset-speed frequency 10	Hz	0.1/0.01	LL-UL	0.0		
F290	0290	Preset-speed frequency 11	Hz	0.1/0.01	LL-UL	0.0		
F291	0291	Preset-speed frequency 12	Hz	0.1/0.01	LL-UL	0.0		
F292	0292	Preset-speed frequency 13	Hz	0.1/0.01	LL-UL	0.0		
F293	0293	Preset-speed frequency 14	Hz	0.1/0.01	LL-UL	0.0		
F294	0294	Preset-speed frequency 15	Hz	0.1/0.01	LL-UL	0.0		5.7 6.30
F295	0295	Bumpless operation selection	-	-	0: Disabled 1: Enabled	0		6.16
F297	0297	Low voltage operation upper limit frequency	Hz	0.1/0.01	0.0: Disabled 0.1-30.0	0.0		6.17
F298	0298	Low voltage operation DC voltage	Vdc	1/0.1	240V class: 72(96)-168 *11 500V class: 72(120)-336 *11	120		

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

*11: 240V class : 4.0kW or less : 72 to 168V, 5.5kW or more : 96 to 168V.
500V class : 4.0kW or less : 72 to 336V, 5.5kW or more : 120 to 336V.

- Operation mode parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F300	0300	PWM carrier frequency	kHz	0.1/0.1	2.0 -16.0	12.0		6.18
F301	0301	Auto-restart control selection	-	-	0: Disabled 1: At auto-restart after momentary stop 2: At ST terminal off and on 3: 1+2 4: At start-up	0		5.9
F302	0302	Regenerative power ride-through control (Deceleration stop)	-	-	0: Disabled 1: Regenerative power ride-through control 2: Deceleration stop during power failure 3: Synchronized acceleration / deceleration (signal) 4: Synchronized acceleration / deceleration (signal + power failure)	0		6.19.2
F303	0303	Retry selection (number of times)	Times	1/1	0: Disabled 1-10	0		6.19.3
F304	0304	Dynamic braking selection	-	-	0: Disabled 1: Enabled, Resistor overload protection enabled 2: Enabled 3: Enabled, Resistor overload protection enabled (At ST terminal on) 4: Enabled (At ST terminal on)	0		6.19.4
F305	0305	Overvoltage limit operation (Deceleration stop mode selection)	-	-	0: Enabled 1: Disabled 2: Enabled (Quick deceleration control) 3: Enabled (Dynamic quick deceleration control)	2		6.19.5
F307	0307	Supply voltage correction (output voltage limitation)	-	-	0: Supply voltage uncorrected, output voltage limited 1: Supply voltage corrected, output voltage limited 2: Supply voltage uncorrected, output voltage unlimited 3: Supply voltage corrected, output voltage unlimited	*1		6.19.6
F308	0308	Dynamic braking resistance	Ω	0.1/0.1	1.0-1000	*2		6.19.4
F309	0309	Dynamic braking resistor capacity	kW	0.01/0.01	0.01-30.00	*2		
F310	0310	Factory specific coefficient 3A	-	-	-	-		* 3
F311	0311	Reverse-run prohibition	-	-	0: Forward/reverse run permitted 1: Reverse run prohibited 2: Forward run prohibited	0		6.19.7
F312	0312	Random mode	-	-	0: Disabled 1: Random mode 1 2: Random mode 2 3: Random mode 3	0		6.18
F314	0314	Factory specific coefficient 3B	-	-	-	-		* 3

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*2: Default setting values vary depending on the capacity. Refer to section 11.4.

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F316	0316	PWM carrier frequency control mode selection	-	-	0: Carrier frequency without reduction 1: Carrier frequency with automatic reduction 2: Carrier frequency without reduction Support for 500V models 3: Carrier frequency with automatic reduction Support for 500V models	1		6.18
F317	0317	Synchronized deceleration time (time elapsed between start of deceleration to stop)	s	0.1/0.01	0.0-3600 (360.0)	2.0		6.19.2
F318	0318	Synchronized acceleration time (time elapsed between start of acceleration to achievement of specified speed)	s	0.1/0.01	0.0-3600 (360.0)	2.0		
F319	0319	Regenerative over-excitation upper limit	%	1/1	100-160	*1		6.19.5
F320	0320	Droop gain	%	0.1/0.1	0.0-100.0	0.0		6.20
F323	0323	Droop insensitive torque band	%	1/1	0-100	10		
F324	0324	Droop output filter	-	0.1/0.1	0.1-200.0	100.0		
F325	0325	Brake releasing waiting time	s	0.01/0.01	0.00-2.50	0.00		6.22.1
F326	0326	Brake releasing small current detection level	%	1/1	0-100	0		
F327	0327	Factory specific coefficient 3C	-	-	-	-		* 3
F328	0328	Light-load high-speed operation selection	-	-	0:Disabled 1:High-speed operation speed set automatically (Power running at F command: Increase) 2:High-speed operation speed set automatically (Power running at R command: Increase) 3:High-speed operation speed set with F330 (Power running at F command: Increase) 4:High-speed operation speed set with F330 (Power running at R command: Increase)	0		6.21
F329	0329	Light-load high-speed learning function	-	-	0:No learning 1:Forward run learning 2:Reverse run learning	0		
F330	0330	Automatic light-load high-speed operation frequency	Hz	0.1/0.01	30.0-UL	*1		
F331	0331	Light-load high-speed operation switching lower limit frequency	Hz	0.1/0.01	5.0-UL	40.0		
F332	0332	Light-load high-speed operation load waiting time	s	0.1/0.1	0.0-10.0	0.5		

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F333	0333	Light-load high-speed operation load detection time	s	0.1/0.1	0.0-10.0	1.0		6.21
F334	0334	Light-load high-speed operation heavy load detection time	s	0.1/0.1	0.0-10.0	0.5		
F335	0335	Switching load torque during power running	%	1/0.01	-250- +250	50		
F336	0336	Heavy-load torque during power running	%	1/0.01	-250- +250	100		
F337	0337	Heavy-load torque during constant power running	%	1/0.01	-250- +250	50		
F338	0338	Switching load torque during regenerative braking	%	1/0.01	-250- +250	50		
F339	0339	Factory specific coefficient 3D	-	-	-	-		* 3
F340	0340	Creeping time 1	s	0.01/0.01	0.00-10.00	0.00		6.22.1
F341	0341	Braking mode selection	-	-	0: Disabled 1: Forward winding up 2: Reverse winding up 3: Horizontal operation	0		
F342	0342	Load portion torque input selection	-	-	0: Disabled 1: Terminal VIA 2: Terminal VIB 3: Terminal VIC 4: F343	4		
F343	0343	Hoisting torque bias input (valid only when F342=4)	%	1/0.01	-250- +250	100		
F344	0344	Lowering torque bias multiplier	%	1/0.01	0-100	100		
F345	0345	Brake release time	s	0.01/0.01	0.00-10.00	0.05		
F346	0346	Creeping frequency	Hz	0.1/0.01	F240 -20.0	3.0		
F347	0347	Creeping time 2	s	0.01/0.01	0.00-10.00	0.10		
F348	0348	Braking time learning function	-	1/1	0:Disabled 1: Learning (0 after adjustment)	0		
F349	0349	Acceleration/deceleration suspend function	-	1/1	0:Disabled 1:Parameter setting 2:Terminal input	0		6.23
F350	0350	Acceleration suspend frequency	Hz	0.1/0.01	0.0-FH	0.0		
F351	0351	Acceleration suspend time	s	0.1/0.1	0.0-10.0	0.0		
F352	0352	Deceleration suspend frequency	Hz	0.1/0.01	0.0-FH	0.0		
F353	0353	Deceleration suspend time	s	0.1/0.1	0.0-10.0	0.0		
F359	0359	PID control waiting time	s	1/1	0-2400	0		6.24
F360	0360	PID control	-	-	0: Disabled 1: Process type PID control 2: Speed type PID control	0		

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F361	0361	Delay filter	s	0.1/0.1	0.0-25.0	0.1		6.24
F362	0362	Proportional gain	-	0.01/0.01	0.01-100.0	0.30		
F363	0363	Integral gain	s^{-1}	0.01/0.01	0.01-100.0	0.20		
F366	0366	Differential gain	s	0.01/0.01	0.00-2.55	0.00		
F367	0367	Process upper limit	Hz	0.1/0.01	0.0-FH	*1		
F368	0368	Process lower limit	Hz	0.1/0.01	0.0-F367	0.0		
F369	0369	PID control feedback signal selection	-	-	0: Disabled 1: Terminal VIA 2: Terminal VIB 3: Terminal VIC 4 to 6: -	0		
F372	0372	Process increasing rate (speed type PID control)	s	0.1/0.1	0.1-600.0	10.0		
F373	0373	Process decreasing rate (speed type PID control)	s	0.1/0.1	0.1-600.0	10.0		
F375	0375	Factory specific coefficient 3E	-	-	-	-		* 3
F376	0376	Factory specific coefficient 3F	-	-	-	-		
F378	0378	Number of pulse train input	pps	1/1	10-500	25		6.10.5
F380	0380	PID forward/reverse characteristics selection	-	-	0: Forward 1: Reverse	0		6.24
F382	0382	Hit and stop control	-	-	0: Disabled 1: Enabled 2: -	0		6.22.2
F383	0383	Hit and stop control frequency	Hz	0.1/0.01	0.1-30.0	5.0		
F384	0384	Factory specific coefficient 3G	-	-	-	-		* 3
F385	0385	Factory specific coefficient 3H	-	-	-	-		
F386	0386	Factory specific coefficient 3I	-	-	-	-		
F389	0389	PID control reference signal selection	-	-	0: F100/F207 selected 1: Terminal VIA 2: Terminal VIB 3: FPid 4: RS485 communication 5: UP/DOWN from external logic input 6: CANopen communication 7: Communication option 8: Terminal VIC 9, 10: - 11: Pulse train input	0		6.24
F390	0390	Factory specific coefficient 3J	-	-	-	-		* 3
F391	0391	Hysteresis for lower-limit frequency operation	Hz	0.1/0.01	0.0-UL	0.2		6.13
F394	0394	Factory specific coefficient 3K	-	-	-	-		* 3

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

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- Torque boost parameters 1

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F400	0400	Auto-tuning	-	-	0: Auto-tuning disabled 1: Initialization of F402 (after execution : 0) 2: Auto-tuning executed (after execution: 0) 3: - 4: Motor constant auto calculation (after execution: 0) 5: 4+2 (after execution: 0)	0		6.25
F401	0401	Slip frequency gain	%	1/1	0-250	70		
F402	0402	Automatic torque boost value	%	0.1/0.1	0.1-30.0	* 2		
F405	0405	Motor rated capacity	kW	0.01/0.01	0.01-22.00	* 2		
F412	0412	Motor specific coefficient 1	-	-	-	-		* 4
F415	0415	Motor rated current	A	0.1/0.1	0.1-100.0	* 2		6.25
F416	0416	Motor no-load current	%	1/1	10-90	* 2		
F417	0417	Motor rated speed	min-1	1/1	100-64000	*1		
F441	0441	Power running torque limit 1 level	%	1/0.01	0-249%, 250:Disabled	250		6.26.1
F443	0443	Regenerative braking torque limit 1 level	%	1/0.01	0-249%, 250:Disabled	250		
F444	0444	Power running torque limit 2 level	%	1/0.01	0-249%, 250:Disabled	250		
F445	0445	Regenerative braking torque limit 2 level	%	1/0.01	0-249%, 250:Disabled	250		
F451	0451	Acceleration/deceleration operation after torque limit	-	1/1	0: In sync with acceleration / deceleration 1: In sync with min. time	0		6.26.2
F452	0452	Power running stall continuous trip detection time	s	0.01/0.01	0.00-10.00	0.00		6.26.3
F454	0454	Constant output zone torque limit selection	-	-	0:Constant output limit 1:Constant torque limit	0		6.26.1
F458	0458	Motor specific coefficient 2	-	-	-	-		* 4
F459	0459	Load inertia moment ratio	Times	0.1/0.1	0.1-100.0	1.0		6.25
F460	0460	Motor specific coefficient 3	-	-	-	-		* 4
F461	0461	Motor specific coefficient 4	-	-	-	-		
F462	0462	Speed reference filter coefficient	-	-	0-100	35		6.25
F467	0467	Motor specific coefficient 5	-	-	-	-		* 4

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*2: Default setting values vary depending on the capacity. Refer to section 11.4.

*4: Motor specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- Input/output parameters 2

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F470	0470	VIA input bias	-	1/1	0-255	128		6.10.3
F471	0471	VIA input gain	-	1/1	0-255	128		
F472	0472	VIB input bias	-	1/1	0-255	128		
F473	0473	VIB input gain	-	1/1	0-255	128		
F474	0474	VIC input bias	-	1/1	0-255	128		
F475	0475	VIC input gain	-	1/1	0-255	128		

- Torque boost parameters 2

Title	Communications No.	Function	Unit	Minimum setting unit Panel/Communications	Adjustment range	Default setting	User setting	Reference
F480	0480	Motor specific coefficient 6	-	-	-	-		* 4
F485	0485	Motor specific coefficient 7	-	-	-	-		
F490	0490	Motor specific coefficient 8	-	-	-	-		
F495	0495	Motor specific coefficient 9	-	-	-	-		
F499	0499	Motor specific coefficient 10	-	-	-	-		

*4: Motor specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- Acceleration/deceleration time parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F500	0500	Acceleration time 2	s	0.1/0.1	0.0-3600 (360.0) *8	10.0		6.27.2
F501	0501	Deceleration time 2	s	0.1/0.1	0.0-3600 (360.0) *8	10.0		
F502	0502	Acceleration/deceleration 1 pattern	-	-	0: Linear 1: S-pattern 1 2: S-pattern 2	0		6.27.1
F503	0503	Acceleration/deceleration 2 pattern	-	-		0		6.27.2
F504	0504	Acceleration/deceleration selection (1, 2 , 3) (Panel keypad)	-	-	1: Acceleration/deceleration 1 2: Acceleration/deceleration 2 3: Acceleration/deceleration 3	1		
F505	0505	Acceleration/deceleration 1 and 2 switching frequency	Hz	0.1/0.01	0.0 (disabled) 0.1-UL	0.0		
F506	0506	S-pattern lower-limit adjustment amount	%	1/1	0-50	10		6.27.1
F507	0507	S-pattern upper-limit adjustment amount	%	1/1	0-50	10		
F510	0510	Acceleration time 3	s	0.1/0.1	0.0-3600 (360.0) *8	10.0		6.27.2

*8: These parameters can be changed to 0.01s unit by setting F519=1.

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F511	0511	Deceleration time 3	s	0.1/0.1	0.0-3600 (360.0) *8	10.0		6.27.2
F512	0512	Acceleration/deceleration 3 pattern	-	-	0: Linear 1: S-pattern 1 2: S-pattern 2	0		
F513	0513	Acceleration/deceleration 2 and 3 switching frequency	Hz	0.1/0.01	0.0 (disabled) 0.1-UL	0.0		
F515	0515	Deceleration time at emergency stop	s	0.1/0.1	0.0-3600 (360.0) *8	10.0		6.29.4
F519	0519	Setting of acceleration/deceleration time unit	-	-	0: - 1: 0.01s unit (after execution: 0) 2: 0.1s unit (after execution: 0)	0		5.2 6.27.2
F590	0590	Shock monitoring	-	-	0: Disabled 1: Current detection 2: Torque detection	0		6.28
F591	0591	Shock monitoring trip/alarm selection	-	-	0: Alarm only 1: Tripping	0		
F592	0592	Shock monitoring detection direction selection	-	-	0: Over-current / torque detection 1: Low-current / torque detection	0		
F593	0593	Shock monitoring detection level	%	1/1	0-250	150		
F595	0595	Shock monitoring detection time	s	0.1/0.1	0.0-10.0	0.5		
F596	0596	Shock monitoring detection hysteresis	%	1/1	0-100	10		
F597	0597	Shock monitoring detection start waiting time	s	0.1/0.1	0.0-300.0	0.0		
F598	0598	Shock monitoring detection action selection	-	-	0: During operation 1: During operation (except acceleration / deceleration)	0		

*8: These parameters can be changed to 0.01s unit by setting F519=1.

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- Protection parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F601	0601	Stall prevention level 1	% (A)	1/1	10-199, 200 (disabled)	150		6.29.2
F602	0602	Inverter trip retention selection	-	-	0: Cleared with power off 1: Retained with power off	0		6.29.3
F603	0603	Emergency stop selection	-	-	0: Coast stop 1: Deceleration stop 2: Emergency DC braking 3: Deceleration stop (F515) 4: Quick deceleration stop 5: Dynamic quick deceleration stop	0		6.29.4
F604	0604	DC braking time during emergency stop	s	0.1/0.1	0.0-20.0	1.0		
F605	0605	Output phase failure detection selection	-	-	0: Disabled 1: At start-up (only one time after power on) 2: At start-up (each time) 3: During operation 4: At start-up + during operation 5: Detection of cutoff on output side	0		6.29.5
F607	0607	Motor 150% overload detection time	s	1/1	10-2400	300		5.6 6.29.1
F608	0608	Input phase failure detection selection	-	-	0: Disabled 1: Enabled	1		6.29.6
F609	0609	Small current detection hysteresis	%	1/1	1-20	10		6.29.7
F610	0610	Small current trip/alarm selection	-	-	0: Alarm only 1: Tripping	0		
F611	0611	Small current detection current	% (A)	1/1	0-150	0		
F612	0612	Small current detection time	s	1/1	0-255	0		
F613	0613	Detection of output short-circuit at start-up	-	-	0: Each time (standard pulse) 1: Only one time after power on (standard pulse) 2: Each time (short pulse) 3: Only one time after power on (short pulse)	0		6.29.8
F614	0614	Ground fault detection selection	-	-	0: Disabled 1: Enabled	1		6.299
F615	0615	Over-torque trip/alarm selection	-	-	0: Alarm only 1: Tripping	0		6.29.10
F616	0616	Over-torque detection level	%	1/0.01	0 (disabled) 1-250	150		
F618	0618	Over-torque detection time	s	0.1/0.1	0.0-10.0	0.5		
F619	0619	Over-torque detection hysteresis	%	1/1	0-100	10		
F620	0620	Cooling fan ON/OFF control	-	-	0: ON/OFF control 1: Always ON	0		6.29.11
F621	0621	Cumulative operation time alarm setting	100 hours	0.1/0.1 (=10 hours)	0.0-999.0	876.0		6.29.12
F625	0625	Factory specific coefficient 6A	-	-	-	-		*3
F626	0626	Over-voltage stall protection level	%	1/1	100-150	*2		6.19.4 6.19.5

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F627	0627	Undervoltage trip/alarm selection	-	-	0: Alarm only(detection level 60% or less) 1: Tripping (detection level 60% or less) 2: Alarm only(detection level 50% or less, inputAC reactor required) 3: -	0		6.29.13
F629	0629	Factory specific coefficient 6B	-	-	-	-		* 3
F631	0631	Inverter overload detection method	-	-	0: 150%-60s (120%-60s) 1: Temperature estimation	0		5.6
F632	0632	Electronic-thermal memory	-	-	0: Disabled (tHr, F173) 1: Enabled (tHr, F173) 2: Disabled (tHr) 3: Enabled (tHr)	0		5.6 6.29.1
F633	0633	Analog input break detection level (VIC)	%	1/1	0: Disabled, 1-100	0		6.29.14
F634	0634	Annual average ambient temperature (parts replacement alarms)	-	-	1: -10 to +10°C 2: 11-20°C 3: 21-30°C 4: 31-40°C 5: 41-50°C 6: 51-60°C	3		6.29.15
F643	0643	Factory specific coefficient 6C	-	-	-	-		* 3
F644	0644	Operation selection of analog input break detection (VIC)	-	-	0: Tripping 1: Alarm only (Coast stop) 2: Alarm only (F649 frequency) 3: Alarm only (Maintain running) 4: Alarm only (Deceleration stop)	0		6.29.14
F645	0645	PTC thermal selection	-	-	1: Tripping 2: Alarm only	1		6.29.16
F646	0646	PTC detection resistor value	Ω	1/1	100-9999	3000		
F648	0648	Number of starting alarm	10000 times	0.1/0.1	0.0-999.0	999.0		6.29.17
F649	0649	Fallback frequency	Hz	0.1/0.01	LL-UL	0.0		6.29.14
F650	0650	Forced fire-speed control selection	-	-	0: Disabled 1: Enabled	0		6.30
F656	0656	Factory specific coefficient 6D	-	-	-	-		* 3
F657	0657	Overload alarm level	%	1/1	10-100	50		5.6
F660	0660	Override addition input selection	-	-	0: Disabled 1: Terminal VIA 2: Terminal VIB 3: Terminal VIC 4: FC	0		6.31
F661	0661	Override multiplication input selection	-	-	0: Disabled 1: Terminal VIA 2: Terminal VIB 3: Terminal VIC 4: F129	0		
F663	0663	Analog input terminal function selection (VIB)	-	-	0: Frequency command 1: Acceleration/deceleration time 2: Upper limit frequency 3, 4: - 5: Torque boost value 6: Stall prevention level 7: Motor electronic-thermal protection level 8 to 10: - 11: Base frequency	0		6.32

*2: Default setting values vary depending on the capacity. Refer to section 11.4.

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- Output parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F667	0667	Integral input power pulse output unit	-	-	0: 0.1kWh 1: 1kWh 2: 10kWh 3: 100kWh	1		6.33.1
F668	0668	Integral input power pulse output width	s	0.1/0.1	0.1-1.0	0.1		
F669	0669	Logic output/pulse train output selection (OUT)	-	-	0: Logic output 1: Pulse train output	0		6.33.2
F676	0676	Pulse train output function selection (OUT)	-	-	0: Output frequency 1: Output current 2: Frequency command value 3: Input voltage (DC detection) 4: Output voltage (command value) 5: Input power 6: Output power 7: Torque 8: - 9: Motor cumulative load factor 10: Inverter cumulative load factor 11: PBR (Braking resistor) cumulative load factor 12: Stator frequency 13: VIA input value 14: VIB input value 15: Fixed output 1 (output current 100% equivalent) 16: Fixed output 2 (output current 50% equivalent) 17: Fixed output 3 (Other than the output current) 18: Communication data 19: - 20: VIC input value 21, 22: - 23: PID feedback value	0		
F677	0677	Maximum numbers of pulse train output	kpps	0.01/0.01	0.50-2.00	0.80		
F678	0678	Pulse train output filter	ms	1/1	2-1000	64		
F679	0679	Pulse train input filter	ms	1/1	2-1000	2		6.10.5
F681	0681	Analog output signal selection	-	-	0: Meter option (0 to 1 mA) 1: Current (0 to 20 mA) output 2: Voltage (0 to 10 V) output	0		5.1 6.33.3
F684	0684	Analog output filter	ms	1/1	2-1000	2		
F691	0691	Inclination characteristic of analog output	-	-	0: Negative inclination (downward slope) 1: Positive inclination (upward slope)	1		
F692	0692	Analog output bias	%	0.1/0.1	-1.0－+100.0	0.0		
F693	0693	Factory specific coefficient 6E	-	-	-	-		* 3

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- Operation panel parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F700	0700	Parameter protection selection	-	-	0: Permitted 1: Writing prohibited (Panel and extension panel) 2: Writing prohibited (1 + RS485 communication) 3: Reading prohibited (Panel and extension panel) 4: Reading prohibited (3 + RS485 communication)	0		6.34.1
F701	0701	Current/voltage unit selection	-	-	0: % 1: A (ampere)/V (volt)	0		5.10.1
F702	0702	Frequency free unit display magnification	Times	0.01/0.01	0.00: Disabled (display of frequency) 0.01-200.0	0.00		5.10.2
F703	0703	Frequency free unit coverage selection	-	1/1	0: All frequencies display 1: PID frequencies display	0		
F705	0705	Inclination characteristic of free unit display	-	1/1	0: Negative inclination (downward slope) 1: Positive inclination (upward slope)	1		
F706	0706	Free unit display bias	Hz	0.1/0.01	0.00-FH	0.00		
F707	0707	Free step 1 (1-step rotation of setting dial)	Hz	0.01/0.01	0.00: Automatic 0.01-FH	0.00		6.34.4
F708	0708	Free step 2 (panel display)	-	-	0: Automatic 1-255	0		
F709	0709	Standard monitor hold function	-	-	0: Real time 1: Peak hold 2: Minimum hold	0		6.34.7

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F710	0710	Initial panel display selection	-	-	0: Output frequency (Hz/free unit) 1: Output current (%/A) 2: Frequency command value (Hz/free unit) 3: Input voltage (DC detection) (%/V) 4: Output voltage (command value) (%/V) 5: Input power (kW) 6: Output power (kW) 7: Torque (%) 8: - 9: Motor cumulative load factor 10: Inverter cumulative load factor 11: PBR (Braking resistor) cumulative load factor 12: Stator frequency (Hz/free unit) 13: VIA input value (%) 14: VIB input value (%) 15 to 17: - 18: Arbitrary code from communication 19: - 20: VIC input value (%) 21: Pulse train input value (pps) 22: - 23: PID feedback value (Hz/free unit) 24: Integral input power (kWh) 25: Integral output power (kWh) 26: Motor load factor (%) 27: Inverter load factor (%) 28: Inverter rated current (A) 29: FM output value (%) 30: Pulse train output value (pps) 31: Cumulative power on time (100 hours) 32: Cumulative fan operation time (100 hours) 33: Cumulative operation time (100 hours) 34: Number of starting (10000 times) 35: Forward number of starting (10000 times) 36: Reverse number of starting (10000 times) 37: Number of trip (times) 38, 39: - 40: Inverter rated current (Carrier frequency corrected) 41 to 51: - 52: Frequency command value / output frequency (Hz/free unit)	0		6.34.5 8.2.1 8.3.2

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F711	0711	Status monitor 1	-	-	0: Output frequency (Hz/free unit) 1: Output current (%/A) 2: Frequency command value (Hz/free unit) 3: Input voltage (DC detection) (%/V) 4: Output voltage (command value) (%/V) 5: Input power (kW) 6: Output power (kW) 7: Torque (%) 8: - 9: Motor cumulative load factor 10: Inverter cumulative load factor 11: PBR (Braking resistor) cumulative load factor 12: Stator frequency (Hz/free unit) 13: VIA input value (%) 14: VIB input value (%) 15 to 17: - 18: Arbitrary code from communication 19: - 20: VIC input value (%) 21: Pulse train input value (pps) 22: - 23: PID feedback value (Hz/free unit) 24: Integral input power (kWh) 25: Integral output power (kWh) 26: Motor load factor (%) 27: Inverter load factor (%) 28: Inverter rated current (A) 29: FM output value (%) 30: Pulse train output value (pps) 31: Cumulative power on time (100 hours) 32: Cumulative fan operation time (100 hours) 33: Cumulative operation time (100 hours) 34: Number of starting (10000 times) 35: Forward number of starting (10000 times) 36: Reverse number of starting (10000 times) 37: Number of trip (times) 38, 39: - 40: Inverter rated current (Carrier frequency corrected) 41 to 51: - 52: Frequency command value / output frequency (Hz/free unit)	2		6.34.6 8.2.1 8.3.2
F712	0712	Status monitor 2	-	-		1		
F713	0713	Status monitor 3	-	-		3		
F714	0714	Status monitor 4	-	-		4		
F715	0715	Status monitor 5	-	-		5		
F716	0716	Status monitor 6	-	-		6		
F717	0717	Status monitor 7	-	-		27		
F718	0718	Status monitor 8	-	-		0		
F719	0719	Selection of operation command clear	-	-	0: Clear at coast stop and retained at nOFF. 1: Retained at coast stop and nOFF. 2: Clear at coast stop and nOFF. 3: 2+ clear when CnOd is changed	1		6.34.8
F720	0720	Initial extension panel display selection	-	-	0-52 (Same as F710)	0		6. 34.5
F721	0721	Panel stop pattern	-	-	0: Deceleration stop 1: Coast stop	0		6. 34.9
F724	0724	Operation frequency setting target by setting dial	-	-	0: Panel frequency (FC) 1: Panel frequency (FC) + Preset speed frequency	0		5.7

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Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F729	0729	Operation panel override multiplication gain	%	1/1	-100-+100	0		6.31
F730	0730	Panel frequency setting prohibition (FC)	-	-	0: Permitted 1: Prohibited	0		6.34.1
F731	0731	Disconnection detection of extension panel	-	-	0: Permitted 1: Prohibited	0		
F732	0732	Local/remote key prohibition of extension panel	-	-	0: Permitted 1: Prohibited	1		6.16 6. 34.1
F733	0733	Panel operation prohibition (RUN key)	-	-	0: Permitted 1: Prohibited	0		6. 34.1
F734	0734	Panel emergency stop operation prohibition	-	-	0: Permitted 1: Prohibited	0		
F735	0735	Panel reset operation prohibition	-	-	0: Permitted 1: Prohibited	0		
F736	0736	CMOd/FMOd change prohibition during operation	-	-	0: Permitted 1: Prohibited	1		
F737	0737	All key operation prohibition	-	-	0: Permitted 1: Prohibited	0		
F738	0738	Password setting (F700)	-	-	0: Password unset 1-9998 9999: Password set	0		
F739	0739	Password verification	-	-	0: Password unset 1-9998 9999: Password set	0		
F740	0740	Trace selection	-	-	0: Disabled 1: At tripping 2: At triggering 3: 1+2	1		6.35
F741	0741	Trace cycle	-	-	0: 4ms 1: 20ms 2: 100ms 3: 1s 4: 10s	2		
F742	0742	Trace data 1	-	-	0-42	0		
F743	0743	Trace data 2	-	-		1		
F744	0744	Trace data 3	-	-		2		
F745	0745	Trace data 4	-	-		3		
F746	0746	Status monitor filter	ms	1/1	8-1000	200		6.34.7
F748	0748	Integrating wattmeter retention selection	-	-	0: Disabled 1: Enabled	0		6.36
F749	0749	Integrating wattmeter display unit selection	-	-	0:1=1kWh 1:1=10kWh 2:1=100kWh 3:1=1000kWh 4:1=10000kWh	*2		

*2: Default setting values vary depending on the capacity. Refer to section 11.4.

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F750	0750	EASY key function selection	-	-	0: Easy / standard setting mode switching function 1: Shortcut key 2: Local / remote key 3: Monitor peak / minimum hold trigger 4: - 5: -	0		4.5 6.16 6.37
F751	0751	Easy setting mode parameter 1	-	-		3 (CMod)		4.5 6.37
F752	0752	Easy setting mode parameter 2	-	-		4 (FMod)		
F753	0753	Easy setting mode parameter 3	-	-		9 (ACC)		
F754	0754	Easy setting mode parameter 4	-	-		10 (dEC)		
F755	0755	Easy setting mode parameter 5	-	-		12 (UL)		
F756	0756	Easy setting mode parameter 6	-	-		13 (LL)		
F757	0757	Easy setting mode parameter 7	-	-		600 (tHr)		
F758	0758	Easy setting mode parameter 8	-	-		6 (FM)		
F759	0759	Easy setting mode parameter 9	-	-		999		
F760	0760	Easy setting mode parameter 10	-	-		999		
F761	0761	Easy setting mode parameter 11	-	-		999		
F762	0762	Easy setting mode parameter 12	-	-		999		
F763	0763	Easy setting mode parameter 13	-	-		999		
F764	0764	Easy setting mode parameter 14	-	-	0-2999 (Set by communication number)	999		
F765	0765	Easy setting mode parameter 15	-	-		999		
F766	0766	Easy setting mode parameter 16	-	-		999		
F767	0767	Easy setting mode parameter 17	-	-		999		
F768	0768	Easy setting mode parameter 18	-	-		999		
F769	0769	Easy setting mode parameter 19	-	-		999		
F770	0770	Easy setting mode parameter 20	-	-		999		
F771	0771	Easy setting mode parameter 21	-	-		999		
F772	0772	Easy setting mode parameter 22	-	-		999		
F773	0773	Easy setting mode parameter 23	-	-		999		
F774	0774	Easy setting mode parameter 24	-	-		999		
F775	0775	Easy setting mode parameter 25	-	-		999		
F776	0776	Easy setting mode parameter 26	-	-		999		
F777	0777	Easy setting mode parameter 27	-	-		999		

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F778	0778	Easy setting mode parameter 28	-	-	0-2999 (Set by communication number)	999		4.5 6.37
F779	0779	Easy setting mode parameter 29	-	-		999		
F780	0780	Easy setting mode parameter 30	-	-		999		
F781	0781	Easy setting mode parameter 31	-	-		701 (F701)		
F782	0782	Easy setting mode parameter 32	-	-		50 (PSEL)		
F790	0790	Panel display selection at power on	-	-	0: HELLO 1: F791 to F794 2, 3: -	0		6.34.10
F791	0791	1st and 2nd characters of F790	hex	-	0-FFFF	2d2d		
F792	0792	3rd and 4th characters of F790	hex	-	0-FFFF	2d2d		
F793	0793	5th and 6th characters of F790	hex	-	0-FFFF	2d2d		
F794	0794	7th and 8th characters of F790	hex	-	0-FFFF	2d2d		
F799	0799	Factory specific coefficient 7A	-	-	-	-		*3

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- Communication parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F800	0800	Baud rate	-	-	3: 9600bps 4: 19200bps 5: 38400bps	4		6.38.1
F801	0801	Parity	-	-	0: No parity 1: Even parity 2: Odd parity	1		
F802	0802	Inverter number	-	1/1	0-247	0		
F803	0803	Communication time-out time	s	0.1/0.1	0.0: Disabled, 0.1-100.0	0.0		
F804	0804	Communication time-out action	-	-	0: Alarm only 1: Trip (Coast stop) 2: Trip (Deceleration stop)	0		
F805	0805	Communication waiting time	s	0.01/0.01	0.00-2.00	0.00		
F806	0806	Setting of master and slave for communication between inverters	-	-	0: Slave (0 Hz command issued in case the master inverter fails) 1: Slave (Operation continued in case the master inverter fails) 2: Slave (Emergency stop tripping in case the master inverter fails) 3: Master (transmission of frequency commands) 4: Master (transmission of output frequency signals)	0		
F808	0808	Communication time-out detection condition	-	-	0: Valid at any time 1: Communication selection of FNOd or CNOd 2: 1 + during operation	1		

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Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F810	0810	Communication command point selection	-	1/1	0: Disabled 1: Enabled	0		6.10.2 6.38.1
F811	0811	Communication command point 1 setting	%	1/1	0-100	0		
F812	0812	Communication command point 1 frequency	Hz	0.1/0.01	0.0-FH	0.0		
F813	0813	Communication command point 2 setting	%	1/1	0-100	100		
F814	0814	Communication command point 2 frequency	Hz	0.1/0.01	0.0-FH	*1		
F829	0829	Selection of communication protocol	-	-	0: Toshiba inverter protocol 1: Modbus RTU protocol	0		6.38.1
F856	0856	Number of motor poles for communication	-	-	1: 2 poles 2: 4 poles 3: 6 poles 4: 8 poles 5: 10 poles 6: 12 poles 7: 14 poles 8: 16 poles	2		
F870	0870	Block write data 1	-	-	0: No selection 1: Communication command 1 2: Communication command 2 3: Frequency command value 4: Output data on the terminal block 5: FM analog output 6: Motor speed command	0		
F871	0871	Block write data 2	-	-		0		
F875	0875	Block read data 1	-	-	0: No selection 1: Status information 1 2: Output frequency 3: Output current 4: Output voltage 5: Alarm information 6: PID feedback value 7: Input terminal monitor 8: Output terminal monitor 9: Terminal VIA monitor 10: Terminal VIB monitor 11: Terminal VIC monitor 12: Input voltage (DC detection) 13: Motor speed 14: Torque	0		
F876	0876	Block read data 2	-	-		0		
F877	0877	Block read data 3	-	-		0		
F878	0878	Block read data 4	-	-		0		
F879	0879	Block read data 5	-	-		0		
F880	0880	Free notes	-	1/1	0-65530 (65535)	0		6.38.3
F898	0898	Factory specific coefficient 8A	-	-	-	-		*3
F899	0899	Communication function reset	-	-	0: - 1: Reset (after execution: 0)	0		6.38.1

*1: Default setting values vary depending on the setup menu setting. Refer to section 11.5.

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- PM motor parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F900	0900	Factory specific coefficient 9A	-	-	-	-		*3
F901	0901	Factory specific coefficient 9B	-	-	-	-		
F902	0902	Factory specific coefficient 9C	-	-	-	-		
F909	0909	Factory specific coefficient 9D	-	-	-	-		
F910	0910	Step-out detection current level	%	1/1	1-150	100		6.39
F911	0911	Step-out detection time	s	0.01/0.01	0.00: No detection 0.01-2.55	0.00		
F912	0912	q-axis inductance	mH	0.01/0.01	0.01-650.0	10.00		6.25.2 6.39
F913	0913	d-axis inductance	mH	0.01/0.01	0.01-650.0	10.00		
F914	0914	Factory specific coefficient 9E	-	-	-	-		* 3
F915	0915	Factory specific coefficient 9L	-	-	-	-		
F916	0916	Factory specific coefficient 9F	-	-	-	-		
F917	0917	Factory specific coefficient 9G	-	-	-	-		
F918	0918	Factory specific coefficient 9H	-	-	-	-		
F919	0919	Factory specific coefficient 9I	-	-	-	-		
F920	0920	Factory specific coefficient 9J	-	-	-	-		
F930	0930	Factory specific coefficient 9K	-	-	-	-		

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- Traverse parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F980	0980	Traverse selection	-	1/1	0: Disabled 1: Enabled	0		6.40
F981	0981	Traverse acceleration time	s	0.1/0.1	0.1-120.0	25.0		
F982	0982	Traverse deceleration time	s	0.1/0.1	0.1-120.0	25.0		
F983	0983	Traverse step	%	0.1/0.1	0.0-25.0	10.0		
F984	0984	Traverse jump step	%	0.1/0.1	0.0-50.0	10.0		

- Factory specific parameters

Title	Function	Reference
A900-A977	Factory specific coefficient	*3

*3: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- Communication option parameters

Title	Function	Reference
C000-C119, C900-C909	Communication option common parameters	E6581913
C120-C149	CC-Link option parameters	E6581830
C150-C199	ProfiBus DP option parameters	E6581738
C200-C249	DeviceNet option parameters	E6581737
C400-C449, C850-C899	EtherCAT option parameters	E6581818
C500-C549	EtherNet common parameters	E6581741
C550-C599	EtherNet/IP option parameters	
C600-C649	Modbus TCP option parameters	
C700-C799, C800-C830	CANopen communication parameters	E6581911

Note) Refer to each Instruction Manual for option about detailed specifications.

11.4 Default settings by inverter rating

Inverter type	Torque boost value ub/F172 (%)	Dynamic braking resistance F308 (Ω)	Dynamic braking resistor capacity F309 (kW)	Automatic torque boost value F402 (%)	Motor rated capacity F405 (kW)	Motor rated current F415 (A)	Motor no-load current F416 (%)	Over-voltage stall protection level F626 (%)	Integrating wattmeter display unit selection F749
VFS15-2004PM-W	6.0	200.0	0.12	6.2	0.40	2.0	65	136	0
VFS15-2007PM-W	6.0	200.0	0.12	5.8	0.75	3.4	60	136	0
VFS15-2015PM-W	6.0	75.0	0.12	4.3	1.50	6.2	55	136	0
VFS15-2022PM-W	5.0	75.0	0.12	4.1	2.20	8.9	52	136	0
VFS15-2037PM-W	5.0	40.0	0.12	3.4	4.00	14.8	48	136	1
VFS15-2055PM-W	4.0	15.0	0.44	3.0	5.50	21.0	46	136	1
VFS15-2075PM-W	3.0	15.0	0.44	2.5	7.50	28.2	43	136	1
VFS15-2110PM-W	2.0	7.5	0.88	2.3	11.00	40.6	41	136	1
VFS15-2150PM-W	2.0	7.5	0.88	2.0	15.00	54.6	38	136	1
VFS15S-2002PL-W	6.0	200.0	0.12	8.3	0.20	1.2	70	136	0
VFS15S-2004PL-W	6.0	200.0	0.12	6.2	0.40	2.0	65	136	0
VFS15S-2007PL-W	6.0	200.0	0.12	5.8	0.75	3.4	60	136	0
VFS15S-2015PL-W	6.0	75.0	0.12	4.3	1.50	6.2	55	136	0
VFS15S-2022PL-W	5.0	75.0	0.12	4.1	2.20	8.9	52	136	0
VFS15-4004PL-W	6.0	200.0	0.12	6.2	0.40	1.0	65	141	0
VFS15-4007PL-W	6.0	200.0	0.12	5.8	0.75	1.7	60	141	0
VFS15-4015PL-W	6.0	200.0	0.12	4.3	1.50	3.1	55	141	0
VFS15-4022PL-W	5.0	200.0	0.12	4.1	2.20	4.5	52	141	0
VFS15-4037PL-W	5.0	160.0	0.12	3.4	4.00	7.4	48	141	1
VFS15-4055PL-W	4.0	60.0	0.44	2.6	5.50	10.5	46	141	1
VFS15-4075PL-W	3.0	60.0	0.44	2.3	7.50	14.1	43	141	1
VFS15-4110PL-W	2.0	30.0	0.88	2.2	11.00	20.3	41	141	1
VFS15-4150PL-W	2.0	30.0	0.88	1.9	15.00	27.3	38	141	1

*1: When region setting is JP, F405 is set to 3.7(kW).

11.5 Default settings by setup menu

Function		Title	Main regions			
			EU (Europe)	AS IA (Asia, Oceania) Note 1)	USA (North America)	JP (Japan)
Frequency		UL / uL / F170 / F204 / F213 / F219 / F330 / F367 / F814	50.0(Hz)	50.0(Hz)	60.0(Hz)	60.0(Hz)
Base frequency voltage 1, 2	240V class	uLu / F171	230(V)	230(V)	230(V)	200(V)
	500V class		400(V)	400(V)	460(V)	400(V)
V/F control mode selection		Pt	0	0	0	2
Supply voltage correction (output voltage limitation)		F307	2	2	2	3
Regenerative over-excitation upper limit		F319	120	120	120	140
Motor rated speed		F417	1410(min^{-1})	1410(min^{-1})	1710(min^{-1})	1710(min^{-1})

Note1) Refer to section 3.1 about setup menu.

11.6 Input Terminal Function

It can be assigned the function No. in the following table to parameter F104, F108, F110 to F118, F151 to F156, A973 to A976.

- Table of input terminal functions 1

Function No.	Code	Function	Action	Reference
0,1	-	No function	Disabled	-
2	F	Forward run command	ON: Forward run, OFF: Deceleration stop	7.2.1
3	FN	Inversion of forward run command	Inversion of F	
4	R	Reverse run command	ON: Reverse run, OFF: Deceleration stop	
5	RN	Inversion of reverse run command	Inversion of R	
6	ST	Standby	ON: Ready for operation OFF: Coast stop (gate OFF)	3.1.1 5.9
7	STN	Inversion of standby	Inversion of ST	6.7.1 6.34.8
8	RES	Reset command 1 *2	ON: Acceptance of reset command, ON → OFF: Trip reset	13.2
9	RESN	Inversion of reset command 1 *2	Inversion of RES	
10	SS1	Preset-speed command 1	Selection of 15-speed SS1 to SS4 (SS1N to SS4N) (4 bits)	5.7 7.2.1
11	SS1N	Inversion of preset-speed command 1		
12	SS2	Preset-speed command 2		
13	SS2N	Inversion of preset-speed command 2		
14	SS3	Preset-speed command 3		
15	SS3N	Inversion of preset-speed command 3		
16	SS4	Preset-speed command 4		5.7
17	SS4N	Inversion of preset-speed command 4		
18	JOG	Jog run mode	ON: Jogging mode, OFF: Jog run canceled	6.14
19	JOGN	Inversion of jog run mode	Inversion of JOG	
20	EXT	Emergency stop by external signal	ON: E trip stop, OFF: After stopped by F603, E trip	6.29.4
21	EXTN	Inversion of emergency stop by external signal	Inversion of EXT	
22	DB	DC braking command	ON: DC braking, OFF: Brake canceled	6.12.1
23	DBN	Inversion of DC braking command	Inversion of DB	
24	AD2	2nd acceleration/deceleration	ON: Acceleration/deceleration 2 OFF: Acceleration/deceleration 1	6.8.1 6.27.2
25	AD2N	Inversion of 2nd acceleration/deceleration	Inversion of AD2	
26	AD3	3rd acceleration/deceleration	ON: Acceleration/deceleration 3 OFF: Acceleration/deceleration 1 or 2	
27	AD3N	Inversion of 3rd acceleration/deceleration	Inversion of AD3	
28	VF2	2nd V/F control mode switching	ON: 2nd V/F control mode (V/F fixed, F170, F171, F172, F173 (tHr when F632=2 or 3)) OFF: 1st V/F control mode (Pt setting, vL, vLv, vb, tHr)	6.8.1
29	VF2N	Inversion of 2nd V/F control mode switching	Inversion of VF2	
32	OCS2	2nd stall prevention level	ON: Enabled at the value of F185, F444 and F445 OFF: Enabled at the value of F601, F441 and F443	6.8.1 6.29.2
33	OCS2N	Inversion of 2nd stall prevention level	Inversion of OCS2	
36	PID	PID control prohibition	ON: PID control prohibited, OFF: PID control enabled	6.24
37	PIDN	Inversion of PID control prohibition	Inversion of PID	
46	OH2	External thermal error input	ON: OH2 trip stop, OFF: Disabled	7.2.1
47	OH2N	Inversion of external thermal error input	Inversion of OH2	
48	SCLC	Forced local from communication	Enabled during communication ON: Local (Setting of CM0d, FM0d) OFF: Communication	6.2.1 6.38
49	SCLCN	Inversion of forced local from communication	Inversion of SCLC	
50	HD	Operation hold (hold of 3-wire operation)	ON: F (forward run), R: (reverse run) held, 3-wire operation OFF: Deceleration stop	7.2.1
51	HDN	Inversion of operation hold (hold of 3-wire operation)	Inversion of HD	

*2: These functions are cannot be assigned to Always active function selection 1 to 3 (F104, F108, F110).

- Table of input terminal functions 2

Function No.	Code	Function	Action	Reference
52	IDC	PID integral/differential clear	ON: Integral/differential clear, OFF: Clear canceled	6.24
53	IDCN	Inversion of PID integral/differential clear	Inversion of IDC	
54	DR	PID characteristics switching	ON: Inverted characteristics of F380 selection OFF: Characteristics of F380 selection	
55	DRN	Inversion of PID characteristics switching	Inversion of DR	
56	FORCE	Forced run operation	ON: Forced run operation if specified faults are occurred (F294 frequency) OFF: Normal operation	6.30
57	FORCEN	Inversion of forced run operation	Inversion of FORCE	
58	FIRE	Fire speed operation	ON: Fire speed operation (F294 frequency) OFF: Normal operation	
59	FIREN	Inversion of fire speed operation	Inversion of FIRE	
60	DWELL	Acceleration/deceleration suspend signal	ON: Acceleration/deceleration suspend OFF: Normal operation	6.23
61	DWELLN	Inversion of acceleration/deceleration suspend signal	Inversion of DWELL	
62	KEB	Power failure synchronized signal	ON: Deceleration stop with synchronizing when power failure OFF: Normal operation	6.19.2
63	KEBN	Inversion of power failure synchronized signal	Inversion of KEB	
64, 65		Factory specific coefficient	-	*1
70, 71		Factory specific coefficient	-	*1
74	CKWH	Integrating wattmeter(kWh) display clear	ON: Integrating wattmeter(kwh) monitor display clear OFF: Disabled	6.36
75	CKWHN	Inversion of integrating wattmeter display clear	Inversion of CKWH	
76	TRACE	Trace back trigger signal	ON: Trigger(start) signal of trace function OFF: Disabled	6.35
77	TRACEN	Inversion of trace back trigger signal	Inversion of TRACE	
78	HSLL	Light-load high-speed operation prohibitive signal	ON: Light-load high-speed operation prohibited OFF: Light-load high-speed operation permitted	6.21
79	HSLLN	Inversion of light-load high-speed operation prohibitive signal	Inversion of HSLL	
80	HDRY	Holding of RY-RC terminal output	ON: Once turned on, RY-RC are held on. OFF: The status of RY-RC changes in real time according to conditions.	7.2.2
81	HDRYN	Inversion of holding of RY-RC terminal output	Inversion of HDRY	
82	HDOUT	Holding of OUT-NO terminal output	ON: Once turned on, OUT-NO are held on. OFF: The status of OUT-NO changes in real time according to conditions.	
83	HDOUTN	Inversion of holding of OUT-NO terminal output	Inversion of HDOUT	
88	UP	Frequency UP	ON: Frequency increased OFF: Frequency increase canceled	6.10.4
89	UPN	Inversion of frequency UP	Inversion of UP	
90	DWN	Frequency DOWN	ON: Frequency decreased OFF: Frequency decrease canceled	
91	DWNN	Inversion of frequency DOWN	Inversion of DWN	
92	CLR	Clear frequency UP/DOWN	OFF → ON: Clear frequency UP/DOWN	
93	CLRN	Inversion of clear frequency UP/DOWN	Inversion of CLR	
96	FRR	Coast stop command	ON: Coast stop (Gate OFF) OFF: Coast stop canceled	3.1.1 6.34.8
97	FRRN	Inversion of coast stop command	Inversion of FRR	
98	FR	Forward/reverse selection	ON: Forward operation command OFF: Reverse operation command	7.2.1
99	FRN	Inversion of forward/reverse selection	Inversion of FR	

*1: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

- Table of input terminal functions 3

Function No.	Code	Function	Action	Reference
100	RS	Run/Stop command	ON: Run command OFF: Stop command	7.2.1
101	RSN	Inversion of run/Stop command	Inversion of RS	
104	FCHG	Frequency setting mode forced switching	ON: F207 (F200=0) OFF: FNOd	6.2.1
105	FCHGN	Inversion of frequency setting mode forced switching	Inversion of FCHG	
106	FMTB	Frequency setting mode terminal block	ON: Terminal block (VIA) enabled OFF: Setting of FNOd	
107	FMTBN	Inversion of frequency setting mode terminal block	Inversion of FMTB	
108	CMTB	Command mode terminal block	ON: Terminal block enabled OFF: Setting of CNOd	
109	CMTBN	Inversion of command mode terminal block	Inversion of CMTB	
110	PWE	Parameter editing permission	ON: Parameter editing permitted OFF: Setting of F700	6.34.1
111	PWEN	Inversion of parameter editing permission	Inversion of PWE	
120	FSTP1	Fast stop command 1	ON: Dynamic quick deceleration command OFF: Forced deceleration canceled (Note that operation is resumed when forced deceleration is canceled)	6.1.4
121	FSTP1N	Inversion of fast stop command 1	Inversion of FSTP1	
122	FSTP2	Fast stop command 2	ON: Automatic deceleration OFF: Forced deceleration canceled (Note that operation is resumed when forced deceleration is canceled)	
123	FSTP2N	Inversion of fast stop command 2	Inversion of FSTP2	
134	TVS	Traverse permission signal	ON: Permission signal of traverse operation OFF: Normal operation	6.40
135	TVSN	Inversion of traverse permission signal	Inversion of TVS	
136	RSC	Low voltage operation signal	ON: Low voltage operation OFF: Low voltage operation canceled	6.17
137	RSCN	Inversion of low voltage operation signal	Inversion of RSC	
140	SLOWF	Forward deceleration	ON: Forward operation with F383 frequency OFF: Normal operation	6.22.2
141	SLOWFN	Inversion of forward deceleration	Inversion of SLOWF	
142	STOPF	Forward stop	ON: Forward stop, OFF: Normal operation	
143	STOPFN	Inversion of forward stop	Inversion of STOPF	
144	SLOWR	Reverse deceleration	ON: Reverse operation with F383 frequency OFF: Normal operation	
145	SLOWRN	Inversion of reverse deceleration	Inversion of SLOWR	
146	STOPR	Reverse stop	ON: Reverse stop, OFF: Normal operation	
147	STOPRN	Inversion of reverse stop	Inversion of STOPR	
148 to 151		Factory specific coefficient	-	*1
152	MOT2	No.2 motor switching (AD2+VF2+OCS2)	ON: No.2 motor (Pt=0, F170, F171, F172, F173 (tHr when F632=2 or 3), F185, F500, F501, F503) OFF: No.1 motor (Set value of Pt, uL, uLv, ub, tHr, ACC, dEC, F502, F601)	6.8.1
153	MOT2N	Inversion of No.2 motor switching (AD2+VF2+OCS2)	Inversion of MOT2	
158	RES2	Reset command 2 *2	ON: Trip reset	13.2
159	RES2N	Inversion of reset command 2 *2	Inversion of RES2	
200	PWP	Parameter editing prohibition	ON: Parameter editing prohibited OFF: Setting of F700	6.34.1
201	PWPN	Inversion of parameter editing prohibition	Inversion of PWP	
202	PRWP	Parameter reading prohibition	ON: Parameter reading / editing prohibited OFF: Setting of F700	
203	PRWPN	Inversion of parameter reading prohibition	Inversion of PRWP	

*1: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

*2: These functions are cannot be assigned to Always active function selection 1 to 3 (F104, F108, F110).

Note 1: Function No. that are not described in the table above are assigned "No function".

- Input terminal function priority

Code	Function No.	2,3 4,5	6,7	8,9	10,11 12,13 14,15 16,17	18 19	20 21	22 23	24,25 28,29 32,33	36,37 52,53 54,55	48 49 106 107 108 109	50 51	88,89 90,91 92,93	96 97	110 111 200 201	122 123
F/ R	2,3 4,5		X	○	○	○	X	X	○	○	○	○	○	X	○	X
ST	6,7	◎		○	◎	◎	○	◎	○	○	○	◎	○	○	○	◎
RES	8,9	○	○		○	○	X	○	○	○	○	○	○	○	○	○
SS1/ SS2/ SS3/ SS4	10,11 12,13 14,15 16,17	○	X	○		X	X	X	○	○	○	○	○	X	○	X
JOG	18,19	○	X	○	◎		X	X	○	◎	○	X	○	X	○	X
EXT	20,21	◎	○	◎	◎	◎		◎	○	○	○	◎	○	○	○	◎
DB	22,23	◎	X	○	◎	◎	X		○	◎	○	◎	○	X	○	X
AD2/ VF2/ OCS2	24,25 28,29 32,33	○	○	○	○	○	○	○		○	○	○	○	○	○	○
PID/ IDC/ PIDSW	36,37 52,53 54,55	○	○	○	○	X	○	X	○		○	○	○	○	○	○
SCLC/ FMTB/ CMTB	48,49 106,107 108,109	○	○	○	○	○	○	○	○	○		○	○	○	○	○
HD	50,51	○	X	○	○	X	X	X	○	○	○		○	X	○	X
UP/ DWN/ CLR	88,89 90,91 92,93	○	○	○	○	○	○	○	○	○	○	○		○	○	○
FRR	96,97	◎	○	○	◎	◎	○	◎	○	○	○	◎	○		○	◎
PWE/ PWP	110,111 200,201	○	○	○	○	○	○	○	○	○	○	○	○	○		○
FST	122,123	◎	X	○	◎	◎	X	◎	○	○	○	◎	○	X	○	

◎ Priority ○ Enabled X Disabled

11.7 Output Terminal Function

It can be assigned the function No. in the following table to parameter F130 to F138, F157, F158.

- Table of output terminal functions 1

Function No.	Code	Function	Action	Reference
0	LL	Frequency lower limit	ON: Output frequency is more than LL OFF: Output frequency is LL or less	5.4
1	LLN	Inversion of frequency lower limit	Inversion of LL	
2	UL	Frequency upper limit	ON: Output frequency is UL or more OFF: Output frequency is less than UL	
3	ULN	Inversion of frequency upper limit	Inversion of UL	
4	LOW	Low-speed detection signal	ON: Output frequency is F100 or more OFF: Output frequency is less than F100	6.5.1 7.2.2
5	LOWN	Inversion of low-speed detection signal	Inversion of LOW	
6	RCH	Output frequency attainment signal (acceleration/deceleration completed)	ON: Output frequency is within command frequency ± F102 OFF: Output frequency is more than command frequency ± F102	6.5.2 7.2.2
7	RCHN	Inversion of output frequency attainment signal (inversion of acceleration/deceleration completed)	Inversion of RCH	
8	RCHF	Set frequency attainment signal	ON: Output frequency is within F101±F102 OFF: Output frequency is more than F101±F102	6.5.3
9	RCHFN	Inversion of set frequency attainment signal	Inversion of RCHF	
10	FL	Fault signal (trip output)	ON: Inverter tripped OFF: Inverter not tripped	7.2.2
11	FLN	Inversion of fault signal (inversion of trip output)	Inversion of FL	
14	POC	Over-current detection pre-alarm	ON: Output current is F601 or more OFF: Output current is less than F601	6.29.2
15	POCN	Inversion of over-current detection pre-alarm	Inversion of POC	
16	POL	Overload detection pre-alarm	ON: F657(%) or more of calculated value of overload protection level OFF: Less than F657(%) of calculated value of overload protection level	5.6
17	POLN	Inversion of overload detection pre-alarm	Inversion of POL	
20	POH	Overheat detection pre-alarm	ON: Approx. 95°C or more of IGBT element OFF: Less than approx. 95°C of IGBT element (90°C or less after detection is turned on)	7.2.2
21	POHN	Inversion of overheat detection pre-alarm	Inversion of POH	
22	POP	Overvoltage detection pre-alarm	ON: Overvoltage limit in operation OFF: Overvoltage detection canceled	6.19.5
23	POPN	Inversion of overvoltage detection pre-alarm	Inversion of POP	
24	MOFF	Power circuit undervoltage detection	ON: Power circuit undervoltage (MOFF) detected OFF: Undervoltage detection canceled	6.29.13
25	MOFFN	Inversion of power circuit undervoltage detection	Inversion of MOFF	
26	UC	Small current detection	ON: After output current comes to F611 or less, value of less than F611+F609 for F612 set time OFF: Output current is more than F611 (F611+F609 or more after detection turns on)	6.29.7
27	UCN	Inversion of small current detection	Inversion of UC	
28	OT	Over-torque detection	ON: After torque comes to F615 or more, value of more than F615-F619 for F618 set time OFF: Torque is less than F615 (F615-F619 or less after detection turns on)	6.29.10
29	OTN	Inversion of over-torque detection	Inversion of OT	

- Table of output terminal functions 2

Function No.	Code	Function	Action	Reference
30	POLR	Braking resistor overload pre-alarm	ON: 50% or more of calculated value of F309 set overload protection level OFF: Less than 50% of calculated value of F309 set overload protection level	6.19.4
31	POLRN	Inversion of braking resistor overload pre-alarm	Inversion of POLR	
40	RUN	Run/stop	ON: While operation frequency is output or DC braking is in operation (db) OFF: Operation stopped	7.2.2
41	RUNN	Inversion of run/stop	Inversion of RUN	
42	HFL	Serious failure	ON: At trip *2 OFF: Other than those trip above	
43	HFLN	Inversion of serious failure	Inversion of HFL	
44	LFL	Light failure	ON: At trip (OC 1~3, OP 1~3, OH, OL 1~3, OLr) OFF: Other than those trip above	
45	LFLN	Inversion of light failure	Inversion of LFL	
50	FAN	Cooling fan ON/OFF	ON: Cooling fan is in operation OFF: Cooling fan is off operation	6.29.11
51	FANN	Inversion of cooling fan ON/OFF	Inversion of FAN	
52	JOG	In jogging operation	ON: In jogging operation OFF: Other than jogging operation	6.14
53	JOGN	Inversion of in jogging operation	Inversion of JOG	
54	JBM	Operation panel / terminal block operation	ON: At terminal block operation command OFF: Other than those operation above	6.2.1
55	JBMN	Inversion of operation panel/terminal block operation	Inversion of JBM	
56	COT	Cumulative operation time alarm	ON: Cumulative operation time is F621 or more OFF: The cumulative operation time is less than F621	6.29.12
57	COTN	Inversion of cumulative operation time alarm	Inversion of COT	
58	COMOP	Communication option communication error	ON: Communication error of communication option occurs OFF: Other than those above	6.38
59	COMOPN	Inversion of communication option communication error	Inversion of COMOP	
60	FR	Forward/reverse run	ON: Reverse run OFF: Forward run (Operation command state is output while motor operation is stopped. No command is to OFF.)	7.2.2
61	FRN	Inversion of forward/reverse run	Inversion of FR	
62	RDY1	Ready for operation 1	ON: Ready for operation (with ST / RUN) OFF: Other than those above	
63	RDY1N	Inversion of ready for operation 1	Inversion of RDY1	
64	RDY2	Ready for operation 2	ON: Ready for operation (without ST / RUN) OFF: Other than those above	
65	RDY2N	Inversion of ready for operation 2	Inversion of RDY2	
68	BR	Brake release	ON: Brake exciting signal OFF: Brake releasing signal	6.22
69	BRN	Inversion of brake release	Inversion of BR	
70	PAL	Pre-alarm	ON: One of the following is turned on ON POL, POHR, POT, MOFF, UC, OT, LL stop, COT, and momentary power failure deceleration stop. Or C, P, Or, H issues an alarm OFF: Other than those above	7.2.2
71	PALN	Inversion of pre-alarm	Inversion of PAL	
78	COME	RS485 communication error	ON: Communication error occurred OFF: Communication works	6.38
79	COMEN	Inversion of RS485 communication error	Inversion of COME	

*2: At trip OCL, OCA, EPH1, EPH0, Ot, Ot2, OtL3, UtL3, OH2, E, EEP1~3, Err2~5, UC, UP1, Etn, Etn1~3, EF2, PrF, EtYP, E-13, E-18~21, E-23, E-26, E-32, E-37, E-39.

- Table of output terminal functions 3

Function No.	Code	Function	Action	Reference
92	DATA1	Designated data output 1	ON: bit0 of FA50 is ON OFF: bit0 of FA50 is OFF	6.38
93	DATA1N	Inversion of designated data output 1	Inversion of DATA1	
94	DATA2	Designated data output 2	ON: bit1 of FA50 is ON OFF: bit1 of FA50 is OFF	
95	DATA2N	Inversion of designated data output 2	Inversion of DATA2	
106	LLD	Light load output	ON: Less than heavy load torque (F335~F338) OFF: heavy load torque (F335~F338) or more	6.21
107	LLDN	Inversion of light load output	Inversion of LLD	
108	HLD	Heavy load output	ON: Heavy load torque (F335~F338) or more OFF: Less than heavy load torque (F335~F338)	
109	HLDN	Inversion of heavy load output	Inversion of HLD	
120	LLS	Lower limit frequency stop	ON: Lower limit frequency continuous operation OFF: Other than those above	6.13
121	LLSN	Inversion of lower limit frequency stop	Inversion of LLS	
122	KEB	Power failure synchronized operation	ON: Power failure synchronized operation OFF: Other than those above	6.19.2
123	KEBN	Inversion of power failure synchronized operation	Inversion of KEB	
124	TVS	Traverse in progress	ON: Traverse in progress OFF: Other than those above	6.40
125	TVSN	Inversion of traverse in progress	Inversion of TVS	
126	TVSD	Traverse deceleration in progress	ON: Traverse deceleration in progress OFF: Other than those above	
127	TVSDN	Inversion of traverse deceleration in progress	Inversion of TVSD	
128	LTA	Parts replacement alarm	ON: Any one of cooling fan, control board capacitor, or main circuit capacitor reaches parts replacement time OFF: Any one of cooling fan, control board capacitor, or main circuit capacitor does not reach parts replacement time	6.29.15
129	LTAN	Inversion of parts replacement alarm	Inversion of LTA	
130	POT	Over-torque detection pre-alarm	ON: Torque current is 70% of F616 setting value or more OFF: Torque current is less than F616x70%-F619	6.29.10
131	POTN	Inversion of over-torque detection pre-alarm	Inversion of POT	
132	FMOD	Frequency setting mode selection 1/2	ON: Select frequency setting mode selection 2 (F207) OFF: Select frequency setting mode selection 1 (Fmod)	5.8
133	FMODN	Inversion of frequency setting mode selection 1/2	Inversion of FMOD	
136	FLC	Panel / remote selection	ON: Operation command or panel OFF: Other than those above	6.2.1
137	FLCN	Inversion of panel / remote selection	Inversion of FLC	
138	FORCE	Forced continuous operation in progress	ON: Forced continuous operation in progress OFF: Other than those above	6.30
139	FORCEN	Inversion of forced continuous operation in progress	Inversion of FORCE	
140	FIRE	Specified frequency operation in progress	ON: Specified Frequency operation in progress OFF: Other than those above	
141	FIREN	Inversion of specified frequency operation in progress	Inversion of FIRE	

- Table of output terminal functions 4

Function No.	Code	Function	Action	Reference
144	PIDF	Signal in accordance of frequency command	ON: Frequency commanded by F389 and F369 are within ±F187. OFF: Other than those above	6.24
145	PIDFN	Inversion of signal in accordance of frequency command	Inversion of PIDF	
146	FLR	Fault signal (output also at a retry waiting)	ON: While inverter is tripped or retried OFF: While inverter is not tripped and not retried	6.19.3
147	FLRN	Inversion of fault signal (output also at a retry waiting)	Inversion of FLR	
150	PTCA	PTC input alarm signal	ON: PTC thermal input value is F646 or more OFF: PTC thermal input value is less than F646	6.29.16
151	PTCAN	Inversion of PTC input alarm signal	Inversion of PTCA	
152, 153		Factory specific coefficient	-	*1
154	DISK	Analog input break detection alarm	ON: VIB terminal input value is F633 or less OFF: VIB terminal input value is more than F633	6.29.14
155	DISKN	Inversion of analog input break detection alarm	Inversion of DISK	
156	LI1	F terminal status	ON: F terminal is ON status OFF: F terminal is OFF status	7.2.2
157	LI1N	Inversion of F terminal status	Inversion of LI1	
158	LI2	R terminal status	ON: R terminal is ON status OFF: R terminal is OFF status	
159	LI2N	Inversion of R terminal status	Inversion of LI2	
160	LTAF	Cooling fan replacement alarm	ON: Cooling fan reaches parts replacement time OFF: Cooling fan does not reach parts replacement time	6.29.15
161	LTAFN	Inversion of cooling fan replacement alarm	Inversion of LTAF	
162	NSA	Number of starting alarm	ON: Number of starting alarm is F648 or more OFF: Number of starting alarm is less than F648	6.29.17
163	NSAN	Inversion of number of starting alarm	Inversion of NSA	
166	DACC	Acceleration operation in progress	ON: Acceleration operation in progress OFF: Other than those above	7.2.2
167	DACCN	Inversion of acceleration operation in progress	Inversion of DACC	
168	DDEC	Deceleration operation in progress	ON: Deceleration operation in progress OFF: Other than those above	
169	DDECN	Inversion of deceleration operation in progress	Inversion of DDEC	
170	DRUN	Constant speed operation in progress	ON: Constant speed operation in progress OFF: Other than those above	
171	DRUNN	Inversion of constant speed operation in progress	Inversion of DRUN	
172	DDC	DC braking in progress	ON: DC braking in progress OFF: Other than those above	6.12.1
173	DDCN	Inversion of DC braking in progress	Inversion of DDC	
174 to 179		Factory specific coefficient	-	*1
180	IPU	Integral input power pulse output signal	ON: Integral input power unit reach OFF: Other than those above	6.33.1
182	SMPA	Shock monitoring pre-alarm signal	ON: Current / torque value reach the shock monitoring detection condition OFF: Other than those above	6.28
183	SMPAN	Inversion of Shock monitoring pre-alarm signal	Inversion of SMPA	
222 to 253		Factory specific coefficient	-	*1
254	AOFF	Always OFF	Always OFF	7.2.2
255	AON	Always ON	Always ON	

*1: Factory specific coefficient parameters are manufacturer setting parameters. Do not change the value of these parameters.

Note 1: As function No. that are not described in the table above are assigned "No function", output signal is always “OFF” at even number, output signal is always “ON” at odd number.

11.8 Application easy setting

When 1 to 7 is set by parameter AUA (Application easy setting), the parameters of the table below are set to parameter F751 to F782 (Easy setting mode parameter 1 to 32).
Parameter F751 to F782 are displayed at easy setting mode.
Refer to section 4.2 about easy setting mode.

AUA	1: Initial easy setting	2: Conveyor	3: Material handling	4: Hoisting	5: Fan	6: Pump	7: Compressor
F751	CNOd	CNOd	CNOd	CNOd	CNOd	CNOd	CNOd
F752	FNOd	FNOd	FNOd	FNOd	FNOd	FNOd	FNOd
F753	ACC	ACC	ACC	ACC	ACC	ACC	ACC
F754	dEC	dEC	dEC	dEC	dEC	dEC	dEC
F755	UL	UL	UL	UL	FH	FH	FH
F756	LL	LL	LL	LL	UL	UL	UL
F757	tHr	tHr	tHr	tHr	LL	LL	LL
F758	FM	FM	FM	FM	tHr	tHr	tHr
F759	-	Pt	Pt	Pt	FM	FM	FM
F760	-	OLM	OLM	OLM	Pt	Pt	Pt
F761	-	Sr1	Sr1	F304	F201	F201	F216
F762	-	Sr2	Sr2	F308	F202	F202	F217
F763	-	Sr3	Sr3	F309	F203	F203	F218
F764	-	Sr4	Sr4	F328	F204	F204	F219
F765	-	Sr5	Sr5	F329	F207	F207	FP1d
F766	-	Sr6	Sr6	F330	F216	F216	F359
F767	-	Sr7	Sr7	F331	F217	F217	F360
F768	-	F201	F240	F332	F218	F218	F361
F769	-	F202	F243	F333	F219	F219	F362
F770	-	F203	F250	F334	F295	F295	F363
F771	-	F204	F251	F340	F301	F301	F366
F772	-	F240	F252	F341	F302	F302	F367
F773	-	F243	F304	F345	F303	F303	F368
F774	-	F250	F308	F346	F633	F610	F369
F775	-	F251	F309	F347	F667	F611	F372
F776	-	F252	F502	F400	F668	F612	F373
F777	-	F304	F506	F405	-	F633	F380
F778	-	F308	F507	F415	-	F667	F389
F779	-	F309	F701	F417	-	F668	F391
F780	-	F701	-	F648	-	-	F621
F781	F701	F702	-	F701	-	-	-
F782	PSEL	PSEL	PSEL	PSEL	PSEL	PSEL	PSEL

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11.9 Unchangeable parameters in running

For reasons of safety, the following parameters cannot be changed during inverter running.
Change parameters while inverter stops.

［Basic parameters］

AUF	(Guidance function)	FMOd *1	(Frequency setting mode selection)
AUA	(Application easy setting)	FH	(Maximum frequency)
AU1	(Automatic acceleration/deceleration)	Pt	(V/F control mode selection)
AU2	(Torque boost setting macro function)	tYP	(Default setting)
CMOd *1	(Command mode selection)	SEt	(Checking the region setting)

［Extended parameters］

F104 to F156	F405 to F417
F190 to F199	F451
F207 / F258 / F261	F454 , F458
F301 , F302	F480 to F495
F304 to F316	F519 / F603 / F605 / F608 / F613
F319	F626 to F631
F328 to F330	F644 / F669 / F681 / F750 / F899
F340 , F341	F909 to F913
F346	F915 , F916
F348 , F349	F980
F360 / F369	A900 to A917
F375 to F378	A973 to A977
F389 / F400	

*1: CMOd and FMOd can be changed during operation by setting F736=0.
Note) Refer to “Communication manual” about parameter Cxxx.

12. Specifications

12.1 Models and their standard specifications

■ Standard specifications

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

Item		Specification														
Input voltage		1-phase 240V					3-phase 500V									
Applicable motor (kW)		0.2	0.4	0.75	1.5	2.2	0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15	
Rating	Type	VFS15S					VFS15									
	Form	2002PL -W	2004PL -W	2007PL -W	2015PL -W	2022PL -W	4004PL -W	4007PL -W	4015PL -W	4022PL -W	4037PL -W	4055PL -W	4075PL -W	4110PL -W	4150PL -W	
	Capacity (kVA) Note 1)	0.6	1.3	1.8	3.0	4.2	1.1	1.8	3.1	4.2	7.2	10.9	13.0	21.1	25.1	
	Rated output current (A) Note 2)	1.5 (1.5)	3.3 (3.3)	4.8 (4.4)	8.0 (7.9)	11.0 (10.0)	1.5 (1.5)	2.3 (2.1)	4.1 (3.7)	5.5 (5.0)	9.5 (8.6)	14.3 (13.0)	17.0 (17.0)	27.7 (25.0)	33.0 (30.0)	
	Rated output voltage Note 3)	3-phase 200V to 240V					3-phase 380V to 500V									
	Overload current rating	150%-60 seconds, 200%-0.5 second					150%-60 seconds, 200% -0.5 second									
Power supply	Voltage-current	1-phase 200V to 240V – 50/60Hz					3-phase 380V to 500V - 50/60Hz									
	Allowable fluctuation	Voltage 170V to 264V Note 4), frequency±5%					Voltage 323V to 550V Note 4), frequency ±5%									
	Required Power supply capacity (kVA) Note 5)	0.8	1.4	2.3	4.0	5.4	1.6	2.7	4.7	6.4	10.0	15.2	19.5	26.9	34.9	
Protection degree (IEC60529)		IP20					IP20									
Cooling method		Self-cooling			Forced air-cooled		Forced air-cooled									
Color		RAL7016					RAL7016									
Built-in filter		EMC filter					EMC filter									

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

Note 2. Indicates rated output current setting when the PWM carrier frequency (parameter F300) is 4kHz or less. When exceeding 4kHz, the rated output current setting is indicated in the parentheses. It needs to be further reduced for PWM carrier frequencies above 12 kHz.
The rated output current is reduced even further for 500V models with a supply voltage of 480V or more.
The default setting of the PWM carrier frequency is 12kHz.

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

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

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

■ Common specification

	Item	Specification
Principal control functions	Control system	Sinusoidal PWM control
	Output voltage range Note1)	Adjustable within the range of 50 to 330V (240V class) and 50 to 660V (500V class) by correcting the supply voltage
	Output frequency range	0.1 to 500.0Hz, default setting: 0.5 to 80Hz, maximum frequency: 30 to 500Hz
	Minimum setting steps of frequency	0.1Hz: analog input (when the max. frequency is 100Hz), 0.01Hz: Operation panel setting and communication setting.
	Frequency accuracy	Digital setting: within ±0.01% of the max. frequency (-10 to +60°C) Analog setting: within ±0.5% of the max. frequency (25°C ±10°C)
	Voltage/frequency characteristics	V/f constant, variable torque, automatic torque boost, vector control, automatic energy-saving. dynamic automatic energy-saving control (for fan and pump), PM motor control, V/F 5-point setting, Auto-tuning. Base frequency (20-500Hz) adjusting to 1 & 2, torque boost (0-30%) adjusting to 1 & 2, adjusting frequency at start (0.1-10Hz)
	Frequency setting signal	Setting dial on the front panel, external frequency potentiometer (connectable to a potentiometer with a rated impedance of 1k-10kΩ), 0-10Vdc / -10-+10Vdc (input impedance: 30kΩ), 4-20mAdc (Input impedance: 250Ω).
	Terminal block base frequency	The characteristic can be set arbitrarily by two-point setting. Possible to set: analog input (VIA, VIB, VIC).
	Frequency jump	Three frequencies can be set. Setting of the jump frequency and the range.
	Upper- and lower-limit frequencies	Upper-limit frequency: 0.5 to max. frequency, lower-limit frequency: 0 to upper-limit frequency
	PWM carrier frequency	Adjustable range of 2.0k to 16.0kHz (default: 12.0kHz).
	PID control	Setting of proportional gain, integral gain, differential gain and control waiting time. Checking whether the amount of processing amount and the amount of feedback agree.
Operation specifications	Acceleration/deceleration time	Selectable from among acceleration/deceleration times 1 & 2 & 3 (0.0 to 3600 sec.). Automatic acceleration/deceleration function. S-pattern acceleration/deceleration 1 & 2 and S-pattern adjustable. Control of forced rapid deceleration and dynamic rapid deceleration.
	DC braking	Braking start-up frequency: 0 to maximum frequency, braking rate: 0 to 100%, braking time: 0 to 25.5 seconds, emergency DC braking, motor shaft fixing control.
	Dynamic Braking Drive Circuit	Control and drive circuit is built in the inverter with the braking resistor outside (optional).
	Input terminal function (programmable)	Possible to select from among about 110 functions, such as forward/reverse run signal input, jog run signal input, operation base signal input and reset signal input, to assign to 8 input terminals. Logic selectable between sink and source.
	Output terminal functions (programmable)	Possible to select from among about 150 functions, such as upper/lower limit frequency signal output, low speed detection signal output, specified speed reach signal output and failure signal output, to assign to FL relay output, open collector output terminal, and RY output terminals.
	Forward/reverse run	The RUN and STOP keys on the operation panel are used to start and stop operation, respectively. Forward/reverse run possible through communication and logic inputs from the terminal block.
	Jog run	Jog mode, if selected, allows jog operation from the terminal block and also from remote keypad.
	Preset speed operation	Frequency references + 15-speed operation possible by changing the combination of 4 contacts on the terminal block.
	Retry operation	Capable of restarting automatically after a check of the main circuit elements in case the protective function is activated. 10 times (Max.) (selectable with a parameter)
	Various prohibition settings / Password setting	Possible to write-protect parameters and to prohibit the change of panel frequency settings and the use of operation panel for operation, emergency stop or resetting. Possible to write-protect parameters by setting 4 digits password and terminal input.
	Regenerative power ride-through control	Possible to keep the motor running using its regenerative energy in case of a momentary power failure (default: OFF).
	Auto-restart operation	In the event of a momentary power failure, the inverter reads the rotational speed of the coasting motor and outputs a frequency appropriate to the rotational speed in order to restart the motor smoothly. This function can also be used when switching to commercial power.
	Light-load high-speed operation	Increases the operating efficiency of the machine by increasing the rotational speed of the motor when it is operated under light load.
	Drooping function	When two or more inverters are used to operate a single load, this function prevents load from concentrating on one inverter due to unbalance.
	Override function	External input signal adjustment is possible to the operation frequency command value.
	Relay output signal	1c- contact output and 1a- contact output Note2) Maximum switching capacity : 250Vac-2A , 30Vdc-2A (At resistive load cosΦ=1), 250Vac-1A (cosΦ=0.4) , 30Vdc-1A (L/R=7ms) Minimum permissible load : 5Vdc-100mA, 24Vdc-5mA

<Continued overleaf>

<Continued>

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

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

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

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

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

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

12.2 Outside dimensions and mass

■ Outside dimensions and mass

Voltage class	Applicable motor (kW)	Inverter type	Dimensions (mm)							Drawing	Approx. weight (kg)
			W	H	D	W1	H1	H2	D2		
3-phase 240V	0.4	VFS15-2004PM-W	72	130	120	60	121.5	13	7.5	A	0.9
	0.75	VFS15-2007PM-W			130						1.0
	1.5	VFS15-2015PM-W	105			93				B	1.4
	2.2	VFS15-2022PM-W									1.4
	4.0	VFS15-2037PM-W	140	170	150	126	157	14		C	2.2
	5.5	VFS15-2055PM-W	150	220	170	130	210	12		D	3.5
	7.5	VFS15-2075PM-W									3.6
	11	VFS15-2110PM-W	180	310	190	160	295	20		E	6.8
	15	VFS15-2150PM-W									6.9
1-phase 240V	0.2	VFS15S-2002PL-W	72	130	101	60	131	13	7.5	A	0.8
	0.4	VFS15S-2004PL-W			120		121.5				1.0
	0.75	VFS15S-2007PL-W			135						1.1
	1.5	VFS15S-2015PL-W	105		150	93		12		B	1.6
	2.2	VFS15S-2022PL-W									1.6
3-phase 500V	0.4	VFS15-4004PL-W	107	130	153	93	121.5	13	7.5	B	1.4
	0.75	VFS15-4007PL-W									1.5
	1.5	VFS15-4015PL-W									1.5
	2.2	VFS15-4022PL-W	140	170	160	126	157	14		C	2.4
	4.0	VFS15-4037PL-W									2.6
	5.5	VFS15-4055PL-W	150	220	170	130	210	12		D	3.9
	7.5	VFS15-4075PL-W									4.0
	11	VFS15-4110PL-W	180	310	190	160	295	20		E	6.4
	15	VFS15-4150PL-W									6.5

■ Outline drawing

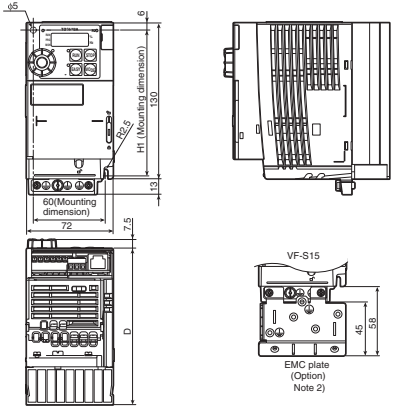
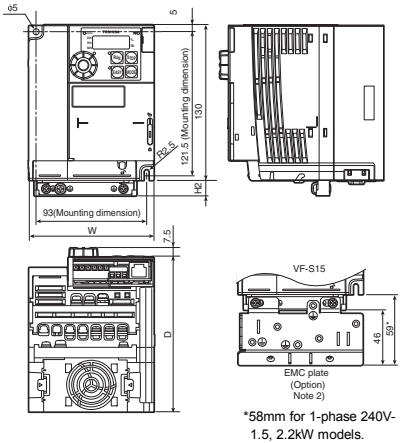


Fig.A



*58mm for 1-phase 240V-1.5, 2.2kW models.

Fig.B

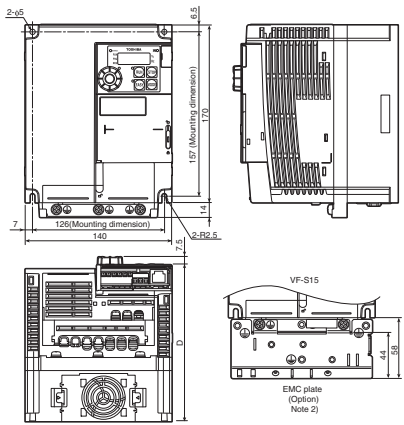


Fig.C

Note 1. To make it easier to grasp the dimensions of each inverter, dimensions common to all inverters in these figures are shown with numeric values but not with symbols.
Here are the meanings of the symbols used.
W: Width, H: Height, D: Depth
W1: Mounting dimension (horizontal)
H1: Mounting dimension (vertical)
H2: Height of EMC plate mounting area
D2: Depth of setting dial

Note 2. Here are the available EMC plate.
Fig.A : EMP007Z
Fig.B : EMP008Z
Fig.C : EMP009Z
Fig.D : EMP010Z
Fig.E : EMP011Z

Note 3. The models shown in Fig. A and Fig. B are fixed at two points: in the upper left and lower right corners.

Note 4. The model shown in Fig. A is not equipped with a cooling fan.

Note 5. The cooling fan of 1-phase 240V-1.5, 2.2kW models are on the upper side of the inverter.

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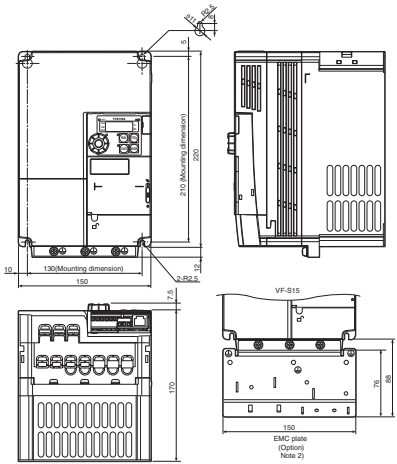
5
210 (Mounting dimension)
220
10
130(Mounting dimension)
150
2-R2.5
7.5
170
VF-S15
76
86
150
EMC plate
(Option)
Note 2)

Fig.D

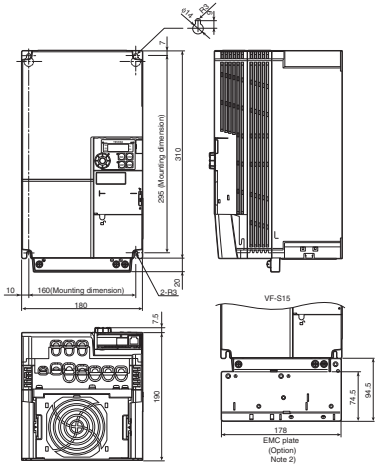
7
295 (Mounting dimension)
310
10
160(Mounting dimension)
180
2-R3
20
7.5
190
VF-S15
74.5
94.5
178
EMC plate
(Option)
Note 2)

Fig.E

13. Before making a service call - Trip information and remedies

13.1 Trip /Alarm causes and remedies

When a problem arises, diagnose it in accordance with the following table.
If it is found that replacement of parts is required or the problem cannot be solved by any remedy described in the table, contact your Toshiba distributor.

[Trip information]

Error code	Failure code	Problem	Possible causes	Remedies
OC 1	0001	Overcurrent during acceleration	• The acceleration time ACC is too short.	• Increase the acceleration time ACC.
			• The V/F setting is improper.	• Check the V/F parameter setting.
			• A restart signal is input to the rotating motor after a momentary stop, etc.	• Use F301 (auto-restart) and F302 (ride-through control).
			• A special motor (e.g. motor with a small impedance) is used.	• In case of Pt=0, 1, 7, decrease ub. • In case of Pt=2 to 6, set F415 (Motor rated current) and make an auto-tuning.
			• Low inductance motor especially High speed motor is used.	• Choose the higher power range drive. (1 class up drive is recommended.)
OC2	0002	Overcurrent during deceleration	• The deceleration time dEC is too short.	• Increase the deceleration time dEC.
			• Low inductance motor especially High speed motor is used.	• Choose the higher power range drive. (1 class up drive is recommended.)
OC3	0003	Overcurrent during constant speed operation	• The load fluctuates abruptly. • The load is in an abnormal condition.	• Reduce the load fluctuation. • Check the load (operated machine).
			• Low inductance motor especially High speed motor is used.	• Choose the higher power range drive. (1 class up drive is recommended.)
OCL	0004	Overcurrent (An overcurrent on the load side at start-up)	• The insulation of the output main circuit or motor is defective. • The motor has too small impedance.	• Check the secondary wiring and insulation state. • Set F613=2, 3
OCA	0005	Overcurrent at start-up	• A main circuit elements is defective.	• Contact your Toshiba distributor.
* EPH1	0008	Input phase failure	• A phase failure occured in the input line of the main circuit. • The capacitor in the main circuit lacks capacitance.	• Check the main circuit input line for phase failure. • Check the capacitor in the main circuit for exhaustion.
* EPH0	0009	Output phase failure	• A phase failure occurred in the output line of the main circuit.	• Check the main circuit output line, motor, etc. for phase failure. • Select output phase failure detection parameter F605.
OP 1	000A	Overvoltage during acceleration	• The input voltage fluctuates abnormally. (1) The power supply has a capacity of 500kVA or more. (2) A power factor improvement capacitor is opened or closed. (3) A system using a thyristor is connected to the same power distribution line.	• Insert a suitable input reactor.
			• A restart signal is input to the rotating motor after a momentary stop, etc.	• Use F301 (auto-restart) and F302 (ride-through control).

* This marking trips can be selected valid or invalid by parameters.

(Continued overleaf)

(Continued)

Error code	Failure code	Problem	Possible causes	Remedies
OP2	000B	Overvoltage during deceleration	• The deceleration time dEC is too short. (Regenerative energy is too large.)	• Increase the deceleration time dEC.
			• Overvoltage limit operation F305 is set to 1. (Disabled).	• Set overvoltage limit operation F305 to 0, 2, 3.
			• The input voltage fluctuates abnormally. (1) The power supply has a capacity of 500kVA or more. (2) A power factor improvement capacitor is opened and closed. (3) A system using a thyristor is connected to the same power distribution line.	• Insert a suitable input reactor.
OP3	000C	Overvoltage during constant-speed operation	• The input voltage fluctuates abnormally. (1) The power supply has a capacity of 500kVA or more. (2) A power factor improvement capacitor is opened or closed. (3) A system using a thyrister is connected to the same power distribution line.	• Insert a suitable input reactor.
			• The motor is in a regenerative state because the load causes the motor to run at a frequency higher than the inverter output frequency.	• Install an optional dynamic braking resistor. (optional)
OL 1	000D	Inverter overload	• The acceleration time ACC is too short.	• Increase the acceleration time ACC.
			• The DC braking amount is too large.	• Reduce the DC braking amount F251 and the DC braking time F252.
			• The V/F setting is improper.	• Check the V/F parameter setting.
			• A restart signal is input to the rotating motor after a momentary stop, etc.	• Use F301 (auto-restart) and F302 (ride-through control).
			• The load is too large.	• Use an inverter with a larger rating.
OL2	000E	Motor overload	• The V/F setting is improper.	• Check the V/F parameter setting.
			• The motor is locked up.	• Check the load (operated machine).
			• Low-speed operation is performed continuously. • An excessive load is applied to the motor during operation.	• Adjust OLN to the overload that the motor can withstand during operation in a low speed range.
OL3	003E	Main module overload	• The carrier frequency is high and load current has increased at low speeds (mainly at 15Hz or less).	• Raise the operation frequency. • Reduce the load. • Reduce the carrier frequency. • When an operating motor is started up at 0Hz, use the auto-restart function. • Set carrier frequency control mode selection F316 to 1 (carrier frequency with automatic reduction).
OLr	000F	Dynamic braking resistor overload trip	• The deceleration time is too short. • Dynamic braking is too large.	• Increase the deceleration time dEC. • Increase the capacity of dynamic braking resistor (wattage) and adjust PBR capacity parameter F309.
* OE	0020	Over-torque trip 1	• Over-torque reaches to a detection level during operation.	• Enable F615 (over-torque trip selection). • Check system error.
OE2	0041	Over-torque trip 2	• Output current reached F601 or more and maintain in F452 during power running. • Power running torque reached F441 or more and maintain in F452 during power running.	• Reduce the load. • Increase the stall prevention level or power running torque limit level.

* This marking trips can be selected valid or invalid by parameters.

(Continued overleaf)

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(Continued)

Error code	Failure code	Problem	Possible causes	Remedies
* OtC3	0048	Over-torque / Overcurrent fault	• Power running torque or output current reached F593 or more and maintain in F595 during power running.	• Enable F591. • Reduce the load. • Check system error.
* UtC3	0049	Small-torque / Small -current fault	• Power running torque or output current decreased F593 or less and maintain in F595 during power running.	• Enable F591. • Check system error.
OH	0010	Overheat	• The cooling fan does not rotate.	• The fan requires replacement if it does not rotate during operation.
			• The ambient temperature is too high.	• Restart the operation by resetting the inverter after it has cooled down enough.
			• The vent is blocked up.	• Secure sufficient space around the inverter.
			• A heat generating device is installed close to the inverter.	• Do not place any heat generating device near the inverter.
OH2	002E	Thermal fault stop command from external device	• A thermal trip command (input terminal function: 46 or 47) is issued by an external control device.	• The motor is overheated, so check whether the current flowing into the motor exceeds the rated current.
E	0011	Emergency stop	• During automatic operation or remote operation, a stop command is entered from the operation panel or a remote input device.	• Reset the inverter. • If the emergency stop signal is input, reset after releasing this signal.
EEP1	0012	EEPROM fault 1	• A data writing error occurs.	• Turn off the inverter, then turn it again. If it does not recover from the error, contact your Toshiba distributor.
EEP2	0013	EEPROM fault 2	• Power supply is cut off during EYP operation and data writing is aborted. • The error occurred when various data was written.	• Turn the power off temporarily and turn it back on, and then try EYP operation again. • Write the data again. Contact your Toshiba distributor when it happening frequently.
EEP3	0014	EEPROM fault 3	• A data reading error occurred.	• Turn off the inverter, then turn it again. If it does not recover from the error, contact your Toshiba distributor.
Err2	0015	Main unit RAM fault	• The control RAM is defective.	• Contact your Toshiba distributor.
Err3	0016	Main unit ROM fault	• The control ROM is defective.	• Contact your Toshiba distributor.
Err4	0017	CPU fault 1	• The control CPU is defective.	• Contact your Toshiba distributor.
Err5	0018	Communication error	• The communication was broken off.	• Check the remote control device, cables, etc.
Err7	001A	Current detector fault	• The current detector is defective.	• Contact your Toshiba distributor.
Err8	001B	Optional unit fault 1	• An optional unit has failed. (such as a communication option)	• Check the connection of optional unit.
Err9	001C	Remote keypad disconnection fault	• After run signal is activated by RUN key of the remote keypad, disconnection is occurred in 10 seconds or more.	• In case the remote keypad is disconnected, press STOP key before. • This fault is disabled by F731= 1 setting.
* UC	001D	Low-current operation fault	• The output current decreased to a low-current detection level during operation.	• Enable F610 (low-current detection). • Check the suitable detection level for the system (F609, F611, F612). • Contact your Toshiba distributor if the setting is correct.
* UP1	001E	Undervoltage fault (main circuit)	• The input voltage (in the main circuit) is too low.	• Check the input voltage. • Enable F627 (undervoltage trip selection). • To take measures to momentary power failure, set F627=0, Regenerative power ride-through control F302 and Auto-restart control selection F301.

* This marking trips can be selected valid or invalid by parameters.

(Continued overleaf)

(Continued)

Error code	Failure code	Problem	Possible causes	Remedies
Etn Etn1 Etn2 Etn3	0028 0054 0055 0056	Auto-tuning error	• The motor parameter uL, uLv, F405, F415, F417 are not set correctly.	• Set the left column parameters correctly as a motor name plate and make an auto-tuning again. • Set parameter F416 to smaller 70% of the present value, and execute the auto-tuning again.
			• The motor with the capacity of 2 classes or less than the inverter is used. • The output cable is too thin. • The inverter is used for loads other than those of three-phase induction motors.	• Set the left column parameters correctly as a motor name plate and make an auto-tuning again. • Then set F400=1, when trip occurs.
			• The motor is not connected.	• Connect the motor. • Check whether the secondary magnetic contactor.
			• The motor is rotating.	• Make an auto-tuning again after the rotation of the motor stops.
			• Parameter Pt=6 is set and High speed motor is connected.	• Choose the higher power range drive. (1 class up drive is recommended.)
EF2	0022	Ground fault	• A ground fault occurs in the output cable or the motor.	• Check the cable and the motor for ground faults.
			• Overcurrent of dynamic braking resistor	• Increase the deceleration time dEC. • Set the supply voltage correction F307 to 1 or 3.
			• When inverters are fed by AC power supply and connected with common DC bus link, unnecessary trip occurs.	• Set the parameter F614 to 0 "Disabled".
* SOUt	002F	Step-out (for PM motor drive only)	• The motor shaft is locked. • One output phase is open. • An impact load is applied. • Using the DC braking function.	• Unlock the motor shaft. • Check the interconnect cables between the inverter and the motor. • Prolong the acceleration / deceleration time. • Turn off the Step-out function when using the DC braking function or change the DC braking to Servo lock function.
EtyP	0029	Inverter type error	• It may be a breakdown failure.	• Contact your Toshiba distributor.
E-13	002D	Over speed fault	• The input voltage fluctuates abnormally. • Over speed fault due to the overvoltage limit operation.	• Check the input voltage. • Install an optional dynamic braking resistor. (optional)
* E-18	0032	Analog input break detection fault	• The input signal from VIC is equal to or less than the F633 setting.	• Check the VIC signal cable for breaks. Also, check the input signal value or setting of F633.
E-19	0033	CPU communications error	• A communications error occurs between control CPUs.	• Contact your Toshiba distributor.
E-20	0034	Over torque boost fault	• The automatic torque boost parameter F402 setting is too high. • The motor has too small impedance.	• Set a lower automatic torque boost parameter F402 setting. • Make an auto-tuning.
E-21	0035	CPU fault 2	• The control CPU is defective.	• Contact your Toshiba distributor.
E-23	0037	Optional unit fault 2	• An optional device is defective.	• Contact your Toshiba distributor.
E-26	003A	CPU fault 3	• The control CPU is defective.	• Contact your Toshiba distributor.
E-27	0057	Internal circuit fault	• Internal circuit is defective.	• Contact your Toshiba distributor.
E-32	0040	PTC fault	• PTC thermal protection is occurred.	• Check the PTC in motor.
E-37	0045	Servo lock fault	• The motor shaft is not locked in servo lock operation.	• Reduce the load in servo lock operation.

* This marking trips can be selected valid or invalid by parameters.

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(Continued)

E-39	0047	Auto-tuning error (PM motor)	• When auto-tuning (relating parameters are PE=6, F400=2), the current of the permanent magnet motor exceeded the threshold level. • The inductance of permanent magnet motor is too small.	• Auto tuning for permanent magnet motor is not allowed for this motor, please measure inductance with the LCR meter etc.

[Alarm information] Each message in the table is displayed to give a warning but does not cause the inverter to trip.

Error code	Problem	Possible causes	Remedies
OFF	ST (assigned standby function) terminal OFF	• The ST-CC (or P24) circuit is opened.	• Close the ST-CC (or P24) circuit.
NOFF	Undervoltage in main circuit	• The supply voltage between R, S and T is under voltage. • Internal communication fault.	• Measure the main circuit supply voltage. If the voltage is at a normal level, the inverter requires repairing for fault.
retry	Retry in process	• The inverter is in process of retry. • A momentary stop occurred. The motor speed is being detected.	• The inverter restarts automatically. Be careful of the machine because it may suddenly restart.
Err1	Frequency point setting error alarm	• The frequency setting signals at points 1 and 2 are set too close to each other.	• Set the frequency setting signals at points 1 and 2 apart from each other.
CLr	Clear command acceptable	• This message is displayed when pressing the STOP key while an error code is displayed.	• Press the STOP key again to clear the trip.
EOFF	Emergency stop command acceptable	• The operation panel is used to stop the operation in automatic control or remote control mode.	• Press the STOP key for an emergency stop. To cancel the emergency stop, press any other key.
HI! LO	Setting error alarm / An error code and data are displayed alternately twice each.	• An error is found in a setting when data is reading or writing.	• Check whether the setting is made correctly.
HEAd/ End	Display of first/last data items	• The first and last data item in the AUX data group is displayed.	• Press MODE key to exit the data group.
db	DC braking	• DC braking in process	• The message goes off in several tens of seconds if no problem occurs. Note 1)
E1 E2 E3	Flowing out of excess number of digits	• The number of digits such as frequencies is more than 4. (The upper digits have a priority.)	• Lower the frequency free unit magnification F702.
StOP	Momentary power failure deceleration stop prohibition function activated.	• The slowdown stop prohibition function set with F302 (momentary power failure ride-through operation) is activated.	• To restart operation, reset the inverter or input an operation signal again.
LStP	Auto-stop because of continuous operation at the lower-limit frequency	• The automatic stop function selected with F256 was activated.	• This function is cancelled, when frequency reference reaches LL+0.2Hz or operation command is OFF.
Init	Parameters in the process of initialization	• Parameters are being initialized to default values.	• Normal if the message disappears after a while (several seconds to several tens of seconds).
A-01	Points setting alarm 1	• In case of PE=7, there are same setting value at least two on parameter UL, F190, F192, F194, F196, or F198 except 0.0Hz.	• Set the points to different values.
A-02	Points setting alarm 2	• In case of PE=7, the inclination of V/f is too high.	• Set the inclination of V/f to be flat.

Note 1) When the DC braking (DB) function is assigned by using the input terminal function 22 or 23, it is normal if "db" disappears when opening the circuit between the terminal and CC(or P24).

(Continued overleaf)

(Continued)

Error code	Problem	Possible causes	Remedies
A-05	Output frequency upper limit	• An attempt was made to operate at a frequency higher than 10 times the base frequency (uL or F170).	• Operate at a frequency within 10 times the base frequency.
A-17	Operation panel key alarm	• The RUN or STOP key is held down for more than 20 seconds. • The RUN or STOP key is faulty.	• Check the operation panel.
A-27	Control terminal block connection alarm	• Control terminal block comes off. • Internal circuit is defective.	• Install the control terminal block to the inverter. • Contact your Toshiba distributor.
A-28	S3 terminal alarm	• Slide switch SW2 and parameter F147 settings are different.	• Match the settings of SW2 and F147. Power supply OFF and ON after these settings.
Atn	Auto-tuning	• Auto-tuning in process	• Normal if it the message disappears after a few seconds.
ALOS	Break in analog signal cable	• The signal input via VIC is below the analog signal detection level set with F633 and setting value of F644 is one or more.	• Check the cables for breaks. And check the setting of input signal or setting value of F633 and F644.
FirE	In forced operation	• "FirE" and operation frequency is displayed alternately in operation of forced fire-speed control.	• It is normal the alarm is gone out after the forced fire-speed control operation.
PASS／FAIL	Password verification result	• After the password setting (F738), the password was input to F739 (password verification).	• If the password is correct, PASS is displayed and if it is incorrect, FAIL is displayed.
EASY／Std	Switching display of Easy setting mode / Standard setting mode	• The EASY key was pushed in the standard monitor mode.	• When EASY is displayed, setting mode becomes easy setting mode. When Std is displayed, it becomes standard setting mode.
SEt Note 2)	Input requirement of region setting	• A region setting is not input yet. • Power supplied to the inverter at first time • As checking the region setting parameter SEt is set to 0, inverter return to default setting. • As tYP is set to 13, inverter return to default setting.	• Set a region setting by using setting dial. Refer to section 3.1.
nErr	No trip of past trip	• No new record of past trip, after past trips were clear.	• Normal operation.
n---	No detailed information of past trip	• The detailed information of past trip is read by pushing the center of setting dial during blinking nErr ⇔ number.	• Normal operation. To be returned by pressing MODE key.

Note 2) SEt is blinking after power supply is on. In this time, the keys are not operated.
But parameter SEt is lighting as same as other parameters and is not blinking.

[Prealarm display]

C	Overcurrent alarm	Same as OC (overcurrent)
P	Overvoltage alarm	Same as OP (overvoltage)
L	Overload alarm	Same as OL 1 and OL2 (overload)
H	Overheat alarm	Same as OH (overheat)
E	Communication alarm	Same as Err5 (communication fault)

If two or more problems arise simultaneously, one of the following alarms appears and blinks.
CP, PL, CPL
The blinking alarms C, P, L, H, E are displayed in this order from left to right.

13.2 Restoring the inverter from a trip

Do not reset the inverter when tripped because of a failure or error before eliminating the cause. Resetting the tripped inverter before eliminating the problem causes it to trip again.

The inverter can be restored from a trip by any of the following operations:

(1) By turning off the power (Keep the inverter off until the LED turns off.)
Note) See inverter trip hold selection F602 for details.
(2) By means of an external signal (Short circuit across RES and CC (or P24) on control terminal block → Open): The reset function must be assigned to the input terminal block. (function number 8, 9)
(3) By panel keypad operation
(4) By inputting a trip clear signal from communication
(Refer to communication manual (E6581913) for details.)

To reset the inverter by panel keypad operation, follow these steps.

1. Press the STOP key and make sure that CLr is displayed.
2. Pressing the STOP key again will reset the inverter if the cause of the trip has already been eliminated.

☆ When any overload function [OL 1: inverter overload, OL2: motor overload, OL3: main module overload, OLr: braking resistor overload] is active, the inverter cannot be reset by inputting a reset signal from an external device or by operation panel operation before the virtual cooling time has passed.

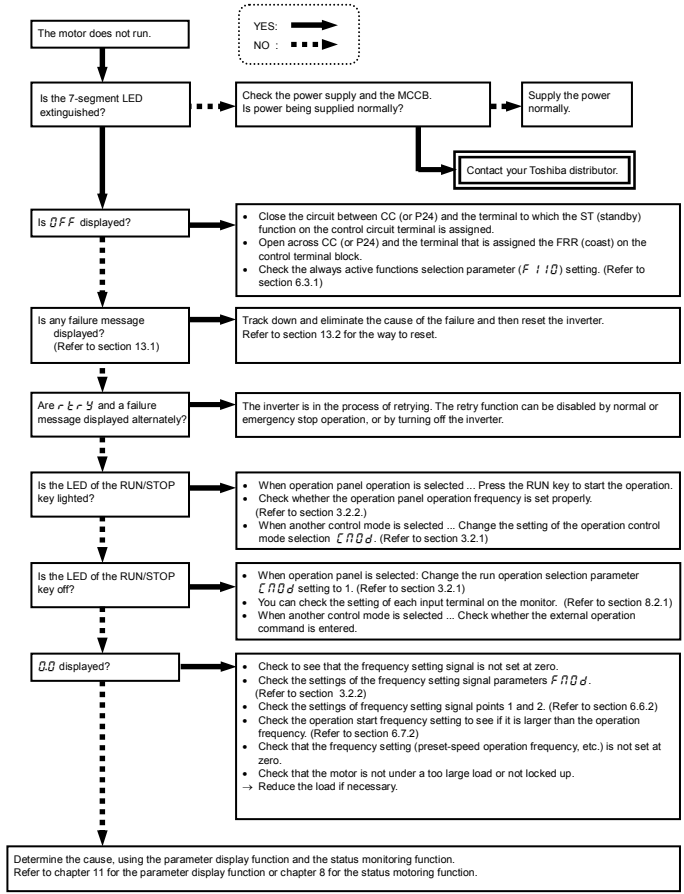
Virtual cooling time ... OL 1 : about 30 seconds after the occurrence of a trip
OL2 : about 120 seconds after a occurrence of a trip
OLr : about 20 seconds after a occurrence of a trip

☆ As to OL3 (Main module overload), there is no virtual cooling time.
☆ In case of a trip due to overheat (OH), the inverter checks the temperature within. Wait until the temperature in the inverter falls sufficiently before resetting the inverter.
☆ The inverter cannot be reset while the emergency stop signal is being input from the terminal.
☆ The inverter cannot be reset while the pre-alarm is occurred.

[Caution]
Turning the inverter off then turning it on again resets the inverter immediately. You can use this mode of resetting if there is a need to reset the inverter immediately. Note, however, that this operation may damage the system or the motor if it is repeated frequently.

13.3 If the motor does not run while no trip message is displayed ...

If the motor does not run while no trip message is displayed, follow these steps to track down the cause.



13.4 How to determine the causes of other problems

The following table provides a listing of other problems, their possible causes and remedies.

Problems	Causes and remedies
The motor runs in the wrong direction.	• Invert the phases of the output terminals U/T1, V/T2 and W/T3. • Invert the forward/reverse run-signal terminals of the external input device. (Refer to section 7.2.1) • Change the setting of the parameter Fr in the case of panel operation.
The motor runs but its speed does not change normally.	• The load is too heavy. Reduce the load. • The soft stall function is activated. Disable the soft stall function. (Refer to section 3.5) • The maximum frequency FH and the upper limit frequency UL are set too low. Increase the maximum frequency FH and the upper limit frequency UL. • The frequency setting signal is too low. Check the signal set value, circuit, cables, etc. • Check the setting characteristics (point 1 and point 2 settings) of the frequency setting signal parameters. (Refer to section 6.6.2) • If the motor runs at a low speed, check to see that the stall prevention function is activated because the torque boost value is too large. Adjust the torque boost value (ub) and the acceleration time (ACC). (Refer to section 5.13 and 5.4)
The motor does not accelerate or decelerate smoothly.	• The acceleration time (ACC) or the deceleration time (dEC) is set too short. Increase the acceleration time (ACC) or the deceleration time (dEC).
A too large current flows into the motor.	• The load is too heavy. Reduce the load. • If the motor runs at a low speed, check whether the torque boost value is too large. (Refer to section 5.13)
The motor runs at a higher or lower speed than the specified one.	• The motor has an improper voltage rating. Use a motor with a proper voltage rating. • The motor terminal voltage is too low. Check the setting of the base frequency voltage parameter (uLu). (Refer to section 5.11) Replace the cable with a cable larger in diameter. • The reduction gear ratio, etc., are not set properly. Adjust the reduction gear ratio, etc. • The output frequency is not set correctly. Check the output frequency range. • Adjust the base frequency. (Refer to section 5.11)
The motor speed fluctuates during operation.	• The load is too heavy or too light. Reduce the load fluctuation. • The inverter or motor used does not have a rating large enough to drive the load. Use an inverter or motor with a rating large enough. • Check whether the frequency setting signal changes. • If the V/F control selection parameter Pt is set at 3, check the vector control setting, operation conditions, etc. (Refer to section 5.12)
Parameter settings cannot be changed.	• Change the setting of the parameter setting selection prohibited parameter F700 to 0 (enabled) if it is set to 1 to 4 (prohibited). • Set the verification code to F739, if password has entered by the password setting F738. (Refer to section 6.29.1) • Switch off the logic input terminal, if this terminal is assigned to input terminal menu 200 to 203 (Parameter editing / reading prohibition). • For reasons of safety, some parameters cannot be reprogrammed while the inverter is running. (Refer to section 4.2)

How to cope with parameter setting-related problems

If you forget parameters which have been reset	• You can search for all reset parameters and change their settings. * Refer to section 4.3.1 for details.
If you want to return all reset parameters to their respective default settings	• You can return all parameters which have been reset to their default settings. * Refer to section 4.3.2 for details.

14. Inspection and maintenance

⚠ Warning	
Mandatory action	• The equipment must be inspected daily. If the equipment is not inspected and maintained, errors and malfunctions may not be discovered which could lead to accidents. • Before inspection, perform the following steps. (1) Shut off all input power to the inverter. (2) Wait at least 15 minutes and check to make sure that the charge lamp is no longer lit. (3) Use a tester that can measure DC voltages (400V/800V DC or more), and check that the voltage to the DC main circuits (across PA/+ - PC/-) does not exceed 45V. Performing an inspection without carrying out these steps first could lead to electric shock.

Be sure to inspect the inverter regularly and periodically to prevent it from breaking down because of the environment of use, such as temperature, humidity, dust and vibration, or deterioration of its components with aging.

14.1 Regular inspection

Since electronic parts are susceptible to heat, install the inverter in a cool, well-ventilated and dust-free place. This is essential for increasing the service life.

The purpose of regular inspections is to maintain the correct environment of use and to find any sign of failure or malfunction by comparing current operation data with past operation records.

Subject of inspection	Inspection procedure			Criteria for judgment
	Inspection item	Inspection cycle	Inspection method	
1. Indoor environment	1) Dust, temperature and gas	Occasionally	1) Visual check, check by means of a thermometer, smell check	1) Improve the environment if it is found to be unfavorable.
	2) Drop of water or other liquid	Occasionally	2) Visual check	2) Check for any trace of water condensation.
	3) Room temperature	Occasionally	3) Check by means of a thermometer	3) Max. temperature: 60°C
2. Units and components	1) Vibration and noise	Occasionally	Tactile check of the cabinet	If something unusual is found, open the door and check the transformer, reactors, contactors, relays, cooling fan, etc., inside. If necessary, stop the operation.
3. Operation data (output side)	1) Load current	Occasionally	Moving-iron type AC ammeter	To be within the rated current, voltage and temperature. No significant difference from data collected in a normal state.
	2) Voltage (*)	Occasionally	Rectifier type AC voltmeter	
	3) Temperature	Occasionally	Thermometer	

*) The voltage measured may slightly vary from voltmeter to voltmeter. When measuring the voltage, always take readings from the same circuit tester or voltmeter.

■ Check points

1. Something unusual in the installation environment
2. Something unusual in the cooling system
3. Unusual vibration or noise
4. Overheating or discoloration
5. Unusual odor
6. Unusual motor vibration, noise or overheating
7. Adhesion or accumulation of foreign substances (conductive substances)

■ Cautions about cleaning

To clean the inverter, wipe dirt off only its surface with a soft cloth but do not try to remove dirt or stains from any other part. If stubborn stains persist, remove them by wiping gently with a cloth dampened with neutral detergent or ethanol.

Never use any of the chemicals in the table below; the use of any of them may damage or peel the coating away from molded parts (such as plastic covers and units) of the inverter.

Acetone	Ethylene chloride	Tetrachloroethane
Benzen	Ethyl acetate	Trichloroethylene
Chloroform	Glycerin	Xylene

14.2 Periodical inspection

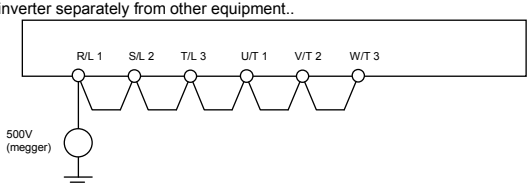
Make a periodical inspection at intervals of 3 to 6 months depending on the operating conditions.

⚠ Warning	
Mandatory action	•Before inspection, perform the following steps. (1) Shut off all input power to the inverter. (2) Wait at least 15 minutes and check to make sure that the charge lamp is no longer lit. (3) Use a tester that can measure DC voltages (400V/800V DC or more), and check that the voltage to the DC main circuits (across PA/+ - PC/-) does not exceed 45V. Performing an inspection without carrying out these steps first could lead to electric shock.
Prohibited	• Do not replace parts. This could be a cause of electric shock, fire and bodily injury. To replace parts, call your Toshiba distributor.

■ Check items

1. Check to see if all screwed terminals are tightened firmly. If any screw is found loose, tighten it again with a screwdriver.
2. Check to see if all caulked terminals are fixed properly. Check them visually to see that there is no trace of overheating around any of them.
3. Check all cables and wires for damage. Check them visually.
4. Remove dirt and dust. With a vacuum cleaner, remove dirt and dust. When cleaning, clean the vents and the printed circuit boards. Always keep them clean to prevent an accident due to dirt or dust.
5. If no power is supplied to the inverter for a long time, the performance of its large-capacity electrolytic capacitor declines.
   When leaving the inverter unused for a long time, supply it with electricity once every two years, for 5 hours or more each, to recover the performance of the large-capacity electrolytic capacitor. And also check the function of the inverter. It is advisable not to supply the commercial power directly to the inverter but to gradually increase the power supply voltage with a transformer, etc.
6. If the need arises, conduct an insulation resistance test on the main circuit terminal block only, using a 500V insulation resistance tester. Never conduct an insulation resistance test on control terminals other than terminals on the printed circuit board or on control terminals. When testing the motor for insulation resistance, separate it from the inverter in advance by disconnecting the cables from the inverter output terminals U/T1, V/T2 and W/T3. When conducting an insulation resistance test on peripheral circuits other than the motor circuit, disconnect all cables from the inverter so that no voltage is applied to the inverter during the test.
   Standard: Several MΩ or more. (Built-in noise filter cause to detect low insulation resistance.)

(Note) Before an insulation resistance test, always disconnect all cables from the main circuit terminal block and test the inverter separately from other equipment..



7. Never test the inverter for dielectric strength. A dielectric test may cause damage to its components.
8. Voltage and temperature check

   Recommended voltmeter : Input side ... Moving-iron type voltmeter ()

   Output side ... Rectifier type voltmeter ()

   It will be very helpful for detecting a defect if you always measure and record the ambient temperature before, during and after the operation.

■ Replacement of expendable parts

The inverter is composed of a large number of electronic parts including semiconductor devices.
The following parts deteriorate with the passage of time because of their composition or physical properties.
The use of aged or deteriorated parts leads to degradation in the performance or a breakdown of the inverter. To avoid such trouble, the inverter should be checked periodically.

Note) Generally, the life of a part depends on the ambient temperature and the conditions of use. The life spans listed below are applicable to parts when used under normal environmental conditions.

1) Cooling fan
   The fan for cooling heat-generating parts has a service life of about ten years. The fan also needs to be replaced if it makes a noise or vibrates abnormally.
2) Smoothing capacitor
   The smoothing aluminum electrolytic capacitor in the main circuit DC section degrades in performance because of ripple currents, etc. It becomes necessary to replace the capacitor after it is used for about 10 years under normal conditions. Since the smoothing capacitor is mounted on a printed circuit board, it must be replaced together with the circuit board.
   <Criteria for appearance check>
   - Absence of liquid leak
   - Safety valve in the depressed position
   - Measurement of electrostatic capacitance and insulation resistance

Note: Checking the life alarm function is useful for roughly determining the parts replacement time. To ensure customer safety, you should never replace parts on your own. (It is also possible to monitor the part replacement alarm and output a signal.)

■ Standard replacement cycles of principal parts

As guides, the table below lists part replacement cycles that were estimated based on the assumption that the inverter would be used in a normal use environment under normal conditions (ambient temperature, ventilation conditions, and energizing time). The replacement cycle of each part does not mean its service life but the number of years over which its failure rate does not increase significantly.
Also, make use of the life alarm function.

Part name	Standard replacement cycle Note 1:	Replacement mode and others
Cooling fan	10 years	Replacement with a new one (To be determined after inspection)
Main circuit aluminum electrolytic capacitor	10 years Note 2	Replacement with a new one (To be determined after inspection)
Relays	-	Whether to replace or not depends on the check results
Aluminum electrolytic capacitor mounted on a printed circuit board	10 years Note 2	Replace with a new circuit board (To be determined after inspection)

Note 1: The replacement cycle is calculated on the assumption that the average ambient temperature over a year is 40°C and operates 24 hours a day. The environment must be free of corrosive gases, oil mist and dust.

Note 2: Figures are for when the inverter output current is 80% of the rated current of the inverter.

Note 3: The life of parts varies greatly depending on the operating environment.

14.3 Making a call for servicing

If defective conditions are encountered, please contact your Toshiba distributor.
When making a call for servicing, please inform us of the contents of the rating label on the right panel of the inverter, the presence or absence of optional devices, etc., in addition to the details of the failure.

14.4 Keeping the inverter in storage

Take the following precautions when keeping the inverter in storage temporarily or for a long period of time.

1. Store the inverter in a well-ventilated place away from heat, damp, dust and metal powder.
2. If no power is supplied to the inverter for a long time, the performance of its large-capacity electrolytic capacitor declines.
   When leaving the inverter unused for a long time, supply it with electricity once every two years, for 5 hours or more each, to recover the performance of the large-capacity electrolytic capacitor. And also check the function of the inverter. It is advisable not to supply the commercial power directly to the inverter but to gradually increase the power supply voltage with a transformer, etc.

15. Warranty

Any part of the inverter that proves defective will be repaired and adjusted free of charge under the following conditions:

1. This warranty applies only to the inverter main unit.
2. Any part of the inverter which fails or is damaged under normal use within twelve months from the date of delivery shall be repaired free of charge.
3. For the following kinds of failure or damage, the repair cost shall be borne by the customer even within the warranty period.
   - Failure or damage caused by improper or incorrect use or handling, or unauthorized repair or modification of the inverter
   - Failure or damage caused by the inverter falling or an accident during transportation after the purchase
   - Failure or damage caused by fire, salty water or wind, corrosive gas, earthquake, storm or flood, lightning, abnormal voltage supply, or other natural disasters
   - Failure or damage caused by the use of the inverter for any purpose or application other than the intended one
4. All expenses incurred by Toshiba for on-site services shall be charged to the customer, unless a service contract is signed beforehand between the customer and Toshiba, in which case the service contract has priority over this warranty.

16. Disposal of the inverter

⚠ Caution	
Mandatory action	• If you dispose of the inverter, have it done by a specialist in industry waste disposal(*). If you dispose of the inverter by yourself, this can result in explosion of capacitor or produce noxious gases, resulting in injury. (*) Persons who specialize in the processing of waste and known as "industrial waste product collectors and transporters" or "industrial waste disposal persons". Please observe any applicable law, regulation, rule or ordinance for industrial waste disposal.

For safety's sake, do not dispose of the disused inverter yourself but ask an industrial waste disposal agent.
Disposing of the inverter improperly could cause its capacitor to explode and emit toxic gas, causing injury to persons.

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- For further information, please contact your nearest Toshiba Representative or Global Industrial Products Business Unit-Producer Goods.
- The data given in this manual are subject to change without notice.