EN

Quick Start Manual
TOSVERT VF-S15

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.
* Read the safety precautions of the instruction manual (CD-ROM) for information not mentioned here.

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.

■ 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.

EN

■ Handling	⚠ Warning
 Disassembly prohibited	• Never disassemble, modify or repair. This can result in electric shock, fire and injury. Call your Toshiba distributor for repairs.
 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.
 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.
■ Handling	⚠ 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.
 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.
■ Transportation & installation	⚠ 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. • Do not place any inflammable objects 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. • 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. Failure to do so can lead to risk of electric shock and can result in death or serious injury. • 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. • When using switchgear for the inverter, it must be installed in a cabinet. Failure to do so can lead to risk of electric shock.
■ Transportation & installation	⚠ 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. • 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.

EN

Mandatory action	• When removing and installing the terminal cover 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. • 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.
■ Wiring	⚠ 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 or VIB terminals are used as logic input terminal by external power supply. It could cause unexpected result as VIA or VIB terminals are ON status.
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. • 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) Turn off all input power. ; (2) Wait at least 15 minutes and check to make sure that the charge lamp is no longer lit. ; and (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. • 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. • 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.
Be Grounded	• Ground must be connected securely. If the ground is not securely connected, it could lead to electric shock or fire.
■ Wiring	⚠ Caution
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.
■ Operations	⚠ Warning
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. • 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.

EN

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. • 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. • If incorrect setting, the drive may has some damage or unexpected movement. Be sure to set the setup menu correctly.
■ Operations ⚠ Caution	
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.
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. • 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.
■ Maintenance and inspection ⚠ Warning	
Prohibited	• Do not replace parts. This could be a cause of electric shock, fire and bodily injury. To replace parts, call your Toshiba distributor.
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. ; and (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.
■ Disposal ⚠ 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.

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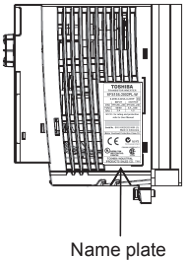
Please operate the inverter in the following procedure 1 to 6;

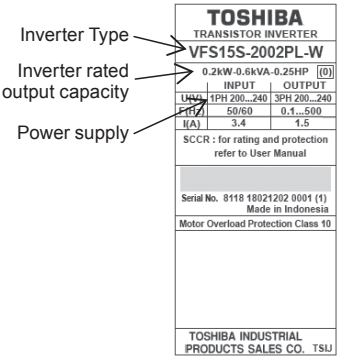
1. Check the purchase

Check that the inverter type is the same as your order.

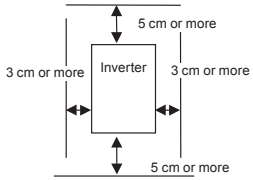
Inverter main unit



Name plate



2. Install the inverter

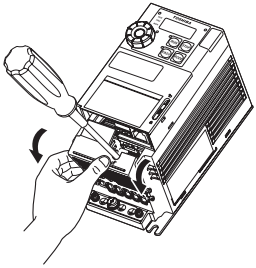


Normal installation

* For side-by-side installation, refer to the instruction manual.

3. Remove the terminal block cover

ex. VFS15S-2002PL-W



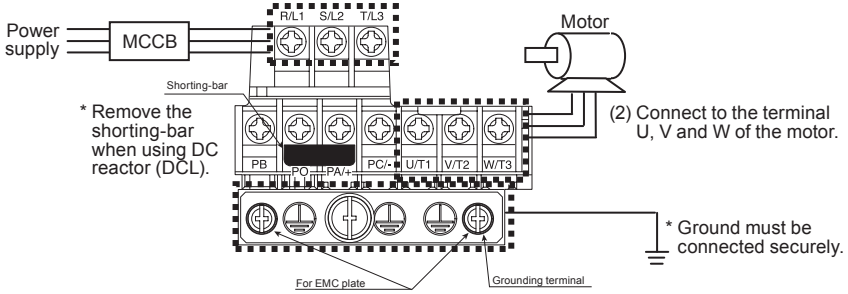
(1) Insert a screwdriver or other thin object into the hole indicated with the 🔓 mark.

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

(3) Next, remove the inside terminal block cover.

4. Connect to the power supply and the motor (wiring)

(1) Connect to the terminal R, S and T(single phase: R and S) of the power supply.



Power circuit terminal block

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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

Voltage class	Applicable motor (kW)	Wire size (mm^2)			
		Power circuit Note 1)			Grounding cable
		Input		Output	
		without DCL	With DCL		
3-phase 240V	0.4-1.5	1.5	1.5	1.5	2.5
	2.2	2.5	1.5	1.5	2.5
	4.0	4.0	2.5	2.5	4.0
	5.5	10	4.0	6.0	10
	7.5	16	6.0	10	16
	11	25	10	16	16
	15	35	16	25	16
1-phase 240V	0.2-0.75	1.5	1.5	1.5	2.5
	1.5	2.5	2.5	1.5	2.5
	2.2	4.0	4.0	1.5	4.0
3-phase 500V	0.4-2.2	1.5	1.5	1.5	2.5
	4.0	2.5	1.5	1.5	2.5
	5.5	4.0	1.5	2.5	4.0
	7.5	6.0	2.5	2.5	6.0
	11	10	4.0	6.0	10
	15	16	6.0	10	16

Note 1) The power circuit wire length is assumed to be 30m or less.

5. Turn on the power supply

Set the setup menu after power on.

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

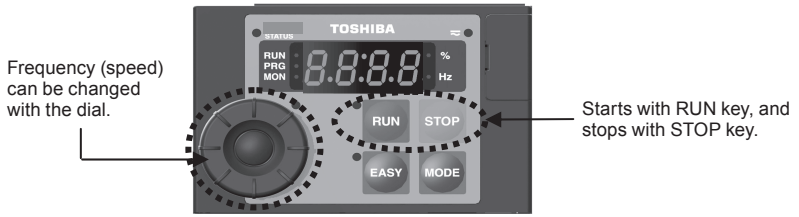
Setting dial	LED display	Operation
	"SEt"	Power on
	EU JP ASIA USA	Turn the setting dial and select region.
	Init	Press the setting dial
	0.0	Finish initial setup

Parameter setting	EU	ASIA	USA	JP
Main region	Europe	Asia, Oceania	North America	Japan
Motor	230/400(V)	230/400(V)	230/460(V)	200/400(V)
	50(Hz)	50(Hz)	60(Hz)	60(Hz)

Note) When you operare the inverter with external signals, please select Sink logic, Source logic, or PLC(external power supply) by SW1.

6. Operate the inverter

Panel operation is possible with default settings.



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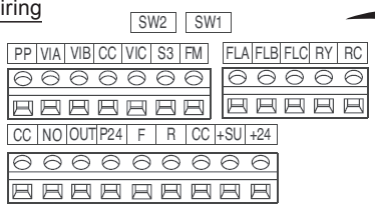
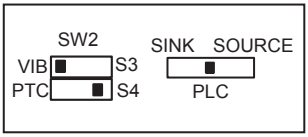
7. Operate the inverter with external signals

Wire the control circuit and set the parameter.

7.1 Wiring

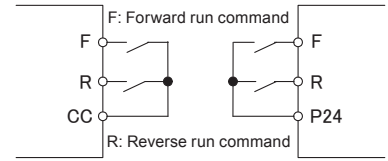




⊕ Screw for removable control terminal block

RS485 connector

Operation command



Forward run when F-CC or P24-F is ON.

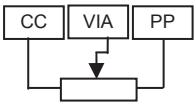
Screw size	Recommended tightening torque
M3 screw	0.5 N·m
	4.4 lb·in

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

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

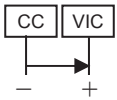
Frequency setting

1)Potentiometer



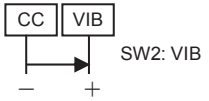
FNOd=1
F109=0 or 1
(Analog)

2) Current input (4 to 20mA)



FNOd=8

3) Voltage input (0 to 10V) or (-10 to +10V)



FNOd=2
F107=0 (0-+10V), 1 (-10-+10V)
F109=0 (Analog)

7.2 Parameter setting

Determine the operation method with CNOd and frequency setting with FNOd.

Title	Function	Adjustment range	Default setting
CNOd	Command mode selection	0: Terminal block, 1: Panel 2: RS485, 3: CANopen, 4: Option	1
FNOd	Frequency setting mode selection 1	0: Setting dial 1, 1: Terminal VIA 2: Terminal VIB, 3: Setting dial 2 4: RS485, 5: UP/DOWN from logic input 6: CANopen, 7: Communication option 8: Terminal VIC 11: Pulse train input, 14: Sr0	0

Select the signal of terminal VIA and VIB

F107	Analog input terminal selection (VIB)	0: 0-+10V, 1: -10-+10V	0
F109	Analog/logic input selection (VIA/VIB)	0 to 4 *See the instruction manual for detail.	0

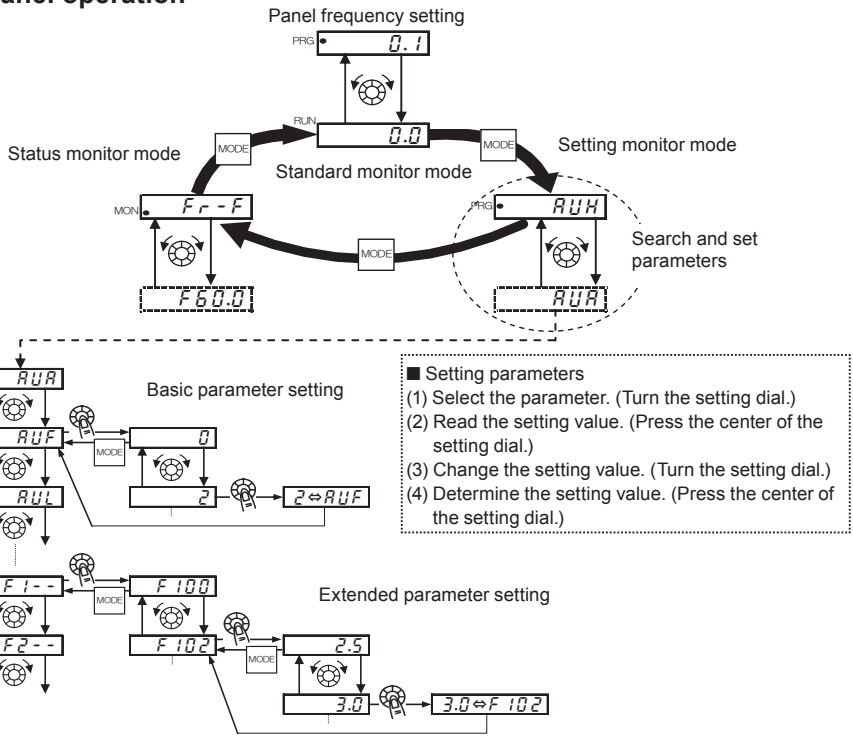
EN

8. Main parameters

Contents	Title	Function	Adjustment range	Default setting
Set acceleration/ deceleration time to suit the machinery. The ACC/dEC value is time that output frequency reach from 0Hz to FH value.	ACC	Acceleration time 1	0.0-3600 (360.0) (s)	10.0
	dEC	Deceleration time 1	0.0-3600 (360.0) (s)	10.0
	FH	Maximum frequency	30.0-500.0 (Hz)	80.0
Set the upper and lower limit of the output frequency	UL	Upper limit frequency	0.5-FH (Hz)	*1
	LL	Lower limit frequency	0.0-UL (Hz)	0.0
Select the V/f control mode to suit the machine	Pt	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 6: PM motor control 7: V/F 5-point setting	*1
Adjust the electronic thermal for the motor protection.	tHr	Motor electronic-thermal protection level 1	10-100 (%/(A))	100

*1: Default setting values vary depending on the setup menu setting.

9. Panel operation



10. Refer to the instruction manual for applied operation or malfunction.