

VS mini J7 Series INSTRUCTION MANUAL

COMPACT GENERAL-PURPOSE INVERTER

Upon receipt of the product and prior to initial operation, read these instructions thoroughly and retain them for future reference.



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PREFACE

Yaskawa's VS mini J7 (hereinafter called VS mini) is a small and simple Inverter; as easy to use as a contactor. This instruction manual describes installation, maintenance, inspection, troubleshooting, and specifications of the VS mini. Read this instruction manual thoroughly before operation.

YASKAWA ELECTRIC CORPORATION

General Precautions

- Some drawings in this manual are shown with protective covers or shields removed in order to show detail with more clarity. Make sure all covers and shields are replaced before operating the product.
- This manual may be modified when necessary because of improvements to the product, modifications, or changes in specifications.
 Such modifications are indicated by revising the manual number.
- To order a copy of this manual, or if your copy has been damaged or lost, contact your Yaskawa representative.
- Yaskawa is not responsible for any modification of the product made by the user, since that will void the guarantee.

NOTATION FOR SAFETY PRECAUTIONS

Read this instruction manual thoroughly before installation, operation, maintenance, or inspection of the VS mini. In this manual, safety precautions are classified as either warnings or cautions and are indicated as shown below.

A WARNING

Indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury.

▲ CAUTION

JOI

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage to equipment.

It may also be used to alert against unsafe practices.

Even items classified as cautions may result in serious accidents in some situations. Always follow these important precautions.

: Indicates information to insure proper operation.

PRECAUTIONS FOR UL/cUL MARKING

- Do not connect or disconnect wiring, or perform signal checks while the power supply is turned ON.
- The Inverter internal capacitor is still charged even after the power supply is turned OFF. To prevent electric shock, disconnect all power before servicing the Inverter, and then wait at least one minute after the power supply is disconnected. Confirm that all indicators are OFF before proceeding.
- Do not perform a withstand voltage test on any part of the Inverter. The Inverter is an electronic device that uses semiconductors, and is thus vulnerable to high voltage.
- Do not remove the Digital Operator or the blank cover unless the power supply is turned OFF. Never touch the printed circuit board (PCB) while the power supply is turned ON.
- This Inverter is not suitable for use on a circuit capable of delivering more than 18,000 RMS symmetrical amperes, 250 V maximum (200 V Class Inverters) or 18,000 RMS symmetrical amperes, 480 V maximum (400 V Class Inverters).

▲ CAUTION

 Use 75°C copper wire or equivalent. Low voltage wires must be wired with Class I Wiring.

PRECAUTIONS FOR CE MARKINGS

- Only basic insulation to meet the requirements of protection class 1 and overvoltage category II is provided with control circuit terminals. Additional insulation may be necessary in the end product to conform to CE requirements.
- For 400 V class Inverters, make sure to ground the supply neutral to conform to CE requirements.
- For conformance to EMC directives, refer to the relevant manuals for the requirements. Document No. EZZ008389 for Japanese version,

Document No. EZZ008390 for English version

RECEIVING THE PRODUCT

▲ CAUTION

(Ref. page)

Do not install or operate any Inverter that is damaged or has missing parts.
 Failure to observe this caution may result in injury or equipment damage.

MOUNTING

▲ CAUTION				
	(Ref. page)			
Lift the Inverter by the heatsinks. When moving the Inverter, never lift it by the plastic case or the terminal cover.	21			
Otherwise, the main unit may fall and be damaged.				
 Mount the Inverter on nonflammable material (i.e., metal). Failure to observe this caution may result in a fire. 	21			
 When mounting Inverters in an enclosure, install a fan or other cooling device to keep the intake air temperature below 50°C. Overheating may cause a fire or damage the Inverter. 	21			
 The VS mini generates heat. For effective cool- ing, mount it vertically. Refer to the figure in <i>Mounting Dimensions</i> on page 22. 	22			

WIRING

A WARNING

	(Ref. page)
• Only begin wiring after verifying that the power supply is turned OFF. Failure to observe this warning may result in an electric shock or a fire.	24
 Wiring should be performed only by qualified personnel. Failure to observe this warning may result in an elec- tric shock or a fire. 	24
 When wiring the emergency stop circuit, check the wiring thoroughly before operation. Failure to observe this warning may result in injury. 	24
• For 400 V class, make sure to ground the sup- ply neutral. Failure to observe this warning can result in an elec- tric shock or a fire.	29
 Always ground the ground terminal according to the local grounding code. (200 V class: ground to 100 Ω or less, 400 V class: ground to 10 Ω or less) Failure to observe this warning may result in an electric shock or a fire. 	29
• When the 3-wire sequence is set, do not make the wiring for the control circuit unless the multi- function input terminal parameter is set. Failure to observe this warning may result in injury.	70

▲ CAUTION	
	(Ref. page)
 Verify that the Inverter rated voltage coincides with the AC power supply voltage. Failure to observe this caution may result in personal injury or a fire. 	
 Do not perform a withstand voltage test on the Inverter. Performing withstand voltage tests may damage semiconductor elements. 	
 Always tighten terminal screws of the main circuit and the control circuits. Failure to observe this caution may result in a malfunction, damage, or a fire. 	24
• Never connect the AC main circuit power supply to output terminals U/T1, V/T2, or W/T3. The Inverter will be damaged and the guarantee will be voided.	24
 Do not connect or disconnect wires or connectors while power is applied to the circuits. Failure to observe this caution may result in injury. 	
• Do not perform signal checks during operation. The machine or the Inverter may be damaged.	

OPERATION

\Lambda WARNING

ZI WARNING	
	(Ref. page)
• Only turn ON the input power supply after con- firming that the front cover, top cover, and bot- tom cover are in place. Do not remove the covers while current is flowing. Failure to observe this warning may result in an elec- tric shock.	
 Never operate the Digital Operator or DIP switches with wet hands. Failure to observe this warning may result in an elec- tric shock. 	
• Never touch the terminals while current is flow- ing, even if the Inverter is stopping. Failure to observe this warning may result in an elec- tric shock.	
• When the fault retry function is selected, stand clear of the Inverter or the load. The Inverter may restart suddenly after stopping. (Construct the system to ensure safety, even if the Inverter should restart.) Failure to observe this warn- ing may result in injury.	60
 When continuous operation after power recovery is selected, stand clear of the Inverter or the load. The Inverter may restart suddenly after stopping. (Construct the system to ensure safety, even if the Inverter should restart.) Failure to observe this warning may result in injury. 	56
 The Digital Operator stop button can be dis- abled by a setting in the Inverter. Install a sepa- rate emergency stop switch. Failure to observe this warning may result in injury. 	

A WARNING

(Ref. page)

• If an alarm is reset with the operation signal ON, the Inverter will restart automatically. Reset an alarm only after verifying that the operation sig- nal is OFF. Failure to observe this warning may result in injury.	32
When the 3-wire sequence is set, do not make the wiring for the control circuit unless the multi- function input terminal parameter is set.	70

Failure to observe this warning may result in injury.

▲ CAUTION (Ref. page) Never touch the heatsinks, which can be extremely hot. Failure to observe this caution may result in harmful burns to the body. It is easy to change operation speed from low to high. Verify the safe working range of the motor and machine before operation. Failure to observe this caution may result in injury and machine damage. Install a holding brake separately if necessary. Failure to observe this caution may result in injury. · If using an Inverter with an elevator, take safety measures on the elevator to prevent the elevator from dropping. Failure to observe this caution can result in personal injury. · Do not perform signal checks during operation. The machine or the Inverter may be damaged.

▲ CAUTION

 All the constants set in the Inverter have been preset at the factory. Do not change the settings unnecessarily.

33

The Inverter may be damaged.

MAINTENANCE AND INSPECTION

A WARNING

(Ref. page) · Never touch high-voltage terminals on the Inverter. Failure to observe this warning may result in an electric shock Disconnect all power before performing maintenance or inspection, and then wait at least one minute after the power supply is disconnected. Confirm that all indicators are OFF before proceedina. If the indicators are not OFF, the capacitors are still charged and can be dangerous. · Do not perform withstand voltage test on any part of the VS mini. The Inverter is an electronic device that uses semiconductors, and is thus vulnerable to high voltage. Only authorized personnel should be permitted 93 to perform maintenance, inspection, or parts replacement. (Remove all metal objects (watches, bracelets, etc.) before starting work.) (Use tools which are insulated against electric shock.) Failure to observe these warnings may result in an electric shock

▲ CAUTION

(Ref. page)

- The control PCB employs CMOS ICs. Do not touch the CMOS elements. They are easily damaged by static electricity.
- Do not connect or disconnect wires, connectors, or the cooling fan while power is applied to the circuit.
 Failure to observe this caution may result in injury.

OTHERS

A WARNING

• Never modify the product. Failure to observe this warning may result in an electric shock or injury and will void the guarantee.

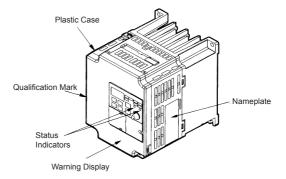
▲ CAUTION

• Do not subject the Inverter to halogen gases, such as fluorine, chlorine, bromine, and iodine, at any time even during transportation or installation.

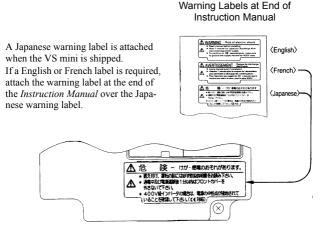
Otherwise, the Inverter can be damaged or interior parts burnt.

WARNING LABEL

A warning label is provided on the front cover of the Inverter, as shown below. Follow the warnings when handling the Inverter.



English and French Warning Labels



Example: 3-phase (200 V Class, 1.5 kW) Inverter

WARRANTY INFORMATION

■ Free Warranty Period and Scope

□ Warranty Period

This product is warranted for twelve months after being delivered to Yaskawa's customer or if applicable eighteen months from the date of shipment from Yaskawa's factory, whichever comes first.

□ Scope of Warranty

Inspections

Periodic inspections must be conducted by the customer. However, upon request, Yaskawa or one of Yaskawa's Service Centers can inspect the product for a fee. In this case, if after conferring with the customer, a Yaskawa product is found to be defective due to Yaskawa workmanship or materials and the defect occurs during the warranty period, then this fee will be waived and the problem remedied free of charge.

Repairs

If a Yaskawa product is found to be defective due to Yaskawa workmanship or materials and the defect occurs during the warranty period, Yaskawa will provide a replacement, repair the defective product, and provide shipping to and from the site free of charge.

However, if the Yaskawa Authorized Service Center determines that the problem with a Yaskawa product is not due to defects in Yaskawa's workmanship or materials, then the customer will be responsible for the cost of any necessary repairs. Some problems that are outside the scope of this warranty are:

- Problems due to improper maintenance or handling, carelessness, or other reasons where the customer is determined to be responsible.
- Problems due to additions or modifications made to a Yaskawa product without Yaskawa's understanding.
- Problems due to the use of a Yaskawa product under conditions that do not meet the recommended specifications.
- · Problems caused by natural disaster or fire.
- Or other problems not due to defects in Yaskawa workmanship or materials.

Warranty service is only applicable within Japan.

However, after-sales service is available for customers outside of Japan for a reasonable fee. Contact your local Yaskawa representative for more information.

Exceptions

Any inconvenience to the customer or damage to non-Yaskawa products due to Yaskawa's defective products whether within or outside the warranty period are NOT covered by this warranty.

RESTRICTIONS

- The VS mini was not designed or manufactured for use in devices or systems that may directly affect or threaten human lives or health.
- Customers who intend to use the product described in this manual for devices or systems relating to transportation, health care, space aviation, atomic or electric power, or underwater use must contact their Yaskawa representatives or the nearest Yaskawa sales office beforehand.
- This product has been manufactured under strict quality-control guidelines. However, if this product is to be installed in any location where failure of this product could involve or result in a life-and-death situation or loss of human life or in a facility where failure may cause a serious accident or physical injury, safety devices must be installed to minimize the likelihood of any accident.

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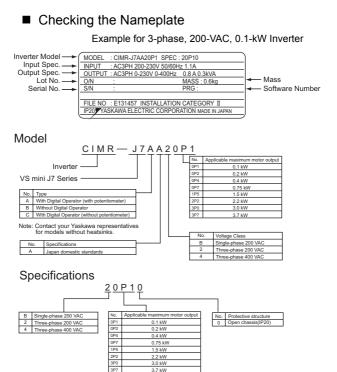
Revision History

1. Receiving the Product

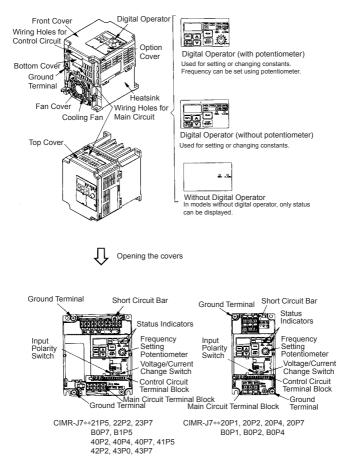
After unpacking the VS mini, check the following.

- Verify that the model number matches your purchase order or packing slip.
- Check the Inverter for physical damage that may have occurred during shipping.

If any part of VS mini is missing or damaged, call for service immediately.



2. Identifying the Parts



3. Mounting

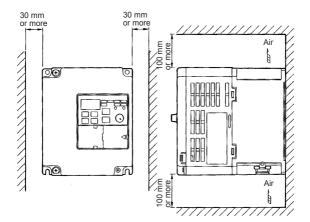
Choosing a Location to Mount the Inverter

Be sure the Inverter is protected from the following conditions.

- Extreme cold and heat. Use only within the specified ambient temperature range:
 - -10 to 50°C
- · Rain and moisture
- · Oil sprays and splashes
- · Salt spray
- · Direct sunlight (Avoid using outdoors.)
- · Corrosive gases (e.g., sulfurized gas) or liquids
- · Dust or metallic particles in the air
- · Physical shock or vibration
- Magnetic noise (Examples: Welding machines, power devices, etc.)
- · High humidity
- · Radioactive substances
- · Combustibles, such as thinner or solvents

Mounting Dimensions

To mount the VS mini, the dimensions shown below are required.



Mounting/Removing Components

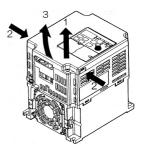
Removing and Mounting the Digital Operator and Covers

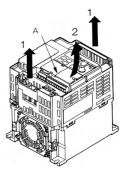
- Removing the Front Cover Use a screwdriver to loosen the screw on the front cover and then remove it in direction 1. Then press the right and left sides in direction 2 and lift the front cover in direction 3.
- Mounting the Front Cover Insert the tab of the upper part of the front cover into the groove of the Inverter, and press the lower part of the front cover onto the plastic case until the cover snaps shut. Then, tighten the screws.
- Removing the Option Cover After removing the front cover, remove the option cover in direction 2 with section A as a supporting point.
- Mounting the Option Cover Mount the terminal cover by reversing the order of the above procedure for removal.
- Removing the Upper/Bottom Covers

After removing the front cover, lift the covers in direction 1.

 Mounting the Upper/Bottom Covers

Mount the front cover by reversing the order of the above procedure for removal.





4. Wiring

Wiring Instructions

 Always connect the power supply to the power input terminals R/L1, S/L2, and T/L3 (R/L1, S/L2 for single-phase power) via a moldedcase circuit breaker (MCCB) or a fuse. Never connect the power supply to terminals U/T1, V/T2, W/T3, -, +1, or +2. Refer to page 119 for recommended peripheral devices. For singlephase Inverters, always use terminals R/L1 and S/L2. Never connect terminal T/L3.

Inverter Power Supply Connection Terminals

200-V 3-phase Input	200-V Single Input	400-V 3-phase Input	
Power Supply Speci-	Power Supply Speci-	Power Supply Speci-	
fication Inverters	fication Inverters	fication Inverters	
CIMR-J7DD2DDD	CIMR-J7□□B□□□	CIMR-J7004000	
Connect to R/L1, S/L2, and T/L3.	Connect to R/L1 and S/L2.	Connect to R/L1, S/L2, and T/L3.	

- 2. Connect the motor wiring to terminals U/T1, V/T2 and W/T3 on the main circuit output side (bottom of the Inverter)
- If the wiring distance between Inverter and motor is long, reduce the Inverter carrier frequency. For details, refer to *Reducing Motor Noise or Leakage Current Using Carrier Frequency Selection (n46)* on page 64.
- 4. Control wiring must be less than 50 m in length and must be separated from the power wiring. Use shielded twisted-pair cable when inputting the frequency signal externally.
- 5. Tighten the screws on the main circuit and control circuit terminals.
- Do not connect or disconnect wiring, or perform signal check while the power supply is turned ON.
- For 400 V Class Inverters, always ground the supply neutral to conform to CE requirements.
- Only basic insulation to meet the requirements of protection class 1 and overvoltage category II is provided with control circuit terminals.

Additional insulation may be necessary in the end product to conform to CE requirements.

- Closed-loop connectors should be used when wiring to the main circuit terminals.
- 10. Voltage drop should be considered when determining the wire size.

Voltage drop can be calculated using the following equation:

Phase-to-phase voltage drop (V)

= $\sqrt{3}$ × wire resistance (Ω /km) × wiring distance (m) × current (A) × 10⁻³

Select a wire size so that voltage drop will be less than 2% of the normal rated voltage.

Wire and Terminal Screw Sizes

Model	Terminal Symbols	Screws	Tightening Torque	Wires				
	Gymbolo		N∙m	Applicable Size			xom- ed Size	Туре
				mm ²	AWG	mm ²	AWG	
Common to all models	MA, MB, MC	М3	0.5 to 0.6	Twisted wires: 0.5 to 1.25, Single: 0.5 to 1.25	20 to 16, 20 to 16	0.75	18	Shielded or equiv- alent
	S1 to S5, SC, FS, FR, FC, AM, AC	M2	0.22 to 0.25	Twisted wires: 0.5 to 0.75, Single: 0.5 to 1.25	20 to 18, 20 to 16	0.75	18	

1. Control Circuits

2. Main Circuits

200 V	Class	3-phase	Input	Inverters
-------	-------	---------	-------	-----------

Model	Terminal Symbols	Screws	Tightening Torque	Wires				
	Symbols		N·m	Applicable Size		Recommended Size		Туре
				mm ²	AWG	mm ²	AWG	
CIMR- J7*A 20P1	R/L1, S/L2, T/L3, -, +1, +2	M3.5	0.8 to 1.0	0.75 to 2	18 to 14	2	14	600 V vinyl- sheathed or equivalent
	٢							
	U/T1, V/T2, W/T3		1.24 (10.97)					
CIMR- J7*A 20P2	R/L1, S/L2, T/L3, -, +1, +2	M3.5	0.8 to 1.0	0.75 to 2	18 to 14	2	14	
	٢							
	U/T1, V/T2, W/T3		1.24 (10.97)					
CIMR- J7*A 20P4	R/L1, S/L2, T/L3, -, +1, +2	M3.5	0.8 to 1.0	0.75 to 2	18 to 14	2	14	
	٢							
	U/T1, V/T2, W/T3		1.24 (10.97)					
CIMR- J7*A 20P7	R/L1, S/L2, T/L3, -, +1, +2	M3.5	0.8 to 1.0	0.75 to 2	18 to 14	2	14	
	٢							
	U/T1, V/T2, W/T3		1.24 (10.97)					
CIMR- J7*A 21P5	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0	2 to 5.5	14 to 10	2	14	
	٢							
CIMR- J7*A 22P2	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0	2 to 5.5	14 to 10	3.5	12	
	Ð							
CIMR- J7*A 23P7	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M4	1.2 to 1.5	2 to 5.5	14 to 10	5.5	10	
	⊕							

Note: The wire size is given for copper wire at 75°C.

4. Wiring

Model	Terminal Symbols	Screws	Tightening Torque	Wires					
	Cymbol3		N·m	Applicable Size		Recommended Size		Туре	
				mm ²	AWG	mm ²	AWG		
CIMR- J7*A B0P1	R/L1, S/L2, T/L3, -, +1, +2	M3.5	0.8 to 1.0	0.75 to 2	18 to 14	2	14	600 V vinyl- sheathed or equivalent	
	-								
	U/T1, V/T2, W/T3		1.24 (10.97)						
CIMR- J7*A B0P2	R/L1, S/L2, T/L3, -, +1, +2	M3.5	0.8 to 1.0	0.75 to 2	18 to 14	2	14		
	Ð								
	U/T1, V/T2, W/T3		1.24 (10.97)						
CIMR- J7*A B0P4	R/L1, S/L2, T/L3, -, +1, +2	M3.5	0.8 to 1.0	0.75 to 2	18 to 14	2	14		
	٢								
	U/T1, V/T2, W/T3		1.24 (10.97)						
CIMR- J7*A B0P7	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0	2 to 5.5	14 to 10	3.5	12		
	Ð					2	14		
CIMR- J7*A B1P5	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0	2 to 5.5	14 to 10	5.5	10		
	⊕					2	14		

200 V Class Single-phase Input Inverters

Note: 1. The wire size is given for copper wire at 75°C.

2. Do not use terminal T/L3 on Inverters with single-phase input.

Model	Terminal Sym- bols	Screws	Tightening Torque	Wires				
	DUIS		N·m	Applicable Size			imended iize	Туре
				mm ²	AWG	mm ²	AWG	
CIMR- J7*A 40P2	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0	2 to 5.5	14 to 10	2	14	600 V vinyl- sheathed or equivalent
	Ð							
CIMR- J7*A 40P4	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0	2 to 5.5	14 to 10	2	14	
	Ð							
CIMR- J7*A 40P7	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0	2 to 5.5	14 to 10	2	14	
	⊕							
CIMR- J7*A 41P5	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0	2 to 5.5	14 to 10	2	14	
	Ð							
CIMR- J7*A 42P2	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M4	1.2 to 1.5	2 to 5.5	14 to 10	2	14	
	Ð							
CIMR- J7*A 43P0	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M4	1.2 to 1.5	2 to 5.5	14 to 10	2	14	
	Ð					3.5	12	
CIMR- J7*A 43P7	R/L1, S/L2, T/L3, -, +1, +2, U/T1, V/T2, W/T3	M4	1.2 to 1.5	2 to 5.5	14 to 10	2	14	
	Ð					3.5	12	

400 V Class 3-phase Input Inverters

Note: The wire size is given for copper wire at 75°C.

Wiring the Main Circuits MCCB or Leakage Breaker Ground Ground

Main Circuit Input Power Supply

Always connect the power supply line to input terminals R/L1, S/L2, and T/L3 (R/L1, S/L2 for single-phase Inverters). Never connect them to terminals U/T1, V/T2, W/T3, B1, B2, -, +1, or +2. The Inverter may be damaged if the wrong terminals are connected.



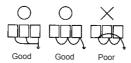
For single-phase Inverters, always use terminals R/L1 and S/L2. Never connect terminal T/L3.

• Grounding (Use ground terminal 🕒.)

Always ground the ground terminal \bigoplus according to local grounding codes. (200 V class: ground to 100 Ω or less, 400 V class: ground to 10 Ω or less)

Never ground the VS mini to the same ground as welding machines, motors, or other electrical equipment.

When several VS mini Inverters are used side by side, ground each as shown in examples. Do not loop the ground wires.



Inverter Output

Connect the motor terminals to U/T1, V/T2, and W/T3.

• Wiring the Main Circuit Terminals Pass the cables through wiring hole to connect them. Always mount the cover in its original position.



Connect with a Phillips screwdriver.

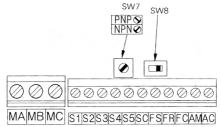
Wiring the Control Circuits

Only basic insulation is provided for the control circuit terminals.

Additional insulation may be necessary in the end product.

· Control Circuit Terminals

Pass the cable through wiring hole to connect it. Always mount the cover in its original position.



SW7 can be changed according to sequence input signal (S1 to S5) polarity.

0 V common: NPN side (Initial setting)

+24 V common: PNP side

Refer to page 115 for SW7.

Refer to page 75 for SW8.

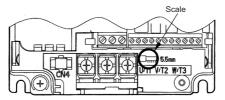
Wiring the Control Circuit Terminals Screwdriver Blade Width



2.5 mm max 0.4 mm ma

Insert the wire into the lower part of the terminal block and connect it tightly with a screwdriver.

5.5 mm The wire sheath strip length must be 5.5 mm. Open the front cover and verify that the strip length is 5.5 mm.



Wiring Inspection

After completing wiring, check the following.

- · Wiring is proper.
- · Wire clippings or screws are not left in the Inverter.
- · Screws are securely tightened.
- · Bare wires in the terminals do not contact other terminals.



If the FWD (or REV) RUN command is given when the RUN command from the control circuit terminal is selected (n02 = 1), the motor will start automatically after the main circuit input power supply is turned ON.

5. Operating the Inverter

Test Run

The Inverter operates when a frequency (speed) is set.

There are three operating modes for the VS mini:

- 1. RUN command from the Digital Operator (potentiometer/digital setting)
- 2. RUN command from the control circuit terminals
- 3. RUN command from MEMOBUS communications

Prior to shipping, the Inverter is set up to receive the RUN command and frequency reference from the Operator. Below are instructions for running the VS mini using the Digital Operator (with potentiometer). For instructions on operation, refer to page 41.

Operation reference or frequency reference constants can be selected separately as shown below.

Name		Constant						
RUN Command Selection	n02	 = 0 Enables run, stop, and reset from Digital Operator. = 1 Enables run and stop from control circuit terminals. = 2 Enables MEMOBUS communications. 						
Frequency Reference Selection	n03	 = 0 Enables the Digital Operator's potentiometer setting. = 1 Enables Frequency Reference 1 (constant n21). = 2 Enables a voltage reference (10 to 10 V) of control circuit terminal. = 3 Enables a current reference (4 to 20 mA) of control circuit terminal. = 4 Enables a current reference (10 to 20 mA) of control circuit terminal. = 6 Enables AMEMOBUS communications. 						

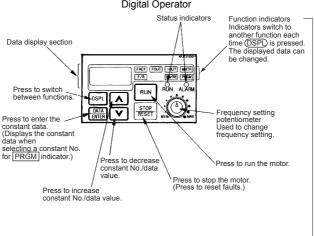
Operation Steps	Operator Display	Function Indicators	Status Indicators				
1. Turn the potentiometer fully counterclock- wise, and then turn the power ON.	0.0	FREF	RUN 🕅 ALARM 单				
2. F/R will flash. Select FWD or REV RUN using the keys. Never select REV when reverse run is prohibited.	Fロー (Forward) or 「E」 (Reverse)	F/R	RUN 🕅 ALARM 单				
Press DSPL to make FREF flash. Then press RUN.	0.0	FREF	RUN -☆- ALARM ●				
 Operate the motor by turning the potentiom- eter clockwise. (A frequency reference cor- responding to the potentiometer position will be displayed.) If the potentiometer is switched rap- idly, the motor also accelerates or decelerates rapidly in proportion to the potentiometer movement. Pay attention to load status and switch the potentiometer at a speed that will not adversely affect motor move- ment. 	0.0 to 60.0 (min ⁻¹) Minimum output frequency is 1.5 Hz.	FREF	RUN ☆ ALARM ●				
Status indicators ☆: ON __:Flashing ●: OFF							

Operation Check Points

- · Motor rotates smoothly.
- · Motor rotates in the correct direction.
- · Motor does not have abnormal vibration or noise.
- · Acceleration and deceleration are smooth.
- · Current matching the load flows.
- · Status indicators and Digital Operator display are correct.

Operating the Digital Operator

All functions of the VS mini are set using the Digital Operator. Below are descriptions of the display and keypad sections.



Details of Indicators	(Color in	parenthesis in	dicates the	color of indicator.)	

	FREF Frequency reference setting/monitoring (GREEN)	FOUT Output frequency monitoring (GREEN)	IOUT Output current monitoring (GREEN)	MNTR Multi-function monitoring (GREEN)	
¢	F/R Operator RUN command FWD/REV selection (GREEN)		LO/RE LOCAL/REMOTE Selection (RED)	PRGM Constant No./data (RED)	-

Description of Status Indicators

There are two status indicators on the middle right section of the face of the VS mini. The combinations of these indicators indicate the status of the Inverter (ON, flashing, and OFF). RUN indicator and status indicator on <u>RUN</u> button have the same function.

-☆ :ON 🔆 :Flashing (long flashing) 🎽 :Flashing ●:OFF

The following table shows the relationship between the Inverter conditions and the indicator on the RUN button of the Digital Operator as well as the RUN and ALARM indicators on the face of the VS mini.

Digital Face of Operator the VS mini Priority Conditions (Optional) RUN RUN ALARM Power supply is shut down. 1 Until the Inverter become ready after the power is turned ON Fault 2 -ờ-Emergency stop (STOP command is sent from the Digital Operator when the control circuit terminals were used to operate the Inverter.) ĕ 3 ĕ Ő Emergency stop (Emergency stop alarm is sent from the control circuit terminal.) Note: Indicators will be the same as with alarm (stopped) occurring after the Inverter is stopped. Emergency stop (Emergency stop fault is sent from ő ő the control circuit terminal.) -ờ́-4 Note: Indicators will be the same as with fault occurring after the Inverter is stopped. Alarm (Stopped) ő ő ő 5 Alarm (Operating) ő The RUN command is carried out when the External -ờ -ờ́-6 baseblock command using the multi-function contact input terminal is issued. ő ő Stopped (During baseblock) 7 Operating (Including the status that the Inverter is operating at a frequency below the minimum output fre-8 -ờ -ờauency.) During dynamic braking when starting. During deceleration to a stop ĕ ĕ 9 During dynamic braking when stopping.

The indicators are lit, unlit or flashing reflecting the order of priority.

For details on how the status indicators function for Inverter faults, refer to *Chapter 8. Fault Diagnosis*. If a fault occurs, the ALARM indicator will light.



The fault can be reset by turning ON the FAULT RESET sig-

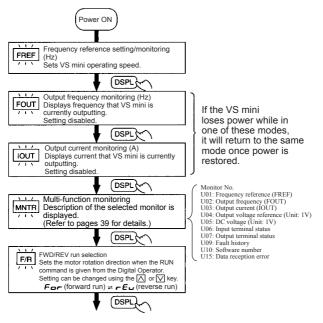
nal (or by pressing the STOP RESET key on the Digital Operator)

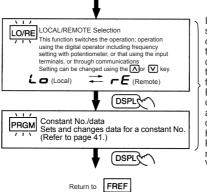
with the operation signal OFF, or by turning OFF the power supply. If the operation signal is ON, the fault cannot be reset using the FAULT RESET signal.

Function Indicator Description

By pressing (DSPL) on the Digital Operator, each of the function indicators can be selected.

The following flowchart describes each function indicator.





If the VS mini is stopped after it has changed to any of these modes during operation, it changes to Program mode from Drive mode. Even if the Run command is turned ON again, the VS mini does not operate. However, if n01=5, the Run command can be received and the VS mini will operate.

WARNING

If n01=5, a Run command can be received even while changing a constant. If sending a Run command while changing a constant, such as during a test run, be sure to observe all safety precautions.

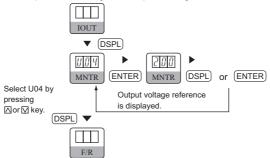
Failure to observe this warning may result in injury.

MNTR Multi-function Monitoring

Selecting the Monitor

Press the (DSPL) key. When (MNTR) is ON, data can be displayed by selecting the monitor number.

Example: Monitoring the Output Voltage Reference



Monitoring The following items can be monitored using U constants.

Constant No.	Name	Unit	Description
U01	Frequency Reference (FREF)	Hz	Frequency reference can be monitored. (Same as FREF)
U02	Output Frequency (FOUT)	Hz	Output frequency can be monitored. (Same as FOUT)
U03	Output Current (IOUT)	A	Output current can be monitored. (Same as IOUT)
U04	Output Voltage	V	Output voltage can be monitored.
U05	DC Voltage	V	Main circuit DC voltage can be monitored.
U06	Input Terminal Status	-	Input terminal status of control circuit terminals can be monitored.
U07	Output Terminal Status	-	Output terminal status of control circuit terminals can be monitored.
U09	Fault History	-	The last four fault history records are displayed.
U10	Software No.	-	Software number can be checked.
U15	Data Reception Error	-	Contents of MEMOBUS communication data recep- tion error can be checked. (Contents of transmission register No. 003DH are the same.)

□ Input/Output Terminal Status

Input terminal status



Output terminal status



Fault History Display Method

Fault description is displayed when U09 is selected.

(Example)

 $\Box\Box\Box$: Fault description

"---" is displayed if there is no fault.

(Refer to page 97 for details.)

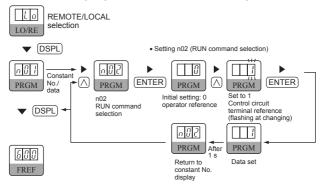
Clearing the Fault History

Set constant n01 to 6 to clear the fault history. Set data returns to its initial value after 6 is set.

Note: Initializing the constants (n01=8, 9) also clears the fault history.

Setting and Referencing Constants

The following diagram shows how to select and change constants.



Simple Data Setting

Digital setting (refer to 5. *Operating the Inverter*) and potentiometer setting are both possible for simple acceleration/deceleration operation of the VS mini.

Frequency reference by potentiometer signal is set with initial setting (n03=0).

Factory setting of the model with operator (without potentiometer) is set by Digital Operator (n03=1).

Following is an example in which the function LEDs are used to set frequency reference, acceleration time, deceleration time, and motor direction.

Operation Steps	Operator Display	Function Indicators	Status Indicators
1. Turn ON the power supply.	0.0	FREF	RUN Ŭ ALARM ●
2. Set constant n03 to 1.	1	PRGM	RUN 🛱 ALARM 单
 Set the following constants. n16: 15.0 (Acceleration Time) n17: 5.0 (Deceleration Time) 	15.0 5.0	PRGM	RUN Ŭ ALARM ●
 Select forward or reverse run by pressing the or key. 	For (Forward) or	FR FR	RUN 💥 ALARM 单
Examine the application. (Never select REV when reverse run is prohibited.)	ر E ر (Reverse)		
5. Set the reference by pressing the \bigcirc or \bigcirc key.	60.0	FREF	RUN Ŭ ALARM ●
6. Press (RUN).	0.0 to 60.0	FOUT	RUN Ŭ ALARM ●
7. Press STOP to stop.	60.0 to 0.0	FOUT	RUN ģ
		71	RUN 🕺 ALARM 单

Status indicators -♀ :ON ♀ :Flashing (long flashing) ♀ :OFF

6. Programming Features

Factory settings of the constants are shaded in the tables.

After wiring is complete, be sure to make the following settings before operation.

□ Hardware

Make the following settings before the Inverter is turned ON.

Item	Ref.
Sequence input signal (S1 to S5) polarity selection	115
Voltage reference / current reference input selection of control circuit terminal FR	75

□ Software (Constant)

	Item	Ref.
Environment	Constant Selection / Initialization (n01)	44
setting	RUN Command Selection (n02)	49
	Frequency Reference Selection (n03)	50
	Stopping Method Selection (n04)	67
Basic	V/f pattern setting (n09 to n15)	45
characteristics and frequency reference setting	Acceleration Time 1 (n16), Deceleration Time 1 (n17)	55
	Frequency Reference 1 to 8 (n21 to n28)	51
Motor protection	Motor Rated Current (n32)	81
	Electric Thermal Motor Protection Selection (n33)	81
Countermeasure for noise and leakage current, Using an optional braking resistor	Carrier Frequency Reference (n46)	64

Constant Setup and Initialization

□ Constant Selection/Initialization (n01)

The following table lists the data that can be set or read when n01 is set. Unused constants between n01 and n79 are not displayed.

n01 Setting	Constant That Can Be Set	Constant That Can Be Referenced
0	n01	n01 to n79
1	n01 to n79 ^{*1}	
5	n01 to n79 ^{°1} (Run command can be received in Program mode.)	
6	Fault history cleared	
7	Not used	
8	Initialize	
9	Initialize (3-wire sequence) ^{*2}	

* 1. Excluding setting-disabled constants.

* 2. Refer to page 70.



 E_{r} appears on the display for one second and the set data returns to its initial values in the following cases.

- 1. If the set values of input terminal function selection 2 to 5 (n36 to n39) are the same.
- If the following conditions are not satisfied in the V/f pattern setting:

Max. Output Frequency (n09)

≥ Max. Voltage Output Frequency (n11) > Mid. Output Frequency (n12) ≥ Min. Output Frequency (n14)

For details, refer to *Adjusting Torque According to Application* (V/f Pattern Setting) on page 45.

 If the following conditions are not satisfied in the jump frequency settings: Jump Frequency 2 (n50) ≤ Jump Frequency 1 (n49)

- If the Frequency Reference Lower Limit (n31) ≤ Frequency Reference Upper Limit (n30)
- 5. If the Motor Rated Current (n32) \leq 120% of Inverter rated current

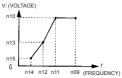
Selecting V/f Pattern

Adjusting Torque According to Application

Adjust motor torque by using the V/f pattern and full-range automatic torque boost settings.

V/f Pattern Setting

Set the V/f pattern in n09 to n15 as described below. Set each pattern when using a special motor (e.g., high-speed motor) or when requiring special torque adjustment of the machine.



Be sure to satisfy the following conditions for the settings of n09 to n15. $n14 \le n12 < n11 \le n09$

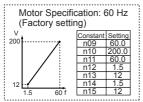
If n14 = n12, the setting of n13 will be disabled.

Constant No.	Name	Unit	Setting Range	Initial Setting
n09	Max. Output Frequency	0.1 Hz	50.0 to 400 Hz	60.0 Hz
n10	Max. Voltage	1 V	1 to 255 V (1 to 510 V)	200 V (400 V)
n11	Max. Voltage Output Fre- quency (Base Frequency)	0.1 Hz	0.2 to 400 Hz	60.0 Hz
n12	Mid. Output Frequency	0.1 Hz	1 to 399 Hz	1.5 Hz
n13	Mid. Output Frequency Voltage	1 V	1 to 255 V (1 to 510 V)	12 V (24 V)
n14	Min. Output Frequency	0.1 Hz	0.1 to 10.0 Hz	1.5 Hz
n15	Min. Output Frequency Voltage	1 V	1 to 50 V (1 to 100 V)	12 V (24 V)

Typical Setting of the V/f Pattern

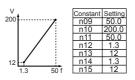
Set the V/f pattern according to the application as described below. For 400-V Class Inverters, the voltage values (n10, n13, and n15) should be doubled. When running at a frequency exceeding 50/60 Hz, change the Maximum Output Frequency (n09).

- Note: Always set the maximum output frequency according to the motor characteristics.
- 1. For General-purpose Applications

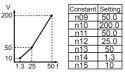


2. For Fans/Pumps

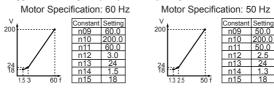
Motor Specification: 60 Hz 200 50 10 15 30. 60 f 15 30. 60 f 15 30. 60 f 115 10 11 Motor Specification: 50 Hz



Motor Specification: 50 Hz

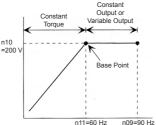


3. For Applications Requiring High Starting Torque



Increasing the voltage of the V/f pattern increases motor torque, but an excessive increase may cause motor overexcitation, motor overheating, or vibration.

When operating with frequency larger than 60 Hz/50 Hz, change only max. output frequency (n09).

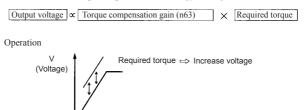


Full-range Automatic Torque Boost

The motor torque requirement changes according to load conditions. The full-range automatic torque boost adjusts the voltage of the V/f pattern according to requirements. The VS mini automatically adjusts the voltage during constant-speed operation, as well as during acceleration.

The required torque is calculated by the Inverter.

This ensures tripless operation and energy-saving effects.



f (Frequency)

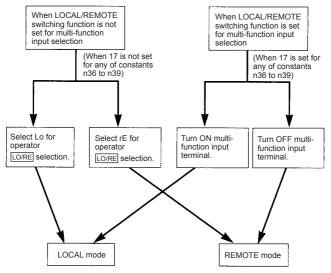
Normally, no adjustment is necessary for the Torque Compensation Gain (n63 factory setting: 1.0). When the wiring distance between the Inverter and the motor is long, or when the motor generates vibration, change the automatic torque compensation gain. In these cases, set the V/f pattern (n09 to n15).

Switching LOCAL/REMOTE Mode

The following functions can be selected by switching LOCAL or REMOTE mode. To select the RUN/STOP command or frequency reference, change the mode in advance depending on the following applications.

- LOCAL mode: Enables the Digital Operator for RUN/STOP commands and FWD/REV RUN commands. The frequency reference can be set using the potentiometer
 - or FREF
- REMOTE mode: Enables RUN Command Selection (n02). The frequency reference can be set by n03 (frequency reference selection) setting.

□ How to Select LOCAL/REMOTE Mode



Selecting RUN/STOP Commands

Refer to *Switching LOCAL/REMOTE Mode* (page 48) to select either the LOCAL mode or REMOTE mode.

The operation method (RUN/STOP commands, FWD/REV RUN commands) can be selected using the following method.

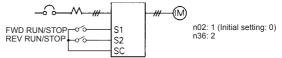
□ LOCAL Mode

When Lo (local mode) is selected for Digital Operator LO/RE ON mode, or when the LOCAL/REMOTE switching function is set and the input terminals are turned ON, run operation is enabled by the <u>STP</u> or **RUN** on the Digital Operator, and FWD/REV is enabled by the **F/R** ON mode (using \bigtriangleup or \bigtriangledown key).

LO/RE is not effective when local/remote switching function is selected for multi-function input selection.

REMOTE Mode

- Select remote mode. There are following two methods to select remote mode.
 - Select rE (remote mode) for the LO/RE selection.
 - When the local/remote switching function is selected for the multi-function input selection, turn OFF the input terminal to select remote mode.
- 2. Select the operation method by setting constant n02.
 - n02 =0: Enables the Digital Operator (same with local mode).
 - =1: Enables the multi-function input terminal (see fig. below).
 - =2: Enables communications (refer to page 83) (When option card is installed).
 - Example when using the multi-function input terminal as operation reference (two-wire sequence)



For an example of three-wire sequence, refer to page 70.

□ Operating (RUN/STOP Commands) Using Communications (When Option Card is Installed)

Setting constant n02 to 2 in REMOTE mode enables using RUN/STOP commands via MEMOBUS communications. For commands using MEMOBUS communications, refer to page 83.

Selecting Frequency Reference

Frequency reference can be selected by the following methods.

□ Setting by Operator

Select REMOTE or LOCAL mode in advance. For the method for selecting the mode, refer to page 48.

LOCAL Mode

Select command method using constant n07.

n07=0: Enables using the potentiometer on the Digital Operator (initial setting).

The factory setting for models with the Digital Operator (without a potentiometer) is n07=1.

- =1: Enables digital setting on the Digital Operator, setting value is stored in constant n21 (frequency reference 1).
- · Digital Setting Using the Digital Operator

Input the frequency while FREF is lit (press ENTER after setting the numeric value).

Frequency reference setting is effective when 1 is set for constant n08 instead of pressing ENTER.

- n08 =0: Enables frequency reference setting using the ENTER key (initial setting).
 - =1: Disables frequency reference setting using the ENTER key.

REMOTE Mode

Select the command method in constant n03.

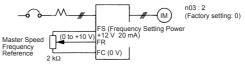
n03 =0: Enables frequency reference setting using the potentiometer on the Digital Operator (initial setting).

Factory setting of models with the Digital Operator (without a potentiometer) is n03=1.

- =1: Enables using frequency reference 1 (n21)
- =2: Enables a voltage reference. (0 to 10 V) (See the following figure.)
- =3: Enables current reference. (4 to 20 mA) (Refer to page 75.)
- =4: Enables current reference. (0 to 20 mA) (Refer to page 75.)

=6: Enables communications. (Refer to page 83.)

Example of frequency reference by voltage signal



Setting Operation Conditions

□ Reverse Run Prohibit (n05)

The Reverse Run Prohibit setting disables accepting a reverse RUN command from the control circuit terminal or Digital Operator. This setting is used for applications where a reverse RUN command can cause problems.

Setting	Description
0	Reverse run enabled.
1	Reverse run disabled.

Multi-step Speed Selection

Up to 16 speed steps (including Jog frequency reference) can be set using the following combinations of frequency reference and input terminal selections.

8-step speed change

 $\label{eq:response} \begin{array}{l} n02=1 \; (Operation mode selection) \\ n03=1 \; (Frequency reference selection) \\ n21=25.0 \; Hz \; (Frequency reference 1) \\ n22=30.0 \; Hz \; (Frequency reference 2) \\ n23=35.0 \; Hz \; (Frequency reference 3) \\ n24=40.0 \; Hz \; (Frequency reference 4) \\ n25=45.0 \; Hz \; (Frequency reference 5) \\ n26=50.0 \; Hz \; (Frequency reference 5) \\ n26=50.0 \; Hz \; (Frequency reference 7) \\ n28=60.0 \; Hz \; (Frequency reference 8) \\ \end{array}$

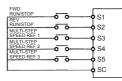


When all multi-function reference inputs are OFF, the frequency reference selected by constant n03 (frequency reference selection) becomes effective. n36=1

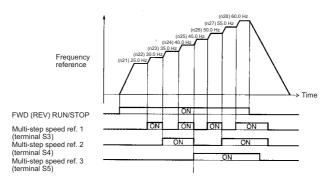
n37=6 (Multi-function contact input terminal S3)

n38=7 (Multi-function contact input terminal S4)

n39=8 (Multi-function contact input terminal S5)



n36=2 (Input terminal S2) Initial Setting n37=6 (Input terminal S3) Change the setting to 6. n38=7 (Input terminal S4) Change the setting to 7. n39=8 (Input terminal S5) Change the setting to 8.



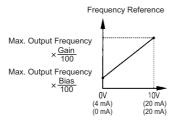
Operating at Low Speed

By inputting a JOG command and then a FORWARD (REVERSE) RUN command, operation is enabled at the jog frequency set in n29. When multi-step speed references 1, 2, 3 or 4 are input simultaneously with the JOG command, the JOG command has priority.

Constant No.	Name	Setting
n29	Jog Frequency	Initial setting: 6.0 Hz
n36 to n39	Jog References	Set to 10 for any constant.

Adjusting Speed Setting Signal

The relationship between the analog inputs and the frequency reference can be set to provide the frequency reference by analog input of control circuit terminal FR or FC.



() indicates the value when a current reference input is selected.

• Frequency reference gain (n41)

The analog input voltage value for the max. output frequency (n09) can be set in units of 1% (max. output frequency n09=100%).

* Factory setting: 100%

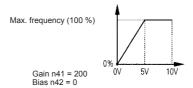
· Frequency reference bias (n42)

The frequency reference provided when analog input is 0 V (4 mA or 0 mA) can be set in units of 1% (max. output frequency n09=100%).

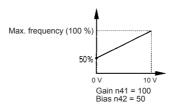
* Factory setting: 0%

Typical Settings

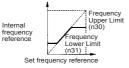
• To operate the Inverter with a frequency reference of 50% to 100% at an input voltage of 0 to 5 V



• To operate the Inverter with a frequency reference of 50% to 100% at an input voltage of 0 to 10 V



□ Adjusitng Frequency Upper and Lower Limits



Frequency Reference Upper Limit (n30)

Sets the upper limit of the frequency reference in units of 1%. (n09: Max. Output Frequency = 100%)

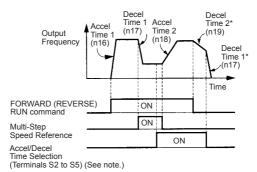
Factory setting: 100%

Frequency Reference Lower Limit (n31)

Sets the lower limit of the frequency reference in units of 1%.

(n09: Max. Output Frequency = 100%) When operating at a frequency reference of 0, operation is continued at the frequency reference lower limit.

However, if the frequency reference lower limit is set to less than the Minimum Output Frequency (n14), operation is not performed. Factory setting: 0%



Using Two Acceleration/Deceleration Times

* When deceleration to a stop is selected (n04 = 0).

By setting input terminal function selection (either of n36 to n39) to 11 (acceleration/deceleration time select), the acceleration/deceleration time is selected by turning ON/OFF the acceleration/deceleration time selection terminals (terminals S2 to S5).

```
At OFF: n16 (Acceleration Time 1)
n17 (Deceleration Time 1)
At ON: n18 (Acceleration Time 2)
n19 (Deceleration Time 2)
```

Acceleration time

Set the time needed for the output frequency to reach 100% from 0%.

 Deceleration time Set the time needed for the output frequency to reach 0% from 100%. (Max. Output Frequency n09 = 100%)

□ Momentary Power Loss Ridethrough Method (n47)

When constant n47 is set to 1 or 2, operation automatically restarts even if a momentary power loss occurs.

Setting	Description
0	Continuous operation after momentary power loss not enabled.
1*1	Continuous operation after power recovery within momentary power loss ridethrough time
2 ^{*1, *2}	Continuous operation after power recovery (Fault output not produced.)

* 1. Hold the operation signal to continue operation after recovery from a momentary power loss.

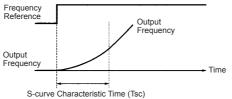
* 2. When 2 is selected, the Inverter restarts if power supply voltage recovers while the control power supply is held. No fault signal is output.

□ S-curve Selection (n20)

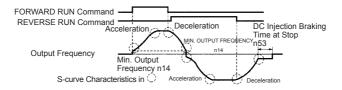
To prevent shock when starting and stopping the machine, acceleration/ deceleration can be performed using an S-curve pattern.

Setting	S-curve Selection
0	S-curve characteristic not provided.
1	0.2 s
2	0.5 s
3	1.0 s

Note: The S-curve characteristic time is the time from acceleration/deceleration rate 0 to the normal acceleration/deceleration rate determined by the set acceleration/deceleration time.



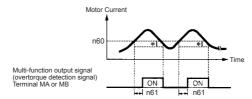
The following time chart shows switching between FWD/REV run when decelerating to a stop.



□ Torque Detection

If an excessive load is applied to the machine, an increase in the output current can be detected to output an alarm signal to multi-function output terminal MA or MB.

To output an overtorque detection signal, set one of the output terminal function selection n40 for overtorque detection (Setting: 6 (NO contact) or 7 (NC contact)).



* The overtorque detection release width (hysteresis) is set at approx. 5% of the Inverter rated current. Overtorque Detection Function Selection (n59)

Setting	Description
0	Overtorque detection not provided.
1	Detected during constant-speed running. Oper- ation continues after detection.
2	Detected during constant-speed running. Oper- ation stops during detection.
3	Detected during running. Operation continues after detection.
4	Detected during running. Operation stops dur- ing detection.

- 1. To detect overtorque during acceleration/deceleration, set n59 to 3 or 4.
- To continue operation after overtorque detection, set n59 to 1 or 3. During detection, the operator will display an at a larm (flashing).
- 3. To stop the Inverter and generate a fault at overtorque detection, set n59 to 2 or 4. At detection, the Digital Operator will display an *□L* ∃ fault (ON).

Overtorque Detection Level (n60)

Set the overtorque detection current level in units of 1%. (Inverter rated current = 100%)

Factory setting: 160%

Overtorque Detection Time (n61)

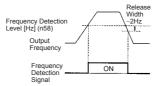
If the time that the motor current exceeds the Overtorque Detection Level (n60) is longer than Overtorque Detection Time (n61), the overtorque detection function will operate. Factory setting: 0.1 s

□ Frequency Detection Level (n58)

Effective when the Multi-function Output Selection n40 is set for frequency detection (setting: 4 or 5). Frequency detection turns ON when the output frequency is higher or lower than the setting for the Frequency Detection Level (n58).

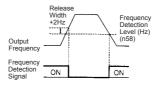
Frequency Detection 1

Output frequency \geq Frequency Detection Level n58 (Set n40 to 4.)



Frequency Detection 2

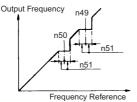
Output frequency ≤ Frequency Detection Level n58 (Set n40 to 5.)



□ Jump Frequencies (n49 to n51)

This function allows the prohibition or "jumping" of critical frequencies so that the motor can operate without resonance caused by the machine system. This function is also used for dead band control. Setting the values to 0.00 Hz disables this function.

Set prohibited frequency 1 or 2 as follows:



n49 ≥ n50

If this condition is not satisfied, the Inverter will display \mathcal{E}_{rr} for one second and restore the data to initial settings.

Operation is prohibited within the jump frequency ranges. However, the motor will operate without jumping during acceleration/ deceleration.

Continuing Operation Using Automatic Retry Attempts (n48)

The Inverter can be set to restart and reset fault detection after a fault occurs. The number of self-diagnosis and retry attempts can be set to up to 10 in n48. The Inverter will automatically restart after the following faults occur:

OC (overcurrent)

GF (ground fault)

OV (overvoltage)

The number of retry attempts is cleared to 0 in the following cases:

- 1. If no other fault occurs within 10 minutes after retry
- 2. When the FAULT RESET signal is ON after the fault is detected
- 3. When the power supply is turned OFF

□ Operating a Coasting Motor without Tripping

To operate a coasting motor without tripping, use the SPEED SEARCH command or DC injection braking at startup.

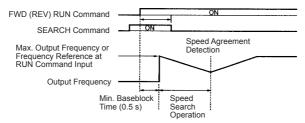
SPEED SEARCH Command

Restarts a coasting motor without stopping it. This function enables smooth switching between motor commercial power supply operation and Inverter operation.

Set a Multi-function Input Selection (n36 to n39) to 14 (SEARCH command from maximum output frequency) or 15 (SEARCH command from set frequency).

Build a sequence so that a FWD (REV) RUN command is input at the same time as the SEARCH command or after the SEARCH command. If the RUN command is input before the SEARCH command, the SEARCH command will be disabled.

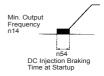
Time Chart at SEARCH Command Input



DC Injection Braking at Startup (n52, n54)

Restarts a coasting motor after stopping it. Set the DC injection braking time at startup in n54 in units of 0.1 second. Set the DC Injection Braking Current in n52 in units of 1% (Inverter rated current =100%). When the setting of n54 is 0, DC injection braking is not performed and acceleration starts from the minimum output frequency.

When n52 is set to 0, acceleration starts from the minimum output frequency after baseblocking for the time set in n54.



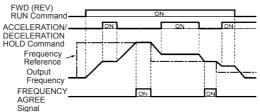
□ Holding Acceleration/Deceleration Temporarily

To hold acceleration or deceleration, input an ACCELERATION/ DECELERATION HOLD command. The output frequency is maintained when an ACCELERATION/DECELERATION HOLD command is input during acceleration or deceleration.

When the STOP command is input while an ACCELERATION/ DECELERATION PROHIBITION command is being input, the acceleration/deceleration hold is released and operation ramps to a stop.

Set a Multi-function Input Selection (n36 to n39) to 16 (acceleration/ deceleration prohibit).

Time Chart for ACCELERATION/DECELERATION HOLD Command Input



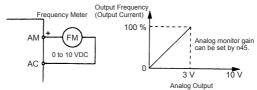
Note: If a FWD (REV) RUN command is input at the same time as an ACCELERATION/DECELERATION HOLD command, the motor will not operate. However, if the Frequency Reference Lower Limit (n31) is set to a value greater than or equal to the Min. Output Frequency (n14), the motor will operate at the Frequency Reference Lower Limit (n31).

□ Using Frequency Meter or Ammeter (n44)

Select to output either output frequency or output current to analog output terminals AM-AC for monitoring.

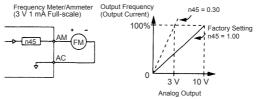
Setting	Description
0	Output frequency
1	Output current

In initial setting, analog voltage of approx. 10 V is output when output frequency (output current) is 100%.



□ Calibrating Frequency Meter or Ammeter (n45)

Used to adjust analog output gain.



Set the analog output voltage at 100% of output frequency (output current).

Frequency meter displays 0 to 60 Hz at 0 to 3 V.

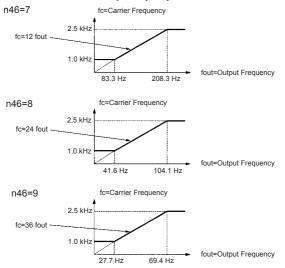
 $10 \text{ V} \times \boxed{\begin{array}{c} \text{n45 setting} \\ 0.30 \end{array}} = 3 \text{ V}$ Output frequency becomes 100 % at this value.

Reducing Motor Noise or Leakage Current Using Carrier Frequency Selection (n46)

Set the Inverter output transistor switching frequency (carrier frequency).

Setting	Carrier Frequency	Metallic Noise from Motor	Noise and Cur- rent Leakage
7	12 fout (Hz)		
8	24 fout (Hz)		
9	36 fout (Hz)	Higher ↑	Smaller
1	2.5 (kHz)		
2	5.0 (kHz)	Not	↓ Larger
3	7.5 (kHz)	audible	Larger
4	10.0 (kHz)		

If the set value is 7, 8, or 9, the carrier frequency will be multiplied by the same factor as the output frequency.



Voltage Class (V)	Capacity (kW)	Ini	tial Setting	Maximum Continuous	Reduced Current
Class (V)	(KVV)	Setting	Carrier Fre- quency (kHz)	Output Cur- rent (A)	(A)
200 V Single-	0.1	4	10	0.8	-
phase or 3-phase	0.2	4	10	1.6	
0-pridac	0.4	4	10	3.0	
	0.75	4	10	5.0	
	1.5	3	7.5	8.0	7.0
	2.2	3	7.5	11.0	10.0
	3.7	3	7.5	17.5	16.5
400 V 3-phase	0.2	3	7.5	1.2	1.0
5-priase	0.4	3	7.5	1.8	1.6
	0.75	3	7.5	3.4	3.0
	1.5	3	7.5	4.8	4.0
	2.2	3	7.5	5.5	4.8
	3.0	3	7.5	7.2	6.3
	3.7	3	7.5	8.6	7.6

The factory setting depends on the Inverter capacity (kW).



 Reduce the continuous output current when changing the carrier frequency to 4 (10 kHz) for 200 V Class (1.5 kW or more) and 400 V Class Inverters. Refer to the table above for the reduced current. Operation Condition

- · Input power supply voltage:
 - 3-phase 200 to 230 V (200 V Class)
 - Single-phase 200 to 240 V (200 V Class)
 - 3-phase 380 to 460 V (400 V Class)
- · Ambient temperature:
 - -10 to 50°C

(Protection structure: open chassis type IP20)

2. If the wiring distance is long, reduce the Inverter carrier frequency as described below.

Wiring Distance between Inverter and Motor	Up to 50 m	Up to 100 m
Carrier Frequency (n46 setting)	10 kHz or less (n46=1, 2, 3, 4, 7, 8, 9)	5 kHz or less (n46=1, 2, 7, 8, 9)

3. The carrier frequency is automatically reduced to 2.5 kHz when the Reducing Carrier Frequency Selection at Low Speed (n75) is set to 1 and the following conditions are satisfied:

Output frequency ≤ 5 Hz Output current ≥ 110% Factory setting: 0 (Disabled)

□ Operator Stop Key Selection (n06)

Set the processing when the STOP key is "pressed" during operation either from a multi-function input terminal or communications.

Setting	Description
0	The STOP key is effective either from a multi- function input terminal or communications. When the STOP key is pressed, the Inverter stops ac- cording to the setting of constant n04. At this time, the Digital Operator displays a $\mathbf{5FP}$ alarm (flashing). This STOP command is held in the Inverter until both forward and reverse RUN com- mands are open, or until the RUN command from communications goes to zero.
1	The STOP key is ineffective either from multi- function input terminals or communications.

Selecting the Stopping Method

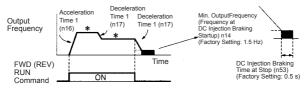
□ Stopping Method Selection (n04)

Select the stopping method suitable for the application.

Setting	Description
0	Deceleration to a stop
1	Coast to a stop

Deceleration to a Stop

Example when acceleration/deceleration time 1 is selected

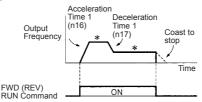


* Changing the Frequency Reference while Running

Upon termination of a FWD (REV) RUN command, the motor decelerates at the deceleration rate determined by the time set in Deceleration Time 1 (n17) and DC injection braking is applied immediately before stopping. DC injection braking is also applied when the motor decelerates because the frequency reference is set lower than the Min. Output Frequency (n14) when the FWD (REV) RUN command is ON. If the deceleration time is short or the load inertia is large, an overvoltage (OV) fault may occur at deceleration. In this case, increase the deceleration time.

Coast to a Stop

Example when Acceleration/deceleration Time 1 is selected



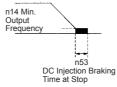
- Changing the Frequency Reference while Running Upon termination of the FWD (REV) RUN command, the motor starts coasting.
- □ Applying DC Injection Braking

DC Injection Braking Current (n52)

Sets the DC injection braking current in units of 1%. (Inverter rated current=100%)

DC Injection Braking Time at Stop (n53)

Sets the DC injection braking time at stopping in units of 0.1 second. When the setting of n53 is 0, DC injection braking is not performed, but the Inverter output is turned OFF when DC injection braking is started.



When coasting to a stop is specified in the Stopping Method Selection (n04), DC injection braking is not applied when stopping.

Building Interface Circuits with External Devices

□ Using Input Signals

The functions of multi-function input terminals S2 to S5 can be changed as necessary by setting constants n36 to n39. The same value cannot be set for more than one of these constants.

Setting	Name	Description	Ref.
0	FWD/REV RUN command (3-wire sequence selection)	Setting possible only for n37.	70
2	REVERSE RUN command (2-wire sequence selection)		49
3	External fault, NO contact input	Inverter stops for an external fault signal input. Digital Operator displays EFD*.	-
4	External fault, NC contact input		-
5	Fault reset	Resets a fault. Fault reset not effective when the RUN signal is ON.	-
6	Multi-step speed reference 1		51
7	Multi-step speed reference 2		51
8	Multi-step speed reference 3		51
10	JOG command		52
11	Acceleration/deceleration time selection		55
12	External baseblock, NO contact input	Motor coasts to a stop for this signal input. Digital Operator displays ьь.	-
13	External baseblock, NC contact input	Operator displays bb .	-
14	SEARCH command from maximum frequency	SPEED SEARCH command signal	61
15	SEARCH command from set frequency		61
16	ACCELERATION/ DECELERATION HOLD command		62
17	LOCAL/REMOTE selection		48
18	Communications/control cir- cuit terminal selection		73

Setting	Name	Description	Ref.
19	Emergency stop fault, NO contact input		
20	Emergency stop alarm, NO contact input	Method Selection (n04). When frequency coasting to	-
21	Emergency stop fault, NC contact input	 a stop (n04 is set to 1) is se- lected, the Inverter coasts to a stop according to Deceleration Time Setting 2 	
22	Emergency stop alarm, NC contact input	Digital Operator displays 5 , 7 , (Lit for fault, flashing for alarm.)	-
34	UP/DOWN commands	Setting enabled only for n39 (terminal S5)	72
35	Self-test	Setting enabled only for n39 (terminal S5)	-
1, 9, 23 to 33	Not used	Set to one of 1, 9, 23 to 33 if a terminal is not used.	-

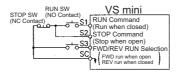
* Numbers 2 to 5 are displayed for □ to indicate the terminal numbers S2 to S5.

Initial Settings

No.	Terminal	Initial Setting	Function
n36	S2	2	REVERSE RUN command (2- wire sequence)
n37	S3	5	Fault reset
n38	S4	3	External fault (NO contact input)
n39	S5	6	Multi-step speed reference 1

Terminal Functions for 3-wire Sequence Selection

When 0 is set for terminal S3 (n37), terminal S1 is the RUN command, terminal S2 is the STOP command, and terminal S3 is the FWD/REV RUN command.



Failure to observe this warning may result in injury.

LOCAL/REMOTE Selection (Setting: 17)

Select the operation reference from either the Digital Operator or from the settings of the RUN Command Selection (n02) and Frequency Reference Selection (n03). The LOCAL/REMOTE Selection can be used only when stopped.

- Open: Run according to the setting of RUN Command Selection (n02) or Frequency Reference Selection (n03).
- Closed: Run according to the frequency reference and RUN command from the Digital Operator.

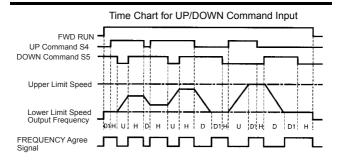
Example: Set n02=1, n03=2, n07=0.

- Open: Run according to the frequency reference from multi-function input terminal FR and RUN command from multi-function input terminals S1 to S5.
- Closed: Run according to the potentiometer frequency reference and RUN command from the Digital Operator.

UP/DOWN Commands (Setting: n39 = 034)

When the FWD (REV) RUN command is ON, acceleration/deceleration is enabled by inputting the UP or DOWN signal from multi-function input terminals S4 and S5 without changing the frequency reference. Operation can thus be performed at the desired speed. When UP/ DOWN commands are specified in n39, any function set in n38 is disabled, terminal S4 is the input terminal for the UP command, and terminal S5 is the input terminal for the DOWN command.

Multi-function Input Termi- nal S4 (UP command)	Closed	Open	Open	Closed
Multi-function Input Termi- nal S5 (DOWN command)	Open	Closed	Open	Closed
Operation Status	Accel- eration	Decel- eration	Hold	Hold



- U = UP (accelerating) status
- D = DOWN (decelerating) status
- H = HOLD (constant speed) status
- U1 = UP status, clamping at upper limit speed
- D1 = DOWN status, clamping at lower limit speed
- Note: 1. When UP/DOWN commands are selected, the upper limit speed is set regardless of frequency reference.
 - Upper limit speed =Maximum Output Frequency (n09)
 - × Frequency Reference Upper Limit (n30)/100%
 - Lower limit value is either the Minimum Output Frequency (n14) or Maximum Output Frequency (n09) × Frequency Reference Lower Limit (n31)/100% (whichever is larger.).
 - When the FWD (REV) RUN command is input, operation starts at the lower limit speed without using the UP/DOWN commands.
 - 4. If the JOG command is input while running for an UP/DOWN command, the JOG command has priority.
 - Multi-step speed references 1 to 3 are not effective when an UP/ DOWN command is selected. Multi-step speed references are effective while running in hold status.
 - 6. When 1 is set for the HOLD Output Frequency Memory Selection (n62), the output frequency can be recorded during HOLD.

Setting	Description
0	Output frequency is not recorded during HOLD.
1	When HOLD status is continued for 5 seconds or longer, the output frequency during HOLD is recorded and the Inverter restarts at the re- corded frequency.

Communications/Multi-function Input Terminal Selection (Setting: 18)

(This function is effective when option card is installed.)

Operation can be changed from communications commands, or from multi-function input terminal or Digital Operator commands.

RUN commands from communications and the frequency reference are effective when the multi-function input terminal for this setting is closed.

RUN commands in LOCAL/REMOTE mode and the frequency reference are effective when the terminal is open.

□ Using Output Signals (n40)

The functions of multi-function output terminals MA and MB can be changed as necessary by setting constants n40.

Do not allocate a function to the MA and MB terminals that requires the terminals to frequently be switched on and off. Otherwise, the life of the relay contact will be shortened.

Life expectancy for the relay contact is about 200,000 cycles (at a current of 1 A with a resistance load).

Setting	Name	Description	Ref.
0	Fault	Closed when Inverter fault oc- curs.	-
1	Operating	Closed when either FWD/REV command is input or voltage is output from the Inverter.	-
2	Frequency agree	Closed when the set frequency agrees with Inverter output fre- quency.	74
3	Zero speed	Closed when Inverter output fre- quency is less than minimum out- put frequency.	-
4	Frequency detection 1	Output frequency ≥ Frequency Detection Level (n58)	59
5	Frequency detection 2	Output frequency ≤ Frequency Detection Level (n58)	59
6	Overtorque detection, NO contact output	-	57
7	Overtorque detection, NC contact output	-	57

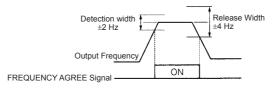
· Terminal MA and MB functions: Set to n40

Setting	Name	Description	Ref.
8, 9	Not used	Set to one of 8 or 9 if a terminal is not used.	-
10	Minor fault	Closed when an alarm has been detected.	-
11	Base blocked	Closed when the Inverter output is OFF.	I
12	Operating mode	Closed when LOCAL is selected for the LOCAL/REMOTE selection.	-
13	Inverter operation ready	Closed when an Inverter fault is not detected, and operation is ready.	-
14	Fault restart	Closed during fault retries.	-
15	UV	Closed when undervoltage is detected.	-
16	Reverse run	Closed during reverse run.	1
17	Speed search	Closed when Inverter conducts a speed search.	-
18	Data output from com- munications	Operates multi-function output terminal independently from In- verter operation (by MEMOBUS communications)	83

Initial Settings

No.	Terminal	Initial Setting
n40	MA, MB	1 (operating)

• FREQUENCY AGREE Signal (setting=2)

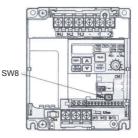


Setting Frequency by Current Reference Input

When setting frequency by inputting current reference (4-20 mA or 0-20 mA) from the control circuit terminal FR, switch the DIP switch SW8 on the control circuit board to "I" side.

SW8 is accessed by removing the option cover.







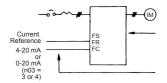
Never input voltage reference to control circuit terminal FR when DIP switch SW8 is switched to "I" side.

Current Reference Selection

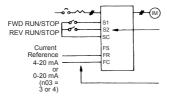
After changing DIP switch (V/I switch of SW8) to the "l" side, press [PRGM] on the Digital Operator, then set the following constants.

4-20 mA....n03=3 0-20 mA....n03=4

• Setting: n02=0, n03=3 or 4



• Setting: n02=1, n03=3 or 4



Press the Digital Operator keys to run or stop the Inverter. Switch run and stop direction by setting F/R LED.

Set frequency by the analog current signal [0-100% (max. frequency)/4-20 mA or 0-20 mA] connected to the control circuit terminal.

Switch run/stop and FWD/REV run with switching device connected to the control circuit terminal.

Multi-function input terminal S2 is set to Reverse run/stop (n36=2).

Set frequency by the analog current signal [0-100% (max. frequency)/4-20 mA or 0-20 mA] connected to the control circuit terminal.

Frequency reference gain (n41)/bias (n42) can be set even when current reference input is selected. For details, refer to *Adjusting Speed Setting Signal* on page 53.

Preventing the Motor from Stalling (Current Limit)

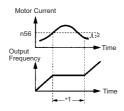
This function automatically adjusts the output frequency and output current according to the load to continue operation without stalling the motor.

Stall Prevention (Current Limit) Level during Acceleration (n56)

Sets the stall prevention (current limit) level during acceleration in units of 1%. (Inverter rated current = 100%)

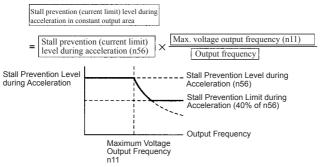
Factory setting: 170%

A setting of 200% disables the stall prevention (current limit) during acceleration. If the output current exceeds the value set for n56 during acceleration, acceleration stops and the frequency is maintained. When the output current goes to the value set for n56, acceleration starts.



- *1: Stops the acceleration to prevent the motor from stalling.
- *2: Release width (hysteresis) of stall prevention during accel is approx. 5% of inverter rated current

In the constant output area (output frequency > Max. Voltage Output Frequency (n11)), the stall prevention (current limit) level during acceleration is automatically decreased using the following equation.



Stall Prevention (Current Limit) Level while Running (n57) Sets the stall prevention (current limit) level while running in units of 1%. (Inverter rated current = 100%)

Factory setting: 160%

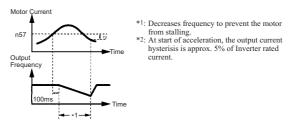
A setting of 200% disables stall prevention (current limit) while running.

If the stall prevention action current at speed agreement exceeds the value set for n57 for longer than 100 ms, deceleration starts.

If the output current exceeds the value set for n57, deceleration continues. If the output current goes to the value set for n57, acceleration to the set frequency starts.

Stall prevention acceleration/deceleration settings during operation are set either for the currently selected Acceleration Time, i.e., for Acceler-

ation Time 1 (n16) and Deceleration Time 1 (n17), or for Acceleration Time 2 (n18) and Deceleration Time 2 (n19).



 Stall Prevention (Current Limit) during Deceleration (n55) To prevent overvoltage during deceleration, the Inverter automati-

cally extends the deceleration time according to the value of main circuit DC voltage.

Setting	Stall Prevention (Current Limit) during Deceleration	Controls the deceleration time to prevent overvoltage fault.
0	Provided	Set Time
1	Not provided	Decel Time

Decreasing Motor Speed Fluctuation

□ Slip Compensation

×

As the load becomes larger, the motor speed is reduced and the motor slip value is increased. The slip compensating function controls the motor speed at a constant value even if the load varies.

When the Inverter output current is equal to the Motor Rated Current (n32), the compensation frequency is added to the output frequency.

Compensation frequency = Motor rated slip (n64)

Output current - Motor no-load current (n65)

Motor rated current (n32) – Motor no-load current (n65)

× Slip compensation gain (n66)

Constant No.	Name	Unit	Setting Range	Initial Setting
n32	Motor Rated Current	0.1 A	0% to 120% of Inverter rated current	*
n64	Motor Rated Slip	0.1 Hz	0.0 to 20 Hz	*
n65	Motor No-load Current	1%	0% to 99% (100%=Mo- tor Rated Current n32)	*
n66	Slip Compensation Gain	0.1	0.0 to 2.5	0.0
n67	Slip Compensation Time Constant	0.1 s	0.0 to 25.5 s When 0.0 s is set, delay time is 2.0 s.	2.0 s

Related Constants

* Depends on Inverter capacity.

- Note: 1. Slip compensation is not performed under the following condition: Output frequency < Minimum Output Frequency (n14)
 - 2. Slip compensation is not performed during regeneration.
 - 3. Slip compensation is not performed when the Motor Rated Current (n32) is set to 0.0 A.

Motor Protection

Motor Overload Detection

The VS mini protects against motor overload with a built-in electronic thermal overload relay.

Motor Rated Current (Electronic Thermal Reference Current, n32)

Set the rated current value shown on the motor nameplate.

Note: Setting n32 to 0.0 A disables the motor overload protective function.

Motor Overload Protection Selection (n33, n34)

n33 Setting	Electronic Thermal Characteristics
0	For general-purpose motor
1	For Inverter motor
2	Electronic thermal overload protection not provided.

Constant No.	Name	Unit	Setting Range	Initial Setting
n34	Protection Constant Selection	1 min	1 to 60 min	8 min

The electronic thermal overload function monitors the motor temperature based on Inverter output current and time to protect the motor from overheating. When the electronic thermal overload relay is enabled, an OL_{I} error occurs, and the Inverter output is turned OFF to prevent excessive overheating in the motor. When operating with one Inverter connected to one motor, an external thermal relay is not needed. When operating more than one motor with one Inverter, install a thermal relay on each motor.

General-purpose Motors and Inverter Motors

Induction motors are classified as general-purpose motors or Inverter motors based on their cooling capabilities. The motor overload function operates differently for these two motor types.

Example for 200 V-Class Motors

	Cooling Effect	Torque Characteristics	Electronic Ther- mal Overload
General-purpose Motor	Effective when operated at 50/ 60 Hz from com- mercial power supply.	100 100 100 100 100 100 100 100	An L f error (motor overload protection) oc- curs when contin- uously operated at 50/60 Hz or less at 100% load.
Inverter Motor	Effective even when operated at low speed (approx. 6 Hz)	Torque (%) 100 Geration Frequency (Hz) Base Frequency 60 Hz (V/f for 60-Hz, 220-V Input Voltage) Use an Inverter motor for continu- ous operation at low speed.	Electronic ther- mal overload pro- tection is not activated even for continuous opera- tion at 50/60 Hz or less at 100% load.

Selecting Cooling Fan Operation

In order to increase the life of the cooling fan, the fan can be set to operate only when Inverter is running

n35	= 0 (Initial setting):	Operates only when Inverter is running (Continues operation for 1 minute after Inverter is stopped.)
	=1:	Operates with power ON

Using MEMOBUS (MODBUS) Communications

Serial communication is available with VS mini using programmable controller (MEMOCON series) and MEMOBUS. In order to perform serial communications, RS-485/422 interface card (optional) must be installed.

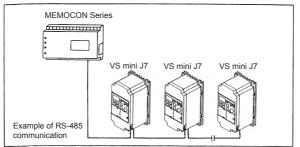
Refer to MEMOBUS Instruction Manual (Manual No.: TOEZ-C736-70.1) for details of communications.

MEMOBUS (MODBUS) Communications

MEMOBUS system is composed of a single master (PLC) and slaves (1 to 31 VS-mini units).

Communication between master and slave (serial communication) is controlled according to the master program with the master initiating communication and the slave responding.

The master sends a signal to one slave at a time. Each slave has a preregistered address No., and the master specifies the number and conduct signal communications. The slave receives the communication to carry out designated functions and reply to the master.



Communications Specifications

Interface	RS-422, RS-485
Synchronization	Asynchronous (Start-stop synchronization)
Communication Parameters	Baud rate: Selected from 2400/4800/9600/19200 bps Data length: 8 bits fixed Parity: Selected from even/odd/none Stop bits: 1 bit fixed
Communication Protocol	MEMOBUS (MODBUS) (RTU mode only)
Max. Number of Inverters that can be Connected	31 units (When using RS-485)

Using Constant Copy Function

Constant Copy Function

The Digital Operator for remote operation (Model JVOP-146, Optional) can store constants for one Inverter. A backup power supply is not necessary because EEPROM is used.

Note: When using a Digital Operator for remote operation, use with a remote interface unit for remote operation (optional) and the cable for remote operation (optional). Refer to the VS mini J7 catalog (Literature No. KAE-S606-12) for details.

The constant copy function is possible only for the Inverters with the same product series and power supply specifications. However, some constants may not be copied. It is also impossible to copy constants between VS mini and VS-606V7 Inverters.

Prohibiting reading constants from the Inverter can be set in n77. The constant data cannot be changed when this constant is set.

If an alarm occurs when copying constants, PRGM will flash and copying will continue.

Constant Copy Function Selection (n76)

Depending on the setting of n76 (Constant Copy Function Selection), the following functions can be used.

- 1. Reading all the constants from the Inverter (READ) and storing them in EEPROM in the Digital Operator
- 2. Copying the constants stored in the Digital Operator to the Inverter (COPY)

- 3. Verifying that the constants in the Digital Operator and the constants in the Inverter are the same (VERIFY)
- Displaying the maximum applicable motor capacity and the voltage class of the Inverter for which constants are stored in the Digital Operator
- 5. Displaying the software number of the Inverter for which constants are stored in the Digital Operator

Constant No.	Name	Unit	Setting Range	Initial Setting
n76	Constant Copy Func- tion Selection	-	rdy: READY rEd: READ CPy: COPY vFy: VERIFY vA: Inverter capacity display Sno: Software No. dis- play	rdy

Prohibiting Constant Read Selection (n77)

Select this function to prevent accidentally overwriting the constants stored in EEPROM or in the Digital Operator. Reading is not possible when this constant is set to 0.

The constant data stored in the Digital Operator are safe from accidental overwriting.

If reading is attempted while this constant is set to 0, PrE will flash. Press DSPL or ENTER and return to the constant No. display.

Constant No.	Name	Unit	Setting Range	Initial Setting
n77	Constant Read Selec- tion Prohibit	1	0: READ prohibited 1: READ allowed	0

□ READ Function

Reads out the constants in batch from the Inverter and stores them in EEPROM inside the Digital Operator. When the read-out is executed, the previously stored constants data in the EEPROM are cleared and replaced with the newly entered constants.

Example: Storing Constants from Inverter in EEPROM in Operator.

Expla	ination	Operator Display
Enable the setting of con- stants n01 to n79.	 Press DSPL to light [PRGM]. Press ENTER to display the set value. Change the set value to 1 by pressing the ⊘ or ⊘ key. Press ENTER. 	$\begin{array}{c} & & & & \\ \hline & & & \\ \hline \hline & & \\ \hline & & \\ \hline \hline \\ \hline \\$
Set Constant Read Pro- hibited Selection (n77) to read-enabled. ¹¹	 Change the constant No. to n77 by pressing the ᢙ or ᢙ key. Press ENTER to display the set value. Change the set value to 1 by pressing the ᢙ or ᢙ key. Press ENTER. 	☐ (The constant No. is displayed.) ☐ 77 ☐ (Lit) / (Flashes) / (Lit for one second.) ↓ ☐ 77 (The constant No. is displayed.)
Execute read-out (READ) using the Constant Copy Function Selection (n76).	 Change the constant No. by pressing the ⊘ or ⊗ key. Press ENTER to display the set value. Change the set value to rEd by pressing the ⊘ or ⊗ key. Press ENTER. 	$ \begin{array}{c} \label{eq:constraint} & \label{eq:constraint} $
	Press DSPL or ENTER.	ר קר (The constant No. is displayed.)

Expla	Operator Display	
 Set Constant Read Pro- hibited Selection (n77) to read-disabled.^{*2} 	 Change the constant No. to n77 by pressing the A or A key. 	770
	 Press ENTER to display the set value. Change the set value to 0 by pressing the or by key. Press ENTER. 	/ (Lit)

Note: 1. When reading is enabled (n77=1), this setting is not necessary.

2. This setting is not necessary unless read-prohibition is selected.

COPY Function

This function writes the constants stored inside the Digital Operator in batch to the Inverter. Write-in is possible only for Inverters with the same product series and power supply specifications.

Therefore, writing from 200 V Class to 400 V Class Inverters (or vice versa), from V/f control mode to vector control mode Inverters (or vice versa), or from VS mini to VS-606V7 Inverters are not possible.

The Constant Copy Function Selection (n76), Constant Read Selection Prohibit (n77), Fault History (n78), Software Version No. (n79), and hold output frequency are not written. vAE will appear (flashing) if the capacities of the Inverters differ.

Press ENTER to continue writing (the COPY function).

Press STOP/RESET to stop the COPY function.

The following constants are not written if the Inverter capacities differ.

Constant No.	Name	Constant No.	Name
n09 to n15	V/f Settings	n64	Motor Rated Slip
n32	Motor Rated Current	n65	Motor No-load Current
n46	Carrier Frequency Selection		

Exp	anation	Operator Display
Enable the settings for constants n01 to n79.	 Press DSPL to light [PRGM]. Press ENTER to display the set value. Change the set value to 1 by pressing the (△) or (△) key. Press ENTER. 	□□□ / (May be a different constant No.) □ (Lit) (May be a different set value.) / (Flashes) / (Lit for one second.) ↓ □□□ / (The constant No. is displayed.)
Execute write-in (COPY) using the Con- stant Copy Function Selection (n76).	 Change the constant No. to n76 by pressing the ⊇ or ⊖ key. Press ENTER to display the set value. Change the set value to CPy by pressing the ⊇ or ⊖ key. Press ENTER. 	∩ 75 ∩ 35 ∩ 25 (Lit) [P5] (Flashes while executing the copy.) $ ↓∂ − 2 $ (End is displayed after the copy has been completed.) ∩ 75 (The constant No. is displayed.)

Example: Writing Constants from EEPROM in Operator to Inverter

A setting range check and matching check for the written constants are executed after the constants are written from the Digital Operator to the Inverter. If a constant error is found, the written constants are discarded and the constants stored before writing are restored.

When a setting range error is found, the constant No. where an error occurs is indicated by flashing.

When an inconsistency in the settings is found, $_{\boldsymbol{\rho}}\boldsymbol{\rho} \square$ (\square : a number) is indicated by flashing.

VERIFY Function

This function compares the constants stored in the Digital Operator with the constant in the Inverter. Verification is possible only for the Inverters with same product series and power supply specifications.

When the constants stored in the Digital Operator are the same as those in the Inverter, vFy will flash, and then End will be displayed.

Example: Comparing Constants Stored in EEPROM in Operator with Constants in Inverter

Exp	lanation	Operator Display
Enable the settings for constants n01 to n79.	 Press DSPL to light (PRGM). Press ENTER to display the set value. Change the set value to 4 by pressing the or or key. Press ENTER. 	$\begin{array}{c} & & & & \\ & & & \\ & & & \\ & &$
Execute VERIFY by Constant Copy Function Selection (n76).	 Change the constant No. to n76 by pressing the a or beyond the constant No. to n76 by Press ENTER to display the set value. Change the set value to vFy by pressing the or beyond the constant No. to co	っ 7日 ー ゴダ (Lit) ッチダ (Lit) ッチダ (Flashes while executing VERI- FY)
 Display the unmatched constant No. 		ロ パ パ (Flashes) (When n011 is different.)
 Display the constant value in the Inverter. 	Press ENTER.	500 (Flashes)
 Display the constant value in the Digital Operator. 	Press ENTER.	50.0 (Flashes)
Continue the execution of VERIFY.	 Press the	$\Box F \stackrel{\downarrow}{\rightarrow}$ (Flashes while executing the verification) $\stackrel{\downarrow}{\models} D {\rightarrow} D {\rightarrow}$
	Press DSPL or ENTER.	רח אלך (The constant No. is displayed.)

While a constant No. that is not the same is displayed or a constant value is displayed, press STOP/RESET to interrupt the execution of the verification. End will be displayed. Press DSPL or ENTER to return to the constant No.

Inverter Capacity Display

The voltage class and maximum applicable motor capacity for which constants are stored in the Digital Operator are displayed.

Example: Displaying Voltage Class and Maximum Applicable Motor Capacity for Inverter whose Constants are in EEPROM in Operator

E	Explanation	Operator Display
Enable the setting for constants n01 to n79.	 Press DSPL to light [PRGM]. Press ENTER to display the set value. Change the set value to 4 by pressing the or	$ \begin{array}{c} \hline & \square & I \\ (May be a different constant No.) \\ \hline & \square & (Lit) \\ (May be a different constant No.) \\ I & (Flashes) \\ I & (Lit for one second.) \\ \downarrow \\ \hline & \square & \square & I \\ \end{array} $
Execute Inverter Capacity Display (vA) using the Con- stant Copy Function Selection (n76).	Change the constant No. to n76 by pressing the ⊘ or ⊘ key. Press ENTER to display the set value. Change the set value to vA fy by pressing the ⊘ or ⊘ key. Press ENTER. Press DSPL or ENTER.	っ 7日 ー d' (Lit) レイ (Lit) こ兄 7 (Lit) (For 20P7)* っ 7日 (The constant No. is displayed.)

* The following figure shows the Inverter Capacity Display

		Ę	<u>[]</u> .	<u>_</u>
	Voltage Class			
b	Single-phase 200 V			
2	Three-phase 200 V			
4	Three-phase 400 V			

No.	Max. Applicable Motor Capacity
0.1	0.1 kW
0.2	0.2 kW
0.4	0.4 kW
0.7	0.75 kW
1.5	1.5 kW
2.2	2.2 kW
3.0	3.0 kW
3.7	3.7 kW

□ Software No. Display

The software number of the Inverter for which constants are stored in the Digital Operator is displayed.

Example: Displaying Software No. of Inverter for which Constants are Stored in EEPROM in Operator

Explanation		Operator Display
Enable the setting for constants n01 to n79.	 Press DSPL to light [PRGM]. Press ENTER to display the set value. Change the set value to 4 by pressing the ⊘ or ⊗ key. Press ENTER. 	$\begin{array}{c} & & & & \\ \hline & & & \\ \hline \hline & & \\ \hline \hline & & \\ \hline & & \\ \hline & & \\ \hline \hline & & \\ \hline \hline \\ \hline & & \\ \hline \hline \\ \hline & & \\ \hline \hline \hline \\ \hline \hline \hline \\ \hline \hline \hline \\ \hline \hline \hline \hline \\ \hline \hline \hline \hline \hline \hline \\ \hline \\ \hline \hline$
Execute Software No. Display (Sno) ⁴ using the Constant Copy Function Selection (n76).	 Change the constant No. to n76 by pressing the ⊇ or ⊇ key. Press ENTER to display the set value. Change the set value to Sno by pressing the ⊇ or ⊇ key. Press ENTER. Press DSPL or ENTER. 	っ 7日 ー ゴゴ (Lit) コート (Lit) (Software version: VSP020011) っ 7日 (The constant No. is displayed.)

* Displays the lower 3 digits of the software version.

Display List

Operator Display	Description	Corrective Action
rdy	Lit: Constant copy function selection enabled.	-
rEd	Lit: READ selected. Flashes: READ under execution.	-
СРУ	Lit: Writing (COPY) selected. Flashes: Writing (COPY) under execu- tion.	-
JFY	Lit: VERIFY selected. Flashes: VERIFY under execution.	-
"Я	Lit: Inverter capacity display selected.	-
500	Lit: Software No. display selected.	-
End	Lit: READ, COPY (writing), VERIFY completed.	-

Operator Display	Description	Corrective Action
PrE	Flashes: Attempt made to execute READ while Constant Read Selection Prohibit (n77) is set to 0.	Confirm the necessity to execute READ, then set Constant Read Selection Prohibit (n77) to 1 to execute READ.
rdE	Flashes: The constant could not be read properly for READ operation. Or, a main circuit low voltage is detected during READ operation.	Confirm that the main circuit power supply voltage is correct, then re-exe- cute READ.
C 5E	Flashes: A checksum error occurred in the constant data stored in the Digital Operator.	The constants stored in the Digital Op- erator cannot be used. Re-execute READ to store the con- stants in the Digital Operator.
dP5	Flashes: The password for the con- nected Inverter and that for the con- stant data stored in the Digital Operator disagree. Example: Writing (COPY) from VS mini to VS-606V7	Check if the Inverters are the same product series.
ndf	Flashes: No constant data stored in the Digital Operator.	Execute READ.
CPE	Flashes: Attempt made to execute writing (COPY) or VERIFY between different voltage classes or different control modes.	Check each voltage class and control mode.
CYE	Flashes: A main circuit low voltage was detected during writing (COPY) operation.	Confirm that the main circuit power supply voltage is correct, then re-exe- cute writing (COPY).
FOH	Lit: A checksum error occurred in the constant data stored in the Inverter.	Initialize the constants. If an error oc- curs again, replace the Inverter due to a failure of constant memory element (EEPROM) in the Inverter.
JAE	Flashes: Attempt made to execute COPY or VERIFY between different Inverters of different capacities.	Press ENTER to continue the execu- tion of COPY or VERIFY. Press STOP to interrupt the execution of COPY or VERIFY.
٬FE	Flashes: A communications error oc- curred between the Inverter and the Digital Operator.	Check the connection between the In- verter and Digital Operator. If a communications error occurs dur- ing the READ operation or writing (COPY) operation, always re-execute the READ or COPY.

Note: While rEd, CPy, or vFy is flashing, key input on the Digital Operator is disabled. While rEd, CPy and vFy are not flashing, pressing DSPL or ENTER redisplays the constant No.

7. Maintenance and Inspection

Periodic Inspection

Periodically inspect the Inverter as described in the following table to prevent accidents and to ensure high performance with high reliability.

Location to Check	Check for	Solution
Terminals, Invert- er mounting screws, etc.	Improper seating or loose connections in hardware.	Properly seat and tighten hardware.
Heatsinks	Buildup of dust, dirt, and debris	Blow with dry compressed air at a pressure of 39.2×10^4 to 58.8×10^4 Pa, 57 to 85 psi (4 to 6kg/cm ²).
Printed circuit boards	Accumulation of con- ductive material or oil mist	Blow with dry compressed air at a pressure of 39.2×10^4 to 58.8×10^4 Pa, 57 to 85 psi (4 to 6kg/cm ²). If dust or oil cannot be removed, replace the Inverter.
Power elements and smoothing capacitor	Abnormal odor or dis- coloration	Replace the Inverter.
Cooling fan	Abnormal noise or vi- bration Cumulative operation time exceeding 20,000 hours	Replace the cooling fan.

Part Replacement

Inverter's maintenance periods are given below. Keep them as guidelines.

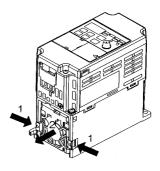
Part	Standard Replacement Period	Replacement Method
Cooling fan	2 to 3 years	Replace with new part.
Smoothing capacitor	5 years	Replace with new part. (Determine need by in- spection.)
Breaker relays	-	Determine need by in- spection.
Fuses	10 years	Replace with new part.
Aluminum capaci- tors on PCBs	5 years	Replace board. (Deter- mine need by inspection.)

Part Replacement Guidelines

Note: Usage conditions are as follows:

- · Ambient temperature: Yearly average of 30°C
- Load factor: 80% max.
- · Operating rate: 12 hours max. per day

- Replacement of Cooling Fan
 Inverters with Width of 68 mm or 140 mm
 - 1. Removal
 - Press the right and left catches on the fan cover in direction 1, and then pull them in direction 2 to remove the fan cover from the Inverter.
 - 2. Pull the wiring in direction 3 from the fan cover rear face, and remove the protective tube and connector.
 - 3. Open the left and right sides of the fan cover to remove the cooling fan from the cover.
 - 2. Mounting
 - Mount the cooling fan on the fan cover. The arrow mark to indicate the airflow direction of the cooling fan must be on the opposite side to the cover.
 - Connect the connector and mount the protective tube firmly. Mount the connector joint section on the fan cover rear face.
 - Mount the fan cover on the Inverter. Always mount the right and left catches on the fan cover on the heatsinks.



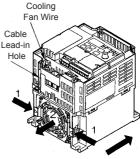


Airflow Direction

Inverters with Width of 108 mm

1. Removal

- 1. Remove the front cover, and then remove the cooling fan connector (CN4).
- Press the right and left catches on the fan cover in direction 1, and pull the fan cover in direction 2 to remove it from the Inverter. Pull out the wiring from the cable lead-in hole at the bottom of the plastic case.
- 3. Open the right and left sides of the fan cover to remove the cover from the cooling fan.
- 2. Mounting
 - Mount the cooling fan on the fan cover. The arrow mark to indicate the airflow direction must be opposite to the cover.
 - Mount the fan cover on the Inverter. Always mount the right and left catches on the fan cover on the heatsinks. Thread in the wiring from the cable lead-in hole at the bottom of the plastic case to the inside of the Inverter.
 - Connect the wiring to the cooling fan connector (CN4) and mount the front cover and the terminal cover.



Airflow Direction

8. Fault Diagnosis

Protective and Diagnostic Functions

This section describes the alarm and fault displays, the fault conditions, and the corrective actions to be taken if the VS mini malfunctions.

Corrective Actions of Models without Digital Operator

- 1. Input fault reset or cycle the power supply OFF and ON.
- When a fault cannot be corrected: Turn the power supply OFF and check the wiring and control logic.

Corrective Actions of Models with Digital Operator

-🔆 : ON 🌼 : Flashing

• : OFF

Alarm Display Inverte Status		Inverter	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)	olulus		
វែប Flashing	₽∰r	Detected as an alarm only. Fault contact output is not activated.	UV (Main circuit low voltage) Main circuit DC voltage dropped below the low- voltage detection level wolf the inverter output is 00 V: Main circuit DC voltage dropps be- low approx. 200 V (160 V for sin- gle-phase) 400 V: Main circuit DC voltage dropped below approx. 400 V.	Check the following: Power supply voltage Main circuit power supply connection. Terminal screws: Loose?
حی Flashing	e a∰e a(OV (Main circuit ov- ervoltage) Main circuit DC voltage exceeded the overvolt- age detection level while the Inverter output is OFF. Detection level 200 V Class: approx. 410 V or more 400 V class: approx. 820 V or more	Check the power supply voltage.
оН Flashing			OH (Heatsink over- heat) Intake air temperature in- creased while the Inverter output is OFF.	Check the intake air tem- perature.

Alarm Displays and Meanings

Alar	m Display	Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)	olalus		Concerve Actions
CRL Flashing		Detected as an alarm only. Fault contact output is not activated.	CAL (MEMOBUS communications waiting) Correct data has not been received from the PLC when the constants n02 (RUN Command Selec- tion) is 2 or n03 (Frequen- cy Reference Selection) is 6, and power is turned ON.	Check communications devices and transmission signals.
⊖ <i>P</i> ⊐ Flashing	ಕ©ಕ ಕ©ತ		OP□ (Constant set- ting error when con- stants are set through MEMOBUS communications) OP1: Two or more val- ues are set for multi-function in- put setection. (c) (Constants not 6 to (33)) OP2: Relationship among V/f con- stants is not cor- rect. (constants not), n11, n12, OP3: Storing value of not rated current. (constant n32) OP4: Qiper/lower limit of frequency refer Rated Current. (constant n32) OP4: Setting values of jump frequencies 1 and 2 are not ap- propriate. (constants n49, n50)	Check the setting values.
oL 3 Flashing			OL3 (Overtorque de- tection) Motor current exceeded the preset value in con- stant n60.	Reduce the load, and in- crease the acceleration/ deceleration time.
SEr Flashing	-`;`,-** © =		SER (Sequence er- ror) Inverter received LOCAL/ REMOTE command or communications/control circuit terminal changing signals from the multi- function terminal while the Inverter output is ON.	Check the external circuit (sequence).

8. Fault Diagnosis

Alar	m Display	Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)	Sialus		
ьь Flashing		Detected as an alarm only. Fault contact output is not activated.	BB (External base- block) BASEBLOCK command at multi-function terminal is ON and the Inverter output is OFF (motor coasting). Condition is cleared when input com- mand is removed.	Check the external circuit (sequence).
EF Flashing	-Ծ-		EF (Simultaneous FWD/REV RUN commands) When FWD and REV RUN commands are si- multaneously input for over 500 ms, the Inverter stops according to con- stant n04.	Check the external circuit (sequence).
5/7 Flashing	~-@e or ₽@e:@e		STP (Operator func- tion stop) (IESET) was pressed dur- ing running via a control circuit terminal FVD/REV command, or by a RUN command from communi- cations. The Inverter stops according to con- stant n04. STP (Emergency stop) Inverter received emer- gency stop alarm signal. Inverter stops according to constant n04.	Open FWD/REV com- mand of control circuit ter- minals. Check the external circuit (sequence).
FR- Flashing			FAN (Cooling fan fault) Cooling fan is locked.	Check the following: • Cooling fan • Cooling fan connec- tion
LE Flashing			CE (MEMOBUS communications fault)	Check the communication devices or signals.

Fau	ılt Display	Inverter Status	Description	Causes and Correc- tive Actions
Digital Operator	RUN (Green) ALARM (Red)	olaldo		
٥٢	•	Protective Op- eration Output is turned OFF and motor coasts to a stop.	OC (Overcurrent) Inverter output current momentality exceeded automotion of a stade 200% of rated current. (Control power supply fault) Voltage fault of control power supply is detected.	 Short circuit or grounding at Inverter output side Excessive load GD² Extremely rapid Acceleration/ Deceleration/ Deceleration/ Starting motor during Motor of a capacity greater than the inverter rating has been started. Magnetic contactor oppened/closed at the Inverter output side Check the cause, and re- store the operation. Cycle power. If the fault remains, replace the Inverter. Note) Bortor turing the power ON again, make sure that no short-circuits at the Inverter output.
GF	- \		GF (Ground fault)* Ground fault current at the Inverter output ex- ceeded Inverter rated cur- rent.	Check that motor insulation has not deteriorated. Certain the connection between Inverter and motor. Note) Before turning the power ON again, make sure that no short-circuit or ground fault occurs at the Inverter output.
٥٦			OV (Main circuit ov- ervoltage) Main circuit DC voltage exceeded the overvolt- age detection level be- cause of excessive regenerative energy from the motor. Detection level: 200 V: Stop at main cir- cuit DC voltage below approx. 400 V: Stops at main cir- cuit DC voltage of approx. 820 V or more	 Insufficient Deceleration Time (constants n17 and n19) Lowering of negative load (e.g., elevator) U Increase deceleration time.

Fault Displays and Meanings

* The ground fault here is one which occurs in the motor wiring while the motor is running. A ground fault may not be detected in the following cases.

· A ground fault with low resistance which occurs in motor cables or terminals.

· A ground fault occurs when the power is turned ON.

Fau	It Display	Inverter Status	Description	Causes and Correc- tive Actions
Digital Operator	RUN (Green) ALARM (Red)	Glatus		
י בט		Protective Op- eration Output is turned OFF and motor coasts to a stop.	UV1 (Main circuit low voltage) Main circuit DC voltage dropped below the low- voltage detection level with the inverter output is 200 V: Stops at main cir- cuit DC voltage below approx. 200 V (160 V for sin- gle-phase) 400 V: Stops at main cir- cuit DC voltage of approx. 400 V or more	Reduction of input cover supply voltage open phase of input supply Momentary power loss U Check the following: Power supply voltage Main circuit power supply connections Terminal screws: Loose?
ьH	• *		OH (Heatsink over- heat) Temperature increased because of Inverter over- load operation or Intake air temperature rise.	Excessive load Improper V/f pattern setting Insufficient acceleration time if the fault occurs dur- ing acceleration instaced in stops. J Cooling fan stops. J Check the following: Load size Vf pattern setting (constants n09 to n15) Intake air tempera- ture.
			OL1 (Motor over- load) Motor overload protec- tion operated by built-in electronic thermal over- load relay.	 Check the load size or V/f pattern setting (constants n09 to n15). Set the motor rated current shown on the nameplate in con- stant n32.
o£2			OL2 (Inverter over- load) Inverter overload protec- tion operated by built-in electronic thermal over- load relay.	 Check the load size or V/f pattern setting (constants n09 to n15). Check the Inverter capacity.
aL 3			OL3 (Overtorque de- tection) Inverter output current ex- ceeded the preset value in constant n60. When overtorque is de- tected, Inverter performs operation according to the preset setting of constant n59.	Check the driven machine and correct the cause of the fault, or increase the value of constant n60 up to the highest value al- lowed for the machine.

Fau	lt Display	Inverter Status	Description	Causes and Correc- tive Actions
Digital Operator	RUN (Green) ALARM (Red)	oldido		
EFO		Protective Op- eration is unred OFF and motor coasts to a stop.	EF⊡ (External fault) Inverter receives an ex- ternal fault input from con- trol circuit terminal. EFC: External fault ref- put command from control circuit ter- minal S2 EF3: External fault in- put command from control circuit ter- minal S3 EF4: External fault in- put command from control circuit ter- minal S4 EF5: External fault in- put command from control circuit ter- minal S4 EF5: External fault in- put command from control circuit ter- minal S4	Check the external circuit (sequence).
FOO			CPF-00 Initial memory fault has detected.	Cycle power. If the fault remains, re- place the Inverter.
FO I	٠		CPF-01 ROM error has detected.	Cycle power. If the fault remains, re- place the Inverter.
FOH	-¤-		CPF-04 EEPROM fault of Inverter control circuit was detect- ed.	 Record all constant data and initialize the constants. (Refer to page 44 for constant initialization.) Cycle power. If the fault remains, replace the Inverter.
FOS			CPF-05 AD converter fault was detected.	Cycle power. If the fault remains, re- place the Inverter.
F06			 CPF-06 Option card connection fault A non-corresponding option card is connected. 	Remove power to the In- verter. Check the connec- tion of the Digital Operator. Verify Software Version No.
FD7			CPF-07 Operator control circuit (EEPROM or A/D con- verter) fault	Cycle power. If the fault remains, replace the In- verter.
CE			CE (MEMOBUS communications fault) Normal reception of com- munication data is not possible.	Check the communication devices or communication signals.

8. Fault Diagnosis

Fau	It Display	Inverter Status	Description	Causes and Correc-
Digital Operator	RUN (Green) ALARM (Red)			
SFP	° or ●☆	Stops accord- ing to con- stant	STP (Emergency stop) The Inverter stopped ac- cording to constant n04 after receiving the emer- gency stop fault signal.	Check the external circuit (sequence).
 (OFF)	•		Insufficient power supply voltage Control power supply fault Hardware fault	Check the following: • Power supply voltage • Main circuit power supply connections • Terminal screws: Loose? • Control sequence. Replace the Inverter.

Note: To display or clear the fault history, refer to page 41.

Troubleshooting

Trouble	Cause	Corrective Actions
The motor does not operate when an external operation signal is input.	The operation method selection is wrong. The run command (n02) is not set to Control Circuit Terminal.	Set the run command (n02) to Control Circuit Terminal.
	A 3-wire sequence is in effect. The multi-function input method (n37) is set to 3-wire sequence, and the S2 control terminal is not closed.	To use a 3-wire sequence, make the wiring so that the S2 control terminal is closed. To use a 2-wire sequence, set the multi-function input (n37) to a value other than 3-wire sequence.
	The frequency reference is too low. The input frequency reference is lower than the setting for the min.output frequency (n14).	Input a frequency reference greater than the min. output frequency (n14).
	Local mode is in effect.	Set the LO/RE selection of the digital operator to RE.
	The SW setting for the refer- ence selection is wrong. Example: The reference 4-20 mA is input, but the SW is set to "V."	For analog input, make sure that the frequency reference (n03) and SW8 settings are correct.
	The setting of NPN/PNP switch (SW7) is not correct.	Set SW7 correctly.
The motor stops. The torque is not output.	The stall prevention level dur- ing acceleration is too low. Because the stall prevention level during acceleration (n56) is set too low, the output current reaches the set level, the output frequency is stopped, and the acceleration time is lengthened.	Check if the stall prevention level during acceleration (n56) is set to an appropriate value.
	The stall prevention level dur- ing running is too low. Because the stall prevention level during running (n57) is set too low, the output current reaches the set level, and the speed drops.	Check if the stall prevention level during running (n57) is set to an appropriate value.
	The load is too heavy. If the load is too heavy, stall prevention is activated, the output frequency is stopped, and the acceleration time is lengthened.	Lengthen the set acceleration time (n16). Reduce the load.
	When the maximum frequency was changed, the maximum voltage frequency was also changed.	To increase the speed of a general- purpose motor, only change the maximum frequency.
	The V/f set value is too low.	Set the V/f (n09 to n15) according to the load characteristics.

Trouble	Cause	Corrective Actions
The motor speed is unstable. The motor speed fluctuates when operating with a light load.	The stall prevention level dur- ing running is too low. Because the stall prevention level during running (n57) is too low, the output current reaches the set level and the speed drops.	Check if the stall prevention level during running (n57) is set to an appropriate value.
	The load is too heavy. If the load is too heavy, stall prevention is activated, the output frequency is stopped, and the acceleration time is lengthened.	Reduce the load.
	The carrier frequency is too high. If operating the motor with a light load, a high carrier frequency may cause the motor speed to fluctuate.	Decrease the carrier frequency (n46).
	The V/f set value is too high for a low speed operation. Because the set value for the V/f is too high, over-excitation occurs at low speeds.	Set the V/f (n09 to n15) according to the load characteristics.
	The maximum frequency and base frequency were incorrect- ly adjusted. Example: To operate a 60 Hz motor at 40 Hz or less, the maximum frequency and base frequency are set to 40 Hz.	Set the maximum frequency and the base frequency according to the motor specifications.
	The Inverter is used for an op- eration at 1.5 Hz or less.	Do not use the J7 Inverter for an operation that runs at 1.5 Hz or less. For an operation at 1.5 Hz or less, use a different Inverter model.
	The analog reference input is unstable and has noise interfer- ence.	Increase the set value for the filter time constant.
The Digital Operator does not turn ON.	The power is not being sup- plied. The breaker or other component on the power input side is not turned ON, and the power is not being supplied.	Check if the power is being supplied.
The LED of the Digital Operator is unlit.	Short-circuit bar for terminals +1 and +2 is not connected.	Confirm that the short-circuit bar is connected properly.
The cooling fan does not turn.	To maximize the life of the cool- ing fan, the fan is set to operate only while the Inverter is run- ning.	Check the operation of the cooling fan. Check if n039 (cooling-fan operation selection) has been set to the correct setting.

9. Specifications

Standard Specifications (200 V Class)

Voltage Class			200 V single-/3-phase						
Model CIMR- J7*ADDDD		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7
		Single- phase	B0P1	B0P2	B0P4	B0P7	B1P5	-	-
Max. Applicable Motor Output kW ^{*1}			0.1	0.2	0.4	0.75	1.5	2.2	3.7
Output Characteristics	Inverter Capacity (kVA)		0.3	0.6	1.1	1.9	3.0	4.2	6.7
	Rated Output Current (A)		0.8	1.6	3	5	8	11	17.5
	Max. Output Voltage (V)		3-phase, 200 to 230 V (proportional to input voltage) 3-phase, 200 to 240 V (proportional to input voltage)						
	Max. Output Fre- quency (Hz)		400 Hz (Programmable)						
Power Supply	Rated Input Voltage and Frequency		3-phase, 200 to 230 V, 50/60 Hz Single-phase, 200 to 240 V, 50/60 Hz						
	Allowable Voltage Fluctuation		-15% to +10%						
	Allowable Frequency Fluctuation		±5%						
Control Characteristics	Control Method		Sine wave PWM (V/f control)						
	Frequency Control Range		0.1 to 400 Hz						
	Frequency Accuracy (Temper- ature Change)		Digital reference: $\pm 0.01\%$ (–10 to 50°C) Analog reference: $\pm 0.5\%$ (25 $\pm 10^\circ C)$						
	Frequency Setting Resolution		Digital reference: 0.1 Hz (less than 100 Hz)/1 Hz (100 Hz or more) Analog reference: 1/1000 of max. output frequency						
	Output Frequency Resolution		0.01 Hz						
	Overload Capacity		150% rated output current for one minute						
	Frequency Reference Signal		0 to 10 VDC (20 k\Omega), 4 to 20 mA (250 $\Omega),$ 0 to 20 mA (250 $\Omega),$ frequency setting potentiometer (Selectable)						
		eleration/ eration Time	0.0 to 999 s (Acceleration/deceleration time are independently pro- grammed.)						

	Voltage	Class			200 V	single-/3	-phase			
Mada	I CIMR-	3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7	
		Single- phase	B0P1	B0P1 B0P2 B0P4 B0P7 B1P5 -					-	
Braking Torque Braking Torque			0.1, 0.2 0.4, 0.7 1.5 kW 2.2 kW Continu	kW: 150 5 kW: 10 50% or more: ious rege	0% 20% nerative t	orque: A	oprox. 20	%		
Contre	V/f Cha	aracteristics	Possibl	Possible to program any V/f pattern						
		r Overload otection	Electronic thermal overload relay							
		intaneous ercurrent	Motor coasts to a stop at approx. 200% of Inverter rated current							
	Ó	verload		Motor coasts to a stop after 1 minute at 150% of Inverter rat- ed output current						
	Ove	ervoltage	Motor coasts to a stop if DC bus voltage exceed 410 V							
ctions	Und	ervoltage	Stops when DC bus voltage is approx. 200 V or less (approx 160 V or less for single-phase series).							
Protective Functions		ntary Power Loss	loss is '	15 ms or I	are select onger), c shorter, c	ontinuous	operatio	l (stops if n if power n.	power r loss is	
Protei	Heatsir	nk Overheat	Protect	ed by ele	ctronic cir	cuit.				
		Prevention Level	Can be provide	set indivi d/not pro	dual leve vided ava	l during a iilable du	cceleratio	on/decele to a stop	ration,	
	Coolin	g Fan Fault	Protected by electronic circuit (fan lock detection).							
	Grou	nd Fault ^{*6}	Protected by electronic circuit (rated output current level).							
		Charge Indi- cation	RUN indicator stays ON or Digital Operator indicator stays ON. (Charge LED is provided for 400 V.) ON until the DC bus voltage becomes 50 V or less.						stays	

	Voltage	Class			200 V	single-/3	-phase			
Mada	I CIMR-	3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7	
J7*AI		Single- phase	B0P1	B0P2	B0P4	B0P7	B1P5	-	-	
suc	Input Signals	Multi- function Input	(3-wire input), i tion/dec contact TION/E selection	Four of the following input signals are selectable: Reverse run (3-wire sequence), fault reset, external fault (NO/NC contact input), multi-step speed operation, JOG command, accelera- tion/deceleration time select, external baseblock (NO/NC contact input), SPEED SEARCH command, ACCELERA- TION/DECELERATION HOLD command, LOCAL/REMOTE selection, communication/control circuit terminal selection, emergency stop fault, emergency stop alarm						
Output Functions	Output Signals	Multi- function Output ^{*3}	Following output signals are selectable (1 NO/NC contact out- put): Fault, running, zero speed, frequency agree, frequency de- tection, (output frequency 5 or 2 set value), overtorque detec- tion, minor error, basebicck, operating mode, Inverter run ready, fault retry, UV, speed search, data output through com- muncation							
		andard Inctions	Full-range automatic torque boost, slip compensation, DC in- jection braking ourrent/time at startup/stop, frequency refer- ence bias/gain, frequency reference with built-in potentiometer, [MEMOBUS communications (RS-485/422, max. 19.2K bps) (optional)]						refer-	
	ndications	Status Indicators	RUN and ALARM provided as standard indicators							
nctions	Indice	Digital Operator	Provide output		nitor frequ	iency refe	erence, ou	utput freq	uency,	
Other Functions	Те	rminals	Main circuit: screw terminals Control circuit: plug-in screw terminal							
0	betwe	g Distance en Inverter d Motor	100 m or less*5							
	Enclos	sure	Open c	hassis IP	20					
	Cooling N	Nethod	200 V, 200 V,	0.75 kW o 1.5 kW or	ovided for or larger l larger In e self-coo	nverters (verters (s	3-phase)			
		mbient iperature	Open c	hassis: -	10 to 50°0	C (not fro:	zen)			
ditions	Н	umidity	95% or	less (nor	n-condens	sing)				
Environmental Conditions	Storage Temperature ^{*4}		-20 to 60 °C							
nmen	Location		Indoor (free from corrosive gases or dust)							
inviro	Elevation		1,000 m or less							
ш	Vi	bration	Up to 9 up to 2	Up to 9.8 m/s ² (1G) at less than 20 Hz, up to 2 m/s ² (0.2G) at 20 to 50 Hz						

- * 1. Based on a standard 4-pole motor for max. applicable motor output.
- * 2. Shows deceleration torque for uncoupled motor decelerating from 60 Hz with the shortest possible deceleration time.
- * 3. Minimum permissible load: 5 VDC, 10 mA (as reference value)
- * 4. Temperature during shipping (for short period).
- * 5. If the wiring distance between Inverter and motor is long, reduce the Inverter carrier frequency. For details, refer to *Reducing Motor Noise or Leakage Current Using Carrier Frequency Selection (n46)* on page 64.
- * 6. The ground fault here is one which occurs in the motor wiring while the motor is running. A ground fault may not be detected in the following cases.
 - A ground fault with low resistance which occurs in motor cables or terminals.
 - · A ground fault occurs when the power is turned ON.

Standard Specifications (400 V Class)

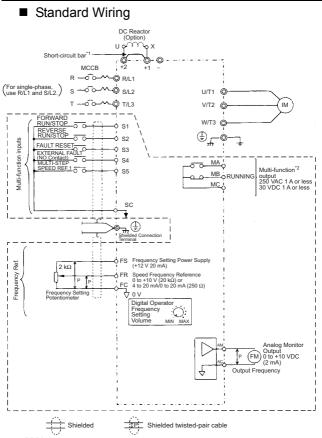
\ \	/oltage C	Class			40	00 V 3-pha	ise			
	Model CIMR- J7*ADDDD		40P2	40P4	40P7	41P5	42P2	43P0	43P7	
Max.	Applicat Output k	ole Motor W ^{*1}	0.2	0.2 0.4 0.75 1.5 2.2 3.0						
stics		verter city (kVA)	0.9	1.4	2.6	3.7	4.2	5.5	6.6	
Output Characteristics		d Output rent (A)	1.2	1.8	3.4	4.8	5.5	7.2	8.6	
put Cha		. Output tage (V)	3-phase, 380 to 460 V (proportional to input voltage)							
Out		. Output iency (Hz)	400 Hz (Programmable)							
yl	Volt	ed Input age and quency	3-phase, 380 to 460 V, 50/60 Hz							
Power Supply	Allowable Voltage Fluctuation			+10%						
ъ д	Fre	owable quency ctuation	±5%							

V	oltage C	Class			40	0 V 3-pha	ise				
Model J7∗A⊡		3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7		
	Contr	ol Method	Sine wave PWM (V/f control)								
	Frequency Control Range		0.1 to 400 Hz								
	Frequency Accuracy (Temperature Change)				±0.01%, – ±0.5%, 25		C				
	S	equency setting solution	0.1 Hz (100 Hz)/1 1/1000 of						
Control Characteristics	Fre	Output equency solution	0.01 Hz								
Charac		verload apacity	150% ra	150% rated output current for one minute							
Control	Re	equency ference Signal	0 to 10 quency	0 to 10 VDC (20 kΩ), 4 to 20 mA (250 $\Omega),$ 0 to 20 mA (250 $\Omega),$ frequency setting potentiometer (Selectable)							
	Dec	eleration/ eleration Time	0.0 to 999 s (Acceleration/deceleration time are independently programmed.)								
	Braki	ng Torque	orque Short-term average deceleration torque ¹² 0.2 kW: 150% 0.4/0.75 kW: 100% 1.5 kW: 50% 2.2 kW or more: 20% Continuous regenerative torque: Pyrex. 20%								
	Chara	V/f acteristics	Possible	e to progra	am any V/f	pattern					
S		Overload	Electron	ic therma	l overload	relay					
unction		ntaneous ercurrent	Motor coasts to a stop at approx. 200% of Inverter rated current								
Protective Functions	0\	verload	Motor coasts to a stop after 1 minute at 150% of Inverter rated output current								
Prot	Ove	ervoltage	Motor c	basts to a	stop if DC	bus volta	ge exceed	1 820 V			
	Unde	ervoltage	Stops w	hen DC b	us voltage	is approx	. 400 V or	less			

١	/oltage (Class			40	00 V 3-pha	ise				
Model J7*AE		3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7		
		mentary ver Loss	15 ms o	r longer), (e selectab continuous nuous ope	s operatio	ovided (sto n if power	ops if powe loss is app	er loss is prox. 0.5		
tions		sink Over- heat	Protecte	Protected by electronic circuit.							
/e Func		Prevention Level		Can be set individual levels during acceleration/deceleration, provided/not provided available during coast to a stop.							
Protective Functions		oling Fan Fault	Protecte	d by elect	ronic circu	uit (fan loc	k detectio	n).			
	Grou	nd Fault ^{*6}	Protecte	ed by elect	ronic circu	uit (rated c	output curr	ent level).			
		er Charge dication	Charge ON until	LED is pro the DC b	ovided. us voltage	becomes	50 V or le	ess.			
suc	Input Signals	Multi- function Input	wire sec multi-ste ation tim SPEED HOLD c control c	Four of the following input signals are selectable: Reverse run (3- wire sequence), fault reset, external fault (NO/NC contact input), multi-step speed operation. JOG command, acceleration/deceler- ation time select, external baseblock (NO/NC contact input), SPEED SEARCH command, ACCELERATION/DECELERATION HOLD command, LOCAL/REMOTE selection, communication/ control circuit terminal selection, emergency stop fault, emergency stop alarm							
Output Functions	Output Signals	Multi- function Output ^{*3}	Following output signals are selectable (1 NO/NC contact output): Fault, running, zero speed, frequency agree, frequency detection (output frequency $\leq or \geq set value)$, overforque detection, minor error, baseblock, operating mode, inverter run ready, fault retry, UV, speed search, data output through communication								
		lard Func- tions	tion brail gain, fre	king curren quency re IEMOBUS	nt/time at a ference w	startup/sto	p frequen potention	sation, DC cy referen neter, cons 2, max.19	ce bias/ stant		
	ndications	Status Indica- tors	RUN an	d ALARM	provided	as standa	rd indicato	ors			
Other Functions	Indica	Digital Opera- tor	Provide put curre	d for moni ent	tor frequer	ncy refere	nce, outpu	ut frequen	cy, out-		
Other F	Те	rminals			v terminals g-in screw						
	Wiring Distance between Inverter and Motor			100 m or less ^{'5}							
	Enclosure		Open chassis IP20								
C	Cooling Method			Cooling fan is provided for the following models: 400 V, 1.5 kW or larger Inverters (3-phase) Other models are self-cooling.							

v	oltage C	Class	400 V 3-phase								
Model CIMR- J7*A		40P2	40P2 40P4 40P7 41P5 42P2 43P0 4								
	Ambient Tem- perature			nassis: -10	0 to 50°C	(not frozer	ו)				
litions	H	umidity	95% or less (non-condensing)								
Environmental Conditions		ge Temper- ture ^{*4}	20 to 60°C								
nem	Lo	ocation	Indoor (free from corrosive gases or dust)								
nviro	El	evation	1,000 m or less								
ш	Vi	bration	Up to 9.8 m/s ² (1G) at less than 20 Hz, up to 2 m/s ² (0.2G) at 20 to 50 Hz								

- * 1. Based on a standard 4-pole motor for max. applicable motor output.
- * 2. Shows deceleration torque for uncoupled motor decelerating from 60 Hz with the shortest possible deceleration time.
- * 3. Minimum permissible load: 5 VDC, 10 mA (as reference value)
- * 4. Temperature during shipping (for short period).
- * 5. If the wiring distance between Inverter and motor is long, reduce the Inverter carrier frequency. For details, refer to *Reducing Motor Noise or Leakage Current Using Carrier Frequency Selection (n46)* on page 64.
- * 6. The ground fault here is one which occurs in the motor wiring while the motor is running. A ground fault may not be detected in the following cases.
 - A ground fault with low resistance which occurs in motor cables or terminals.
 - · A ground fault occurs when the power is turned ON.



- Conty basic insulation (Protective class 1, overvoltage categoly II) is provided for the control circuit terminals. Additional insulation may be necessary in the end product to conform to CE requirements.
 - *1. Shorting bar must be removed when connecting DC reactor.
 - *2. Minimum permissible load: 5 VDC, 10 mA (as reference value)

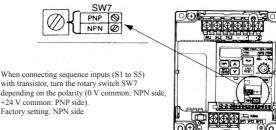
Terminal Descriptions

Ту	rpe	Term	inal	Name	Function (Signal Le	evel)	
		R/L1, T/I		AC power supply input	Use main circuit power input. (R/L1 and S/L2 for single-phas Never use terminal T/L3.)	Use terminals e Inverters.	
	_	U/T1, W/	V/T2, T3	Inverter output	Inverter output		
Maio Cironit		+2, +1		DC reactor connec- tion When connecting optional I move the main circuit short tween +2 and +1.			
-	2	+1	, -	DC power supply input	DC power supply input (+1: potive)*1	sitive -: nega-	
				Grounding	For grounding (according to the ing codes) (200 V class: groun less, 400 V class: ground to 10	id to 100Ω or	
			S1	Forward run input	Closed: FWD run, open: REV run	Photo- coupler insulation,	
			S2	Multi-function input selection 2	Factory setting closed:REV run open: FWD run	24 VDC, 8 mA	
		Sequence	nence	S3	Multi-function input selection 3	Factory setting: Fault reset	
			S4	Multi-function input selection 4	Factory setting: External fault (NO contact)		
	Input		S5 Multi-function input selection 5		Factory setting: Multi-step speed reference 1		
Ę			SC	Multi-function input selection common	For control signal		
Control Circuit		cy e	FS	Power for frequen- cy setting	+12 V (permissible current 20	mA max.)	
Cont		Frequency reference	FR	Master speed fre- quency reference	0 to +10 VDC (20 k $\Omega)$ or 4 to 2 or 0 to 20 mA (250 $\Omega)$ (1/1000	20 mA (250 Ω) resolution)	
		1	FC	Frequency refer- ence common	0 V		
		tion tput	MA	NO contact output	Factory setting: running	Contact ca- pacity	
	Output Multi-function contact output		MB	NC contact output		250 VAC 1 A or less,	
			MC	Contact output common		30 VDC 1 A or less	
	0	A	N	Analog monitor out- put	Factory setting: Output fre- quency 0 to +10 VDC	0 to +10 VDC, 2 mA or less.	
* 1		A	C	Analog monitor common	0V	8-bit resolu- tion	

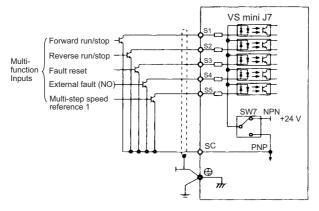
* 1. DC power supply input terminal is not applied to CE/UL standard.

* 2. Minimum permissible load: 5 VDC, 10 mA (as reference value)

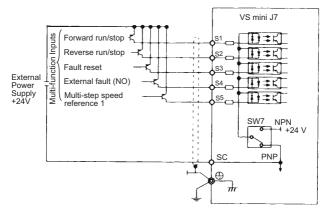
Sequence Input Connection with NPN/PNP Transistor



Sequence Connection with NPN Transistor (0 V Common)



Sequence Connection with PNP Transistor (+24 V Common)



Dimensions/Heat Loss (Unit: mm)

The following diagram shows the external dimensions and heat loss of the open-chassis type (IP20).

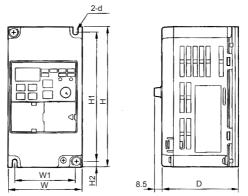
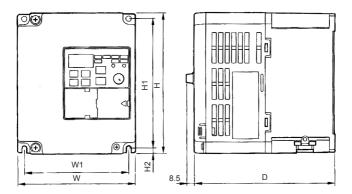


Fig. 1



Dimensions in mm/Mass in kg/Heat Loss (W)

Voltage class	Capacity (kW)	W	н	D	W1	H1	H2	d	Mass	Hea	at Loss	(W)	Fig.
61835	(KW)									Heat- sink	Unit	Total	
200 V 3-phase	0.1	68	128	70	56	118	5	M4	0.5	3.7	9.3	13.0	1
o pridoc	0.2	68	128	70	56	118	5	M4	0.5	7.7	10.3	18.0	1
	0.4	68	128	102	56	118	5	M4	0.8	15.8	12.3	28.1	1
	0.75	68	128	122	56	118	5	M4	0.9	28.4	16.7	45.1	1
	1.5	108	128	129	96	118	5	M4	1.3	53.7	19.1	72.8	2
	2.2	108	128	154	96	118	5	M4	1.5	60.4	34.4	94.8	2
	3.7	140	128	161	128	118	5	M4	2.1	96.7	52.4	149.1	2
200 V single-	0.1	68	128	70	56	118	5	M4	0.5	3.7	10.4	14.1	1
phase	0.2	68	128	70	56	118	5	M4	0.5	7.7	12.3	20.0	1
	0.4	68	128	112	56	118	5	M4	0.9	15.8	16.1	31.9	1
	0.75	108	128	129	96	118	5	M4	1.5	28.4	23.0	51.4	2
	1.5	108	128	154	96	118	5	M4	1.5	53.7	29.1	82.8	2
400 V 3-phase	0.2	108	128	81	96	118	5	M4	1.0	9.4	13.7	23.1	2
5-priase	0.4	108	128	99	96	118	5	M4	1.1	15.1	15.0	30.1	2
	0.75	108	128	129	96	118	5	M4	1.5	30.3	24.6	54.9	2
	1.5	108	128	154	96	118	5	M4	1.5	45.8	29.9	75.7	2
	2.2	108	128	154	96	118	5	M4	1.5	50.5	32.5	83.0	2
	3.0	140	128	161	128	118	5	M4	2.1	58.2	37.6	95.8	2
	3.7	140	128	161	128	118	5	M4	2.1	73.4	44.5	117.9	2

Recommended Peripheral Devices

It is recommended that the following peripheral devices be mounted between the AC main circuit power supply and VS mini input terminals R/L1, S/L2, and T/L3.

· MCCB (Molded-case Circuit Breaker)/Fuse:

Always connect for wiring protection.

· Magnetic Contactor:

Mount a surge suppressor on the coil. (Refer to the table shown below.) When using a magnetic contactor to start and stop the Inverter, do not exceed one start per hour.

Recommended MCCB, Magnetic Contactors and Fuses

VS mini Model		J7*A 20P1	J7*A 20P2	J7*A 20P4	J7*A 20P7	J7*A 21P5	J7*A 22P2	J7*A 23P7
Capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7
Rated Output (A)	Current	0.8	1.6	3	5	8	11	17.5
MCCB type NI (MITSUBISHI)		5 A	5 A	5 A	10 A	20 A	20 A	30 A
Magnetic con- tactor (Fuji Electric FA	Without reactor	SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-4-0 (18A)	SC-N1 (26A)	SC-N2 (35A)
Components & Systems) With reactor		SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-4-0 (18A)	SC-N1 (26A)
Fuse (UL Class RK5)		5 A	5 A	5 A	10 A	20 A	20 A	30 A

· 200 V 3-phase

· 200 V Single-phase

VS mini Mode	J7*A B0P1	J7*A B0P2	J7*A B0P4	J7*A B0P7	J7*A B1P5	
Capacity (kVA)		0.3	0.6	1.1	1.9	3.0
Rated Output Current	(A)	0.8	1.5	3	5	8
MCCB type NF30, NF5 SUBISHI)	50 (MIT-	5 A	5 A	10 A	20 A	30 A
Magnetic contactor (Fuji Electric FA Com- ponents & Systems)	(Fuji Electric FA Com- reactor		SC-03 (11A)	SC-03 (11A)	SC-4-0 (18A)	SC-N2 (35A)
With reactor		SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-4-0 (18A)	SC-N1 (26A)
Fuse (UL Class RK5)	5 A	5 A	10 A	20 A	20 A	

• 400 A 3-phase

VS mini Mo	J7*A 40P2	J7*A 40P4	J7*A 40P7	J7*A 41P5	J7*A 42P2	J7*A 43P0	J7*A 43P7	
Capacity (kVA)		0.9	1.4	2.6	3.7	4.2	5.5	6.6
Rated Output Curr	rent (A)	1.2	1.8	3.4	4.8	5.5	7.2	8.6
MCCB type NF30, (MITSUBISHI)	NF50	5 A	5 A	5 A	10 A	15 A	20 A	20 A
Magnetic con- tactor (Fuji Elec- tric FA		SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-4-0 (18A)	SC-4-0 (18A)	SC-N1 (26A)
Components & With Systems) With		SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-03 (11A)	SC-4-0 (18A)
Fuse (UL Class RK5)		5 A	5 A	5 A	10 A	10 A	20 A	20 A

Surge Suppressors

Coils and Re	Surge Suppressors	Model DCR2-	Specifica- tions	Code No.
200 V to 230 V	Large size magnetic contactors	50A22E	250 VAC 0.5 μF 200 Ω	C002417
	Control relays MY-2, -3 (OMRON) HH-22, -23 (FUJI) MM-2, -4 (OMRON)	10A25C	250 VAC 0.1 μF 100 Ω	C002482

· Ground Fault Interrupter:

Select a ground fault interrupter not affected by high frequencies. To prevent malfunctions, the current should be 200 mA or higher and the operating time 0.1 s or longer.

Example:

- NV series by Mitsubishi Electric Co., Ltd. (manufactured in 1988 and after)
- EG, SG series by Fuji Electric Co., Ltd. (manufactured in 1984 and after)

· AC and DC Reactor:

Install an AC reactor to connect to a power supply transformer of large capacity (600 kVA or more) or to improve power factor on the power supply side.

· Noise Filter:

Use a noise filter exclusively for Inverter if radio noise generated from the Inverter causes other control devices to malfunction.



- Never connect a general LC/RC noise filter to the Inverter output circuit.
- Do not connect a phase-advancing capacitor to the I/O sides and/or a surge suppressor to the output side.
- 3. When a magnetic contactor is installed between the Inverter and the motor, do not turn it ON/OFF during operation.

For the details of the peripheral devices, refer to the catalog.

Constants List

 Addition of Constants Accompanied by the Upgraded Software Version

The constants marked with #1 are applicable for the upgraded software version No. VSP 020011 or later.

No.	Regis- ter No. for Trans- mission	Name	Setting Range	Setting Unit	Initial Setting	Change during Opera- tion	User Set- ting	Ref. Page
01	0101H	Password	0, 1, 6, 8, 9	1	1	Yes		44
02	0102H	RUN Command Se- lection	0 to 2	1	0	Yes		49
03	0103H	Frequency Refer- ence Selection	0 to 4, 6	1	0 *4	Yes		50
04	0104H	Stopping Method Selection	0, 1	1	0	Yes		67
05	0105H	Reverse Run Pro- hibit	0, 1	1	0	Yes		51
06	0106H	Stop Key Selection	0, 1	1	0	Yes		66
07	0107H	Frequency Refer- ence Selection in Local Mode	0, 1	1	0 *4	Yes		49
08	0108H	Frequency Refer- ence Setting Meth- od From Digital Operator	0, 1	1	0	Yes		50
09	0109H	Max. Output Fre- quency	50.0 to 400 Hz	0.1 Hz (less than 100 Hz)	60.0 Hz	Yes		45
10	010AH	Max. Voltage	1 to 255 V ^{*1}	1 V	200 V ^{*1}	Yes		45
11	010BH	Max. Voltage Out- put Frequency	0.2 to 400 Hz	1 Hz (100 Hz or more)	60.0 Hz	Yes		45
12	010CH	Mid. Output Fre- quency	0.1 to 399 Hz	1 Hz (100 Hz or more)	1.5 Hz	Yes		45
13	010DH	Mid. Output Fre- quency Voltage	1 to 255 V ^{*1}	1 V	12 V *1	Yes		45

9. Specifications

No.	Regis- ter No. for Trans- mission	Name	Setting Range	Setting Unit	Initial Setting	Change during Opera- tion	User Set- ting	Ref. Page
14	010EH	Min. Output Fre- quency	0.1 to 10.0 Hz	0.1 Hz	1.5 Hz	Yes		45
15	010FH	Min. Output Fre- quency Voltage	1 to 50 V ^{*1}	1 V	12 V ^{*1}	Yes		45
16	0110H	Acceleration Time 1	0.0 to 999 s	0.1 s (less than 100 s) 1 s (100 s or more)	10.0 s	No		55
17	0111H	Deceleration Time 1	0.0 to 999 s	0.1 s (less than 100 s) 1 s (100 s or more)	10.0 s	No		55
18	0112H	Acceleration Time 2	0.0 to 999 s	0.1 s (less than 100 s) 1 s (100 s or more)	10.0 s	No		55
19	0113H	Deceleration Time 2	0.0 to 999 s	0.1 s (less than 100 s) 1 s (100 s or more)	10.0 s	No		55
20	0114H	S-curve Selection	0 to 3	1	0	Yes		56
21	0115H	Frequency Refer- ence 1 (Master Speed Frequency Reference)	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	6.0 Hz	No		51
22	0116H	Frequency Refer- ence 2	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	0.0 Hz	No		51
23	0117H	Frequency Refer- ence 3	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	0.0 Hz	No		51

No.	Regis- ter No. for Trans- mission	Name	Setting Range	Setting Unit	Initial Setting	Change during Opera- tion	User Set- ting	Ref. Page
24	0118H	Frequency Refer- ence 4	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	0.0 Hz	No		51
25	0119H	Frequency Refer- ence 5	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	0.0 Hz	No		51
26	011AH	Frequency Refer- ence 6	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	0.0 Hz	No		51
27	011BH	Frequency Refer- ence 7	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	0.0 Hz	No		51
28	011CH	Frequency Refer- ence 8	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	0.0 Hz	No		51
29	011DH	Jog Frequency	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1Hz (100 Hz or more)	6.0 Hz	No		52
30	011EH	Frequency Refer- ence Upper Limit	0% to 110%	1%	100%	Yes		54
31	011FH	Frequency Refer- ence Lower Limit	0% to 110%	1%	0%	Yes		54
32	0120H	Motor Rated Cur- rent	0% to 120% of Inverter rated cur- rent	0.1 A	*2	Yes		81

9. Specifications

No.	Regis- ter No. for Trans- mission	Name	Setting Range	Setting Unit	Initial Setting	Change during Opera- tion	User Set- ting	Ref. Page
33	0121H	Electronic Thermal Motor Protection Selection	0 to 2	1	0	Yes		81
34	0122H	Electronic Thermal Motor Protection Time Constant Set- ting	1 to 60 min	1 min	8 min	Yes		81
35	0123H	Selecting Cooling Fan Operation	0, 1	1	0	Yes		83
36	0124H	Multi-function Input Selection 2	2 to 8, 10 to 22	1	2	Yes		69
37	0125H	Multi-function Input Selection 3	0, 2 to 8, 10 to 22	1	5	Yes		69
38	0126H	Multi-function Input Selection 4	2 to 8, 10 to 22	1	3	Yes		69
39	0127H	Multi-function Input Selection 5	2 to 8, 10 to 22, 34, 35	1	6	Yes		69
40	0128H	Multi-function Out- put Selection	0 to 7, 10 to 18	1	1	Yes		73
41	0129H	Analog Frequency Reference Gain	0% to 255%	1%	100%	No		53
42	012AH	Analog Frequency Reference Bias	-99% to 99%	1%	0%	No		53
43	012BH	Analog Frequency Reference Filter Time Constant	0.00 to 2.00 s	0.01 s	0.10 s	Yes		
44	012CH	Multi-function Ana- log Output (terminal AM-AC)	0, 1	1	0	Yes		63
45	012DH	Analog Monitor Gain	0.00 to 2.00	0.01	1.00	No		63
46	012EH	Carrier Frequency Selection	1 to 4, 7 to 9	1	*3	Yes		64
47	012FH	Momentary Power Loss Ridethrough Method	0 to 2	1	0	Yes		56
48	0130H	Automatic Retry At- tempts	0 to 10 times	1	0 time	Yes		60

No.	Regis- ter No. for Trans- mission	Name	Setting Range	Setting Unit	Initial Setting	Change during Opera- tion	User Set- ting	Ref. Page
49	0131H	Jump Frequency 1	0.0 to 400 Hz	0.1 Hz (less than 100 Hz)/ 1 Hz (100 Hz or more)	0.0 Hz	Yes		60
50	0132H	Jump Frequency 2	0.0 to 400 Hz	0.1 Hz (less than 100 Hz) 1 Hz (100 Hz or more)	0.0 Hz	Yes		60
51	0133H	Jump Frequency Range	0.0 to 25.5 Hz	0.1 Hz	0.0 Hz	Yes		60
52	0134H	DC Injection Brak- ing Current	0% to 100%	1%	50%	Yes		61
53	0135H	DC Injection Brak- ing Time at Stop	0.0% to 25.5%	0.1s	0.5 s	Yes		68
54	0136H	DC Injection Brak- ing Time at Startup	0.0% to 25.5%	0.1s	0.0 s	Yes		61
55	0137H	Stall Prevention During Deceleration	0, 1	1	0	Yes		79
56	0138H	Stall Prevention Level During Accel- eration	30% to 200%	1%	170%	Yes		77
57	0139H	Stall Prevention while Running	30% to 200%	1%	160%	Yes		78
58	013AH	Frequency Detec- tion Level	0.0 to 400 Hz	0.1 Hz (less than 100 Hz)/1 Hz (100 Hz or more)	0.0 Hz	Yes		59
59	013BH	Overtorque Detec- tion Function	0 to 4	1	0	Yes		58
60	013CH	Overtorque Detec- tion Level	30% to 200%	1%	160%	Yes		58
61	013DH	Overtorque Detec- tion Time	0.1 to 10.0 s	0.1 s	0.1 s	Yes		58
62	013EH	Hold Output	0, 1	1	0	Yes		72
63	013FH	Torque Compensa- tion Gain	0.0 to 2.5	0.1	1.0	No		47

9. Specifications

No.	Regis- ter No. for Trans- mission	Name	Setting Range	Setting Unit	Initial Setting	Change during Opera- tion	User Set- ting	Ref. Page
64	0140H	Motor Rated Slip	0.0 to 20.0 Hz	0.1 Hz	*2	No		80
65	0141H	Motor No-load Cur- rent	0% to 99%	1%	*2	Yes		80
66	0142H	Slip Compensation Gain	0.0 to 2.5	0.1	0.0	No		80
67	0143H	Slip Compensation Time Constant	0.0 to 25.5 s	0.1 s	2.0 s	Yes		80
68	0144H	MEMOBUS Tim- eover Detection Se- lection	0 to 4	1	0	Yes		
69	0145H	Baud Rate Setting	0 to 3	1	0	Yes		
70	0146H	MEMOBUS Slave Address	0 to 32	1	0	Yes		
71	0147H	MEMOBUS BPS Selection	0 to 3	1	2	Yes		
72	0148H	MEMOBUS Parity Selection	0 to 2	1	0	Yes		
73	0149H	Transmission Wait- ing Time	10 to 65 ms	1 ms	10 ms	Yes		
74	014AH	RTS Control	0, 1	1	0	Yes		
75 #1	014BH	Reducing Carrier Frequency Selec- tion At Low Speed	0, 1	1	0	Yes		66
76 #1	014CH	Constant Copy Function Selection	rdy, rEd, Cpy, vFy, vA, Sno		rdy	Yes		84
77 #1	014DH	Constant Read Se- lection Prohibit	0, 1	1	0	Yes		85
78	014EH	Fault History	Stores, displays most recent alarm	Setting disabled	-	Yes		41
79	014FH	Software Version No.	Displays lower- place 3 digits of software No.	Setting disabled	-	Yes		

- * 1. Upper limit of setting range and initial setting are doubled for 400 V Class.
- * 2. Depends on Inverter capacity. Refer to the next page.
- * 3. Depends on Inverter capacity. Refer to page 65.
- * 4. Initial setting of the model with Digital Operator (without potentiometer) is 1. Setting can be set to 0 by constant initialization.

No.	Name	Unit		-	-	Initial S	etting	-	_	-
-	Inverter Capacity	kW	0.1	0.2	0.4	0.75	1.5	2.2	-	3.7
n32	Motor Rated Current	A	0.6	1.1	1.9	3.3	6.2	8.5	-	14.1
n64	Motor Rated Slip	Hz	2.5	2.6	2.9	2.5	2.6	2.9	-	3.3
n65	Motor No-load Current	%	72	73	62	55	45	35	-	32

· 200 V Class 3-phase

· 200 V Class Single-phase

No.	Name	Unit		li	nitial Settir	Ig	
-	Inverter Capacity	kW	0.1	0.2	0.4	0.75	1.5
n32	Motor Rated Current	А	0.6	1.1	1.9	3.3	6.2
n64	Motor Rated Slip	Hz	2.5	2.6	2.9	2.5	2.6
n65	Motor No-load Current	%	72	73	62	55	45

· 400 V Class 3-phase

No.	Name	Unit				Initial S	Setting			
-	Inverter Capac- ity	kW	-	0.2	0.4	0.75	1.5	2.2	3.0	3.7
n32	Motor Rated Current	A	-	0.6	1.0	1.6	3.1	4.2	7.0	7.0
n64	Motor Rated Slip	Hz	-	2.5	2.7	2.6	2.5	3.0	3.2	3.2
n65	Motor No-load Current	%	-	73	63	52	45	35	33	33

10. Conformance to CE Markings

Points regarding conformance to CE markings are given below.

CE Markings

CE markings indicate conformance to safety and environmental standards that apply to business transactions (including production, imports, and sales) in Europe. There are unified European standards for mechanical products (Machine Directive), electrical products (Low Voltage Directive), and electrical noise (EMC Directive). CE markings are required for business transactions in Europe (including production, imports, and sales).

The VS mini Series Inverters bear CE markings indicating conformance to the Low Voltage Directive and the EMC Directive.

Low Voltage Directive: 73/23/EEC

93/68/EEC

 EMC Directive: 89/336/EEC 92/31/EEC 93/68/EEC

Machinery and installations that incorporate the Inverter are also subject to CE markings. It is ultimately the responsibility of customers making products incorporating the Inverter to attach CE markings to the finished products. The customer must confirm that the finished products (machines or installations) conform to the European Standards.

Requirements for Conformance to CE Markings

Low Voltage Directive

VS mini Series Inverters satisfy testing for conformance to the Low Voltage Directive under the conditions described in European Standard EN50178.

Requirements for Conformance to the Low Voltage Directive VS mini Series Inverters must satisfy the following conditions in order to conform to the Low Voltage Directive.

 Only basic insulation to meet the requirements of protection class 1 and overvoltage category II is provided with control circuit terminals. Additional insulation may be necessary in the end product to conform to CE requirements. For 400 V Class Inverters, always ground the supply neutral to conform to CE requirements.

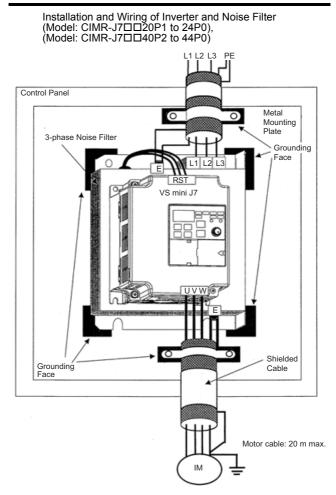
EMC Directive

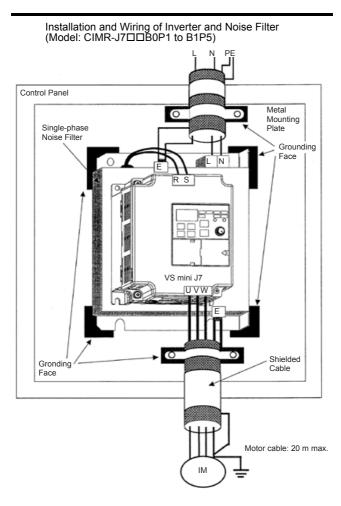
VS mini Series Inverters satisfy testing for conformance to the EMC Directive under the conditions described in European Standard EN61800-3.

Installation Method

In order to ensure that the machinery or installation incorporating the Inverter conforms to the EMC Directive, perform installation according to the method below.

- Install a noise filter that conforms to European Standards on the input side. (Refer to EMC Noise Filter on page 133.)
- Use a shielded line or metal piping for wiring between the Inverter and Motor. Make the wiring as short as possible.
- For details of installation method, refer to Installation Manual (document No. EZZ008390.)



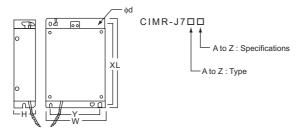


10. Conformance to CE Markings

EMC Noise Filter

Volt-	Inverter		Ν	loise Filter (N	/lanufactu	irer: RASMI)		
age Class	Model CIMR- J7*ロロ	Model No.	Num- ber of Phases	Rated Current (A)	Mass (kg)	Dimensions W×L×H	Y×X	φd
200 V	B0P1	RS1010-J7	1	10	0.6	$71\times 169\times 45$	51 × 156	5.0
	B0P2							
	B0P4							
	B0P7	RS1020-J7	1	20	1.0	$111\times 169\times 50$	91 × 156	5.0
	B1P5							
	20P1	RS2010-J7	3	10	0.8	$82\times194\times50$	62 × 181	5.0
	20P2							
	20P4							
	20P7							
	21P5	RS2020-J7	3	16	1.0	$111\times 169\times 50$	91 × 156	5.0
	22P2							
	23P7	RS2030-J7	3	26	1.1	$144\times174\times50$	120 × 161	5.0
	24P0							
400 V	40P2	RS3005-J7	3	5	1.0	$111\times 169\times 45$	91 × 156	5.0
	40P4							
	40P7	RS3010-J7	3	10	1.0	$111\times 169\times 45$	91 × 156	5.0
	41P5							
	42P2							
	43P0	RS3020-J7	3	15	1.1	$144 \times 174 \times 50$	120 × 161	5.0
	43P7							
	44P0							

The EMC-compliant J7 Series noise filter is footprint type.



Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.

Date of Publication	Rev. No.	Section	Revised Content
October 1999	-	-	First edition
January 2000	$\langle \hat{1} \rangle$	End of a book	Revision: Contents of sticker
June 2001	Ô	Notation for	Revision: Warning/Caution mark
	>	safety precau- tions	Partly deleted
March 2002	3	Chapter 9	Addition: Minimum permissible load
April 2002	4	Notation for safety precau- tions	Addition: Warnings for CE Markings
July 2002	\$	Chapter 8	Addition: Troubleshooting
August 2002	\$	Front cover	Deletion: CE and UL marks
May 2003	$\langle \hat{\gamma} \rangle$	Back cover	Revision: Address
July 2003	8	Chapter 5 Chapter 9	Partly revised
November 2003	\$	Chapter 6	Revision: Inverter diagrams
October 2005	10	Notation for safety precau- tions	Addition: • WIRING Precaution when the 3- wire sequence is selected • Warranty Information
		Chapter 4	Revision: Descriptions of terminal symbols and tightening torque of the main circuits.

Date of Publication	Rev. No.	Section	Revised Content
October 2005	10	Chapter 5	Addition: - Table in the Description of Status Indicators - Flowchart in the Function Indicator Description Additional information for when LOCAL/REMOTE Selection and Constant No./data are selected
		Chapter 6	Addition: • Settings needed before operation after wiring • Setting 5 of Constant Se- lection/Initialization (n01) • *3 in the n081 Setting ta- ble • Settings 1, 9, 23 to 33 for multi-function input selec- tion • Settings 8 and 9 for multi- function output selection.
		Chapter 8	 Addition: • Descriptions of short circuit and grounding. • Description of setting for NPN/PNP switch. • Description of short-circuit bar.
		Chapter 9	Revision: Descriptions of recom- mended magnetic contac- tor in the Recommended Peripheral Devices sec- tion. • A Change during Opera- tion column has been in- serted in the Constants list.
		Chapter 10	Added
		Back cover	Revision: Address
February 2006	1	Chapter 9	Revision: Max. output voltage in the Standard Specifications (200 V Class)

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July 2007	<2>	Chapter 1	Revision: Nameplate
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		Chapter 8	Revision: Descriptions that the cooling fan does not turn in <i>Troubleshooting</i> .
		Chapter 9	 Revision: The following descriptions in the diagrams of the Sequence Connection with NPN/PNP Transistors. <i>External fault (NO)</i> changed to <i>Fault reset.</i> <i>Fault reset</i> changed to <i>External</i> <i>fault (NO).</i>
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VS mini J7 Series INSTRUCTION MANUAL

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