YASKAWA

VS mini C Series

INSTRUCTION MANUAL

ULTRA-COMPACT ALL DIGITAL INVERTER

ADVANCED FUNCTION TYPE

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

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YASKAWA

MANUAL NO TOE-S606-10 20C

PREFACE

YASKAWA's VS mini is such a small and simple inverter; as easy as using a contactor. This instruction manual describes installation, maintenance and 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 the protective cover or shields removed, in order to describe detail with more clarity. Make sure all covers and shields are replaced before operating this product.
- This manual may be modified when necessary because of improvement of the product, modification, or changes in specifications.
  Such modifications are denoted by a revised manual No.
- To order a copy of this manual, 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 your guarantee.

NOTES FOR SAFE OPERATION

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the VS mini. In this manual, NOTES FOR SAFE OPERATION are classified as "WARNING" or "CAUTION".

⚠ WARNING

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

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel and damage to equipment.
It may also be used to alert against unsafe practices.

Even items described in ⚠ CAUTION may result in a vital accident in some situations. In either case, follow these important notes.

NOTE : These are steps to be taken to insure proper operation.

RECEIVING

⚠ CAUTION

(Ref. page)

- Do not install or operate any inverter which is damaged or has missing parts.
  Failure to observe this caution may result in personal injury or equipment damage. 12

MOUNTING

⚠ CAUTION

(Ref. page)

- Lift the cabinet by the cooling fin. When moving the unit, never lift by the plastic case or the terminal covers.
  Otherwise, the main unit may be dropped causing damage to the unit. 14
- Mount the inverter on nonflammable material (i.e. metal).
  Failure to observe this caution can result in a fire. 14
- When mounting units in an enclosure, install a fan or other cooling device to keep the intake air temperature below 50℃ (122℉).
  Overheating may cause a fire or damage to the unit. 15
- The VS mini generates heat. For effective cooling, mount it vertically.
  Refer to the figure in "Mounting Dimensions" on page15.

WIRING

⚠ WARNING

(Ref. page)

- Only commence wiring after verifying that the power supply is turned OFF.
  Failure to observe this warning can result in an electrical shock or a fire. 16
- Wiring should be performed only by qualified personnel.
  Failure to observe this warning can result in an electrical shock or a fire. 16
- When wiring the emergency stop circuit, check the wiring thoroughly before operation.
  Failure to observe this warning can result in personal injury. 16

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(Ref. page)

- Make sure to ground the ground terminal ⏚.
  (Ground resistance : 100Ω or less)
  Failure to observe this warning can result in an electrical shock or a fire. ····· 17

⚠ CAUTION

(Ref. page)

- Verify that the inverter rated voltage coincides with the AC power supply voltage.
  Failure to observe this caution can result in personal injury or a fire.
- Do not perform a withstand voltage test of the inverter.
  It may cause semi-conductor elements to be damaged.
- To connect a braking resistor, braking resistor unit or braking unit, follow the procedures described in this manual.
  Improper connection may cause a fire. ····· 17
- Make sure to tighten terminal screws of the main circuit and the control circuit.
  Failure to observe this caution can result in a malfunction, damage or a fire. ····· 16
- Never connect the AC main circuit power supply to output terminals U, V and W.
  The inverter will be damaged and invalidate the guarantee. ····· 16
- Do not connect or disconnect wires or connectors while power is applied to the circuit.
  Failure to observe this caution can result in personal injury.
- Do not change signals during operation.
  The machine or the inverter may be damaged.

OPERATION

⚠ WARNING

(Ref. page)

- Only turn ON the input power supply after replacing the digital operator/blank cover (optional) and switching the dip switch. Do not remove the digital operator or the covers while current is flowing.
  Failure to observe this warning can result in an electrical shock.····20
- Never operate the digital operator or the switches when your hand is wet.
  Failure to observe this warning can result in an electrical shock.
- Never touch the terminals while current is flowing, even during stopping.
  Failure to observe this warning can result in an electrical shock.
- When the fault retry function is selected, stand clear of the inverter or the load, since it may restart suddenly after being stopped.
  (Construct machine system, so as to assure safety for personnel, even if the inverter should restart.) Failure to observe this warning can result in personal injury.·····38
- When continuous operation after power recovery is selected, stand clear of the inverter or the load, since it may restart suddenly after being stopped.
  (Construct machine system, so as to assure safety for personnel, even if the inverter should restart.) Failure to observe this warning can result in personal injury.·····34
- Since the digital operator stop button can be disabled by a function setting, install a separate emergency stop switch.
  Failure to observe this warning can result in personal injury.
- If an alarm is reset with the operation signal ON, the inverter restarts automatically. Only reset the alarm after verifying that the operation signal is OFF.
  Failure to observe this warning can result in personal injury.·····20

⚠ CAUTION

(Ref. page)

- Never touch the heatsink or braking resistor since the temperature is very high.
  Failure to observe this caution can result in harmful burns to the body.
- Since it is easy to change operation speed from low to high speed, verify the safe working range of the motor and machine before operation.
  Failure to observe this caution can result in personal injury and machine damage.
- Install a holding brake separately if necessary.
  Failure to observe this caution can result in personal injury.
- Do not change signals during operation.
  The machine or the inverter may be damaged.
- All the constants of the inverter have been preset at the factory. Do not change the settings unnecessarily.
  The inverter may be damaged. ····· 20

MAINTENANCE AND INSPECTION

⚠ WARNING

(Ref. page)

- Never touch high-voltage terminals in the inverter.
  Failure to observe this warning can result in an electrical shock ····· 59
- Disconnect all power before performing maintenance or inspection. Then wait at least one minute after the power supply is disconnected and all LED's are extinguished.
  The capacitors are still charged and can be dangerous. ····· 59

⚠ WARNING

(Ref. page)

- Do not perform withstand voltage test on any part of the VS mini.
  This electronic equipment uses semiconductors and is vulnerable to high voltage. 59
- Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.
  [Remove all metal objects (watches, bracelets, etc.) before operation.]
  (Use tools which are insulated against electrical shock.)
  Failure to observe this warning can result in an electrical shock. 59

⚠ CAUTION

(Ref. page)

- The control PC board employs CMOS ICs.
  Do not touch the CMOS elements.
  They are easily damaged by static electricity. 59
- Do not connect or disconnect wires or connectors while power is applied to the circuit.
  Failure to observe this caution can result in personal injury. 59

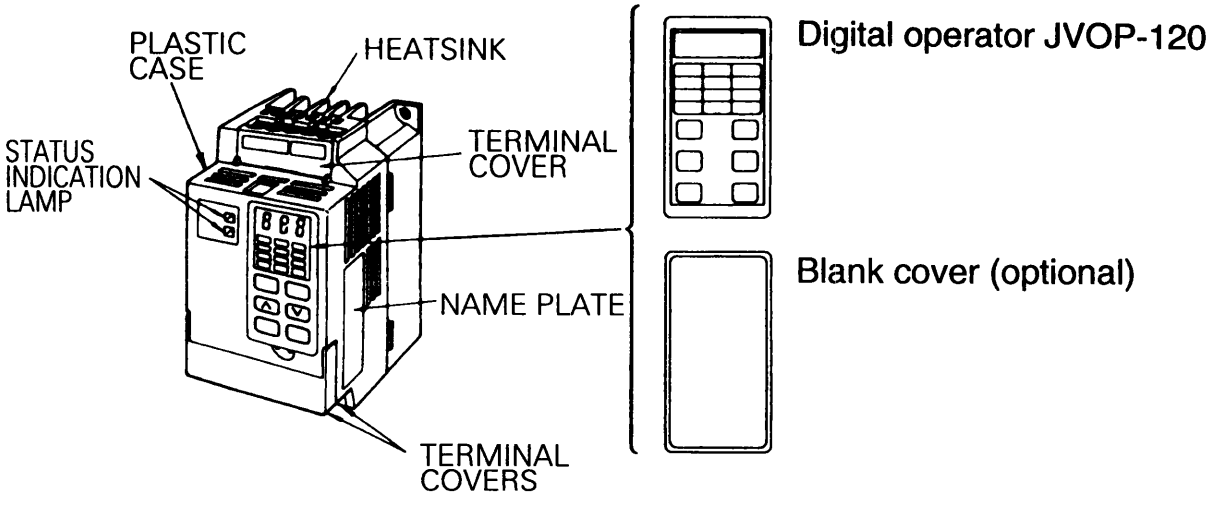
Others

⚠ WARNING

- Never modify the product.
  Failure to observe this warning can result in an electrical shock or personal injury and will invalidate the guarantee.

WARNING LABEL

A warning label is displayed on the front cover of the inverter, as shown below. Follow these instructions when handling the inverter.



Warning Label

⚠ WARNING
May cause electric shock. • Disconnect all power before opening terminal cover of unit. Wait 1 minute until DC Bus capacitors discharge.

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1. RECEIVING

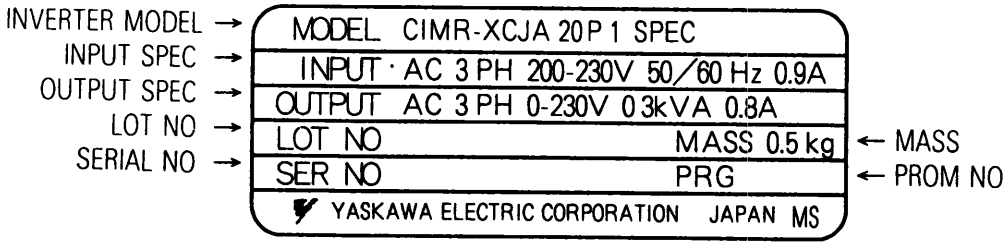
After unpacking the VS mini, check the following :

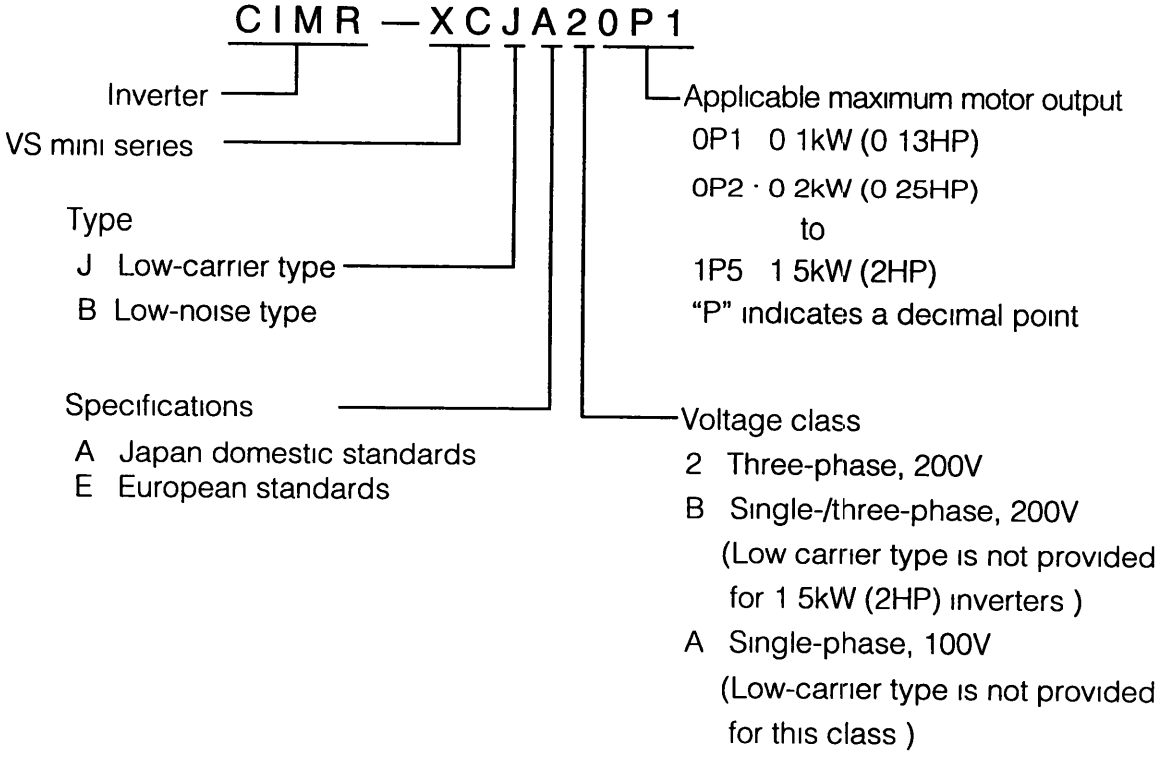
- □ Verify that the part numbers match your purchase order or packing slip.
- □ Check the unit for physical damage that may have occurred during shipping.

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

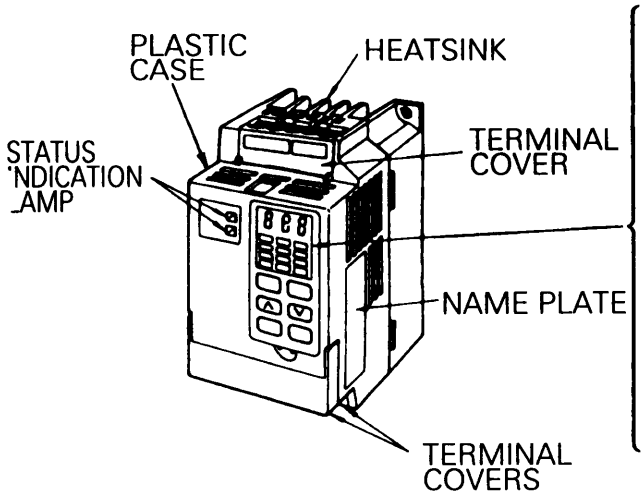
■ Checking the Name Plate

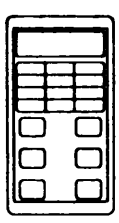
Japan Domestic Standards for Types of 3-phase, 200VAC, 0.1kW (0.13HP)





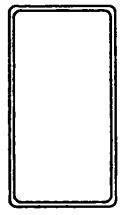
2. IDENTIFYING THE PARTS





Digital operator JVOP-120

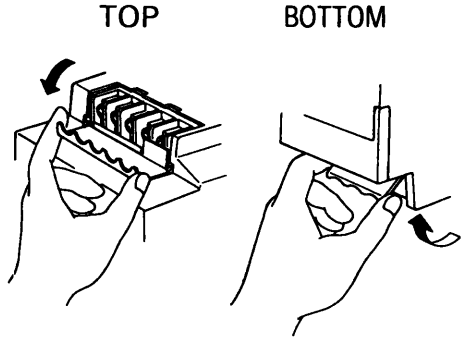
Used for setting or changing constants.

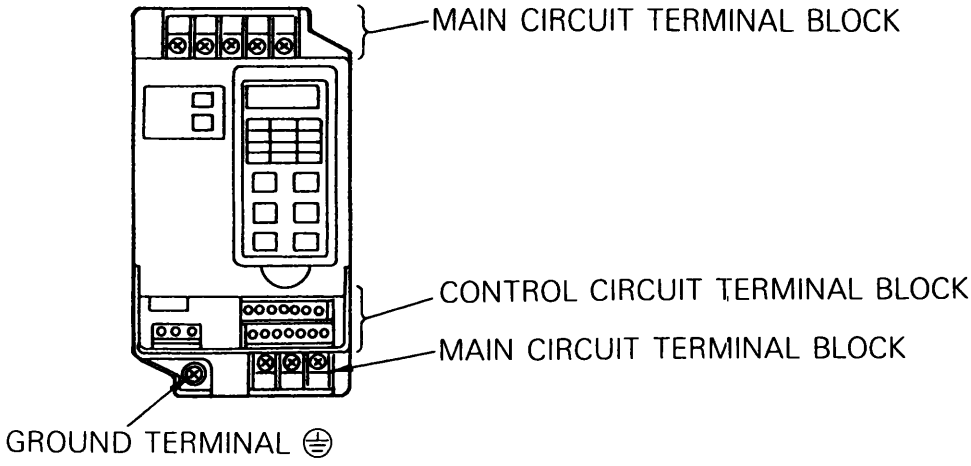


Blank cover (optional)

In models with blank cover, the blank cover is mounted in place of the digital operator.

⇩ Opening the terminal covers





3. MOUNTING

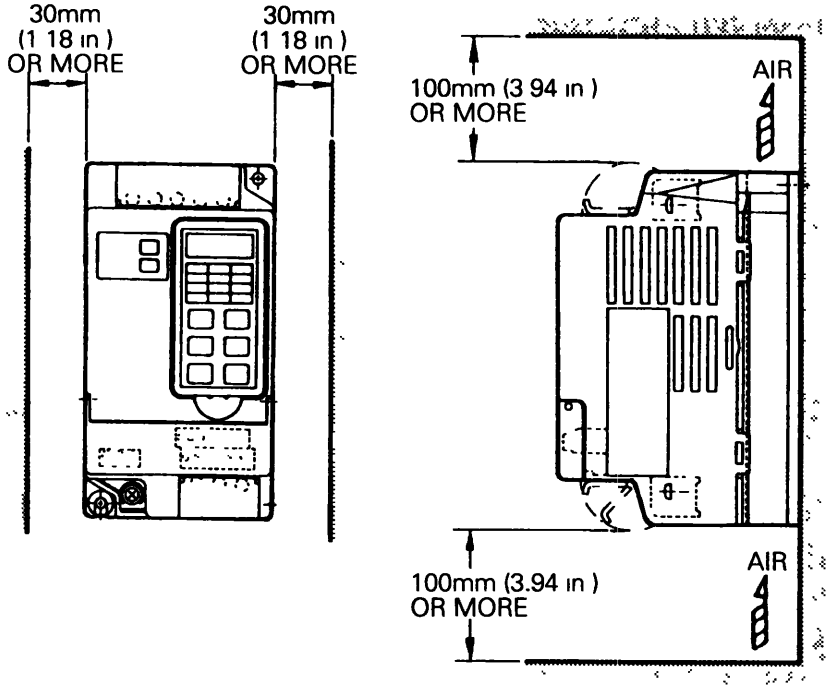
■ Choosing a Location to Mount the Inverter

Be sure the inverter is protected from the following conditions :

- □ Extreme cold and heat. Use only within the ambient temperature range : -10 to +50℃ (14 to 122℉)
- □ Rain, moisture.
- □ Oil sprays, 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, vibration.
- □ Magnetic noise. (Example : welding machines, power devices, etc.)
- □ High humidity.
- □ Radioactive substances.
- □ Combustibles : thinner, solvents, etc.

■ Mounting Dimensions

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



4. WIRING

■ Wiring Instructions

(1) Connect the power supply wiring to terminals L1(R), N/L2(S) and L3(T) on the main circuit input side (top of the inverter).

Inverter Power Supply Specifications

200V 3-phase Input Power Supply Specification Product CIMR-XC□2□□	200V Single-/3-phase Input Power Supply Specification Product CIMR-XC□□B□□□		100V Single-phase Input Power Supply Specification Product CIMR-XC□A□□
Connect to L1(R), N/L2(S), L3(T)	3-phase input Single-phase input	Connect to L1(R), N/L2(S), L3(T) Connect to L1(R), N/L2(S)	Connect to L1(R), N/L2(S)

(2) Connect the motor wiring to terminals U, V and W on the main circuit output side (bottom of the inverter).

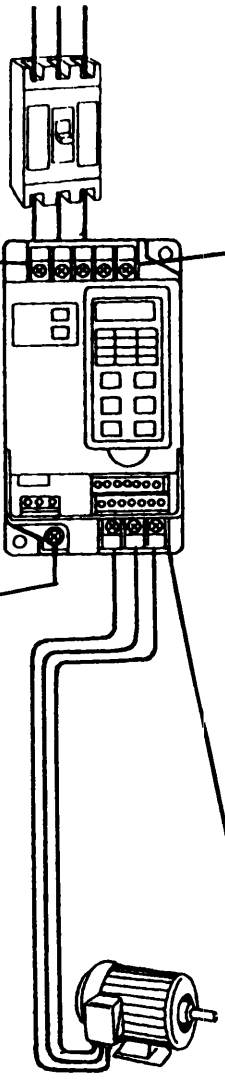
(3) Separate the inverter wiring from the motor wiring – 100m (328ft) max. If the wiring distance between inverter and motor is long, reduce the inverter carrier frequency. For details, refer to "Reducing motor noise or leakage current (n37)" on page 42.

(4) Control wiring must be less than 50m (164ft) in length and separate from the power wiring. Use twisted-pair shielded wire when inputting the frequency signal externally.

■ Wire and Terminal Screw Sizes

Circuit	Model	Terminal Symbol	Screw	Wire Size mm²	Wire Size AWG	Wire Type
Main Circuit	CIMR-XC□A□□□ (Japan use)	R, S, T, B1, B2, U, V, W, ⏚	M3.5	0.75 to 2 (100V single-phase 1.25 to 2)	18 to 14 (100V single-phase 16 to 14)	600V vinyl-sheathed wire or equivalent
	CIMR-XC□E□□□ (Europe use)	L1, N/L2, L3, B1, B2, U, V, W, ⏚				
Control Circuit	Common to all models	SF, SR, S1, S2, S3, SC, FS, FR, FC, AM, AC, PA, PC	—	Twisted 0.5 to 0.75 Single 0.5 to 1.25	Twisted 20 to 18 Single 20 to 16	Shielded wire or equivalent
		MA, MB, MC		Twisted 0.5 to 1.25 Single 0.5 to 1.25	Twisted 20 to 16 Single 20 to 16	

■ Wiring the Main Circuit



• Main circuit input power supply

Connect the power supply wiring to input terminals L1(R), N/L2(S) and L3(T) [L1(R), N/L2(S) for single-phase specifications] Never connect them to U, V, W, B1 or B2

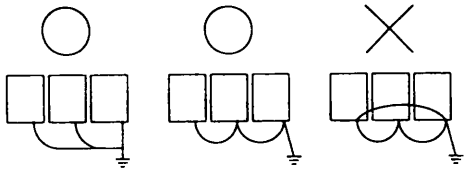
Otherwise the inverter may be damaged

• Grounding (Use ground terminal ⏚)

Ground resistance should be 100Ω or less.

Never ground the VS mini in common with welding machines, motors, or other electrical equipment

When several VS mini units are used side by side, ground each unit as shown in examples (a) or (b) below. Do not loop the ground wires as shown in example (c).



(a) (b) (C)

• Braking resistor connection (optional)

To connect the braking resistor, cut the protector on terminals B1 and B2.

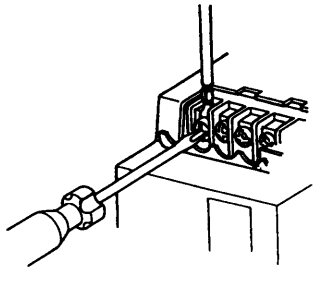
To protect the braking resistor from overheating, install a thermal overload relay between the braking resistor and the inverter This provides a sequence which shuts off the power supply, by a thermal relay trip contact.

Use this same procedure when connecting a braking resistor unit.

• Inverter output

Connect the motor terminals to U, V, W.

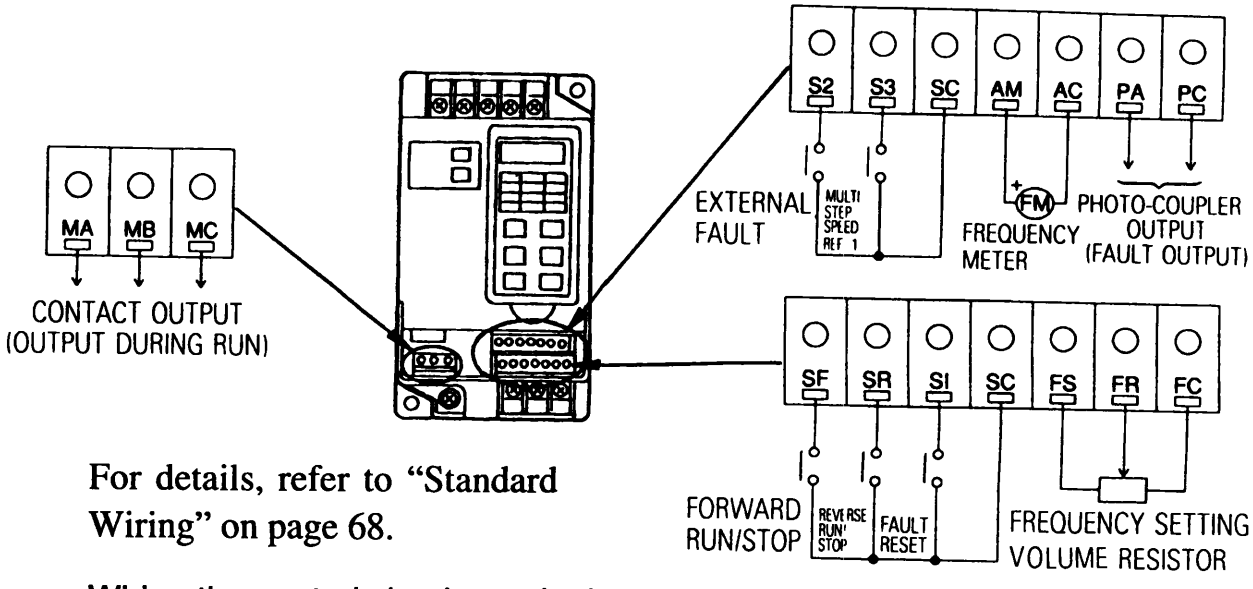
Wiring the main circuit terminals



Connect with a Phillips (plus) screwdriver.

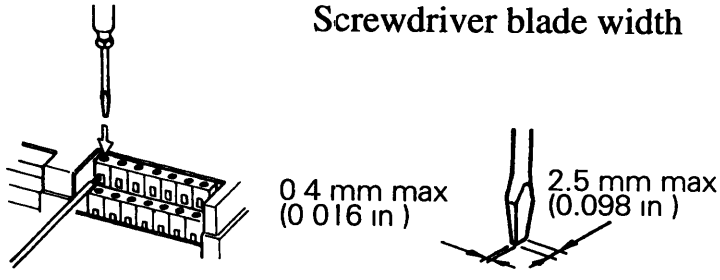
■ Wiring the Control Circuit

Terminal functions described below are based on factory settings.

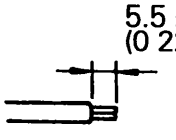


For details, refer to "Standard Wiring" on page 68.

Wiring the control circuit terminals

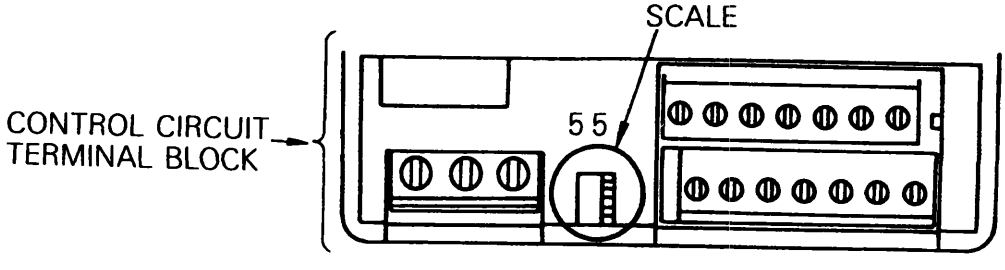


Insert the wire into the lower part of the terminal block and connect it tightly with a screwdriver.



Wire sheath strip length must be 5.5mm (0.22in.).

Open the control circuit terminal cover and verify that the strip length is 5.5mm (0.22in.).



■ Wiring Inspection

After completing wiring, check the following :

□ Wiring is proper.

□ Wire clippings or screws are not left in the unit.

□ Screws are securely tightened.

□ Bare wire in the terminal does not contact other terminals.



If the FWD (REV) run command is given during the operation mode (MODE = 1, 3 or 5) from the control circuit terminal, the motor will start automatically after the main circuit input power supply is turned ON.

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5. OPERATING THE INVERTER

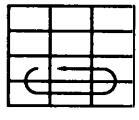
■ Test Run

The inverter operates by setting the frequency (speed).
There are two types of operation modes for the VS mini :

① Run command from the digital operator.

② Run command from the control circuit terminal.

Prior to shipping, the drive is set up to receive run command and frequency reference from the operator. Below are instructions for running the VS mini using the digital operator. For instructions on using the control circuit terminals, refer to MODE description on page 26.

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
(1) Turn ON the power supply Frequency reference (6.0Hz) is displayed	6.0	FREF lights	RUN ☼ ALARM ● (Operation ready)
(2) Press RUN. Inverter runs at 6.0Hz The motor rotates in a counterclockwise direction (FWD run), when viewed from opposite drive end		 LED's rotate in direction of motor	RUN ☼ ALARM ● (Normal operation)
(3) Press STOP RESET to stop motor rotation	6.0		

Status indicator lamp ☼ ON ◎ Blinking ● OFF

Operation Check Points

□ Motor rotates smoothly.

□ Motor rotates in the correct direction.

□ Motor does not have abnormal vibration or noise.

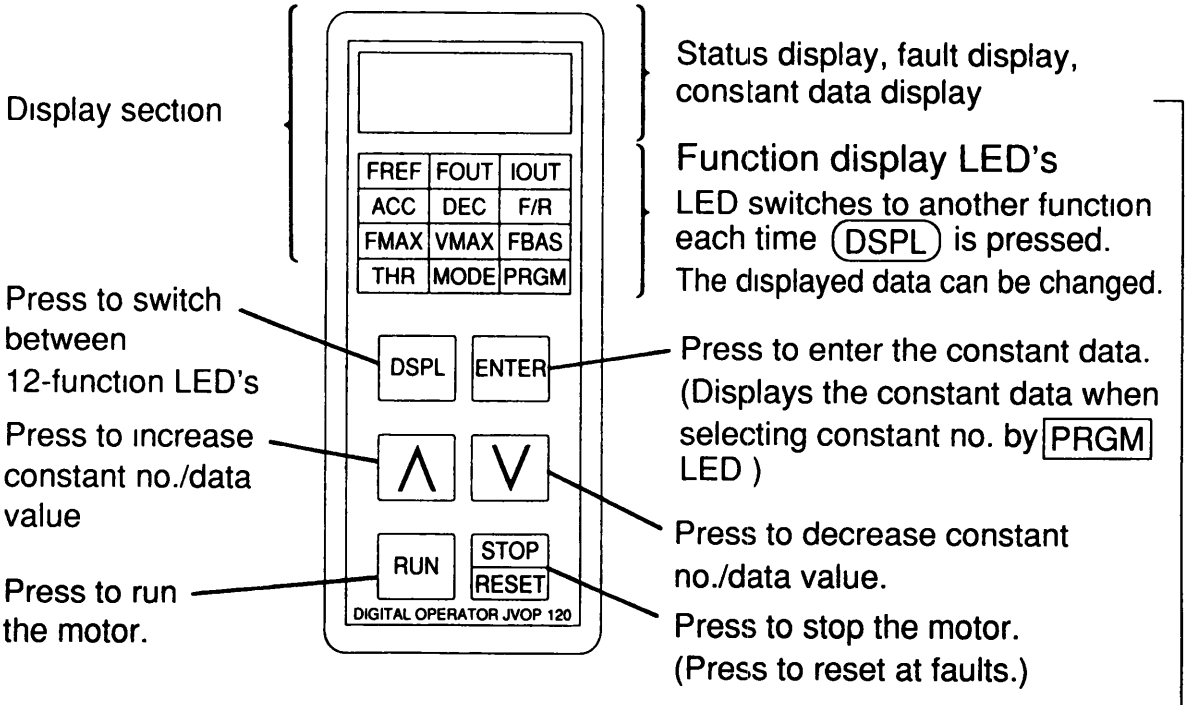
□ Acceleration or deceleration is smooth.

□ Current matching the load flows.

□ Status indicator LED's and digital operator display are correct.

■ Operating the Digital Operator

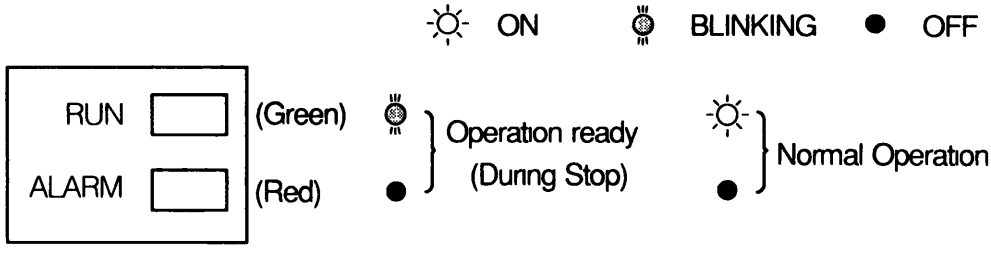
All functions of the VS mini are set by the digital operator. Below are descriptions of the display and keypad sections.



Green	FREF Frequency reference setting/monitoring	FOUT Output frequency monitor	IOUT Output current monitor
	ACC Accel time	DEC Decel time	F/R Operator RUN command FWD/REV selection
Red	FMAX Max frequency	VMAX Max voltage	FBAS Max voltage output frequency (base frequency)
	THR Electronic thermal reference current (Motor rated current)	MODE Operation mode selection	PRGM Constant no /data

Description of Status Indicator LED's

There are two LED's on the upper left section of the face of the VS mini. The inverter status is indicated by various combinations of ON, BLINKING and OFF LED's.



For the details on how the status indicator LED's function at inverter faults, refer to Section 8 "FAULT DIAGNOSIS AND CORRECTIVE ACTIONS" on page 60. If a fault occurs, the ALARM LED lights.

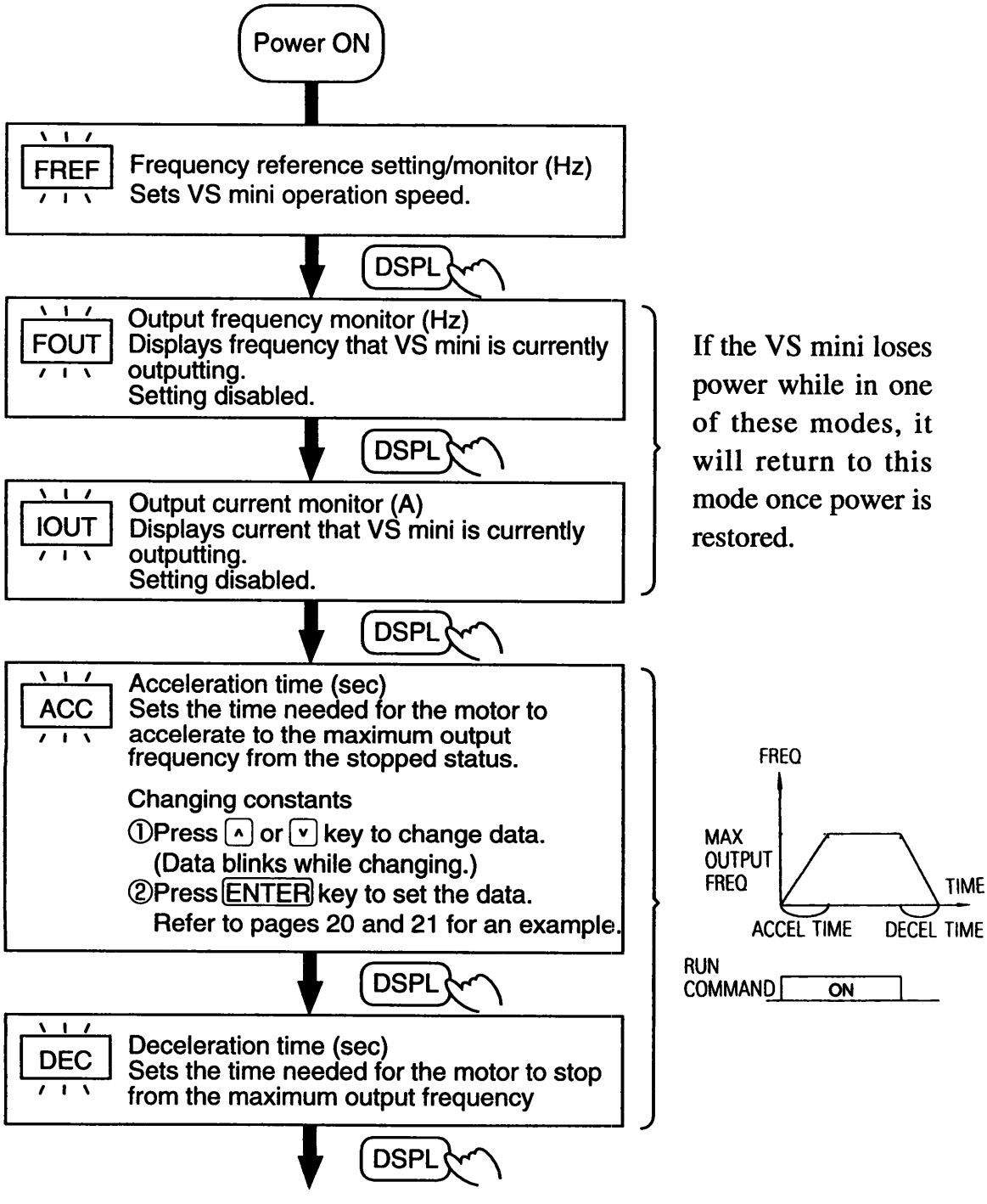
NOTE

The fault can be reset by turning ON the fault reset signal (or depressing 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 by the fault reset signal.

■ LED Description

By pressing (DSPL) on the digital operator, each of the function LED's can be selected.

The following flowchart describes each function LED.



F/R

FWD/REV run selection
Sets the motor rotation direction when run command is given by the digital operator.
FoR (forward run) = rEv (reverse run)

DSPL

FMAX

Maximum output frequency (Hz)
Sets the maximum output frequency.

DSPL

VMAX

Maximum voltage (V)
Sets the maximum voltage that VS mini outputs. (Motor rated voltage setting)

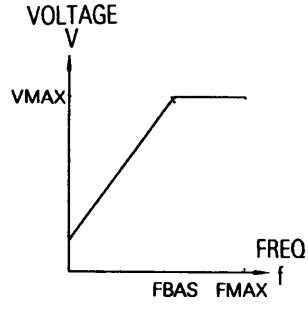
DSPL

FBAS

Maximum voltage output frequency (Hz)
Sets frequency when the maximum voltage is output. (Base frequency)

DSPL

Sets V/f pattern which matches the motor characteristics according to FMAX, VMAX and FBAS.



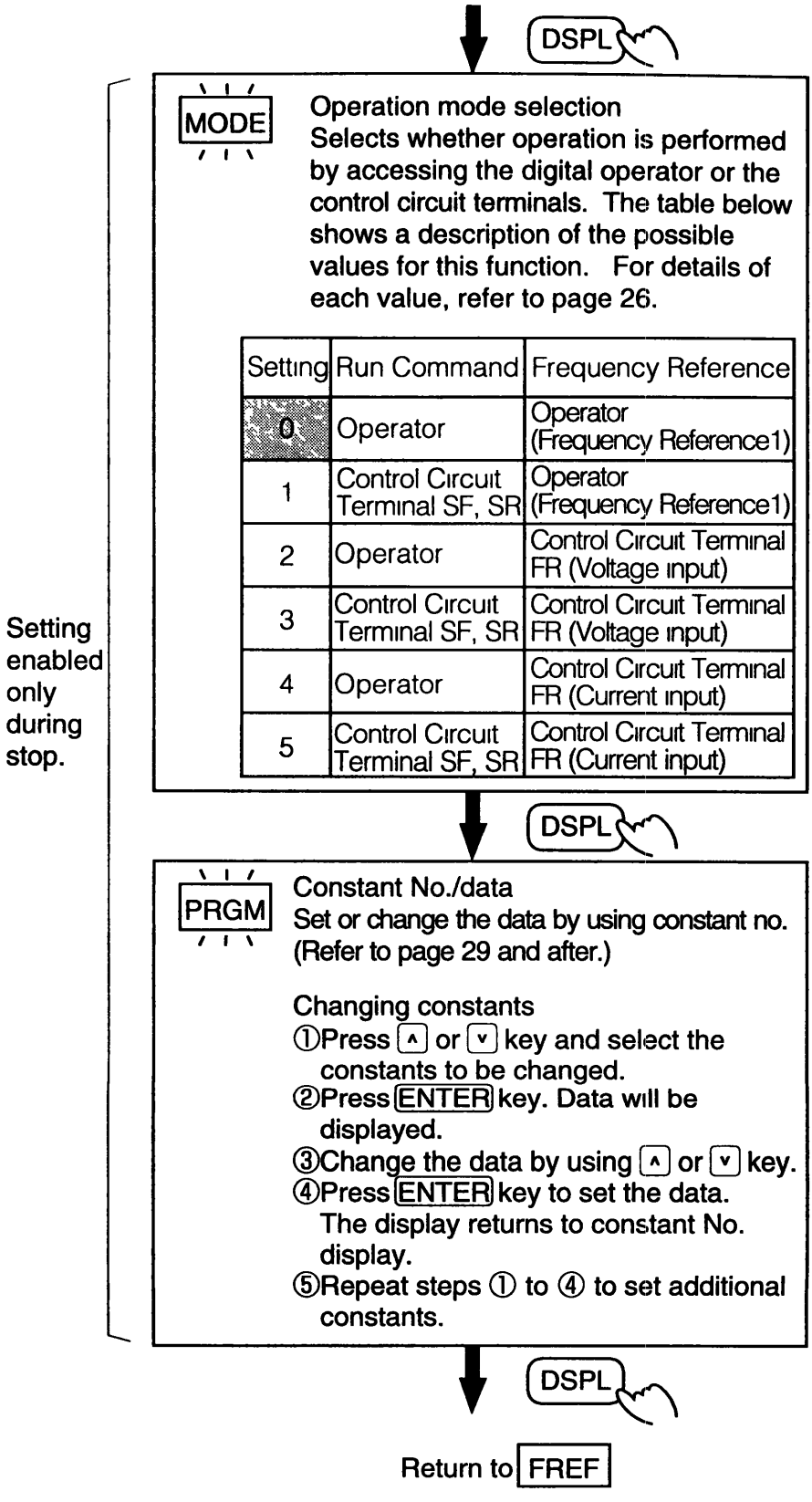
Setting enabled only during stop.

THR

Electronic thermal reference current (A)
Sets motor rated current. The following table shows the standard set value for each capacity. When the applicable motor rated current value differs from the value listed below, change the set value. When set to 0.0A, motor overload protection will not be activated.

VS mini Model CIMR-XC□A□□ CIMR-XC□E□□	20P1 B0P1 A0P1	20P2 B0P2 A0P2	20P4 B0P4 A0P4	20P7 B0P7 A0P7	21P5 B1P5
Max Applicable Motor Output kW (HP)	0 1 (0.13)	0.2 (0 25)	0.4 (0 5)	0.75 (1)	1.5 (2)
Motor Current Factory Setting (A)	0 6	1 1	1 9	3.3	6.2

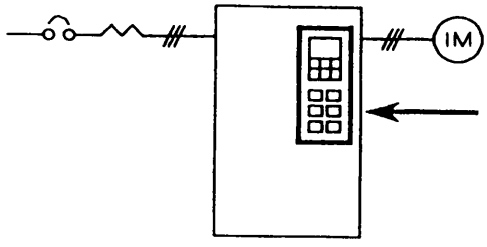
DSPL


DSPL
MODE
Operation mode selection
Selects whether operation is performed by accessing the digital operator or the control circuit terminals. The table below shows a description of the possible values for this function. For details of each value, refer to page 26.
Setting
Run Command
Frequency Reference
0
Operator
Operator (Frequency Reference1)
1
Control Circuit Terminal SF, SR
Operator (Frequency Reference1)
2
Operator
Control Circuit Terminal FR (Voltage input)
3
Control Circuit Terminal SF, SR
Control Circuit Terminal FR (Voltage input)
4
Operator
Control Circuit Terminal FR (Current input)
5
Control Circuit Terminal SF, SR
Control Circuit Terminal FR (Current input)
Setting enabled only during stop.
DSPL
PRGM
Constant No./data
Set or change the data by using constant no. (Refer to page 29 and after.)
Changing constants
①Press ∧ or ∨ key and select the constants to be changed.
②Press ENTER key. Data will be displayed.
③Change the data by using ∧ or ∨ key.
④Press ENTER key to set the data. The display returns to constant No. display.
⑤Repeat steps ① to ④ to set additional constants.
DSPL
Return to FREF

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Detailed Description of [MODE] (Operation Mode Selection)

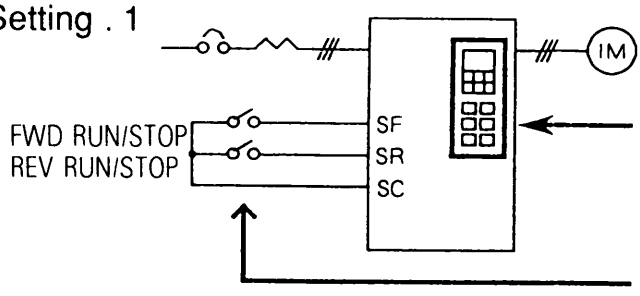
Setting : 0



Give RUN/STOP command and set frequency by operating the digital operator

Use [F/R] to alternate between FWD/REV run

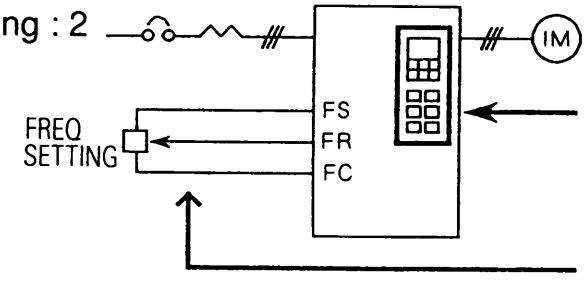
Setting : 1



Use the digital operator keys to set the frequency

Use the switch connected to the control circuit terminal to alternate between RUN/STOP and FWD/REV run

Setting : 2

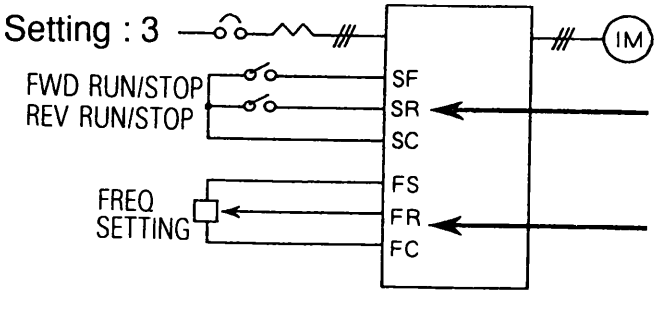


Give RUN/STOP command by operating the digital operator

Use [F/R] to alternate between FWD/REV run.

Set frequency by analog voltage signal [0-100% (max. frequency)/ 0-10V] from the control circuit terminal.

Setting : 3



Use the switch connected to the control circuit terminal to alternate between RUN/STOP and FWD/REV run.

Set frequency by analog voltage signal [0-100% (max. frequency)/ 0-10V] from the control circuit terminal.

Note To set frequency reference with a volume resistor, it will be 100% at rotation ratio of 80%. To set frequency reference to 100% at rotation ratio of 100%, set constant n39 (frequency reference gain) to approx. 1.2

Setting : 4 or 5

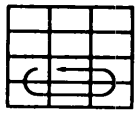
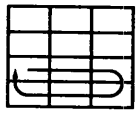
For details, refer to "Setting Frequency by Current Reference Input" on page 50.

■ Simple Data Setting

By using the function LED's on the digital operator, simple accel/decel operation of the VS mini is possible.

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

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
1 Turn ON the power supply	6 0	FREF	RUN ○ ALARM ●
2 Set frequency Press [DSPL] to move to [FREF].	6 0	FREF	
3 Press [∧] to display 60 0.	60 0 (Blinking)		
4. Press [ENTER].	60.0		
5. Set the acceleration time. Press [DSPL] to move to [ACC].	10.0	ACC	
6 Press [∧] to display 15.0.	15.0 (Blinking)		
7. Press [ENTER].	15.0		
8. Set the deceleration time Press [DSPL] to move [DEC]	10 0	DEC	
9. Press [∨] to display 5.0.	5.0 (Blinking)		
10 Press [ENTER]	5.0		
11. Monitor output frequency Press [DSPL] to move to [FOUT]	0.0	FOUT	

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
12 Press RUN The motor accelerates to 60Hz in 15 seconds	60 0		RUN ☼ ALARM ●
13 Press STOP/RESET to stop the motor The motor decelerates to stop in 5 seconds	0 0		RUN ☼ ALARM ●
14 Rotate the motor in reverse direction NOTE • Never rotate the motor in reverse in applications where reverse run is not allowed. Press DSPL to move to F/R .	For		
15 Press ∧ or ∨ to display rEv	rEv (Blinking)		
16. Press ENTER	rEv		
17. Press RUN Reverse run starts			RUN ☼ ALARM ●
18 Press STOP/RESET to stop the motor.			RUN ☼ ALARM ●

6. PROGRAMMING FEATURES

Factory settings of the constants are shown as [1] in the tables.

■ Constant Set-up and Initialization

Constant selection/initialization (n01)

The following table describes the data which can be set or read when n01 is set.

Setting	Constant that can be set	Constant that can be referred
0 (Constant write disable)	n01	n01 to n69
1	n01 to n69*	n01 to n69
2 to 7	Not used (disabled)	
8	Initialize	
9 (Constant Initialization)	Initialize (3-wire sequence)†	

* Excluding setting disabled constants.
† Refer to page 47.

NOTE • « Err » appears on the LED display for one second and the set data returns to its initial values in the following cases :

(1) The set values of input terminal function selection 1, 2 and 3 (n06, n07 and n08) are the same.

(2) If the following conditions are not satisfied in the torque pattern setting (V/f pattern setting) :
Max. output frequency (n24) ≧ Max. voltage output frequency (n26)
> Mid. output frequency (n27)
≧ Min. output frequency (n29)
For details, refer to "Adjusting torque according to application" (V/f pattern setting) on page 51.

(3) If the following conditions are not satisfied in the Jump frequency setting :
Jump frequency 3 (n58) ≦ Jump frequency 2 (n57)
≦ Jump frequency 1 (n56)

(4) If Frequency reference lower limit (n42) ≦ Frequency reference upper limit (n41)

(5) If Electronic thermal reference current (n31) ≦ 120% of inverter rated current

(6) If the following is set when reverse run prohibit is set (n05=1) :
Reverse run is set by function LED [F/R] or by FWD/REV run selection (n04).

■ Setting Operation Conditions

Reverse run prohibit (n05)

"Reverse run disabled" setting does not accept 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

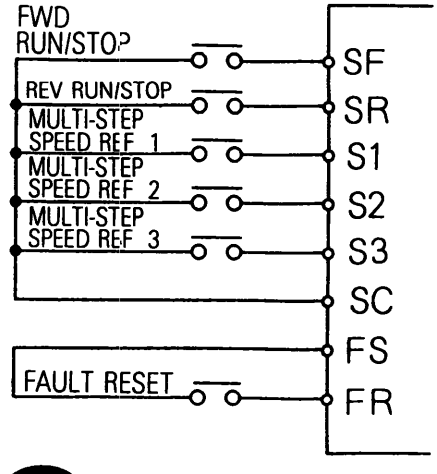
Multi-step speed selection

By combining frequency reference and input terminal function selections, up to 8 steps of speed can be set.

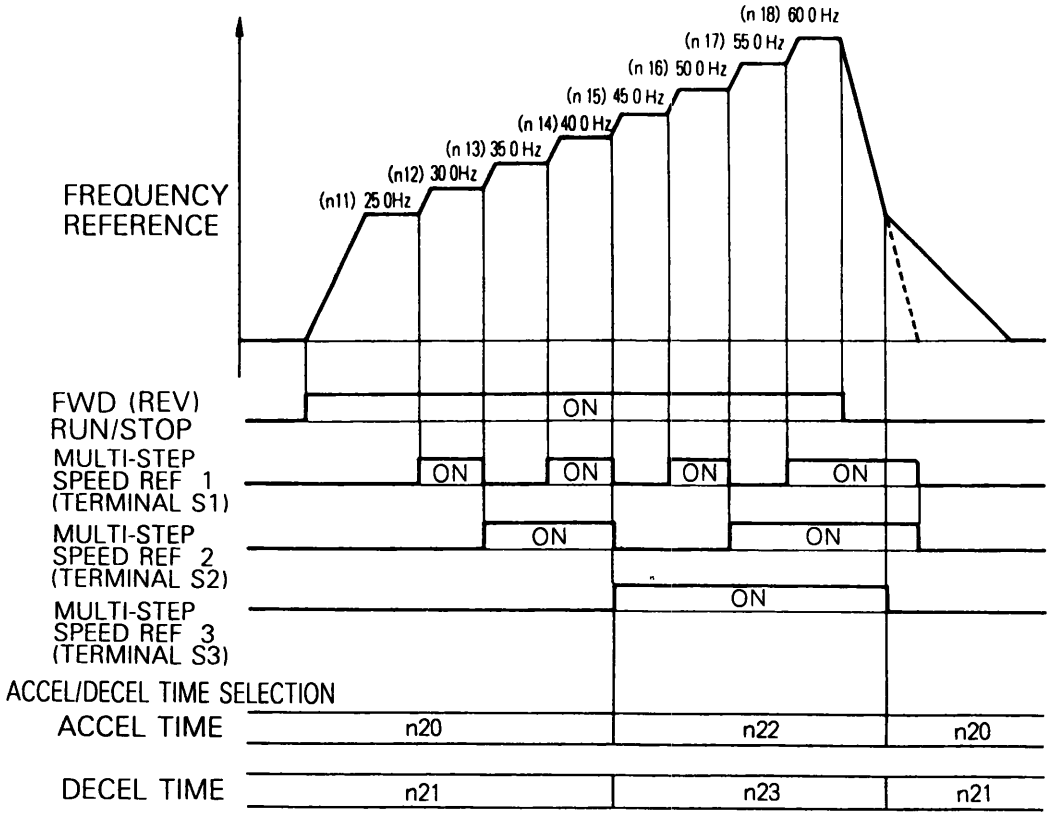
8-step speed change

n02=1 (operation mode selection)
n11=25.0Hz
n12=30.0Hz
n13=35.0Hz
n14=40.0Hz
n15=45.0Hz
n16=50.0Hz
n17=55.0Hz
n18=60.0Hz

n06=4 (Multi-function contact input terminal)
n07=5 (Multi-function contact input terminal)
n08=6 (Multi-function contact input terminal)
n43=1 (Terminal FR function selection)



NOTE When n02 is set at 2, 3, 4 or 5, frequency reference 1 (n11) becomes disabled. To output a reference from control circuit terminal FR, set n43 to 0.



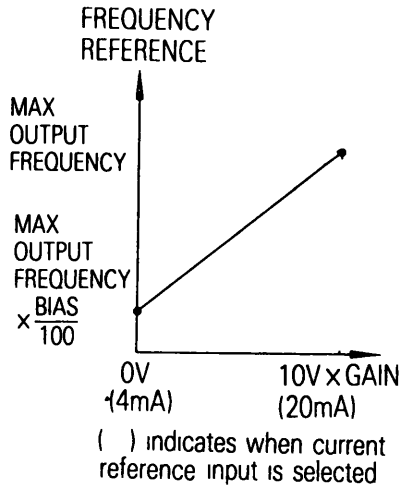
Multi-step speed reference 3 is used in common with accel/decel time selection. When multi-step speed reference 3 is turned OFF, accel/decel time 1 (n20, 21) is selected. When it is turned ON, accel/decel time 2 (n22, 23) is selected.

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 n19. When multi-step speed references 1, 2 or 3 are input simultaneously with the jog command, the jog command has priority.

Name	Constant No.	Setting
Jog frequency reference	19	Factory setting : 6.0Hz
Jog command	6, 7, 8	Set to "7" for any constant.

Adjusting frequency setting signal



When the frequency reference is output by analog input of control circuit terminals FR and FC, the relation between analog voltage and frequency reference can be set.

• Frequency reference gain (n39)

The analog input voltage value for the maximum output frequency (n24) can be set in units of 0.01 times.
Factory setting : 1.00

• Frequency reference bias (n40)

The frequency reference provided when analog input is 0V (4mA) can be set in units of 1%.
(n24: Maximum output frequency = 100%)
Factory setting: 0%

Gain : Outputs 100% (max. output frequency : FMAX, n24) at A V.

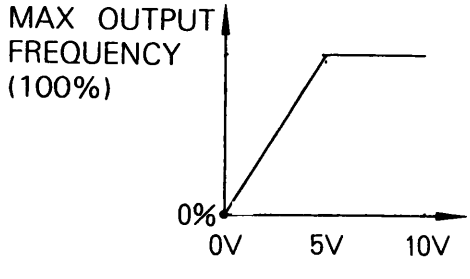
$$\Rightarrow n39 = \frac{A\,V}{10V}$$

Bias : Outputs B % (ratio to max. output frequency) at 0V.

$$\Rightarrow n40 = B\,\%$$

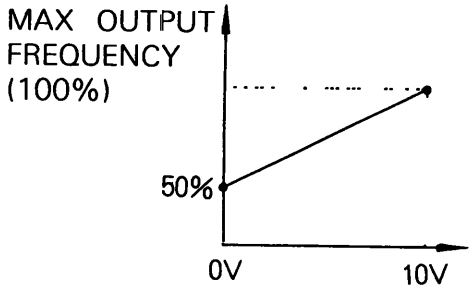
Typical Setting

① At 0 to 5V input



Gain : Constant n39=0.50
Bias : Constant n40=0

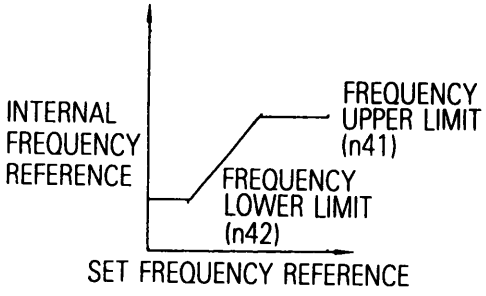
② To operate the inverter with frequency reference of 50% to 100% at 0 to 10V input



Gain : Constant n39=1.00
Bias : Constant n40=50

Note : When using VS operator model JVOP-95·□ (small plastic type), set frequency reference gain (constant n39) to 0.80.

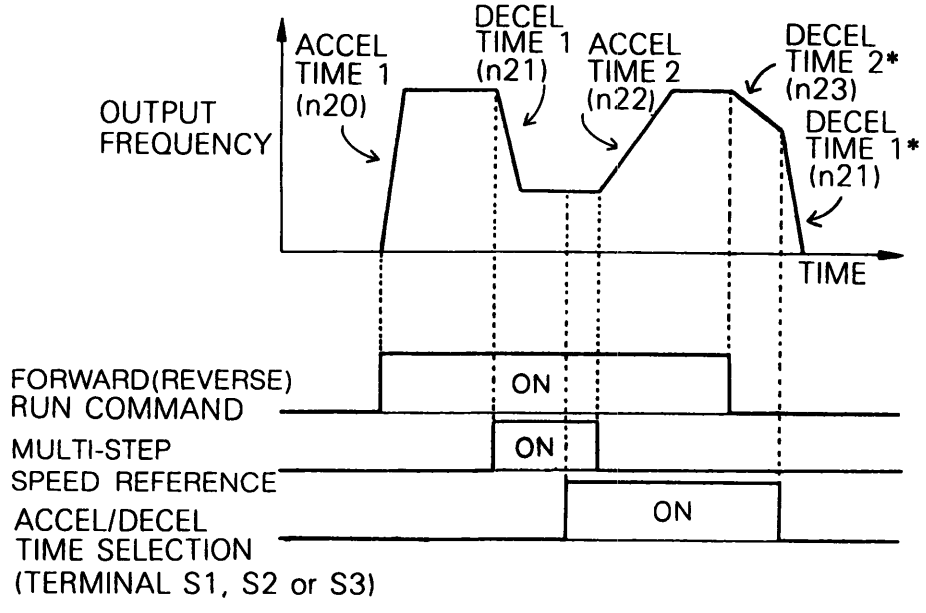
Adjusting frequency upper and lower limits



- Frequency reference upper limit (n41)
  Sets the upper limit of the frequency reference in units of 1%.
  (n24: Maximum output frequency = 100%)
  Factory setting: 100%

- Frequency reference lower limit (n42)
  Sets the lower limit of the frequency reference in units of 1%.
  (n24: Maximum output frequency = 100%)
  When operating at frequency reference 0, operation is continued at the frequency reference lower limit.
  However, when frequency lower limit is set to less than the minimum output frequency (n29), operation is not performed.
  Factory setting: 0%

Using two accel/decel times



* When "deceleration to a stop" is selected (n03 = 0).

By setting input terminal function selection (n06, 07 or 08) to "8 (accel/decel time select)", accel/decel time is selected by turning ON/OFF the accel/decel time select (terminal S1, S2 or S3).

At OFF : n20 (accel time 1)
n21 (decel time 1)

At ON : n22 (accel time 2)
n23 (decel time 2)

No.	Name	Unit	Setting range	Initial setting
n20	Accel time 1	0.1s	0.0 to 999s	10.0s
n21	Decel time 1	0.1s	0.0 to 999s	10.0s
n22	Accel time 2	0.1s	0 0 to 999s	10 0s
n23	Decel time 2	0 1s	0.0 to 999s	10.0s

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

Automatic restart after momentary power loss (n36)

When momentary power loss occurs, operation restarts automatically.

Setting	Description
0	Continuous operation after momentary power loss not provided.
1*	Continuous operation after power recovery within 0.5 second
2*†	Continuous operation after power recovery (Fault output not provided)

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

† When 2 is selected, operation restarts if power supply voltage reaches its normal level. No fault signal is output.

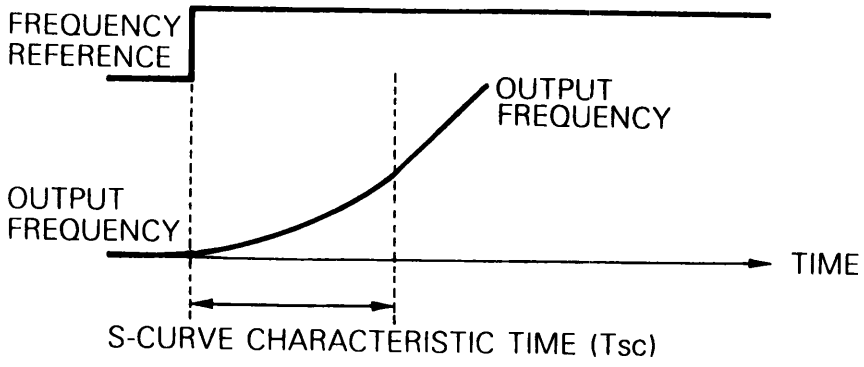
Soft-start characteristics (n49)

To prevent shock at machine start/stop, accel/decel can be performed in S-curve pattern.

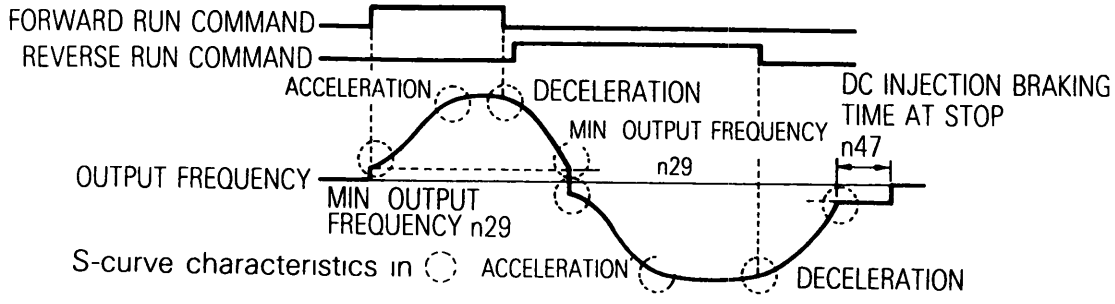
Setting	S-curve characteristic time
0	S-curve characteristic not provided
1	0.2 second
2	0.5 second
3	1.0 second

Note : S-curve characteristic time is the time from accel/decel rate 0 to a regular accel/decel rate determined by the set accel/decel time.

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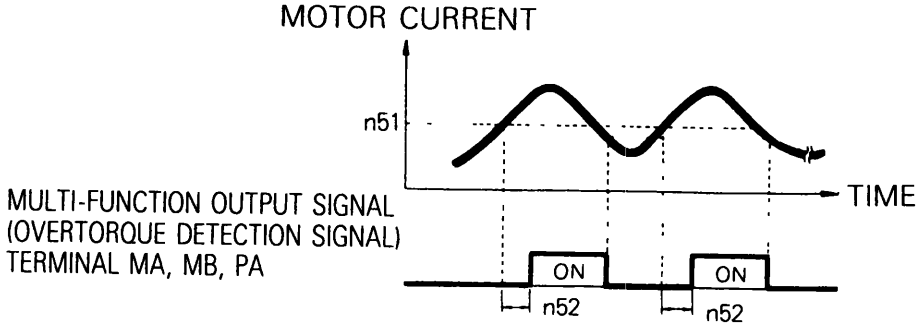
The following time chart shows FWD/REV run switching at deceleration to a stop.



Torque detection

If an excessive load is applied to the machine, output current increase can be detected to output alarm signals to multi-function output terminals MA, MB and PA.

To output an overtorque detection signal, set output terminal function selection n09 or n10 to "overtorque detection" (setting: 6).



• Overtorque detection function selection (n50)

Setting	Description
0	Overtorque detection not provided
1	Detected during constant-speed running, and operation continues after detection
2	Detected during constant-speed running, and operation stops during detection
3	Detected during running, and operation continues after detection
4	Detected during running, and operation stops during detection

(1) To detect overtorque at accel/decel, set to 3 or 4.

(2) To continue the operation after overtorque detection, set to 1 or 3. During detection, the operator displays "oL 3" alarm (blinking).

(3) To halt the inverter by a fault at overtorque detection, set to 2 or 4. At detection, the operator displays "oL 3" fault (ON).

• Overtorque detection level (n51)

Sets the overtorque detection current level in units of 1%. (Inverter rated current = 100%)
Factory setting: 160%

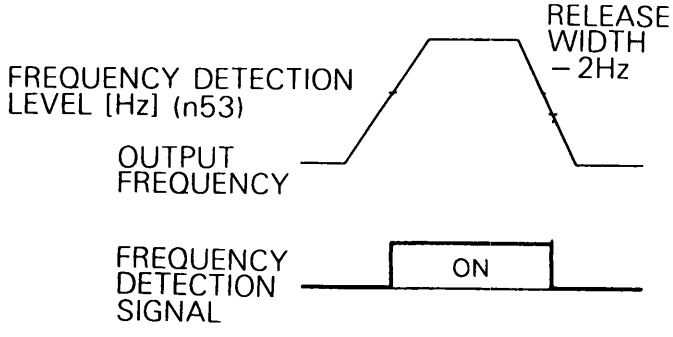
• Overtorque detection time (n52)

If the time when motor current exceeds the overtorque detection level (n51) is longer than overtorque detection time (n52), the overtorque detection function operates.

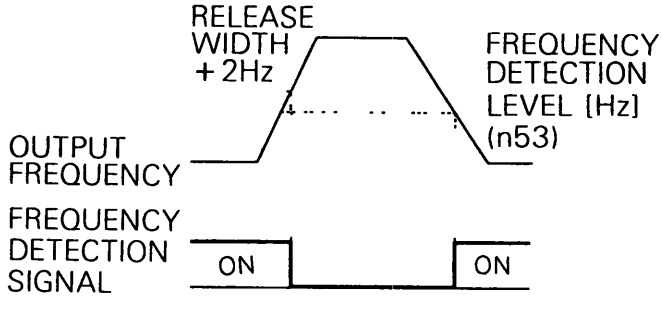
Frequency detection (n53)

Effective when output terminal function selections n09 or n10 are set to "frequency detection" (setting: 4 or 5). "Frequency detection" turns ON when output frequency is higher or lower than the frequency detection level (n53).

- Frequency detection (Output frequency ≧ Frequency detection level) (Set n09 or n10 to "4".)



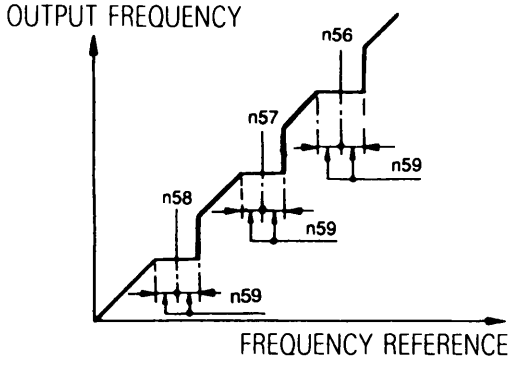
- Frequency detection (Output frequency ≦ Frequency detection level) (Set n09 or n10 to "5".)



Jump frequencies (n56 to n59)

This function allows the prohibition or "jumping" of critical frequencies so that the motor can operate without resonance caused by machine systems. This function is also used for dead band control. Setting the value to 0.0Hz disables this function.

Set prohibited frequency 1, 2 or 3 as follows :



n56 ≧ n57 ≧ n58

If this condition is not satisfied the inverter displays Err for one minute and restores the data to original settings

Continuing operation by automatic fault reset (n60)

Sets the inverter to restart and reset fault detection after a fault occurs.

The number of self-diagnosis and retry attempts can be set at n60 up to 10.

The inverter will automatically restart after the following faults occur :

- OC (overcurrent)
- OV (overvoltage)

The number of retry attempts are 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) Power supply is turned OFF

Operating coasting motor without trip

To operate coasting motor without trip, use the speed search command or DC injection braking at start.

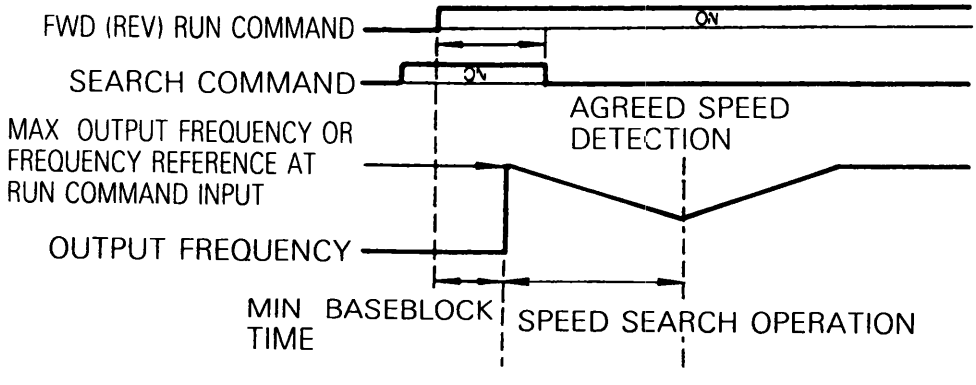
- Speed search command

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

Set input terminal function selection (n06, 07 or 08) to "11" (search command from maximum output frequency) or "12" (search command from set frequency).

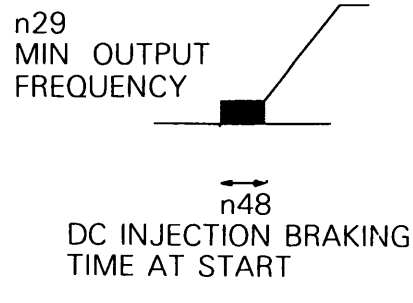
Build a sequence so that FWD (REV) run command is input at the same time as the search command or after the search command. If the run command is input before the search command, the search command becomes disabled.

Time chart at search command input



- DC injection braking at start (n46, n48)

Restarts a coasting motor after stopping it. Set the DC injection braking time at start in n48 in units of 0.1 second. Set DC injection braking current in n46 in units of 1% (inverter rated current =100%). When the setting of n48 is "0", DC injection braking is not performed and acceleration starts from the minimum output frequency.



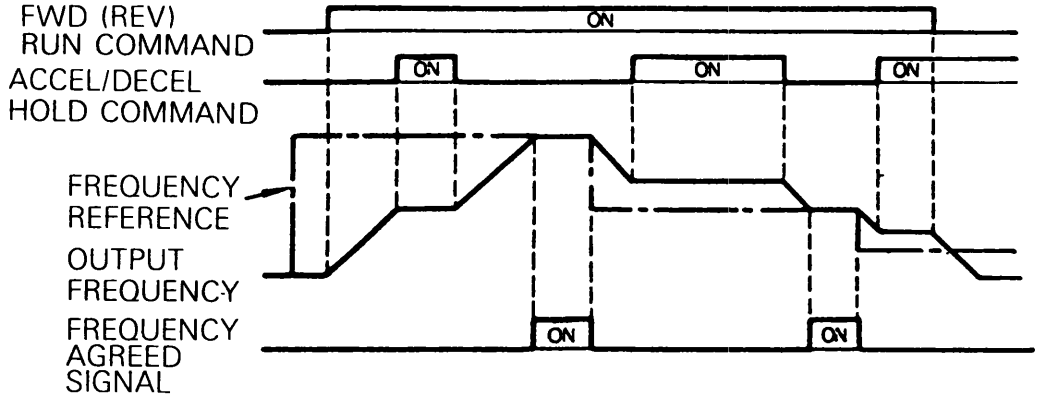
Holding accel/decel temporarily

To hold acceleration or deceleration, input accel/decel hold command. The output frequency is maintained when the accel/decel hold command is input during acceleration or deceleration.

The stop command releases the accel/decel hold and the operation ramps to stop.

Set input terminal function selection (n06, 07 or 08) to 13 (accel/decel hold command).

Time chart at accel/decel hold command input



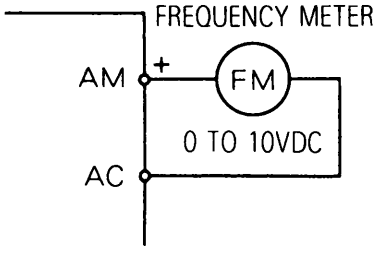
Note When the FWD (REV) run command is input along with the accel/decel hold command, the motor does not operate However, when frequency reference lower limit (n42) is set greater than or equal to minimum output frequency (n29), the motor operates at frequency reference lower limit (n42)

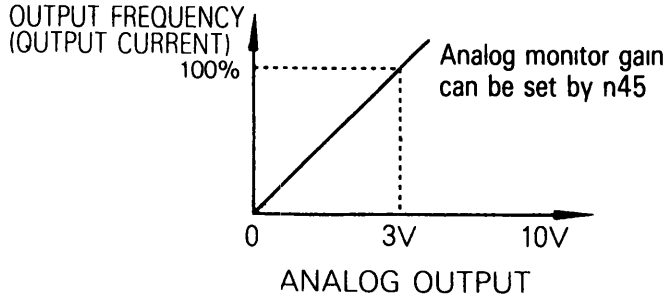
Using frequency meter or ammeter (n44)

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

Setting	Description
0	Output frequency
1	Output current

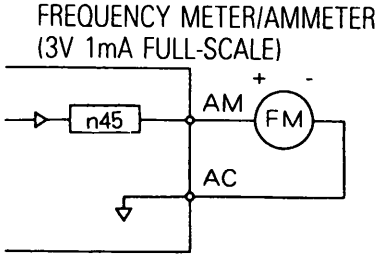
In initial setting, analog voltage of approx. 3V is output when output frequency (output current) is 100%.

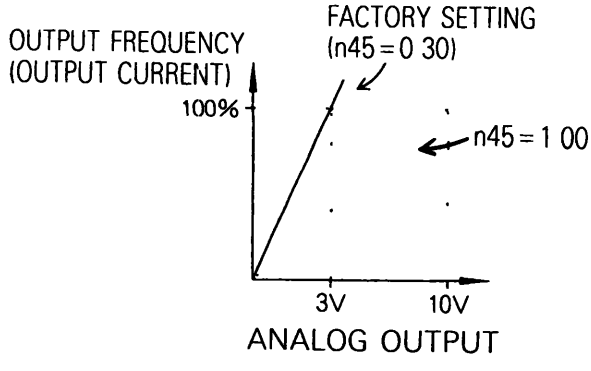




Calibrating frequency meter or ammeter (n45)

Used to adjust analog output gain.





Set the analog output voltage at 100% of output frequency (output current). Frequency meter displays 0 to 60Hz at 0 to 3V.

$$10V \times \frac{\text{n45 Setting}}{0.30} = 3V$$

Output frequency becomes 100% at this value.

Reducing motor noise or leakage current (n37)

Sets inverter output transistor switching frequency (carrier frequency).

Setting	Carrier frequency (kHz)	Metallic noise from motor	Noise and current leakage
1	2.5	Higher ↕ Not audible	Smaller ↕ Larger
2	5.0		
3	7.5		
4	10.0		
5	12.5		
6	15.0		

Note . n37 setting

Low-carrier type 1 (fixed)

Low-noise type setting range 1 to 6*, factory setting 4

* Setting range is 1 to 4 for software version No NSP600101 or before

NOTE

1. Reduce continuous output current for changing the carrier frequency to 5 or 6.

Carrier Frequency Set Value	Maximum Continuous Output Current
1 to 4	Up to 100% of inverter rated output current
5, 6	Up to 90% of inverter rated output current

2. Wiring Distance between Inverter and Motor

If the wiring distance between inverter and motor is long, reduce the inverter carrier frequency as described below.

Wiring Distance between Inverter and Motor	Up to 30m	Up to 50m	Up to 100m	More than 100m
Carrier Frequency (Set value of constant n37)	15kHz or less (6)	10kHz or less (4)	5kHz or less (2)	2.5kHz (1)

Operator stop key selection (n61)*

Selects processing when STOP key is depressed during operation from control circuit terminal.

Setting	Description
0	STOP key effective when running from terminals. When STOP key is depressed, the inverter stops according to the setting of constant n03 At this time, the digital operator displays "SrP" alarm (blinking) This stop command is held in the inverter until both forward and reverse run commands are open
1	STOP key ineffective when running from terminals

* Not provided for software version No NSP600101 or before

■ Selecting Stopping Method

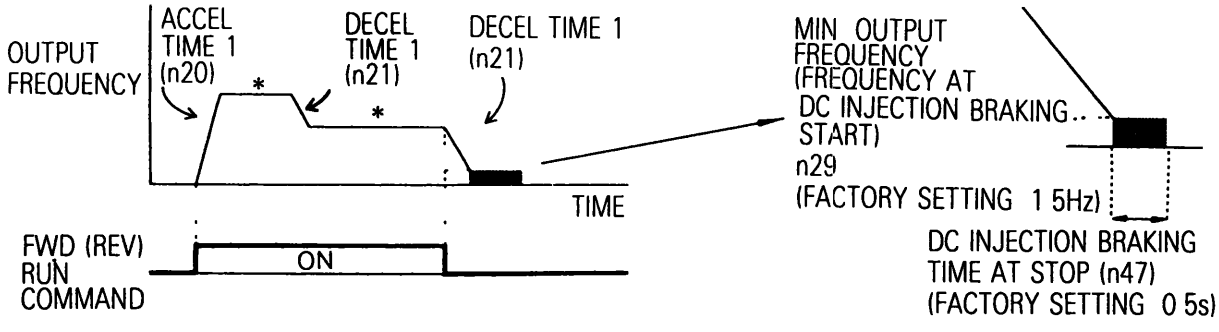
Selecting stopping method (n03)

Selects the stopping method suitable for application.

Setting	Description
0	Deceleration to stop
1	Coast to stop

• Deceleration to stop

Example when accel/decel time 1 is selected



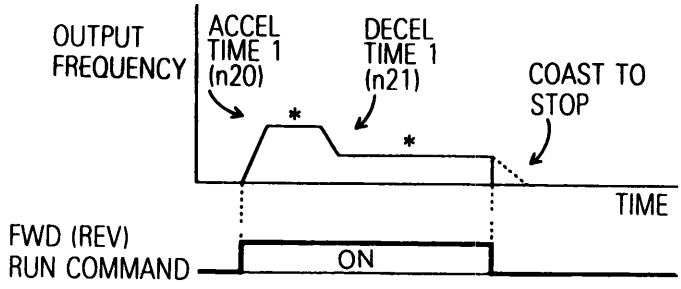
* When frequency reference is changed during running.

Upon removal of the FWD (REV) run command, the motor decelerates at the decel rate determined by the time set to decel time 1 (n21) and DC injection braking is applied immediately before stop. If the decel time is short or the load inertia is large, overvoltage (OV) fault may occur at deceleration. In this case, increase the decel time or install a optional braking resistor.

Braking torque : Without braking resistor : Approx. 20% torque of motor rating
With braking resistor: Approx. 150% torque of motor rating

• Coast to stop

Example when accel/decel time 1 is selected



* When frequency reference is changed during running.

Upon removal of the FWD (REV) run command, the motor starts coasting.

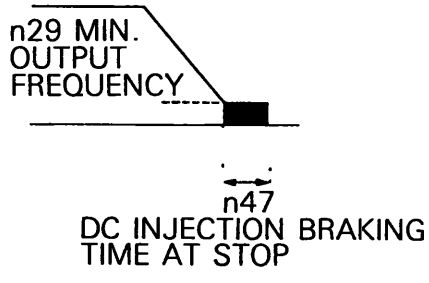
Applying DC injection braking

• DC injection braking current (n46)

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

• DC injection braking time at stop (n47)

Sets the DC injection braking time at stopping in units of 0.1 second. When the setting of n44 is 0, DC injection braking is not performed but inverter output is shut OFF at the timing of DC injection braking start.



When coasting to a stop is specified in stopping method selection (n03), DC injection braking at stop does not operate.

■ Building Interface Circuits with External Devices

Using input signals (n06, n07, n08)

Multi-function input terminal S1, S2 and S3 functions can be changed when necessary by setting constants n06, n07 and n08, respectively. The same value cannot be set to different constant setting.

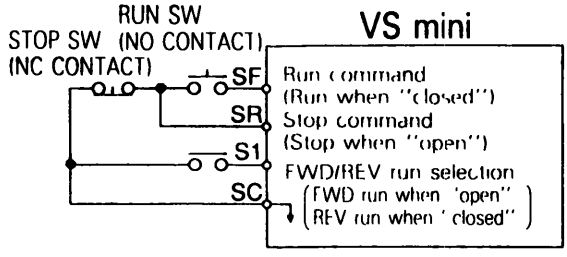
- Terminal S1 function: Set to n06
- Terminal S2 function: Set to n07
- Terminal S3 function: Set to n08

Setting	Name	Description	Ref
0	FWD/REV run command (3-wire sequence selection)	Setting enabled only for n06	47
1	Fault reset	—	—
2	External fault (NO contact input)	Inverter stops by external fault signal input. Digital operator display is "EF□*".	—
3	External fault (NC contact input)		
4	Multi-step speed reference 1	—	30
5	Multi-step speed reference 2	—	
6	Multi-step speed reference 3	—	
7	JOG command	—	31
8	Accel/decel time select	—	33
9	External baseblock (NO contact input)	Motor coasts to a stop by this signal input. Digital operator display is "bb" alarm (blinking).	—
10	External baseblock (NC contact input)		
11	Search command from maximum frequency	Speed search command signal	39
12	Search command from set frequency		
13	Accel/decel hold command	—	40
14	LOCAL/REMOTE selection	—	47
15	UP/DOWN command		47

* 1, 2 or 3 is displayed in □ corresponding to the numbers of S1, S2 and S3, respectively.

Factory settings n06 : 1, n07 · 2, n08 . 4

Terminal function at 3-wire sequence selection



- LOCAL/REMOTE select (setting: 14)

  Selects operation reference by the digital operator or by the control circuit terminal.

  LOCAL/REMOTE select is available only during stop.

  Open : Run according to the setting of operation mode selection (n02).

  Closed : Run by frequency reference and run command from the digital operator.

  (Example) Set n02 to 3 or 5.

  Open : Run by frequency reference from control circuit terminal FR and run command from control circuit terminals SF, SR.

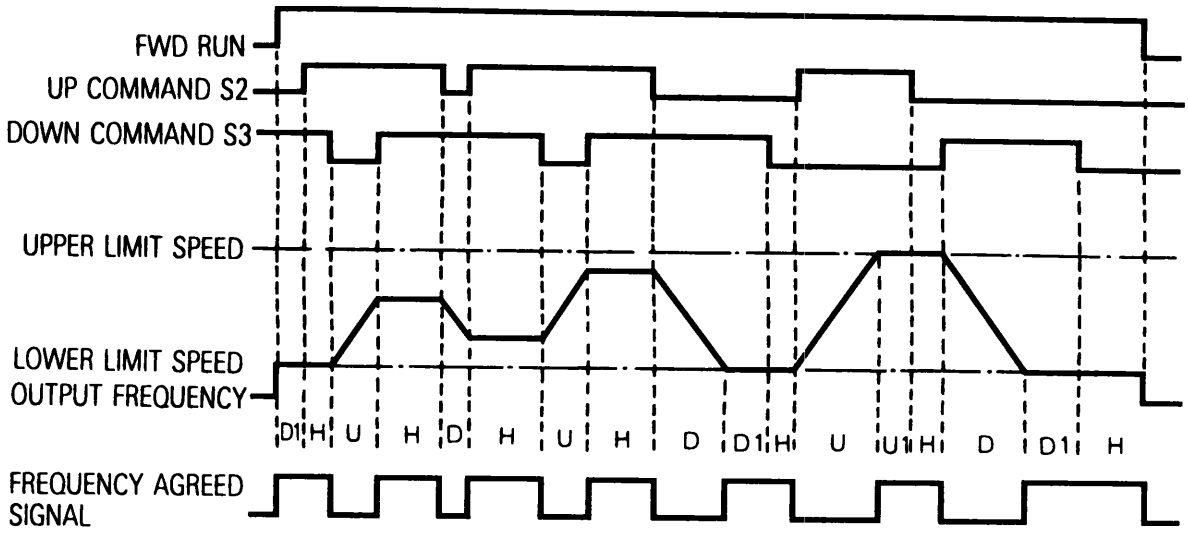
  Closed : Run by frequency reference and run command from the digital operator.

- UP/DOWN command (setting: n08 = 15)

  With the FWD (REV) run command entered, accel/decel is enabled by inputting the UP or DOWN signals to control circuit terminals S2 and S3 without changing the frequency reference, so that operation can be performed at the desired speed. When UP/DOWN commands are specified by n08, any function set to n07 becomes disabled; terminal S2 becomes an input terminal for the UP command and terminal S3 for the DOWN command.

Control Circuit Terminal S2 (UP command)	Closed	Open	Open	Closed
Control Circuit Terminal S3 (DOWN command)	Open	Closed	Open	Closed
Operation Status	Accel	Decel	Hold	Hold

Time Chart at UP/DOWN Command Input



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

Notes :

1. When UP/DOWN command is selected, the upper limit speed is set regardless of frequency reference.

   Upper limit speed = Maximum output frequency (n24)
   × Frequency reference upper limit (n41)/100

2. Lower limit value is either minimum output frequency (n29) or frequency reference lower limit (n42) (whichever is larger.).
3. When the FWD (REV) run command is input, operation starts at the lower limit speed without an UP/DOWN command.
4. If the jog command is input while running by the UP/DOWN command, the jog command has priority.
5. Multi-step speed reference cannot be used when selecting UP/DOWN command.

Using output signals (n09, n10)

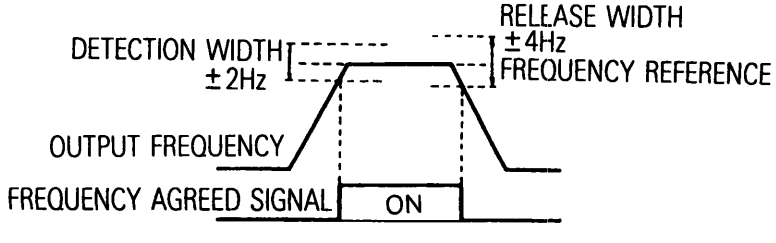
Multi-function output terminal MA, MB and PA functions can be changed when necessary by setting constants n09 and n10.

- Terminal MA and MB functions: Set to n09
- Terminal PA function: Set to n10

Setting	Name	Description	Ref
0	Fault	"Closed" when inverter fault occurs.	—
1	In operation	"Closed" when FWD or REV run command is input, or when the inverter outputs voltage.	—
2	Agreed frequency	—	49
3	Zero speed	"Closed" when the inverter output frequency is less than min. output frequency	—
4	Frequency detection (output frequency ≧ frequency detection level)	—	37
5	Frequency detection (output frequency ≦ frequency detection level)	—	
6	Overtorque detection	—	35
7	Base blocked	"Closed" when the inverter output is shut off.	—
8	Low voltage detected	"Closed" when the inverter is detecting low voltage.	—
9	Speed search	"Closed" when the inverter is searching for the speed.	—
10	Operation mode	"Closed" when "LOCAL" is selected by LOCAL/REMOTE selection.	—

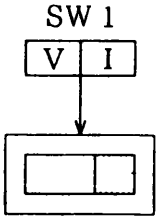
Factory settings n09 : 1 n10 : 0

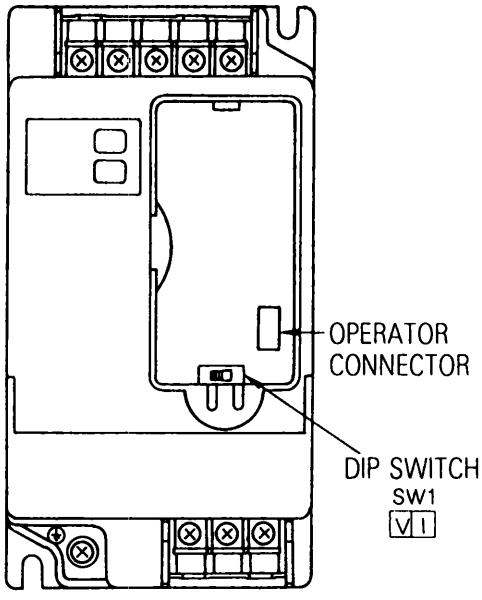
- Setting example of "Frequency agreed signal" (Setting = 2)



■ Setting Frequency by Current Reference Input

When setting frequency by inputting current reference (4-20mA) from the control circuit terminal FR, switch the dip switch SW1 on the printed circuit board to "I" side.
SW1 is accessed by removing the digital operator.



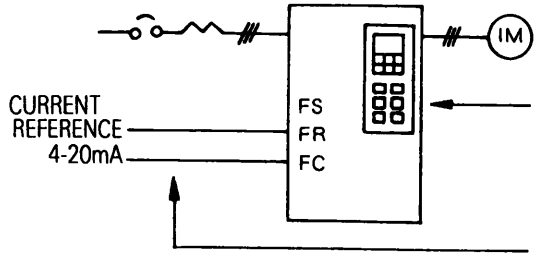


NOTE

Never input voltage reference to control circuit terminal FR when dip switch SW1 is switched to "I" side.

After switching SW1, set MODE LED item to 4 or 5.

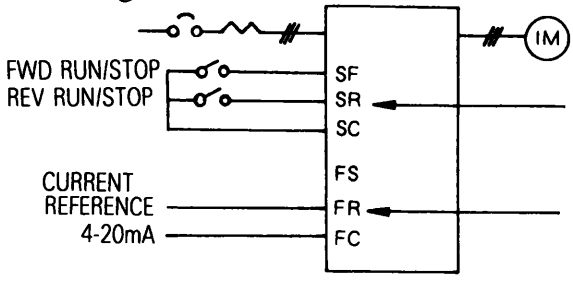
• Setting : 4



Depress the digital operator keys to run or stop the inverter. Switch run and stop direction by setting F/R LED item.

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

• Setting : 5



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

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

Frequency reference gain (n39)/bias (n40) can be set even when current reference input is selected. For details, refer to "Adjusting frequency setting signal" on page 32.

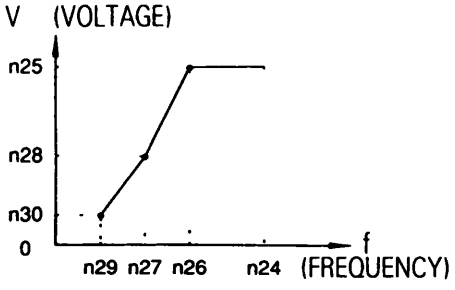
■ Adjusting Motor Torque

Adjusting torque according to application

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

- V/f pattern setting

  Set V/f pattern by n24 to n30 as described below. Set each pattern when using a special motor (high-speed motor, etc.) or when requiring special torque adjustment of machine.



Be sure to satisfy the following conditions for the setting of n24 to n30.

$n29 \leqq n27 < n26 \leqq n24$

If n29 = n27 is set, the set value of n28 is disabled.

Constants No.	Name	Unit	Setting range	Initial Setting
n24	Max. output frequency	0.1Hz	50.0 to 400Hz	60.0Hz
n25	Max. voltage	1V	1 to 255V	200V
n26	Max. voltage output frequency (base frequency)	0.1Hz	0.6 to 400Hz	60.0Hz
n27	Mid. output frequency	0.1Hz	0.5 to 399Hz	1.5Hz
n28	Mid. output frequency voltage	1V	1 to 255V	12V
n29	Min. output frequency	0.1Hz	0.5 to 10.0Hz	1.5Hz
n30	Min output frequency voltage	1V	1 to 50V	12V

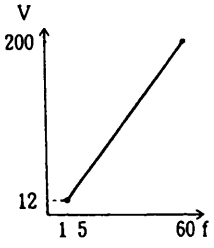
• Typical setting of V/f pattern

Set the V/f pattern according to the application as described below. When running at a frequency exceeding 50Hz/60Hz, change the maximum output frequency (n24).

Note Be sure to set the maximum output frequency according to the motor characteristics

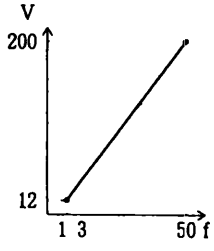
(1) For general-purpose applications

Motor Specification : 60Hz
(Factory setting)



Constant	Setting
n24	60.0
n25	200
n26	60.0
n27	1.5
n28	12
n29	1.5
n30	12

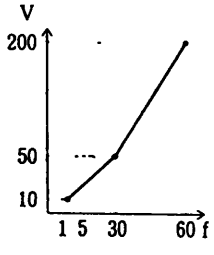
Motor Specification : 50Hz



Constant	Setting
n24	50.0
n25	200
n26	50.0
n27	1.3
n28	12
n29	1.3
n30	12

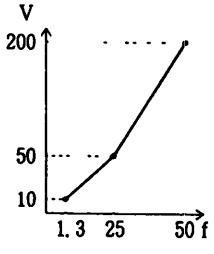
(2) For fans/pumps

Motor Specification : 60Hz



Constant	Setting
n24	60.0
n25	200
n26	60.0
n27	30.0
n28	50
n29	1.5
n30	10

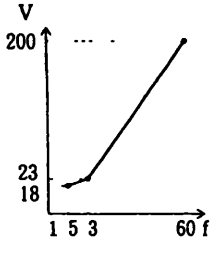
Motor Specification : 50Hz



Constant	Setting
n24	50.0
n25	200
n26	50.0
n27	25.0
n28	50
n29	1.3
n30	10

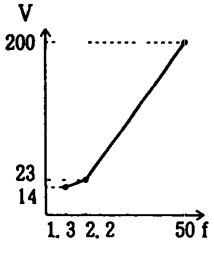
(3) For applications requiring high starting torque

Motor Specification : 60Hz



Constant	Setting
n24	60.0
n25	200
n26	60.0
n27	3.0
n28	23
n29	1.5
n30	18

Motor Specification : 50Hz



Constant	Setting
n24	50.0
n25	200
n26	50.0
n27	2.2
n28	23
n29	1.3
n30	14

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

Note : n25 is to be set to motor rated voltage.

• Full-range automatic torque boost

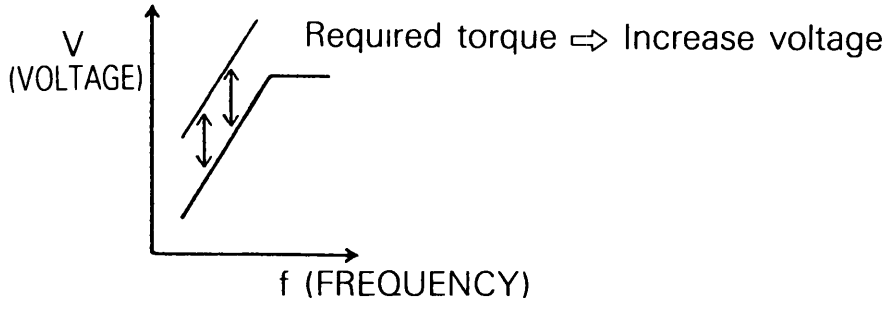
Motor torque requirement changes according to load conditions. Full-range automatic torque boost adjusts voltage of V/f pattern according to the requirement. The VS mini automatically adjusts the voltage during constant-speed operation as well as during acceleration.

The required torque is calculated by the inverter.

This ensures tripless operation and energy-saving effects.

Output voltage ∝ Automatic torque boost gain (n38) × Required torque

• Operation



Normally, no adjustment is necessary for automatic torque boost gain (n38 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 boost gain. In these cases, set the V/f pattern (n24 to n30).

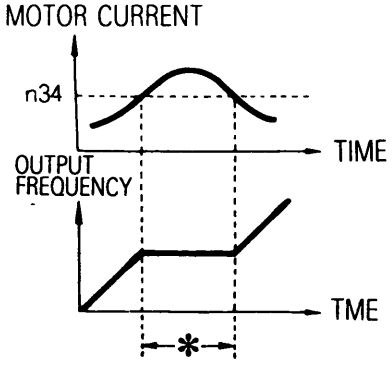
Preventing motor from stalling (Current limit)

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 (n34)
  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. During acceleration, if the output current exceeds the value set for n34, acceleration stops and frequency is maintained. When the output current goes down to the value set for n34, acceleration starts.



* Controls the acceleration rate to prevent the motor from stalling.

In the constant output area [output frequency ≧ max. voltage output frequency (n26)], the stall prevention (current limit) level during acceleration is changed by the following equation.

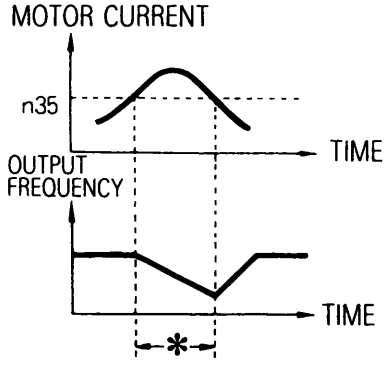
Stall prevention (current limit) level during accel in constant output area

$$= \text{Stall prevention (current limit) level during accel (n34)} \times \frac{\text{Max. voltage output frequency (n26)}}{\text{Output frequency}}$$

• Stall prevention (current limit) level during running (n35)
Sets the stall prevention (current limit) level during running in units of 1%. (Inverter rated current = 100%)

* Factory setting: 160%

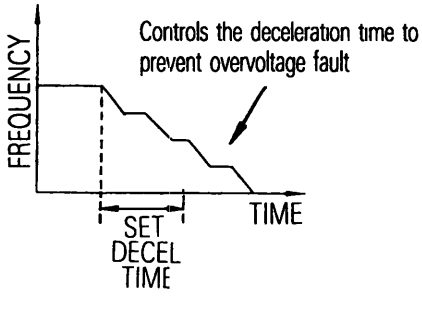
A setting of 200% disables the stall prevention (current limit) during running.
During agreed speed if the output current exceeds the value set for n35, deceleration starts.
When the output current exceeds the value set for n35, deceleration continues. When the output current goes down to the value set for n35, acceleration starts, up to the set frequency.



* Decreases frequency to prevent the motor from stalling

• Stall prevention (current limit) during deceleration (n33)
To prevent overvoltage during deceleration, the inverter automatically extends the deceleration time according to the value of main circuit DC voltage. When using an optional braking resistor, set n33 to 1.

Setting	Stall prevention (current limit) during deceleration
0	Provided
1	Not Provided (when braking resistor mounted)



■ Decreasing Motor Speed Fluctuation

Slip compensation

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

When inverter output current is equal to the electronic thermal reference current (motor rated current), the compensation frequency is added to the output frequency.

$$\text{Compensation frequency} = \text{Motor rated slip value} \times \frac{\text{Output current} - \text{Motor no-load current (n55)}}{\text{Electronic thermal reference current (n31)} - \text{Motor no-load current (n55)}}$$

$$\text{Motor rated slip value} = \text{Max. voltage output frequency (n26)} \times \text{Slip compensation gain (n54)}$$

Constants

Constants No	Name	Unit	Setting range	Initial Setting
n24	Max output frequency	0.1Hz	50.0 to 400Hz	60.0Hz
n26	Max voltage output frequency	0 1Hz	0.6 to 400Hz	60.0Hz
n31	Electronic thermal reference current	0.1A	0 to 120% of inverter rated current	*
n54	Slip compensation gain	0.1%	0.0 to 9.9% (100%=max. voltage output frequency n26) Setting 0.0% invalidated slip compensation	0 0%
n55	Motor no-load current	1%	0 to 99% (100%=Electronic thermal reference current n31)	40%
n62†	Slip compensation primary delay time	0.1s	0 0 to 25 5s When 0 0s is set, delay time becomes 2.0s	2.0s

* Differs depending on inverter capacity

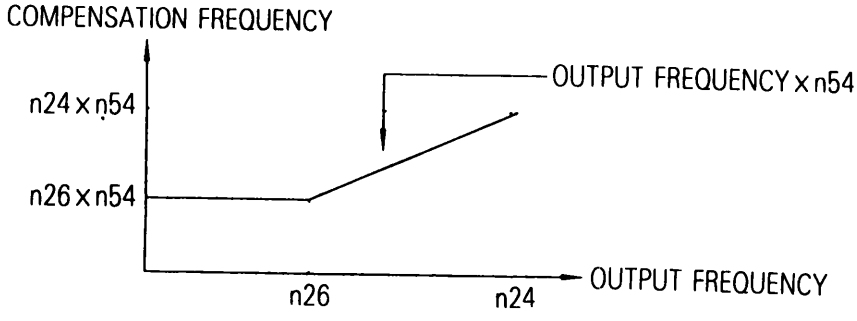
† Not provided for software version No. NSP 600101 or before.

Notes . 1. Slip compensation is not performed in the following conditions:

- Output frequency < minimum output frequency (n29)
- During regeneration
- Setting to electronic thermal reference current (n31) to 0.0A.

2 In the constant output area [output frequency ≧ max voltage output frequency (n26)], compensation frequency is increased automatically as described on the following page

The figure below shows the compensation frequency when the inverter output current is equal to the motor rated current.



■ Motor Protection

Motor overload detection

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

- Electronic thermal reference current (n31)
  Set to the rated current value shown on the motor nameplate.

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

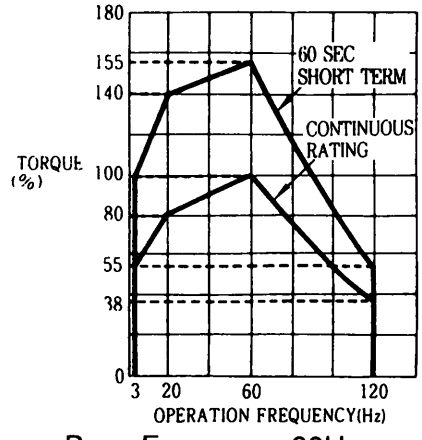
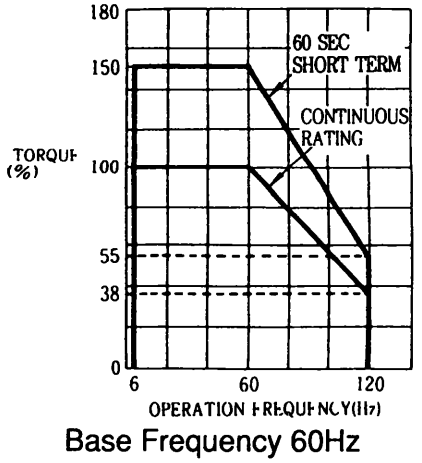
- Motor overload protection selection (n32)

Setting	Electronic Thermal Characteristics
0	Applied to general-purpose motor, standard ratings
1	Applied to general-purpose motor, short-term ratings
2	Applied to inverter motor, standard ratings
3	Applied to inverter motor, short-term ratings
4	Electronic thermal overload protection not provided

The electronic thermal overload function monitors motor temperature, based on inverter output current and time, to protect the motor from overheating. When electronic thermal overload relay is enabled, an "oL 1" error occurs, shutting OFF the inverter output and preventing excessive overheating in the motor. When operating with one inverter connected to one motor, an external thermal relay is not needed. When operating several motors with one inverter, install a thermal relay on each motor.

• General-purpose motor and inverter motor

Induction motors are classified as general-purpose motors or inverter motors, based on their cooling capabilities. Therefore, the motor overload function operates differently between these two motor types.

	Cooling effect	Torque characteristics	Electronic thermal overload
General-purpose motor	Effective when operated at 50/60Hz from commercial power supply	 Base Frequency 60Hz (V/f for 60Hz, 220V Input Voltage) For low-speed operation, torque must be limited in order to stop motor temperature rise.	"oL 1" error (motor overload protection) occurs when continuously operated at 50/60Hz or less at 100% load.
Inverter motor	Effective even when operated at low speed (approx. 6Hz)	 Base Frequency 60Hz (V/f for 60Hz, 220V Input Voltage) Use an inverter motor for continuous operation at low speed.	Electronic thermal overload protection not activated even when continuously operated at 50/60Hz or less at 100% load.

7. MAINTENANCE AND 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, unit mounting bolts, etc	Connection hardware is properly seated and securely tightened.	Properly seat and tighten hardware
Cooling fins	Built up dust, dirt, and debris	Blow with dry compressed air : 39 2 × 10^4 to 58 8 × 10^4 Pa, 57 to 85 psi (4 to 6kg / cm^2) pressure
Printed circuit board	Accumulation of conductive material or oil mist	Blow with dry compressed air · 39.2 × 10^4 to 58.8 × 10^4 Pa, 57 to 85 psi (4 to 6kg / cm^2) pressure If dust or oil cannot be removed, replace the inverter unit.
Power elements and smoothing capacitor	Abnormal odor or discoloration	Replace the inverter unit.

8. FAULT DIAGNOSIS AND CORRECTIVE ACTIONS

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

<Corrective actions for models with blank cover (no operator)>

1. Input fault reset or cycle the power supply OFF and ON.
2. When a fault cannot be corrected:
   (1) Turn the power supply OFF and check the wiring and control logic.
   (2) Turn the power supply OFF and replace the blank cover with the digital operator to display faults.

<Corrective Actions of Models with Digital Operator>

☼ ON ◉ : BLINKING ● . OFF

Alarm Display and Contents

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
EF Blinking	☼ or ◉ ◉	Warning Fault contacts do not change state	EF (Simultaneous FWD/ REV run commands) When FWD and REV run commands are simultaneously input for over 500ms, the inverter stops according to constant n03	Check SF and SR input terminals
bb Blinking			BB (External baseblock) Base block command at multi-function terminal is active, the inverter output is shut OFF (motor coasting) Temporary condition, cleared when input command is removed	Check multi-function input terminals S1, S2, or S3
SrP Blinking			STP (Operator function stop) STOP RESET is pressed during running by the control circuit terminals SF and SR The inverter stops according to constant n03	Check terminals SF and SR
oL3 Blinking	☼ ◉		OL 3 (Overtorque detection) Motor current exceeded the preset value in constant n51. Inverter continues operation	Check the driven machine and correct the cause of the fault, or increase the value of constant n51 up to the highest value allowed for the machine
SEr Blinking			SEr (Sequence error) Inverter receives LOCAL/REMOTE select command from the multi-function terminal while the inverter is outputting Refer to page 39 for LOCAL/REMOTE select signal	Check the multi-function input terminals S1, S2, and S3

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
Uu Blinking		Warning Fault contacts do not change state	UV (Main circuit low voltage) Main circuit DC voltage drops below the low-voltage detection level while the inverter output is OFF	Check the following • Power supply voltage • Main circuit power supply wiring is connected • Terminal screws are securely tightened
ou Blinking			OV (Main circuit overvoltage) Main circuit DC voltage exceeds the overvoltage detection level while the inverter output is OFF	Check the power supply voltage
oH Blinking			OH (Cooling fin overheat) Intake air temperature rises while the inverter output is OFF	Check the intake air temperature

Fault Display and Contents

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oC	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop	OC (Overcurrent) Inverter output current momentarily exceeds approx 250% of rated current	• Short circuit or grounding at inverter output side • Excessive load GD^2 • Extremely rapid accel/decel time (constants n20 to n23) • Special motor used • Starting motor during coasting • Motor of a capacity greater than the inverter rating has been started • Magnetic contactor open/closed at the inverter output side
ou			OV (Main circuit over-voltage) Main circuit DC voltage exceeds the overvoltage detection level because of excessive regenerative energy from the motor	• Insufficient decel time (constants n21 and n23) • Lowering of minus load (elevator, etc) ⇩ • Increase decel time • Connect optional braking resistor
Uu1			UV1 (Main circuit low voltage) Main circuit DC voltage drops below the low-voltage detection level while the inverter output is ON.	• Reduction of input power supply voltage • Open phase of input supply • Occurrence of momentary power loss • Insufficient accel time (constants n20 and n22) ⇩ Check the following : • Power supply voltage • Main circuit power supply wiring is connected. • Terminal screws are secure • Increase accel time
Uu2			UV2 (Control power supply fault) Voltage fault of control power supply is detected	Cycle power If the fault remains, replace the inverter

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oH	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop.	OH (Cooling fin overheat) Temperature rise because of inverter overload operation or intake air temperature rise.	• Excessive load • Improper V/f pattern setting • Insufficient accel time if the fault occurs during acceleration • Intake air temperature exceeding 50°C (122°F) ⇩ Check the following • Load size • V/f pattern setting (constants n24 to n30) • Intake air temperature
oL 1			OL1 (Motor overload) Motor overload protection operates by built-in electronic thermal overload relay	• Check the load size or V/f pattern setting (constants n24 to n30) • Set the motor rated current shown on the nameplate by constant n31.
oL2			OL2 (Inverter overload) Inverter overload protection operates by built-in electronic thermal overload relay.	• Check the load size or V/f pattern setting (constants n24 to n30) • Check the inverter capacity.
oL3			OL3 (Overtorque detection) Motor current exceeded the preset value in constant n51 because of machinery fault or overload.	Check the driven machine and correct the cause of the fault, or increase the value of constant n51 up to the highest value allowed for the machine.
EF 1 EF2 EF3			EF1, EF2, EF3 (External fault) Inverter receives an external fault input from control circuit terminal.	Check the multi-function input terminals S1, S2 and S3.

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
F00	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop	CPF-00 Initial memory fault is detected	Cycle power If the fault remains, replace the inverter
F01			CPF-01 ROM fault is detected.	
F04			CPF-04 Constant fault is detected.	• Record all constant data and initialize the constants (Refer to page 22 for constant initialization) • Cycle power If the fault remains, replace the inverter
F05			CPF-05 AD converter fault is detected	Cycle power. If the fault remains, replace the inverter
F06			CPF-06 Option connecting fault	Remove power to the inverter Check the connection of the option .
— (OFF)	● ●		• Insufficient power supply voltage • Control power supply fault • Hardware fault	Check the following : • Power supply voltage • Main circuit power supply wiring is connected • Terminal screws are securely tightened. • Control sequence. • Replace the inverter.

9. SPECIFICATIONS

■ Standard Specifications

Model CIMR-XC	200V 3-phase	Low-carrier type	J 20P1	J 20P2	J 20P4	J 20P7	J 21P5
		Low-noise type	B 20P1	B 20P2	B 20P4	B 20P7	B 21P5
	200V single-/ 3-phase*	Low-carrier type	J B0P1	J B0P2	J B0P4	J B0P7	—
		Low-noise type	B B0P1	B B0P2	B B0P4	B B0P7	B B1P5
	100V single-phase *†	Low-noise type	B A0P1	B A0P2	B A0P4	B A0P7	—
Max Applicable Motor Output HP (kW)‡			0 13 (0.1)	0 25 (0 2)	0 5 (0 4)	1 (0 75)	2 (1 5)
Output characteristics	Inverter capacity (kVA)		0 3	0 6	1 1	1 9	2.6
	Rated output current (A)		0 8	1 5	3.0	5.0	7 0
	Max output voltage(V)	200V 3-phase	3-phase, 200 to 230V (proportional to input voltage)				
		200V single-/ 3-phase	3-phase, 200 to 240V (proportional to input voltage)				
		100V single-phase	3-phase, 200 to 230V (proportional to input voltage)				
	Max output frequency (Hz)		400Hz (Programmable)				
Power supply	Rated input voltage and frequency	200V 3-phase	3-phase, 200 to 230V, 50/60Hz				
		200V single-/3-phase	Single-phase 200 to 240V, 50/60Hz 3-phase, 200 to 230V, 50/60Hz				
		100V single-phase	Single-phase 100 to 115V, 50/60Hz				
	Allowable voltage fluctuation		-15% to +10% (-10% to +10% for 100V single-phase model)				
	Allowable frequency fluctuation		±5%				
Control characteristics	Control method		Sine wave PWM (High-carrier frequency PWM for low-noise)				
	Frequency control range		0.5 to 400Hz				
	Frequency accuracy (temperature change)		Digital command . ±0 01% (-10 to +50°C, 14 to 122°F)				
			Analog commands : ±1% (25 ±10°C, 77 ±18°F)				
	Frequency setting resolution		Digital operator reference 0 1Hz (less than 100Hz) 1Hz (100Hz or more)				
			Analog reference 0.06Hz/60Hz (1/1000)				
	Output frequency resolution		0 1Hz				
	Overload capacity		150% rated output current for one minute				
	Frequency reference signal		0 to +10VDC (20kΩ), 4 to 20mA (250Ω) (Selectable)				
	Accel/decel time		0.1 to 999 sec (accel/decel time are independently programmed)				
	Braking torque		Short-term average deceleration torque# 0 1kW, 0.2kW (0.13HP, 0 25HP) 150% 0 4kW, 0.75kW (0 5HP, 1HP) 100% 1.5kW (2HP) 50% or more Continuous regenerative torque Approx 20% (150% with optional braking resistor, braking transistor built-in)				
	V/f characteristic		Possible to program any V/f pattern				
Protective functions	Motor overload protection		Electronic thermal overload relay				
	Instantaneous overcurrent		Motor coasts to a stop at approx 250% of inverter rated current				
	Overload		Motor coasts to a stop after 1 minute at 150% of inverter rated output current				
	Overvoltage		Motor coasts to a stop if DC bus voltage exceeds 410V				
	Undervoltage		Stops when DC bus voltage is approx 200V or less (approx 160V or less for single-phase series)				
	Momentary power loss		One of the following operations are selectable Not provided (Stops if power loss is 15ms or longer)/Automatically restarts at recovery from momentary power loss of approx 0 5 sec /Automatically restarts				
	Cooling fin overheat		Protected by electronic circuit				
	Stall prevention level		Provided during acceleration and constant-speed run (fixed level) Provided/not provided available during deceleration				
	Ground fault		Protected by electronic circuit (Overcurrent level)				
	Power charge indication		Run lamp stays ON or digital operator LED stays ON				

* Low-carrier type is not provided for 100V single-phase and 200V single- / 3-phase, 1 5kW (2HP) inverters
† 100V single-phase models If excessively short accel time is set, main-circuit low-voltage protection (UV1) is activated according to the load status during acceleration In this case, extend the accel time
‡ Based on a standard 4-pole motor for max. applicable motor output
# Shows deceleration torque for an uncoupled motor decelerating from 60Hz with the shortest possible deceleration time

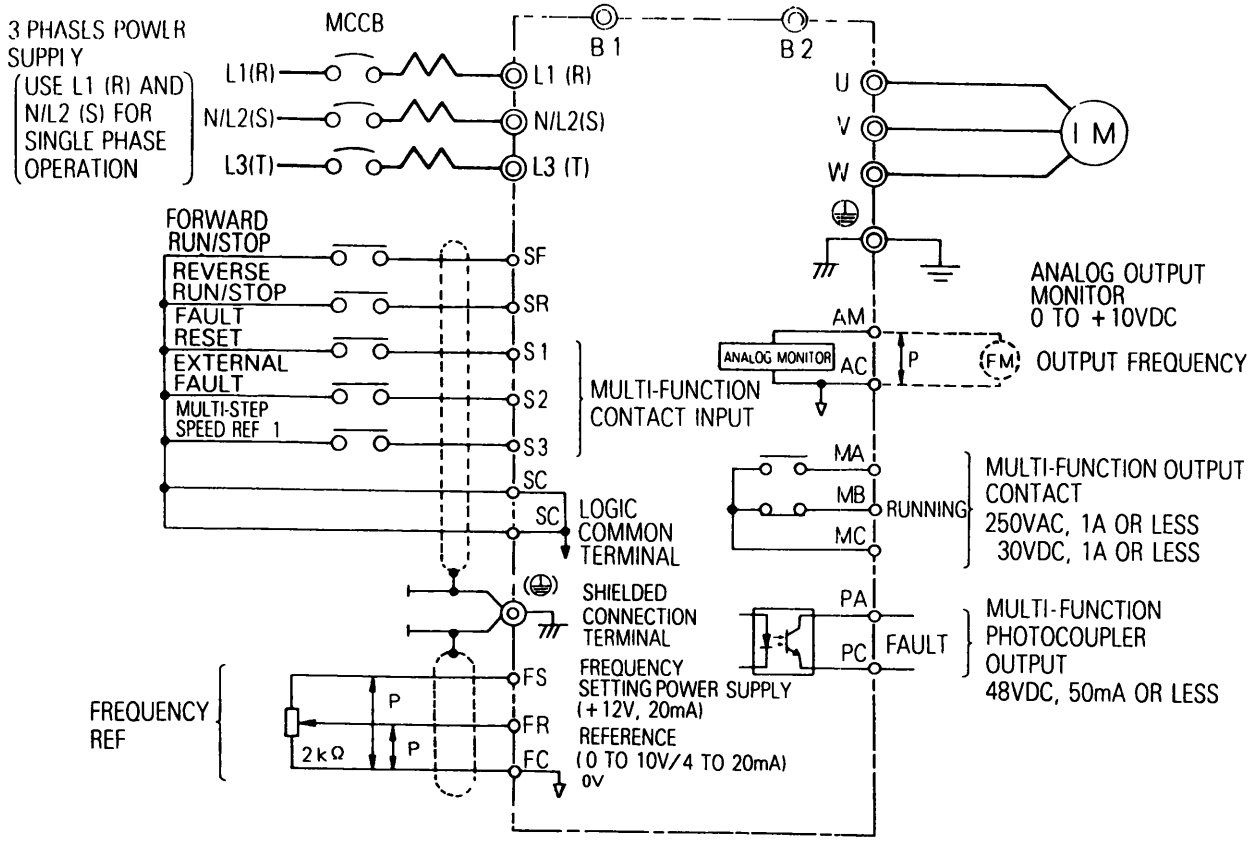
Model CIMR-XC·	200V 3-phase	Low-carrier type	J 20P1	J 20P2	J 20P4	J 20P7	J 21P5
		Low-noise type	B 20P1	B 20P2	B 20P4	B 20P7	B 21P5
	200V single-/ 3-phase*	Low-carrier type	J B0P1	J B0P2	J B0P4	J B0P7	—
		Low-noise type	B B0P1	B B0P2	B B0P4	B B0P7	B B1P5
	100V single-phase*	Low-noise type	B A0P1	B A0P2	B A0P4	B A0P7	—

Other functions	Input signals	Run/Stop input	Two signals (Forward run/stop, reverse run/stop)
		Multi-function input	Three of the following input signals are selectable . Forward/reverse run (3-wire sequence), fault reset, external fault (NO/NC contact input), multi-step speed operation, jog command, accel/decel time select, external base block (NO/NC contact input), speed search command, accel/decel hold command, LOCAL/REMOTE select, UP/DOWN command
	Output signals	Multi-function output	Two of the following output signals are selectable (1 NONC contact output, 1 photo-coupler output) Fault, running, at frequency, zero speed, frequency detection (output frequency $\leq$ or $\geq$ set value), during overtorque detection, during base block, during undervoltage detection, during speed search, operation mode
		Analog monitor	0 to +10VDC output, programmable for output frequency or output current
	Standard functions		Full-range automatic torque boost, fault retry, upper/lower frequency limit, DC injection braking current/time at start/stop, frequency reference bias/gain, prohibited frequency, analog meter calibrating gain, S-curve accel/decel, slip compensation
	Display	Status indicator LED	Run and ALARM provided as standard LED's
		Digital operator (JVOP-120)	Available to monitor frequency reference, output frequency, output current, FWD/REV selection
	Terminals		Main circuit : screw terminals Control circuit : plug-in screw terminal
	Wiring distance between inverter and motor		100m (328ft) or less
Enclosure			Open chassis
Cooling method			Self-cooling
Environmental conditions	Ambient temperature		-10 to 50℃ (14 to 122°F) (not frozen)
	Humidity		90% RH or less (non-condensing)
	Storage temperature†		-20 to 60℃ (-4 to 140°F)
	Location		Indoor (free from corrosive gases or dust)
	Elevation		1000m (3280ft) or less
	Vibration		Up to 9.8m/s² (1G) at less than 20Hz, up to 2m/s² (0 2G) at 20 to 50Hz

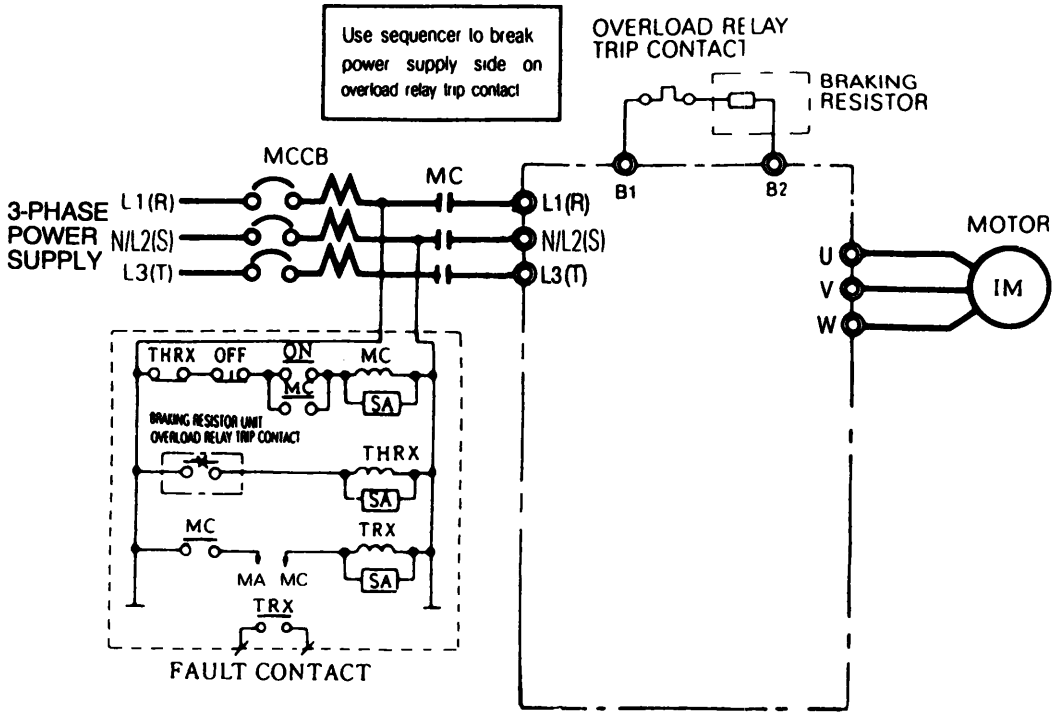
† Low-carrier type is not provided for 100V single-phase and 200V single- / 3-phase, 1 5kW (2HP) inverters.

* Temperature during shipping (for short periods)

■ Standard Wiring



Connection Example of Braking Resistor



Terminal Description

Type			Terminal	Name	Function (Signal Level)	
Main Circuit			L1 (R) N/L2 (S), L3 (T)	AC power supply input	L1 (R) and N/L2 (S) for single-phase power supply	
			U V W	Inverter output	For inverter output	
			B1, B2	Braking resistor connection	For braking resistor connection	
			⏚	Grounding	For grounding (grounding resistance should be 100Ω or less)	
Control Circuit	Input	Sequence	SF	Forward run/stop	Runs when CLOSED, stops when OPEN	24VDC 8mA, Photocoupler insulation
			SR	Reverse run/stop	Runs when CLOSED, stops when OPEN	
			S1	Multi-function contact input 1	Factory preset is "Fault reset"	
			S2	Multi-function contact input 2	Factory preset is "External fault (NO contact) input"	
			S3	Multi-function contact input 3	Factory preset is "Multi-step speed reference 1"	
			SC	Sequence common	Common terminal for sequence input	
		Frequency Reference	FS	Power supply terminal for frequency setting	+12V (allowable current . max 20mA)	
			FR	Frequency reference input	0 to 10VDC (20kΩ) or 4 to 20mA (250Ω)	
			FC	Frequency reference input common	0V	
	Output		AM	Analog monitor output *	Factory preset is "Output frequency"	0 to 10VDC 2mA or less
			AC	Analog monitor output common	0V	
		Multi-function Contact Output	MA	NO contact output	Factory preset is "During running"	Contact capacity 250VAC, 1A or less 30VDC, 1A or less
			MB	NC contact output		
			MC	Contact output common		
			PA	Photocoupler output	Factory preset is "Fault"	Photocoupler output : 48VDC, 50mA or less
			PC	Photocoupler output common		

* Analog monitor is a terminal to monitor exclusively for frequency meter or ammeter. Do not use it as a control signal for feedback control, etc.
The factory preset of signal level is 0 to +3VDC. By setting a constant, 0 to +10VDC output is available.

■ Dimensions

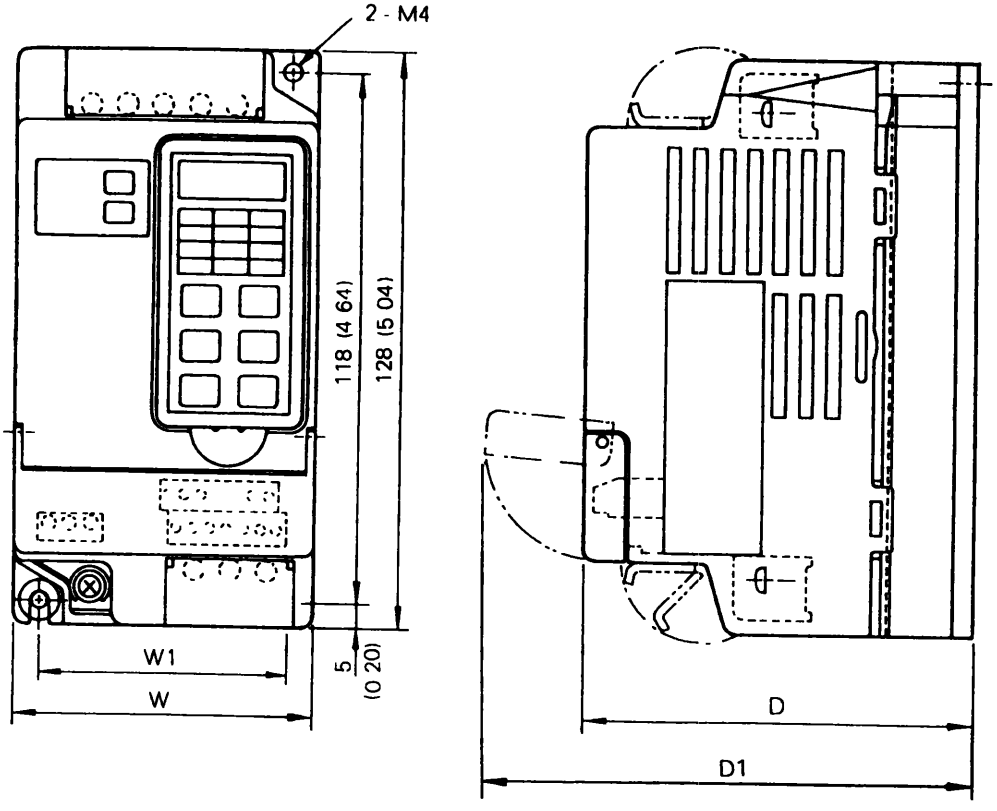


Fig. 1

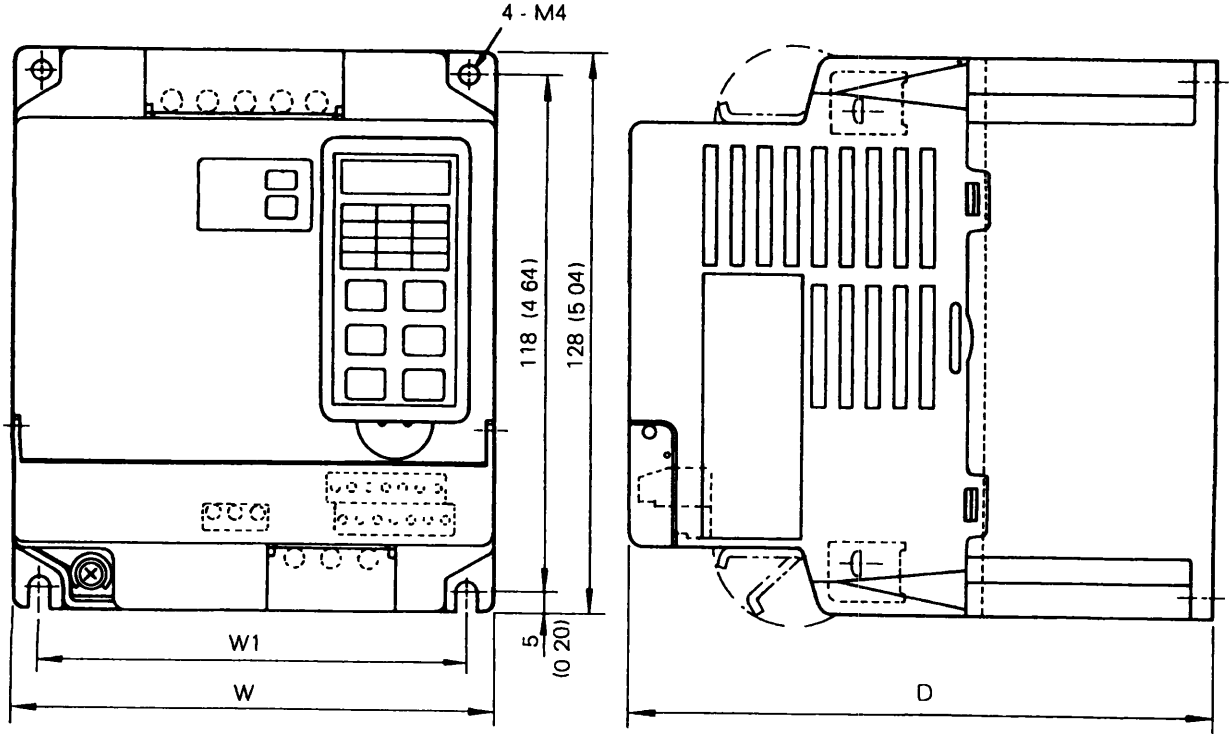


Fig. 2

Dimensions in mm (inches)/mass in kg (lb)

Model		Low-carrier type						Low-noise type					
Capacity kW(HP)		W	D	W1	D1	Mass	Fig.	W	D	W1	D1	Mass	Fig
3-phase 200V	0 1 (0 13)	68 (2 68)	70 (2 76)	56 (2 20)	91 (3 58)	0 5 (1 1)	1	68 (2 68)	75 (2 95)	56 (2 20)	96 (3 78)	0.5 (1 1)	1
	0 2 (0 25)	68 (2 68)	75 (2.95)	56 (2 20)	96 (3 78)			68 (2 68)	88 (3 46)	56 (2 20)	109 (4 29)	0.6 (1 3)	
	0 4 (0 5)	68 (2 68)	88 (3 46)	56 (2.20)	109 (4 29)	0 6 (1 3)		68 (2 68)	110 (4 33)	56 (2 20)	131 (5.16)	0 9 (2 0)	
	0 75 (1)	68 (2.68)	130 (5 12)	56 (2 20)	151 (5 94)	0 9 (2.0)		108 (4-25)	130 (5 12)	96 (3.78)	151 (5 94)	1.3 (2.9)	2
	1 5 (2)	108 (4 25)	155 (6 10)	96 (3.78)	176 (6 93)	1 5 (3.3)	2	108 (4 25)	155 (6 10)	96 (3.78)	176 (6.93)	1 5 (3.3)	
Single-/3-phase 200V	0 1 (0 13)	68 (2 68)	75 (2 95)	56 (2 20)	96 (3 78)	0 5 (1 1)	1	68 (2 68)	75 (2 95)	56 (2 20)	96 (3 78)	0.5 (1.1)	1
	0 2 (0 25)	68 (2 68)	95 (3 74)	56 (2 20)	116 (4 57)	0 6 (1 3)		68 (2 68)	108 (4 25)	56 (2 20)	129 (5.09)	0.6 (1 3)	
	0 4 (0 5)	108 (4 25)	130 (5 12)	96 (3 78)	151 (5 94)	1.3 (2.9)	2	108 (4 25)	130 (5 12)	96 (3 78)	151 (5 94)	1 3 (2.9)	2
	0 75 (1)	108 (4 25)	130 (5 12)	96 (3 78)	151 (5 94)			108 (4 25)	130 (5 12)	96 (3 78)	151 (5 94)		
	1 5 (2)	—						130 (5 12)	170 (6 69)	118 (4.65)	191 (7.52)	0.9 (2.0)	
Single-phase 100V	0 1 (0 13)	—						68 (2.68)	95 (3.74)	56 (2.20)	116 (4.57)	0.6 (1.3)	1
	0 2 (0.25)							68 (2.68)	108 (4.25)	56 (2.20)	129 (5 09)		
	0.4 (0.5)							108 (4.25)	130 (5 12)	96 (3.78)	151 (5 94)	1.3 (2.9)	2
	0 75 (1)							108 (4.25)	155 (6.10)	96 (3.78)	176 (6.93)	1.4 (3.1)	

■ Recommended Peripheral Devices

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

- MCCB (Molded-case circuit breaker) :
  Be sure to connect it 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 and magnetic contactor

- 200V 3-phase

VS mini model CIMR-XC□A□ CIMR-XC□E□	20P1	20P2	20P4	20P7	21P5
Capacity (kVA)	0.3	0.6	1.1	1.9	2.6
Rated Output Current (A)	0.8	1.5	3	5	7
MCCB type NF30 (MITSUBISHI)	5A	5A	5A	10A	20A
Magnetic contactor type HI (YASKAWA CONTROL)	HI-7E	HI-7E	HI-7E	HI-7E	HI-10-2E

- 200V single-/3-phase

VS mini model CIMR-XC□A□ CIMR-XC□E□	B0P1	B0P2	B0P4	B0P7	B1P5
Capacity (kVA)	0.3	0.6	1.1	1.9	2.7
Rated Output Current (A)	0.8	1.5	3	5	7
MCCB type NF30, NF50 (MITSUBISHI)	5A	5A	10A	20A	40A
Magnetic contactor type HI (YASKAWA CONTROL)	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-20E

- 100V single-phase

VS mini model CIMR-XCBA□ CIMR-XCBE□	A0P1	A0P2	A0P4	A0P7
Capacity (kVA)	0.3	0.6	1.1	1.9
Rated Output Current (A)	0.8	1.5	3	5
MCCB type NF30, NF50 (MITSUBISHI)	10A	15A	30A	40A
Magnetic contactor type HI (YASKAWA CONTROL)	HI-7E	HI-10E	HI-25E	HI-30E

Surge suppressors

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

- Ground fault interrupter:
  Select a ground fault interrupter not affected by high frequencies. To prevent malfunctions, the current should be 200mA or more and the operating time 0.1 sec. or more.
  Example : • NV series by Mitsubishi Electric Co., Ltd. (manufactured in 1988 and after)
  • EGSG series by Fuji Electric Co., Ltd. (manufactured in 1984 and after)
- AC reactor :
  Install an AC reactor to connect to a power supply transformer of large capacity (600kVA 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.

NOTE

1. Never connect a general LC/RC noise filter to the inverter output circuit.
2. 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

No	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
1	Constant write-in prohibit/initialize	0, 1 8 9	1	1		29
2	Operation mode selection	0 to 5	1	0		26
3	Stopping method selection	0, 1	1	0		44
4	FWD/REV run selection	For FWD rEv REV Note This set value becomes effective when the run command is set to "opertator" at operation mode selection (n02)		For		23
5	REV run prohibit	0, 1	1	0		30
6	Multi-function input select 1 (terminal S1)	0 to 14	1	1		46
7	Multi-function input select 2 (terminal S2)	1 to 14	1	2		
8	Multi-function input select 3 (terminal S3)	1 to 15 Note Setting 15 disables the function set to constant n07 Then terminal S2 becomes an input terminal for the UP command, and terminal S3 becomes that for the DOWN command	1	4		
9	Multi-function output select 1 (terminal MA/MB)	0 to 10	1	1		49
10	Multi-function output select 2 (terminal PA)	0 to 10	1	0		
11	Frequency reference 1	0 0 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	6 0Hz		30
12	Frequency reference 2			0 0Hz		
13	Frequency reference 3			0 0Hz		
14	Frequency reference 4			0 0Hz		
15	Frequency reference 5			0 0Hz		
16	Frequecny reference 6			0 0Hz		
17	Frequency reference 7			0 0Hz		
18	Frequency reference 8			0 0Hz		
19	Jog frequency reference	0 0 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	6 0Hz		31

No	Name	Setting Range	Setting Unit	Inital Setting	User Setting	Ref. Page
20	Acceleration time 1	0 0 to 999s	0 1s (less than 100s)/ 1s (100s or more)	10 0s		23, 33
21	Deceleration time 1			10 0s		
22	Acceleration time 2			10 0s		
23	Deceleration time 2			10 0s		
24	Maximum output frequency	50 0 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	60 0Hz		24, 51
25	Maximum voltage	1 to 255V	1V	230V		
26	Maximum voltage output frequency	0 6 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	60 0Hz		
27	Mid output frequency	0 5 to 399Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	1 5Hz		51
28	Mid output frequency voltage	1 to 255V	1V	12V		
29	Minimum output frequency	0 5 to 10 0Hz	0 1Hz	1 5Hz		
30	Minimum output frequency voltage	1 to 50V	1V	12V		
31	Electronic thermal reference current	0 to 120% of inverter rated current	0 1A	*		24, 57
32	Electronic thermal motor protection	0 to 4	1	0		57
33	Stall prevention (current limit) during deceleration	0, 1	1	0		55
34	Stall prevention (current limit) level during acceleration	30 to 200%	1%	170%		54
35	Stall prevention (current limit) level during running	30 to 200%	1%	160%		55
36	Operation selection after momentray power loss	0 to 2	1	0		34
37	Carrier frequency — Low-carrier type	1 (2 5 kHz)	1=2 5kHz (Carrier frequency =set value ×2 5kHz)	1 (2 5kHz)		42
	Carrier frequency — Low-noise type	1 to 6 (2 5 to 15kHz)†		4 (10kHz)		
38	Automatic torque boost gain	0 0 to 3 0	0 1	1 0		53
39	Frequency reference gain	0 10 to 2 00	0 01	1 00		32
40	Frequency reference bias	-99 to 99%	1%	0%		
41	Frequency reference upper limit	0 to 110%	1%	100%		33
42	Frequency reference lower limit	0 to 110%	1%	0%		

* Differs depending on the inverter capacity.

† Setting range is 1 to 4 for software version No. NSP 600101or before.

No	Name	Setting Range	Setting Unit	Initial Setting	User setting	Ref. Page
43	Control circuit terminal function selection (FR)	0 1	1	0		30
44	Analog monitor selection	0 1	1	0		41
45	Analog monitor gain	0 00 to 2 00	0 01	0 30		
46	DC injection braking current	0 to 100%	1%	50%		39, 45
47	DC injection braking time at stop	0 0 to 5 0s	0 1s	0 5s		45
48	DC injection braking time at start	0 0 to 5 0s	0 1s	0 0s		39
49	S-curve accel/ decel selection	0 to 3	1	0		34
50	Overtorque detection	0 to 4	1	0		35, 36
51	Overtorque detection level	30 to 200%	1%	160%		
52	Overtorque detection time	0 1 to 10 0	0 1s	0 1s		
53	Frequency detection level	0 0 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	0 0Hz		37
54	Slip compensation gain	0 0 to 9 9%	0 1%	0 0%		56
55	Motor no-load current	0 to 99%	1%	40%		
56	Jump frequency 1	0 0 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	0 0Hz		38
57	Jump frequency 2			0 0Hz		
58	Jump frequency 3			0 0Hz		
59	Jump width	0 0 to 25 5Hz	0 1Hz	1 0Hz		
60	No of fault retry time	0 to 10 times	1 time	0		38
61	Operator stop key selection*	0, 1	1	0		43
62	Slip compensation primary delay time*	0 0 to 25 5s	0 1s	2 0s		56
68	Fault record	Stores, displays most recent alarm (setting disabled)		—	—	—
69	PROM no	Displays lower three digits of the PROM number NSP600□□□ (setting disabled)		—	—	—

* Not provided for software version No. NSP600101 or before.

VS mini C Series
INSTRUCTION MANUAL

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