

FUJI INVERTER

FVR-C9S

(0.1 ~ 3.7kW)

of compact and extremely low noise type

INSTRUCTION MANUAL



FUJI ELECTRIC CO., LTD.

Si 47-0255a

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Thank you for purchasing the Fuji "FVR-C9S" inverter.
 This instruction manual is included with the inverter and equipment,
 and is provided for the convenience of the end user. Please be sure
 it accompanies the inverter.

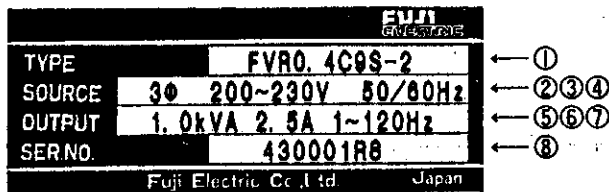
1. Inspection Upon Receipt

Please inspect the following items upon receipt of your inverter.

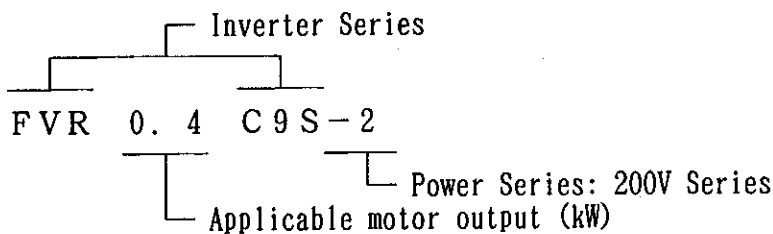
- ★ Check the nameplate to insure that the specifications correspond to those ordered.
- ★ Inspect the unit for damage which may have occurred during shipping.

If you have any problems or questions regarding the inverter, please contact the nearest Fuji sales office or the distributor where the unit was purchased.

Nameplate

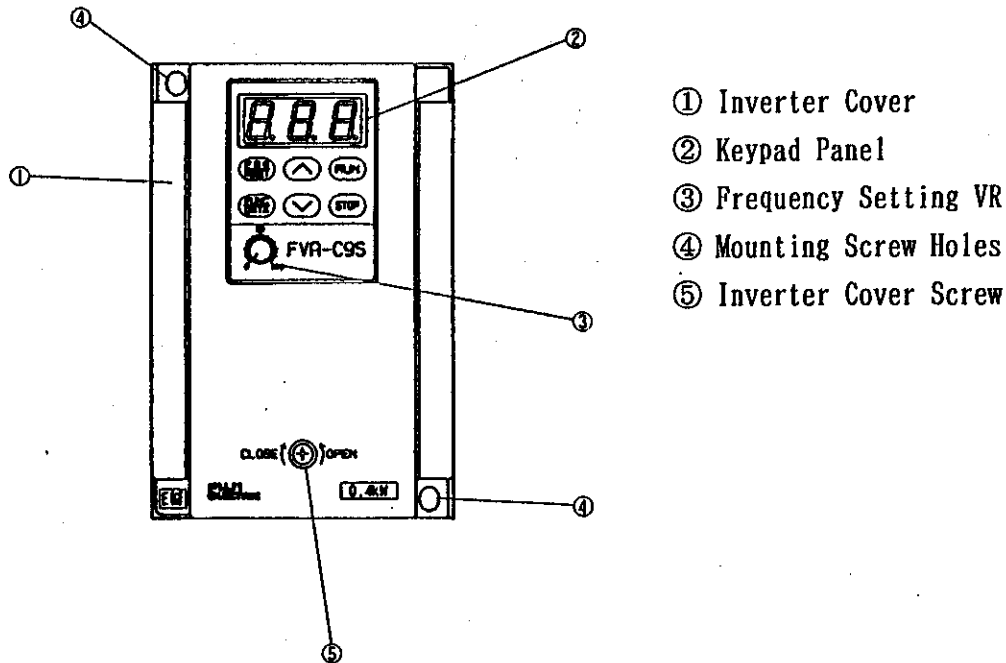


① Type



- ② Phase : 3φ ⇒ 3 phase
- ③ Voltage range : 200V ~ 230V ⇒ AC200V Series
- ④ Frequency : 50/60Hz
- ⑤ Rated output capacity
- ⑥ Rated output current
- ⑦ Output frequency range : 1 ~ 120Hz
- ⑧ Serial No.

2. Part Names



3. Warning and Caution

Mis-Wiring will result in damage to, and failure of the unit.

Please carefully note the items listed below, and use the unit as indicated.

-
- ① Do not impress power supply voltage that exceeds the standard specification voltage permissible fluctuation. (Permissible voltage: AC200V ~ 230V)
 - ② Do not connect power supply to the inverter output terminals (U, V, W).
Connect power supply only to the power terminals (R, S, T).
 - ③ Whenever removing the inverter cover, always switch off the power supply. Do not switch on the power supply to the inverter with the inverter cover removed.
 - ④ Do not touch the live part until the CRG lamp located above the main circuit terminals goes out.
 - ⑤ Avoid using a magnetic contactor (ON/OFF) installed on the line side of the inverter for RUN and STOP. Use the FWD-CM (forward) and REV-CM (reverse) terminals for RUN and STOP.
 - ⑥ Do not connect a power factor correcting capacitor to the output side of the inverter.
 - ⑦ Do not perform a megger test between the inverter terminals or on the control circuit terminals.
-

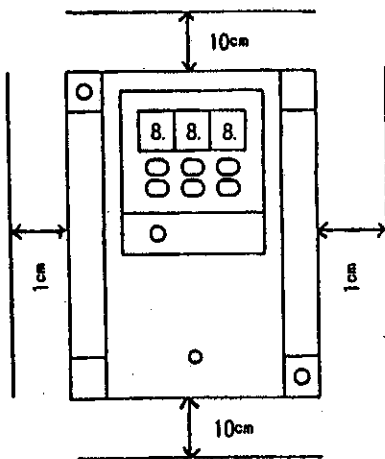
4. Installation Instructions

Installation Conditions

Install the inverter in a location which meets the following requirements.

- The ambient temperature should be between -10°C and $+50^{\circ}\text{C}$.
- The humidity should be between 20 and 90% RH. Avoid any location subject to dew condensation, freezing or where the inverter should come into contact with any liquids.
- Do not install in any location subject to any of the following conditions: direct sunlight, dust, corrosive gas, inflammable gas or oil mist.
- The inverter should be installed at an elevation below 1000m, and vibration should be less than 5.9m/s^2 (0.6G).

Mounting Direction and Space



☆ NOTICE ☆

The durability and reliability of the inverter will be affected by the ambient temperature. Do not place the unit where ambient temperature is not proper.

• Direction

Insert M4 size screws in the mounting screw holes in the left upper and right lower of the inverter, and install the inverter with these screws. Install the inverter vertically. Horizontal or other positional installation will cause overheat of the inverter.

• Space

The inverter will generate heat during operation. Allow sufficient space around the unit as shown in the above figure.

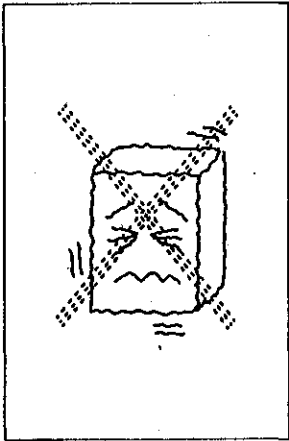
• Mounting plate

Heat sink temperature will reach $+90^{\circ}\text{C}$ during operation. Please use thermostable material for inverter mounting plate.

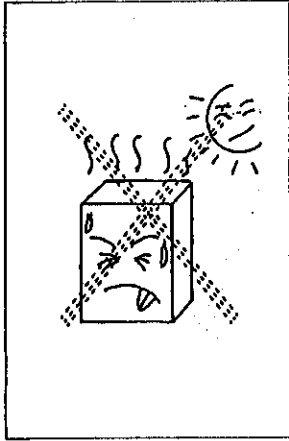
• Multi-mounting

When 2 or more inverters are installed within an inverter switchboard, arrange them side by side, also keeping the spacing (shown in the above figure) between each inverter. If the inverters must be lined up vertically, provide adequate ventilation so that the hot air from each inverter will not affect the one above it.

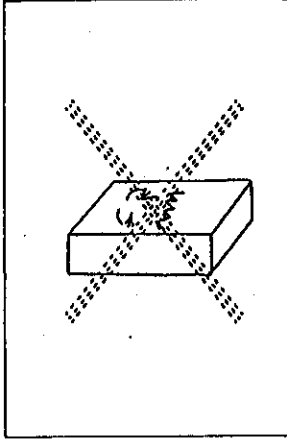
<Vibration>



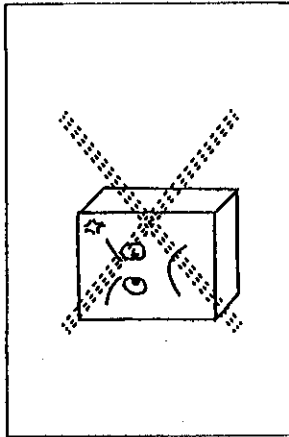
<Direct sunlight>



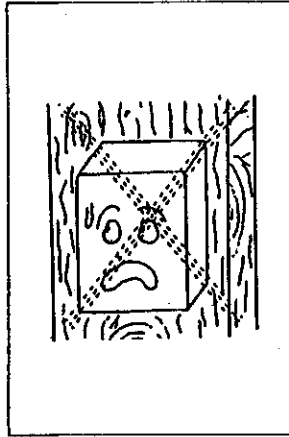
<Placed horizontally>



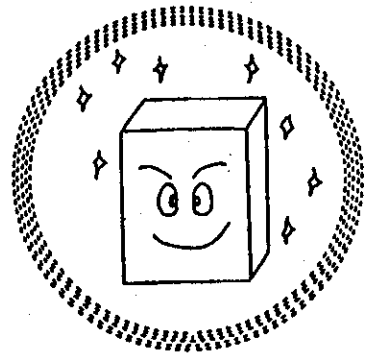
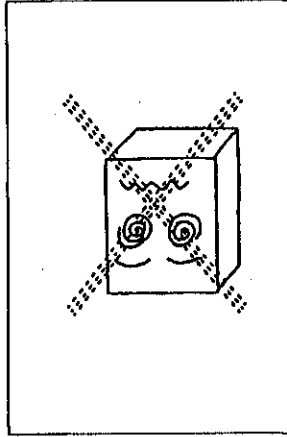
<Placed sideways>



<Combustible material>



<Placed upside down>

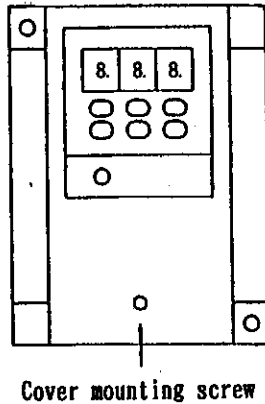


<Installed vertically>

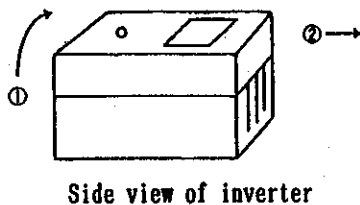
5. Wiring

Perform wiring in accordance with the following procedure:

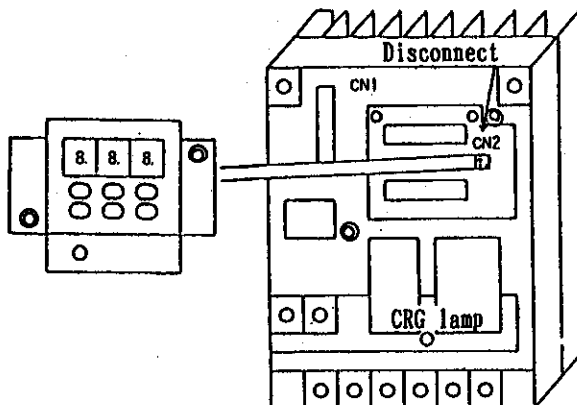
- 1) Remove the cover mounting screw at the center of the cover.



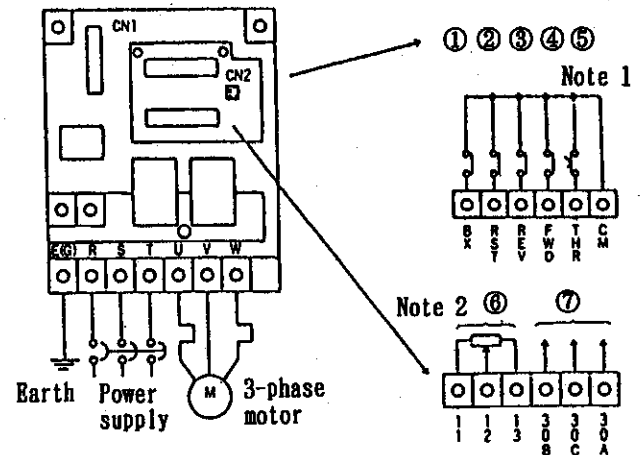
- 2) Hold the lower end of the cover, lift it up and remove the cover.



- 3) Remove the keypad panel from the main unit, and disconnect the harness from CN2 at the same time.



- 4) Arrange the main circuit and the control circuit wiring as follows.



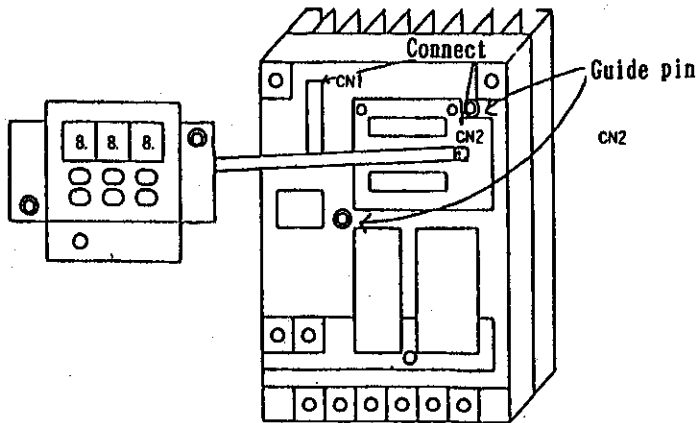
- ① Motor coast-to-stop
- ② Reset signal
- ③ Reverse-direction operation command
- ④ Forward-direction operation command
- ⑤ External alarm
- ⑥ Frequency setting VR
- ⑦ Combined alarm relay output

Note 1) FWD and THR are connected to CM at the factory. In this condition, starting/stopping can be performed via RUN/STOP keys on the keypad panel.

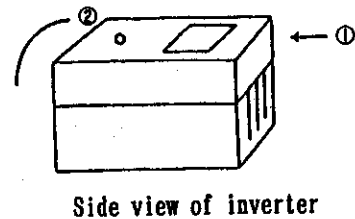
Note 2) In case of using an external volume, remove the connector by which the keypad panel and the CN2 on the inverter main unit are connected.

5) Reinstall the cover.

Connect the harness of keypad panel to the CN2 on the main unit, then reinstall the keypad panel fitting it onto the guide pins.



6) As shown below, reinstall the cover onto the inverter main unit, and fix it with the mounting screw.



Side view of inverter

6. Operation

☆ Pre-Operation Inspection

- Check for wiring errors.
- Check that all loose wire stands, metal chips and unnecessary screws, etc. have been removed.
- Check that no screws, terminals, etc. are loose.
- Check that the wire ends of crimp terminal are not in contact with other terminals.

☆ Test Run Check Points

- Smooth rotation and correct rotation direction
- No abnormal vibrations and noise from the motor
- Smooth acceleration and deceleration

Frequency Setting Method

- Frequency setting by volume control (Factory preset at time of shipment; F01 : 1)
As wired at the factory, frequency setting can be performed by turning the volume control knob on the keypad panel.
Turn the volume control knob clockwise to increase frequency.

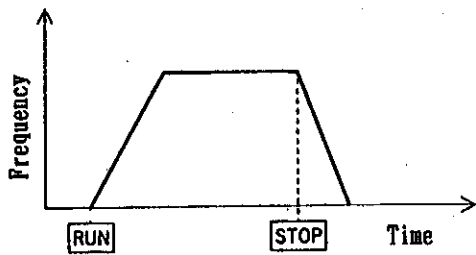
- Frequency setting by digital signal (F01 : 0)
With the function F01 set to 0, frequency can be increased or decreased by the ⓪/⓷ keys on the keypad panel.

⓪ : Frequency up

⓷ : Frequency down

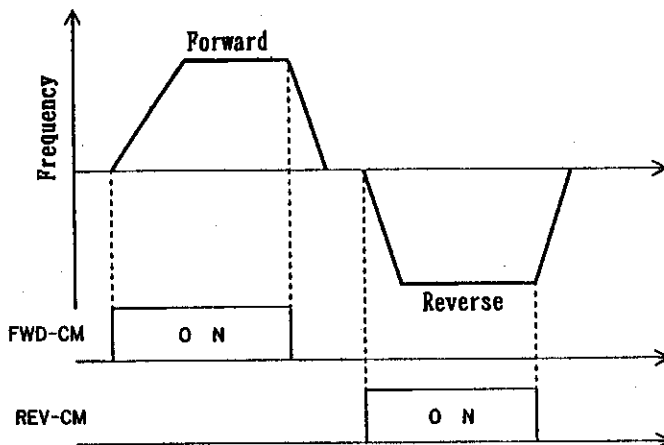
RUN/STOP Method

- Run/Stop by keypad panel operation (Factory preset at time of shipment; F02 : 0)



At the time of shipment, between FWD-CM is short-circuited, so only forward operation is possible. To make reverse operation possible, open between FWD-CM and short-circuit between REV-CM.

- Run/Stop by terminal operation (F02 : 1)



Note)
Open FWD and REV terminals when changing F02 data.
Data cannot be changed if not open.

Selecting Operation Method

- With the FVR-C9S Series, the following methods can be selected to input the run/stop signals and for frequency setting.

Run/Stop	Operation method Code setting	Frequency setting	Operation method Code setting
1 Keypad panel operation	F02 0	Keys *)	F01 = 0
2 Keys	0	Analog signal (DC0 ~ 10V)	F01 = 1
3 Terminal operation (operation by external signal, FWD, REV terminals)	F02 1	Keys *)	F01 = 0
4	1	Analog signal (DC0 ~ 10V)	F01 = 1

*) Frequency changing speed increases when key and or are pressed simultaneously.

7. Keypad Panel

Part Names and Functions

☆ Digital monitor

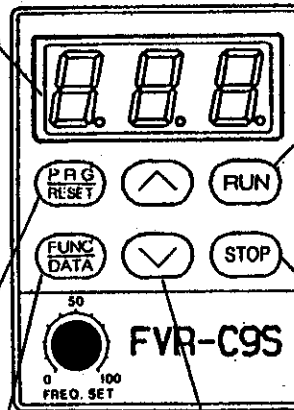
Displays the various function codes and data values during setting of the program. During operation, it displays the output frequency, current, voltage, etc. If a fault occurs, the causes of the problem will be displayed as a code.

☆ PROGRAM key (RESET key)

Normal mode or program setting mode select key. When the protection function is activated, this key is used to reset the fault.

☆ FUNCTION key (DATA key)

During the normal mode, this key can be used to change the display unit (frequency display and output current display) while operation is either stopped or running. During the program setting mode, this key can be used to read and write the function codes and the data.



☆ RUN key

This key is used for starting operation. The LED (green) lights up during operation. This key does not function when terminal operation control $F02-\square\square1$ is selected.

☆ STOP key

This key is used for stopping operation. This key does not function when terminal operation control $F02-\square\square1$ is selected.

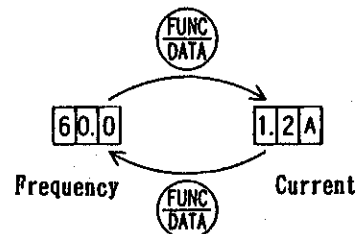
☆ UP/DOWN keys

These keys increase or decrease the frequency. When unit is in program setting mode, they change the function code or data values.

Controlling Method for Keypad Panel

1) Monitor change

During the normal mode, frequency display and output current display can be changed by pressing FUNC DATA key.



2) Run/stop







When $F02$ is $\square\square0$: Press RUN to run inverter; press STOP to stop inverter.

3) Frequency change

When $F01$ is $\square\square0$: Press UP to increase frequency; press DOWN to decrease frequency.

Note) If FUNC DATA is pressed while pressing UP or DOWN , frequency changing speed increases.

4) Function setting method

	Operation Procedure	Display
1	 <p>Press this key to switch to the program setting mode.</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">6 0. 0</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">F 0 0</div>
2	 <p>Press UP key or DOWN key to select function code.</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">F 0 1</div>
3	 <p>Press this key to let data be displayed.</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1</div>
4	 <p>Press UP key or DOWN key to change function code or data.</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1</div>
5	 <p>Press this key to let data be memorized.</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">F 0 2</div>
6	<p>Change other function code</p>  <p>Press this key to cancel program mode.</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">6 0. 0</div>

8. Function Explanation

Function Code Tables

Function code	Function	Data code, range	Unit	Min. setting	Factory setting	Change during operation
F00	Data protection	0: Data change possible 1: Data change not possible	—	—	0	×
F01	Frequency command	0: Keypad panel (Δ / ∇ keys) 1: Analog input (Volume setting)	—	—	1	×
F02	Operation command	0: Keypad panel operation (RUN/STOP keys) 1: External signal operation (FWD/REV terminals)	—	—	0	×
F03	Maximum frequency	50 ~ 120Hz	Hz	1	60Hz	×
F04	Base frequency	50 ~ 120Hz	Hz	1	60Hz	×
F05	Acceleration time	0.0 ~ 60s (0.0 setting = 0.01s)	s	0.1	6.0s	○
F06	Deceleration time	0.0 ~ 60s (0.0 setting = 0.1s)	s	0.1	6.0s	○
F07	Torque boost	0 ~ 31 (code)	—	—	13	○
F08	Electronic thermal overload relay operation	0: Inactive 1: Active (Standard 4-pole motor) 2: Active (Fuji inverter motor)	—	—	0	×
F09	Electronic thermal overload relay level	30 ~ 105% of rated current of inverter	%	1	100%	×
F10	Restart after momentary power failure	0: Inactive 1: Active (Restart inverter in 0.5s after power failure)	—	—	0	×
F11	Gain for frequency setting signal	0: For 0 ~ 10V 1: For 0 ~ 5V	—	—	0	×
F12	DC brake (Level setting)	0 ~ 100%	—	1	50%	○

Function code	Function	Data code, range	Unit	Min. setting	Factory setting	Change during operation
F13	DC brake (Time)	0.0 (Inactive) 0.1 ~ 30s	s	0.1	0.1s	○
F14	Starting frequency	1 ~ 6Hz	Hz	1	1Hz	×
F15	Motor running sound	0 ~ 5 (code)	—	—	5	○
F16	Fault memory	The current and previous 3 fault events are displayed in order to occurrence.	—	—	—	×
F17	Data initialization	0: Inactive 1: Reset to the initial value (value set at the factory)	—	—	0	×
F18	Retry	0: Inactive 1: Active (Retry times fixed at 5, Retry starts in 0.5s after trip)	—	—	0	×
F19	Motor characteristics	0 ~ 10	—	—	4	○
F20	Jump frequency range	0 ~ 10Hz	Hz	1	3	○
F21	Jump frequency 1	0 ~ 120Hz	Hz	1	0	○
F22	Jump frequency 2	0 ~ 120Hz	Hz	1	0	○
F23	Jump frequency 3	0 ~ 120Hz	Hz	1	0	○
F24	High limiter	0 ~ 100%	%	1	100	○
F25	Low limiter	0 ~ 100%	%	1	0	○
F26	Bias setting	0 ~ 100%	%	1	0	○

Function code	Function	Data code, range	Unit	Min. setting	Factory setting	Change during operation
F27	THR terminal function	0: External alarm input 1: Multistep speed selection (X1)	—	—	0	×
F28	BX terminal function	0: Motor coast-to-stop command input 1: Multistep speed selection (X2)	—	—	0	×
F29	Multistep speed setting 1	0.0 ~ 120Hz	Hz	* 1	10	○
F30	Multistep speed setting 2	0.0 ~ 120Hz	Hz	* 1	20	○
F31	Multistep speed setting 3	0.0 ~ 120Hz	Hz	* 1	30	○
F32	Meter adjustment	0 ~ 99 (Full scale DC 6.5 ~ 10.5V)	—	1	85	○
F33	Meter output selection	0: Output frequency monitor 1: Output current monitor	—	1	0	○

* 1 : Frequency can be set in increments of 0.1Hz within a range of 0.0 to 99.9Hz, and can be set in increments of 1Hz within a range of 100 to 120Hz.

Detailed Explanation of Each Function

F 0 0 Data Protection



The set data can be locked so that it will not be changed by mistake.

0 : Data change possible 1 : Data change not possible

To change data, simultaneously press the  key and either the  or  key.

F 0 1 Frequency Command



Either of the following two frequency setting methods can be selected:

0 : Keypad panel setting (  keys)

1 : Analog input (setting by volume control)

F 0 2 Operation Command

Either of the following two control methods can be selected:

0 : Keypad panel operation (  keys)

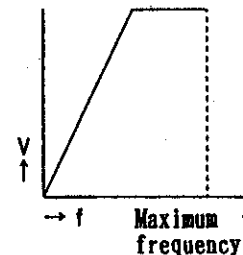
1 : External signal operation (PWD, REV)

F 0 3 Maximum Frequency

Sets the maximum value for the output frequency.

50 }
120 } Frequency can be set in increments of 1Hz within a range of 50 to 120Hz.

Multipurpose motors and other motors which are designed to operate at low speed can be damaged if operated at high frequency. Be sure to set the frequency to match the characteristics of the motor.

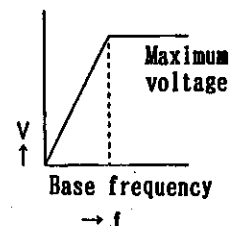


F 0 4 Base Frequency

Sets the base frequency (the frequency which is the divergent point of the specified torque characteristics and the specified output characteristics).

50 }
120 } Frequency can be set in increments of 1Hz within a range of 50 to 120Hz.

- Set to match the characteristics of the motor.
- Although the base frequency may exceed the maximum frequency, in that case the voltage will be decreased accordingly.



F 0 5 Acceleration Time

F 0 6 Deceleration Time

} The time required to reach the maximum output frequency can be set within a
 } range of 0.0s to 60s (in increments of 0.1s).

Note) 0.0s setting is taken for 0.01s for acceleration and 0.1s for deceleration.

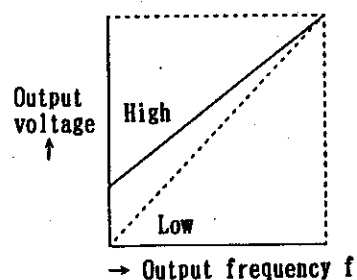
F 0 7 Torque Boost

Can be set from among 32 different levels in accordance with the type of load, the characteristics of the motor, etc.

} For a reduced torque
 } load (fan, pump, etc.)

Low
↓
 High

When using a Fuji FV motor designed for use with an inverter, set to .



F 0 8 Electronic Thermal Overload Relay

Either of the following two can be selected:

- : Inactive
- : Active (electronic thermal overload relay protection)
 . . . For a standard 4-pole motor
- : Active (electronic thermal overload relay protection)
 . . . For a Fuji FV motor

F 0 9 Electronic Thermal Overload Relay Level

Sets the operation level for the electronic thermal overload relay.

} Setting range: 30 to 105% (increments of 1%)
 }

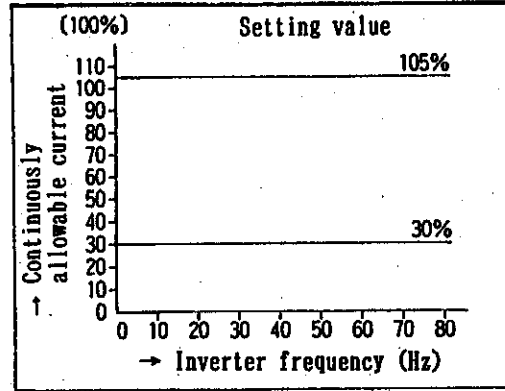
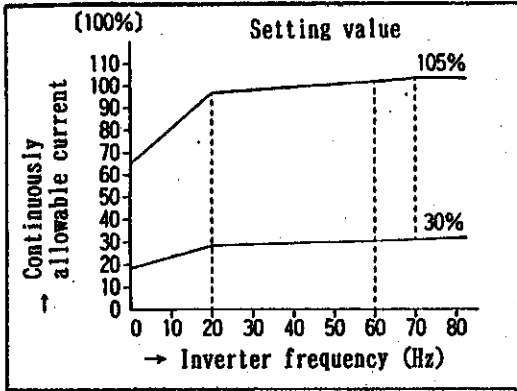
$$\text{Setting value (\%)} = K \times \frac{\text{Motor's rated current}}{\text{Inverter's rated current}} \times 100$$

Inverter capacity	Wiring length			
	0m	40m	50m	100m 200m
0.1C9S-2	K=1.2	External thermal OL relay is recommended		
0.2C9S-2	K=1	K=1.1		K=1.2
0.4C9S-2	K=1			K=1.1
0.75C9S-2 3.7C9S-2	K=1			

★ De-rating characteristics for the continuously allowable current

1) For a standard 4-pole motor 1

2) For a Fuji FV motor 2



F 1 0 Restart After Momentary Power Failure

It is possible to select whether or not to restart operation when power supply is resumed after a momentary power failure.

0 Inactive While stopped: Stopped condition is maintained even after power supply has been restored.
While running: After power supply has been restored, LU is lit and an alarm is outputted.

1 Active Operation is restarted in 0.5s after power supply has been restored. (When the inverter is stopped, it is maintained in the stopped condition even after power supply has been restored.)

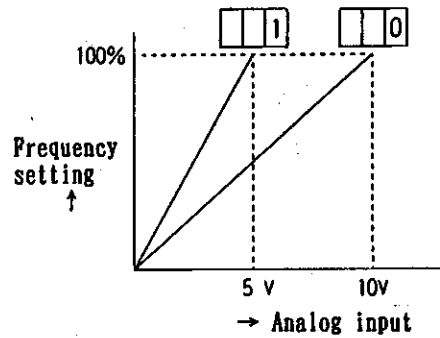
1 = This is valid only if power supply is restored while LU is lit. The length of time that LU will remain lit after a power failure occurs is as follows.

Inverter model	0.1	0.2	0.4	0.75
Time [s]	0.7	0.7	1.4	1.4

F 1 1 Gain for Frequency Setting Signal

Outputs a frequency which is a proportional ratio of the analog frequency setting. Selects an analog input signal level when **F01** is **11**.

- 00** : Maximum frequency is outputted at 10V.
- 11** : Maximum frequency is outputted at 5V.



When used together with the frequency setting bias **F26**, this frequency setting gain takes priority, and the bias is applied to the frequency after the gain has been applied.

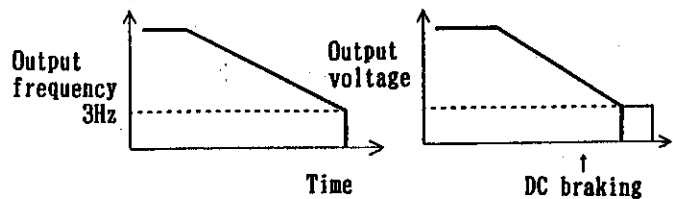
F 1 2 DC Brake

The current level of DC brake can be set. Taking the rated current of inverter as 100%, this current level can be set in increments of 1%.

F 1 3 DC Brake (Braking Time)

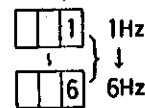
The DC braking time can be set.

- 0.0 : Inactive
- 0.1 ~ 30.0 : Braking time can be set within a range of 0.1 to 30s (in increments of 0.1s).



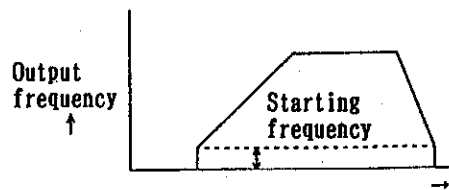
F 1 4 Starting Frequency

The starting frequency can be set in increments of 1Hz within a range of 1 to 6Hz.



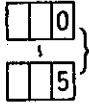
Note that stopping will also occur at the frequency set by this function.

Set to 2Hz when using a high-speed motor.



F 1 5 Motor Running Sound

The sound of the motor operation can be changed by changing the carrier frequency.




Select from among 6 levels in accordance with the usage conditions.

















- Data code 0: Low carrier frequency
)
 5: High carrier frequency
 (Low noise)

F 1 6 Fault Memory

The current and previous 3 fault events are stored in memory.

The data for each can be displayed by using the  key.

The procedure for displaying the data is as follows.

No.	Procedure	Display (ex)	Remarks
1	Display 		
2	Press  key	Press  key	 The information for the latest trip will be displayed.
3	Press  key	Press  key	 The information for the first preceding trip will be displayed.
4	Press  key	Press  key	 The information for the second preceding trip will be displayed.
5	Press  key	Press  key	 The information for the third preceding trip will be displayed. (In this example, there is no history of a third preceding trip.)
6	Press  key		

The information for any new trip will be stored in the area for the "information for the latest trip" shown above, each trip history will be removed downward, and the "information for the third preceding trip" will be erased.

F 1 7 Data Initialization

Resets the data for all of the functions to the values set at the factory.

0 : Inactive

1 : Resets to the values set at the factory

From the 0 display, by simultaneously pressing **STOP** and **▲**, the display will change to 1. By pressing **FUNC DATA** in this state, the data will be reset to the values set at the factory, and the mode will automatically change to the 6 0 0 frequency display mode.

F 1 8 Retry

The number of times of retry for automatic restart after the inverter has been tripped can be set.

0 } The number of retry times is fixed at 5. Retry takes place in 0.5s after trip.
 1 }

Note that the retry takes place only in the case where the inverter is tripped due to overcurrent or overvoltage applied during operation.

F 1 9 Motor Characteristics

Used to adjust in the event that a problem such as current vibration, etc. occurs in the output current.

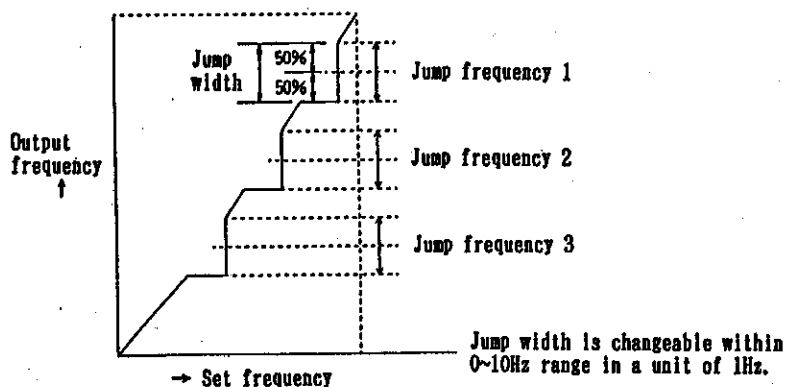
F 2 0 Jump Frequency Range

F 2 1 Jump Frequency 1

F 2 2 Jump Frequency 2

F 2 3 Jump Frequency 3

Frequency is jumped so that the mechanical common point of load and the output frequency of inverter do not coincide with each other.



F 2 4 High Limiter

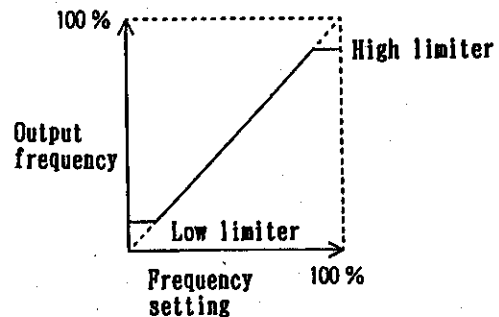
F 2 5 Low Limiter

The upper and lower limits of the output frequency can be set.

		0
1	0	0

 } Set as a percentage of the maximum frequency in increments of 1% within a range of 0 to 100%.

If the value set for the low limiter is higher than that set for the high limiter, the high limiter will take priority and the low limiter will be ignored. Thus, operation will always be in accordance with the high limiter value regardless of the frequency setting.

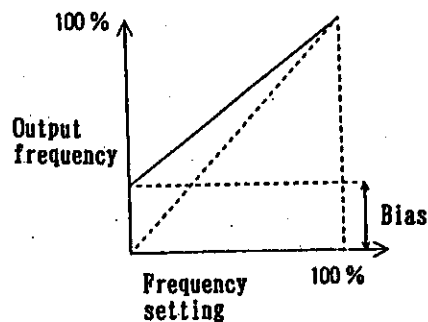


F 2 6 Bias Frequency

Outputs a bias frequency with respect to the analog frequency setting.

		0
1	0	0

 } Set as a percentage of the maximum frequency in increments of 1% within a range of 0 to 100%.



F 2 7 THR Terminal Function

This function enables terminal THR to be used for two different functions by changing the data code as follows.

- | | | |
|--|--|---|
| | | 0 |
|--|--|---|

 : External alarm input
- | | | |
|--|--|---|
| | | 1 |
|--|--|---|

 : Multistep speed selection (X1)

This function data cannot be changed during operation.
(Possible to change only in STOP mode.)

F 2 8 BX Terminal Function

This function enables terminal BX to be used for two different functions by changing the data code as follows.

- 0 : Motor coast-to-stop command input
- 1 : Multistep speed selection (X2)

This function data cannot be changed during operation.
(Possible to change only in STOP mode.)

F 2 9 Multistep Speed setting 1 (Speed 1)

F 3 0 Multistep Speed setting 2 (Speed 2)

F 3 1 Multistep Speed setting 3 (Speed 3)

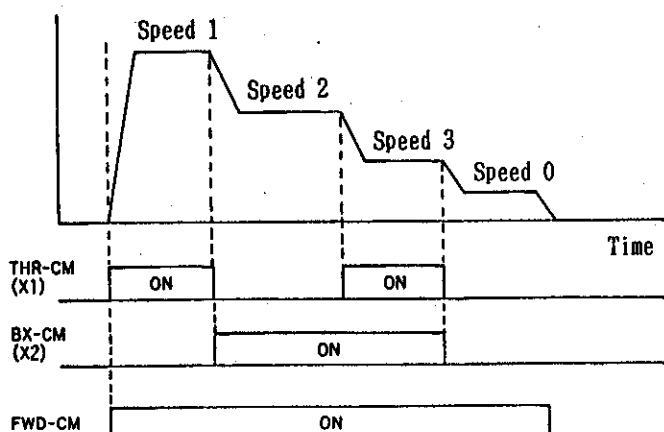
Multistep speeds can be set within a range of 0 to 120Hz only by changing the contact signal from outside. (X1-CM, X2-CM)

Setting of speed of optional step is possible within a range of 0 to 120Hz during inverter operation.

(Note 1) X1 or X2 terminal is selected via THR/BX terminal function change (F27, F28).

(Note 2) In selecting THR/BX terminal function (F27, F28), individual setting is possible.

Terminal / Function code	F 2 7 : 1 F 2 8 : 0	F 2 7 : 0 F 2 8 : 1	F 2 7 : 1 F 2 8 : 1	F 2 7 : 0 F 2 8 : 0
THR	X 1	External alarm input	X 1	External alarm input
BX	Motor coast-to-stop command input	X 2	X 2	Motor coast-to-stop command input



Speed 0: Frequency setting is made by either the analog signal or the keypad panel.

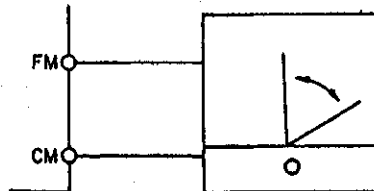
F 3 2 FM Terminal Output Level Calibration

Adjusts the level of the voltage output to terminal FM for the frequency meter.

0 : (Approx. DC 6.5V at full scale)

↓

99 : (Approx. DC 10.3V at full scale)



Note) The FM terminal output is a pulse output of which frequency is constant (38.1Hz) and duty is variable.

F 3 3 FM Terminal Function Selection

With regard to the data outputted to the FM terminal, either the output frequency or the output current can be selected.

0 : Output frequency

1 : Output current

9. Specifications

★ FVR-C9 Series

Type (FVR□□□C9S-2)		0.1	0.2	0.4	0.75	1.5	2.2	3.7
Applicable motor output *1 [kW]		0.1	0.2	0.4	0.75	1.5	2.2	3.7
Output rating	Rated capacity *2 [kVA]	0.28	0.56	1.0	1.6	2.8	4.0	6.6
	Voltage [V]	200 ~ 230V 50/60Hz (Output voltage is proportioned to input voltage)						
	Rated current [A]	0.7	1.4	2.5	4.0	7.0	10.0	16.5
	Overload current rating	150% 1 min						
	Rated frequency [Hz]	50/60Hz						
Input power supply	Phase, Voltage, Frequency	Three-phase 200 ~ 230V 50/60Hz						
	Allowable variation in voltage/frequency	Voltage: +10 ~ -15% Frequency: ±5% (Imbalance in power supply voltage: 3%)						
	Instantaneous voltage drop withstanding capacity	Inverter is kept running if voltage is 165V or more. If voltage drops more than 165V from rated voltage, inverter is run for 15ms *3.						
	Required power supply capacity [kVA]	0.3	0.7	1.2	1.8	3.2	4.5	7.3
Output frequency	Ad-just ment	Maximum freq *4 [Hz]	50 ~ 120Hz Setting variable (in increments of 1Hz)					
		Base freq [Hz]	50 ~ 120Hz Setting variable (in increments of 1Hz)					
		Starting freq [Hz]	1 ~ 6Hz Setting variable (in increments of 1Hz)					
	Accuracy	Analog setting : ±1.0% of max frequency (25±10°C) Digital setting: ±0.01% of max frequency (-10~+50°C)						
	Setting resolution	Analog setting : 1/256 of max frequency (ex. 0.25Hz/60Hz, 0.5Hz/120Hz) Digital setting: 0.1Hz (99.9Hz max) 1Hz (100 ~ 120Hz)						
Control	Control method	Sine wave PWM control (Extremely low noise by high frequency carrier)						
	Operation	Key operation: Operation control by RUN/STOP keys Input signal : Forward command, Reverse command, Coast-to-stop command, Reset, External alarm						

*1: "Applicable motor" indicates a standard 4-pole motor.

*2: "Rated capacity" indicates a capacity at 230V rating.

*3: This applies to the case where momentary power failure occurs under such condition that rated voltage is inputted and load factor is 85%.

*4: Shows the case where an applicable motor equipped with an AC reactor (option) on the input side is used.

★ FVR-C9 Series (cont' d)

Control	Frequency setting		Key operation : Setting with ∇/Δ keys Terminal for setter: Terminal for 1 ~ 5k Ω VR is provided Analog signal : 0 ~ 5Vdc 0 ~ 10Vdc (Input resistance = 22k Ω)			
	Dis-play	While running	Output frequency is digital displayed (3 digits LED)			
		Trip for protection	Cause of trip for protection is displayed (\uparrow)			
		Others	LED comes on with charging voltage applied			
	Acceleration/Deceleration time		0 ~ 60s (Setting variable --- Acceleration time and deceleration time can be set independently)			
	Voltage/frequency characteristics		Setting of maximum frequency/base frequency is variable			
	Restart after momentary power failure		"Automatic restart" setting makes it possible to keep motor running and restart inverter in case of a momentary power failure			
	High limiter & Low limiter		Upper limit and lower limit of frequency can be set			
	Bias setting		Bias setting is possible with respect to analog frequency setting			
	Jump frequency		3 jump points and 1 jump width can be set			
	Torque boost		Setting variable in 32 steps			
	Starting torque [%]		150% min			
Braking	Braking torque*5 [%]	150% min	100% min	50% min	30% min	
	DC brake		Brake starting frequency: 3Hz (fixed) Setting of braking current/braking time is variable			
Protection	Overload		Detects overload current and stops inverter			
	Momentary overcurrent		Protects inverter in case of ground fault (detected at start) and short circuit of output circuit			
	Overvoltage		Detects overvoltage of DC intermediate circuit and stops inverter			
	Overheating of cooling element		Detects abnormal temperature rise of cooling element and stops inverter			
	Motor protection		Protects standard 4-pole motor and Fuji inverter motor by means of electronic thermal overload relay			
	Alarm output		Outputs contact signal in case of trip for protection (1c contact capacity: AC250V 0.3A $\cos\phi=0.3$)			

*5: This indicates average braking torque of a single motor.
(Value varies according to motor efficiency)

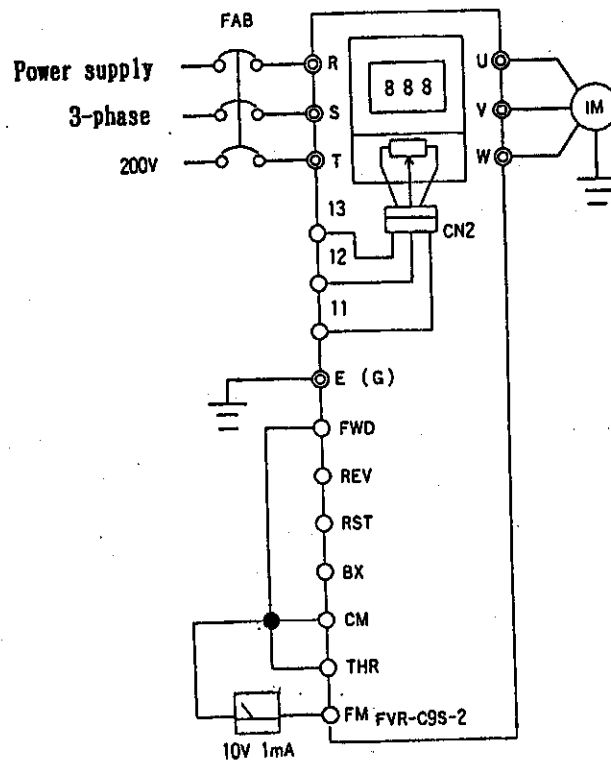
★ FVR-C9 Series (cont'd)

Environment	Place where inverter is used (installed)	An indoor place at an altitude of 1000m or less and free of dust, corrosive gas and oil mist						
	Ambient temperature	-10 ~ 50°C						
	Ambient humidity	20 ~ 90%RH (There shall be no dew condensation)						
	Vibration	5.9m/s ² or less Vibration frequency: 5 ~ 55Hz						
	Storage temperature	-25 ~ 65°C						
Protective structure (JEM 1030)		Enclosed type (IP 20)						
Cooling method		Self-cooling				Forcedly air-cooling		
Mass	[kg]	0.6	0.6	0.7	0.8	1.5	1.6	2.5

1 0. Basic Wiring Diagram

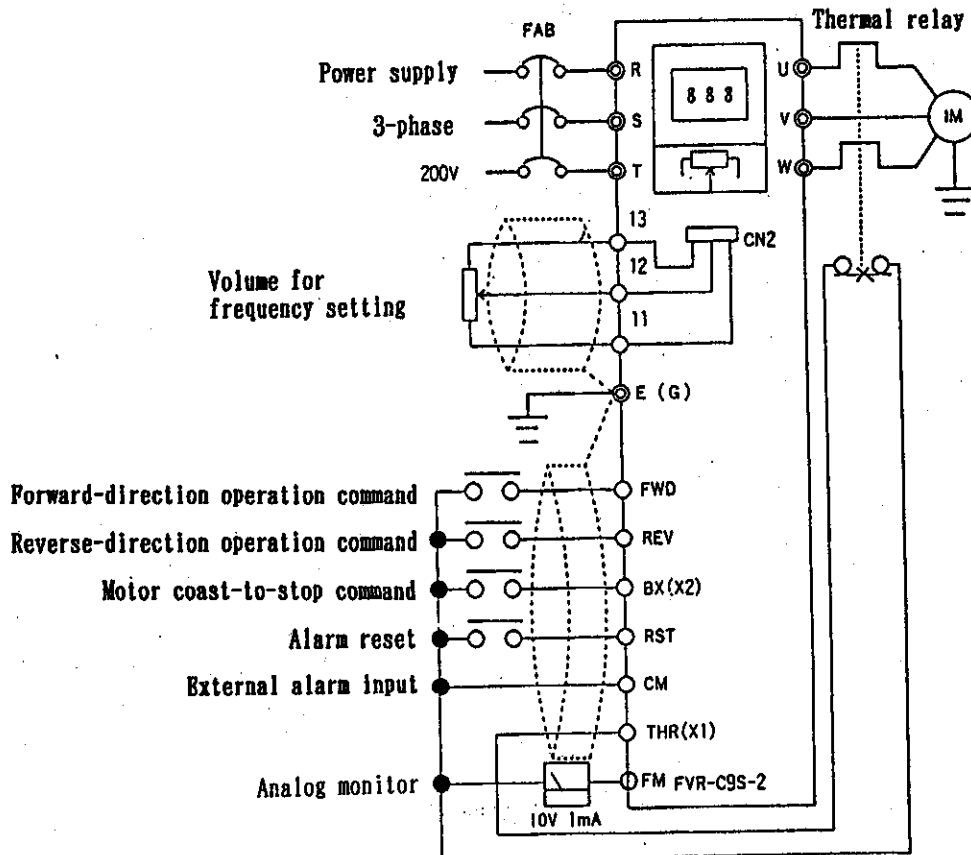
1) Keypad Panel Operation

In the state of setting done at the time of shipment from the factory, it is so arranged that connection of the power supply and the motor only makes it possible to set frequency by means of the volume control knob on the keypad panel as well as to perform run/stop operation of the inverter by means of the RUN/STOP keys on the keypad panel.



2) External Signal Operation

Ensure that the connection is as shown in the following diagram in case of operating the inverter by means of external frequency setting volume or contact signal.



Note 1) Set function F02 to 1.

Note 2) In case of using an external frequency setting volume, disconnect the volume connector (CN2) from the keypad panel.

Use of an external volume together with the volume on the keypad panel may result in damage to the inverter.

☆☆ Caution ☆☆

- The control circuit terminal wiring should be kept as far as possible from the main circuit wiring to prevent operational error due to noise interference. Never install them in the same duct or conduit. (A separation distance of 10cm or more is recommended.) If the control circuit wiring must cross the main circuit wiring, make sure it crosses at a right angle.
- Use shielded wire or twisted wire for the control circuit wiring, which should be as short as possible (20m or less).
- Install a surge absorber in parallel with any magnet contactors, solenoids, relays or timer coils, which are close to the inverter.
- The longer the wiring between the inverter and the motor is, the larger current flows in parallel with the motor through the floating capacity between wires. This may cause earlier activation of such protective function as overcurrent protection, overheating protection and electronic thermal overload, or the error in current detection may become large. To avoid these, adjust the length of wiring between the inverter and the motor so that it does not exceed the length shown below.

FVRO.1C9S-2 : 50m

FVRO.1~3.7C9S-2 : 100m

1 1. Application of Wiring and Equipment

Applicable motor output [kW]	0.1	0.2	0.4	0.75	1.5	2.2	3.7
Inverter type	FVRO.1 C9S-2	FVRO.2 C9S-2	FVRO.4 C9S-2	FVRO.75 C9S-2	FVR1.5 C9S-2	FVR2.2 C9S-2	FVR3.7 C9S-2
Output rated capacity [kVA]	0.28	0.56	1.0	1.6	2.8	4.0	6.6
Applicable wire size [mm]	Main circuit	1.25 *1			2 *2		3.5 *3
	Control circuit	0.5 (1.25)					
Fuji MCCB	SA33B/15			SA33B/20		SA33B/30	
Fuji ELCB	SA33B/15			SA33B/20		SA33B/30	
Fuse [A]	5		10		20		30
Fuji electromagnetic contactor	SC-1N/SC-05 *4						SC-5-1
Fuji thermal relay	TR-1SN (0.95 ~ 1.45A)	TR-1SN (1.7 ~ 2.6A)	TR-1SN (2.8 ~ 4.2A)	TR-1SN (5 ~ 8A)	TR-1SN (7 ~ 11A)	TR-1SN (12 ~ 18A)	
Spark killer	S2-A-0 (for electromagnetic contactor) S1-B-0 (for mini control relay)						

*1: Applicable crimp-type terminal lug (JIS C 2805) R1.25-3.5 Terminal lugs having a width of max 7.5mm can be used.

*2: Applicable crimp-type terminal lug (JIS C 2805) R2-3.5 Terminal lugs having a width of max 7.5mm can be used.

*3: Applicable crimp-type terminal lug (JIS C 2805) R5.5-4 Terminal lugs having a width of max 9.7mm can be used.

*4: Use SC-1N in the case where AC reactor (option) is not provided on the power supply side of the inverter.

1 2. Terminal Function Explanation

Classification	Terminal Code	Terminal Name	Explanation of Function
Main circuit	R, S, T	Commercial power supply input terminals	Connection for 3-phase commercial power supply.
	U, V, W	Inverter output terminals	For connection of a 3-phase motor.
	E (G)	Inverter earthing terminal	Earthing terminal of inverter chassis (case). Be sure to earth the inverter to prevent electric shock or to lower noise.
Frequency setting	13	Power supply for frequency setting	Used as a power supply for frequency setter (variable resistor: 1 ~ 5k Ω). (DC + 10V, 10mA max)
	12	Frequency setting voltage input	DC 0 ~ +10V / 0 ~ 100% (Input resistance: 22k Ω)
	11 *1	Frequency setting common terminal	Terminal common to frequency setting signals 12 and 13
Control input	FWD	Forward/Stop command input terminal	Forward-direction operation takes place when FWD-CM is closed. Inverter decelerates and stops when FWD-CM is opened.
	REV	Reverse/Stop command input terminal	Reverse-direction operation takes place when REV-CM is closed. Inverter decelerates and stops when REV-CM is opened.
	BX	Motor coast-to-stop input terminal	<ul style="list-style-type: none"> • Inverter output is cut off instantly and motor will coast-to-stop when BX-CM is closed. In this case, however, alarm signal is not outputted. • This functions as multistep frequency selection terminal X2 when changing function.
	THR	External alarm input terminal	<ul style="list-style-type: none"> • When THR-CM is opened during operation, inverter output is cut off (motor will coast-to-stop) and an alarm signal is outputted. This signal is self-held and reset by RST input. • This functions as multistep frequency selection terminal X1 when changing function.
	RST	Alarm reset terminal	When RST-CM is closed, the protection function after inverter trip is reset.
	CM *1	Control input common terminal	Common terminal for control input signals

*1: Electric potential of 11 terminal is identical with that of CM terminal.

Terminal Function Explanation (cont'd)

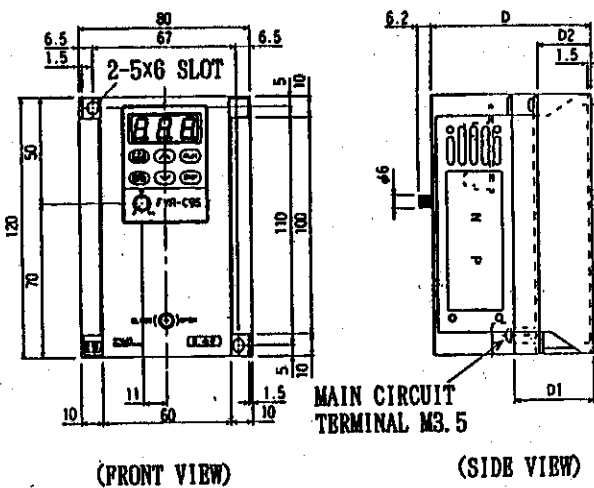
Classification	Terminal Code	Terminal Name	Explanation of Function
Output for meter	FM *2	Analog monitor	<p>Outputs DC + 10V at the maximum frequency between FM and CM terminals. Outputs DC + 10V at 150% current when monitoring output current.</p> <ul style="list-style-type: none"> • 2 pieces of 7 ~ 10V full scale DC voltmeter (internal resistance of 10kΩ or greater) can be connected. • In case of DC ammeter (1mA full scale), it is necessary to add series resistance of 10kΩ (1/2W). • This output is a pulse output of which frequency is constant (38.1Hz) and duty is variable.
Contact output	30A, B, C	Combined alarm output terminals	<p>Output via novolt signal (contact 1c) to indicate that the inverter's protective function has been activated by an alarm.</p> <ul style="list-style-type: none"> • Contact capacity (AC250V, 0.3A, $\cos\phi = 0.3$)

*2 : FM terminal cannot be used when an optional card for DC 4 ~ 20mA input is used.

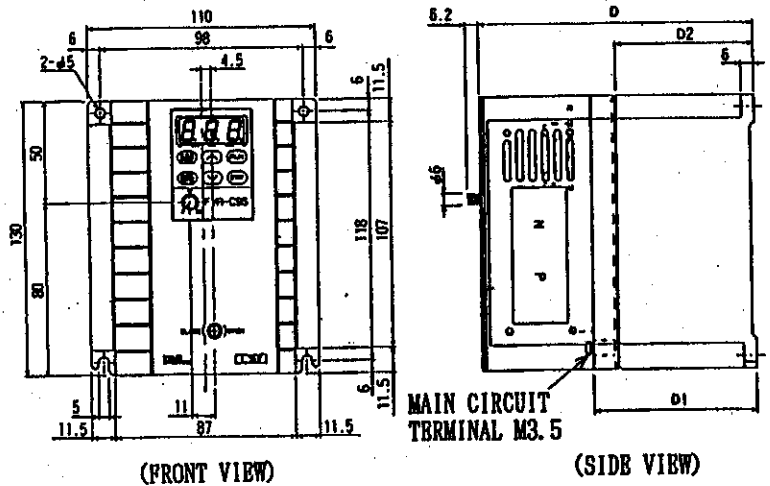
1 3. Protective Function

Function	Explanation	Display	Alarm output
Momentary over-current protection	Stops inverter to protect it against overcurrent yielded due to overload on output side. * [A = During acceleration C = During constant- [B = During deceleration speed operation]	OC1 (*A) OC2 (*B) OC3 (*C)	Yes
Overvoltage protection	Detects overvoltage of DC intermediate circuit and stops inverter.	OU	Yes
Undervoltage protection	Detects undervoltage of DC intermediate circuit and stops inverter.	LU	Yes
Protection against overheating of cooling element	Detects abnormal temperature rise of cooling element and stops inverter.	OH1	Yes
External alarm input	Stops inverter by input of an external signal.	OH2	Yes
Electronic thermal overload	Detects overload of motor and stops inverter.	OL	Yes
Inverter overload	Detects overload of inverter and stops inverter.	OLU	Yes
Memory error	Stops inverter in case of a memory error.	Er1	Yes
CPU error	Stops inverter in case of a CPU error.	Er3	Yes

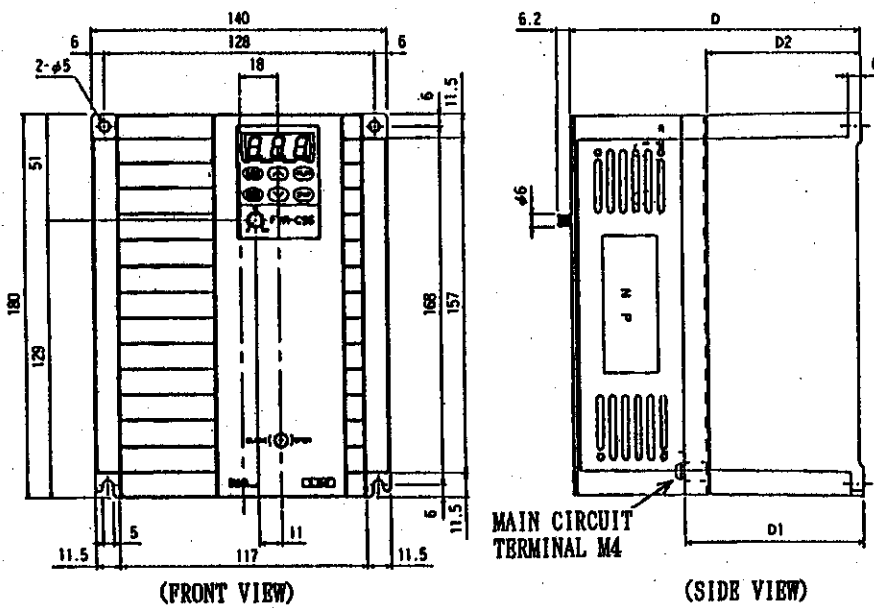
1 4. External Dimensions



<DWG 1> FVRO. 1C9S-2 ~ FVRO. 75C9S-2



<DWG 2> FVR1. 5C9S-2 ~ FVR2. 2C9S-2



<DWG 3> FVR3. 7C9S-2

Type	Rated current [A]	External dimensions [mm]			DWG No.
		D	D ₁	D ₂	
FVRO. 1C9S-2	0.7	60	22	10	DWG 1
FVRO. 2C9S-2	1.4	65	27	15	
FVRO. 4C9S-2	2.5	75	37	25	
FVRO. 75C9S-2	4.0	100	62	50	
FVR1. 5C9S-2	7.0	130	77	65	DWG 2
FVR2. 2C9S-2	10.0	140	77	65	DWG 3
FVR3. 7C9S-2	16.5	138	85	73	