Changes for the Better

MITSUBISHI ELECTRIC

MITSUBISHI INVERTER AND ENERGY SAVING DRIVE UNIT OPTION CATALOG







OPTIONAL PARTS

FREQROL

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 standards for environmental management systems) and ISO9001(standards for quality assurance managememt systems)

MELSOFT

ISO 14001 JACO EC97J1113 UKAS ENVIRONMENTAL MANAGEMENT 051

ISO 9001 BUREAU VERITAS Certification UKAS QUALITY MANAGEMENT 008

Lineup of wide variety of options, such as an installation attachment, improves function /performance of the inverter and energy saving drive unit!

Extended control function

Plug-in option

- Orientation control / Machine end orientation control → P.5, 6
- Encoder feedback control → P.5
- Vector control → P.5
- Position control → P.6
- Encoder pulse dividing output → P.8
- Motor thermistor interface → P.8

Dedicated cable option

- Cable for encoder → P.12

Extension I/O

Plug-in option

- 16bit/12bit digital input → P.7
- Pulse train input → P.6
- Extension contact input → P.8
- High resolution analog input → P.8
- Digital output → P.7
- Relay output → P.7
- Analog output / Bipolar analog output → P.7, 8
- Extension open collector output → P.8
- Trace card → P.8

Supported communication

Plug-in option

- RS-485 → P.9
- CC-Link → P.9
- LonWorks® → P.10
- DeviceNet™ → P.10
- PROFIBUS-DP → P.10
- Modbus Plus → P.10
- Ethernet → P.10
- SSCNET → P.11
- SSCNETⅢ → P.11

Dedicated cable option

- SSCNET cable → P.13
- SSCNETⅢ cable → P.14

Improved operability

Options for operation

- Parameter unit / Parameter unit with battery pack → P.15
- Connectors → P.15
- Parameter unit connection cable → P.15

Software

- FR Configurator → P.16
- RS-232C⇔RS-485 converter → P.16
- USB cable → P.16

Power factor improvement

Reactor

- AC reactor → P.17
- DC reactor → P.18
- High power factor converter → P.28

Improved regeneration capability

Braking unit

- Brake resistor → P.19
- Brake unit → P.21
- Power regeneration converter → P.24
- Power regeneration common converter → P.26

Reduced noise

Noise filter

- Capacitor type filter → P.31
- Common mode filter → P.30
- EMC Directive compliant EMC filter → P.31

Output filter

- Surge voltage suppression filter → P.33
- Sine wave filter → P.35

Control panel installation method was changed

Structure option

- Heatsink protrusion attachment → P.36
- Totally-enclosed structure attachment → P.37
- Attachment for cable conduit connection → P.37
- Intercompatibility attachment → P.37
- EMC filter installation attachment → P.37
- DIN rail installation attachment → P.40

Supported system

FR series manual controller/speed controller

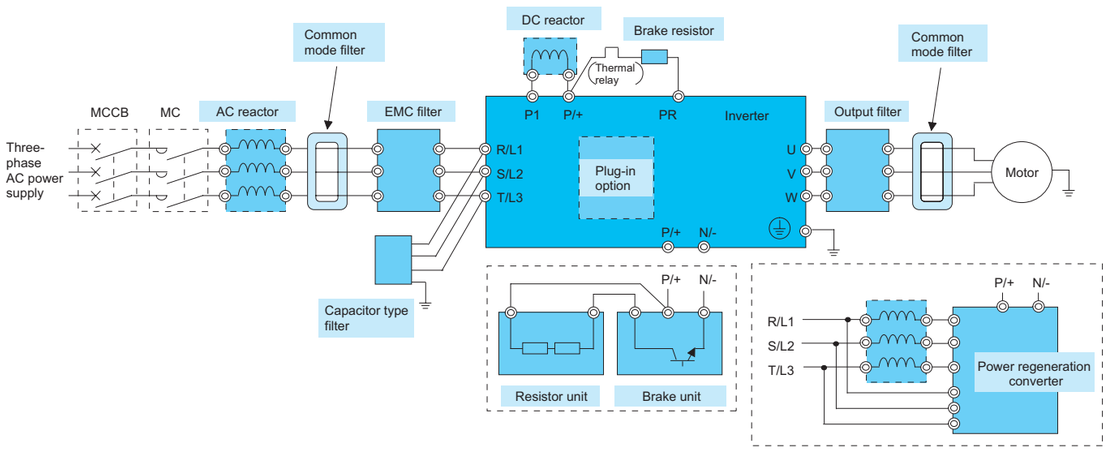
- Preamplifier → P.41
- Soft starter → P.41
- Deviation detector → P.41
- Master controller → P.42
- Ratio setter → P.42
- Motorized speed setter → P.42
- Speed detector → P.43
- DC tach. follower → P.43
- Three speed selector → P.44
- Manual controller → P.44

Other options

- Pilot generator → P.45
- Deviation sensor → P.45
- Digital frequency meter → P.45
- Analog frequency meter → P46
- Calibration resistor → P.46
- Frequency setting potentiometer / Pointer scale / Knob → P.46

Connection example

This diagram shows connection of main optional devices with the inverter. All devices in the connection diagram below are not necessarily connected .
Select necessary options referring to the table below and descriptions.



Reactor	Noise Filter		Braking Unit			Output Filter	Plug-in Option
AC reactor DC reactor	Common mode filter Capacitor type filter	EMC filter	Brake resistor	Brake unit Resistor unit	Power regeneration converter High power factor converter		
Use when power harmonics measures are required, the power factor is to be improved or the inverter is installed under a large power supply system.	Use to reduce the electromagnetic noise generated from the inverter.	Use this EMC filter to comply with the European EMC Directive.	Increases the braking capability of the inverter which has a built-in brake transistor.	Increases the braking capability more than the brake resistor. The inverter without a built-in brake transistor can be connected.	Returns regeneration energy to the power supply, enabling continuous regeneration operation. A high power factor converter whose power factor is 1 is available.	Limits surge voltage supplied to the motor terminal.	Mounts to the inverter to expand functions and make communication.

Option list

Name	Type	Applicable Inverter							Applicable Energy Saving Drive (IPM)		Refer to Page
		FR-A700	FR-F700	FR-E700	FR-V500(L)	FR-E500	FR-S500E	FR-F500J	FR-FP700	FR-FP500J	
Plug-in option (extended control function/extension I/O)											
Orientation control Encoder feedback control Vector control	FR-A7AP	○	×	×	× *1	×	×	×	×	×	5
Machine end orientation	FR-V5AM	×	×	×	○	×	×	×	×	×	6
Machine end orientation control Pulse train input	FR-A5AP	× *2	× *2	×	○	×	×	×	×	×	6
Position control	FR-V5AP	×	×	×	○	×	×	×	×	×	6
16-bit digital input	FR-A7AX	○	○	○ E kit	×	×	×	×	×	×	7
	FR-V5AH	×	×	×	○	×	×	×	×	×	7
12-bit digital input	FR-A5AX	×	×	×	○	×	×	×	×	×	7
Analog output (2 points) Digital output (7 points)	FR-A7AY	○	○	○ E kit	×	×	×	×	×	×	7
	FR-A5AY	×	×	×	○	×	×	×	×	×	7
Relay output (3 points)	FR-A7AR	○	○	○ E kit	×	×	×	×	×	×	7
	FR-A5AR	×	×	×	○	×	×	×	×	×	7
Relay output (1 point) (RS-485 communication)	FR-A5NR	×	×	×	○	×	×	×	×	×	7
Bipolar analog output High resolution analog input Motor thermistor interface	FR-A7AZ	○	×	×	×	×	×	×	×	×	8
Extension contact input (6 points) High resolution analog input Motor thermistor interface	FR-V5AX	×	×	×	○	×	×	×	×	×	8
Extension open collector output Encoder pulse dividing output	FR-V5AY	×	×	×	○	×	×	×	×	×	8
Trace card	T-TRC50	×	×	×	○	×	×	×	×	×	8
Plug-in option (for communication)											
USB	USB connector (inverter)	Equipped as standard	×	Equipped as standard	×	×	×	×	×	×	—
RS-485	PU connector (inverter)	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	—
	Dedicated terminal (inverter)	Equipped as standard	Equipped as standard	×	×	×	×	×	Equipped as standard	×	—
	FR-A5NR	×	×	×	○	×	×	×	×	×	9
CC-Link	FR-A7NC	○	○	○ E kit	×	×	×	×	×	×	9
	FR-A5NC	×	×	×	○	×	×	×	×	×	9
	FR-E5NC	×	×	×	×	Support E540 only	×	×	×	×	9
	Dedicated inverter	×	×	×	×	E520-□□KN	×	×	×	×	9
LONWORKS	FR-A7NL	○	○	×	×	×	×	×	○	×	10
	FR-E5NL	×	×	×	×	Support E540 only	×	×	×	×	10

*1 Vector control/orientation control are available as the inverter function.
*2 One phase pulse train input is available as the inverter function.

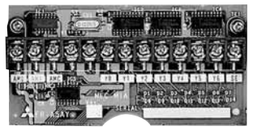
Name		Type	Applicable Inverter							Applicable Energy Saving Drive (IPM)		Refer to Page
			FR-A700	FR-F700	FR-E700	FR-V500(L)	FR-E500	FR-S500E	FR-F500J	FR-FP700	FR-FP500J	
Plug-in option												
DeviceNet™		FR-A7ND	○	○	×	×	×	×	×	×	×	10
		FR-A5ND	×	×	×	○	×	×	×	×	×	10
		FR-E5ND	×	×	×	×	Support E540 only	×	×	×	×	10
		Dedicated inverter	×	×	×	×	E520-□□KND	×	×	×	×	10
PROFIBUS-DP		FR-A7NP	○	○	×	×	×	×	×	×	×	10
		FR-A5NPA	×	×	×	○	×	×	×	×	×	10
Modbus Plus		FR-A5NM	×	×	×	Support V500L only	×	×	×	×	×	10
Ethernet		FR-V5NE	×	×	×	Support V500 only	×	×	×	×	×	10
SSCNET		FR-V5NS	×	×	×	○	×	×	×	×	×	11
SSCNET III		FR-A7NS	○	×	×	×	×	×	×	×	×	11
Dedicated cable option												
Cable for encoder		FR-V7CBL□□	○	×	×	×	×	×	×	×	×	12
		FR-V5CBL□□	×	×	×	○	×	×	×	×	×	12
		FR-JCBL□□	○	×	×	○	×	×	×	×	×	12
SSCNET cable		FR-V5NSCBL□□	×	×	×	○	×	×	×	×	×	13
SSCNET III cable		MR-J3BUS□M-□	○	×	×	×	×	×	×	×	×	14
Options for operation												
Parameter unit		FR-PU07	○	○	○	×	×	×	×	○	×	15
		FR-PU04	○	○	○	×	○	○	○	○	○	15
		FR-PU04V	×	×	×	○	×	×	×	×	×	15
Parameter unit with battery pack		FR-PU07BB	○	○	○	×	×	×	×	×	×	15
Operation panel connection connector		FR-ADP	○	○	×	×	×	×	×	○	×	15
Operation panel rear cover/adaptor set		FR-E5P	×	×	×	×	○	×	×	×	×	15
Parameter unit connection cable		FR-CB20□	○	○	○	○	○	○	○	○	○	15
Software												
FR Configurator		FR-SW3-SETUP-WJ	×	×	○	×	×	×	×	×	×	16
		FR-SW2-SETUP-WJ	○	○	×	×	×	×	×	×	×	16
		FR-SW1-SETUP-WJ	×	×	×	○	○	○	○	×	×	16
USB cable		MR-J3USBCBL3M	×	×	○	×	×	×	×	×	×	16
Reactor												
AC reactor		FR-HAL	○	○	○	○	○	○	○	○	○	17
DC reactor		FR-HEL	○ *3	○ *3	○	○ *3	○	○	○	○	○	18
Braking unit												
Brake resistor		MRS, MYS	×	×	○ *4	×	○ *4	○ *4	×	×	×	19
High-duty brake resistor		FR-ABR	○ *4	×	○ *4	○ *4	○ *4	○ *4	×	×	×	19
Brake unit		FR-BU2	○ *5	○ *5	○ *5	○ *5	○ *5	○ *5	○ *5	○ *5	○ *5	21
	Resistor	GRZG	○	○	○	○	○	○	○	○	○	21
	Resistor unit	FR-BR	○	○	○	○	×	×	○	○	○	21
		MT-BR5	○	○	×	○	×	×	×	×	×	21
Power regeneration converter		FR-RC	○	○	○	○	○	○ *6	○	○	○	24
		MT-RC	○	○	×	○	×	×	×	×	×	24
Power regeneration common converter		FR-CV	○	○	○	○	○	○ *6	○	○	○	26
	Dedicated, standalone reactor	FR-CVL	○	○	○	○	○	○	○	○	○	26
High power factor converter		FR-HC	○	○	○	○	○	○ *6	○	○	○	28
		MT-HC	○	○	×	○	×	×	×	×	×	28
Noise filter												
Capacitor type filter		FR-BIF	Corresponding filter is built-in	Corresponding filter is built-in	○	○	○	○	○	Corresponding filter is built-in	○	31
Common mode filter		FR-BSF01	○ *7	○ *7	○	○	○	○	○	○ *7	○	30
		FR-BLF	○ *7	○ *7	○	○	○	○	○	○ *7	○	30
EMC Directive compliant EMC filter		Built-in filter	Standard equipped (2nd Environment)		×	×	×	×	×	×	×	—
		SF□□	×	×	×	○	○	○	○	×	×	31
		FR-E5NF	×	×	×	×	○	○	○	×	×	31
		FR-S5NFSA	×	×	×	×	×	○	×	×	×	31
Output filter												
Surge voltage suppression filter		FR-ASF	○ *8	○	×	×	○	○	○	×	×	33
		FR-BMF	○ *8	○	×	×	○	○	○	×	×	33
Sine wave filter	Reactor	MT-BSL(-HC)	○ *8	○	×	×	×	×	×	×	×	35
	Capacitor	MT-BSC	○ *8	○	×	×	×	×	×	×	×	35
Structure option												
Heatsink protrusion attachment		FR-A7CN	○	○	×	×	×	×	×	○	×	36
		FR-A5CN	×	×	×	○	×	×	×	×	×	36
		MT-A5CN	×	×	×	○	×	×	×	×	×	36
Totally-enclosed structure attachment		FR-A5CV	×	×	×	○	×	×	×	×	×	37
		Dedicated inverter	×	×	×	×	E520/540-C	S520E-C	×	×	×	37
Attachment for cable conduit connection		FR-A5FN	×	×	×	○	×	×	×	×	×	37
Intercompatibility attachment		FR-AAT	○	○	×	×	×	×	○	×	×	37
		FR-A5AT	○	○	×	○	×	×	○	×	×	37
EMC filter installation attachment		FR-E5T	×	×	×	×	○	○	○	×	×	37
DIN rail installation attachment		FR-UDA	×	×	○ *9	×	×	○	○ *9	×	○ *9	40
FR series manual controller/speed controller												
Preamplifier		FR-FA	○	○	○	○	○	○	○	○	○	41
Soft starter		FR-FC	○	○	○	○	○	○	○	○	○	41
Deviation detector		FR-FD	○	○	○	○	○	○	○	○	○	41
Master controller		FR-FG	○	○	○	○	○	○	○	○	○	42
Ratio setter		FR-FH	○	○	○	○	○	○	○	○	○	42
Motorized speed setter		FR-FK	○	○	○	○	○	○	○	○	○	42
Speed detector		FR-FP	○	○	○	○	○	○	○	○	○	43
DC tach. follower		FR-AL	○	○	○	○	○	○	○	○	○	43
Three speed selector		FR-AT	○	○	○	○	○	○	○	○	○	44
Manual controller		FR-AX	○	○	○	○	○	○	○	○	○	44
Other options												
Pilot generator		QVAH-10	○	○	○	○	○	○	○	×	×	45
Deviation sensor		YVGC-500W-NS	○	○	○	○	○	○	○	×	×	45
Analog frequency meter		YM206NRI 1mA	○	○	○	×	○	○	○	○	○	46
Calibration resistor		RV24YN 10Ω	○	○	○	×	○	○	○	○	○	46
Frequency setting potentiometer		WA2W 1Ω	○	○	○	○	○	○	○	○	○	46

*3 For the 75K or more, a DC reactor is supplied as standard.
*4 Only models with a built-in brake transistor can be used. Refer to the text (page 19) for details.
*5 For the 200V class 0.2K or less, 400V class 1.5K or less, FR-S520E-0.1K to 0.75K inverters, they can not be used in combination with a brake unit.
*6 The FR-S520E-0.1K to 0.75K inverters can not be used.
*7 For the 55K or less, a corresponding appliance is built-in on the input side.
*8 They can not be used under vector control and real sensorless vector control operation.
*9 Only 3.7K or less is supported.

Plug-in option (extended control function/extension I/O)

700 series plug-in option example: FR-A7AY

This option can be mounted in the 700 series inverter. Up to three* cards are connectable for the FR-A700 and only one for the FR-F700 and E700. The FR-E700 has "E kit" in the end of the name and sold as a package set with a dedicated front cover, etc.
* Same type of plug-in option cannot be used in parallel.



FR-V500 series plug-in option example: FR-A5AY

This option can be mounted in the V500 series inverter. Up to three* cards are connectable.
* Same type of plug-in option cannot be used in parallel.

Orientation control/encoder feedback control/vector control FR-A7AP (A700)

Orientation control : This function is used with a position detector (encoder) installed to the spindle of a machine tool, etc. to allow a rotation shaft to be stopped at the specified position (oriented).

Encoder feedback control : This controls the inverter output frequency so that the motor speed is constant to the load variation by detecting the motor speed with the speed detector (encoder) to feed it back to the inverter under V/F control and advanced magnetic flux vector control.

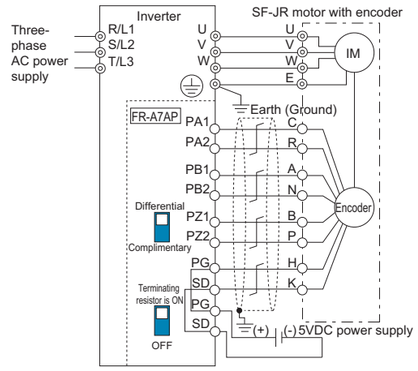
Vector control : Vector control operation can be performed using a motor with encoder.

● Specifications

Function			Description
Orientation control	Repeated positioning accuracy		±1.5°
	Permissible speed		Encoder-mounted shaft speed (6000r/min with 2048 pulse encoder) The motor and encoder-mounted shaft should be coupled with a speed ratio of 1 to 1.
Encoder feedback control	Speed variation ratio		±0.1% (to the speed 3600r/min)
Vector control	Speed control	Speed control range	1:1500 (both driving/regeneration *1)
		Speed variation ratio	±0.01% (to the speed 3000r/min)
		Speed response	300rad/s (to the analog command input) Note that the internal response is 600rad/s (with model adaptive speed control)
	Torque control	Torque control range	1:50
		Absolute torque accuracy	±10% *2
		Repeated torque accuracy	±5% *2

*1 Regeneration unit (option) is necessary for regeneration.
*2 With online auto tuning (adaptive magnetic flux observer), dedicated motor, rated load

● Connection diagram



(Applicable machine end encoder)
- Differential line driver or complimentary
- 1000P/R to 4096P/R
- A separate power supply of 5V/12V/15V/24V is necessary according to the encoder power specification.

Machine end orientation control FR-V5AM (V500)
Machine end orientation control/pulse train input FR-A5AP (V500)

Machine end orientation control : This function is used with a position detector (encoder) installed to the spindle of a machine tool, etc. to allow a rotation shaft to be stopped at the specified position (oriented). Orientation is the machine end.

Pulse train input : Speed setting to the inverter can be input as pulse train signal.

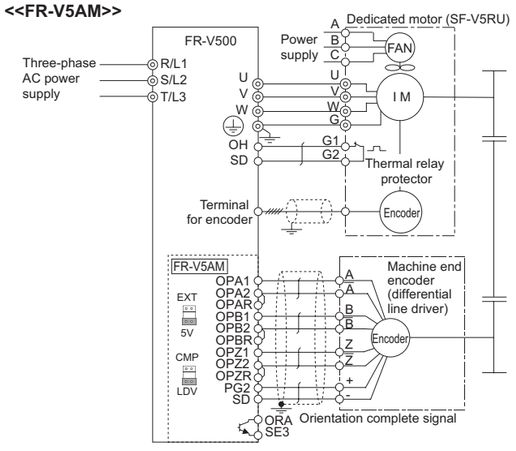
● Specifications

Function		Description
Machine end orientation control	Repeated positioning accuracy	±1.5°
	Permissible speed	Encoder-mounted shaft speed (6000r/min)
Pulse train input *	Circuit method	Open collector
	Maximum input pulse	100kpps

* This function is not available with the FR-V5AM.

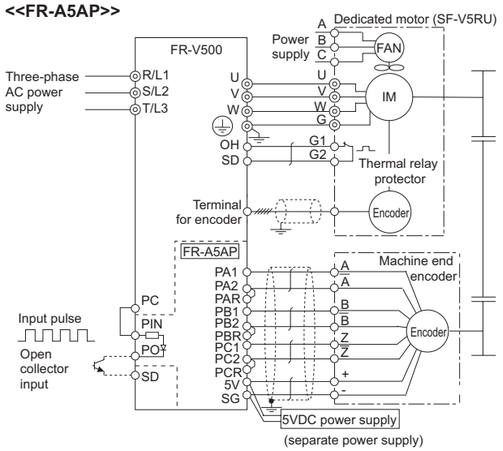
● Connection diagram

<<FR-V5AM>>



(Applicable machine end encoder)
- Differential line driver or complimentary
- 1000P/R to 4096P/R
- 5V power supply for encoder is provided. In the case of 12V/24V power supply type encoder, a separate power supply is necessary.

<<FR-A5AP>>



(Applicable machine end encoder)
- Differential line driver
- 1000P/R to 4096P/R
- Separate power supply of 5V is necessary.

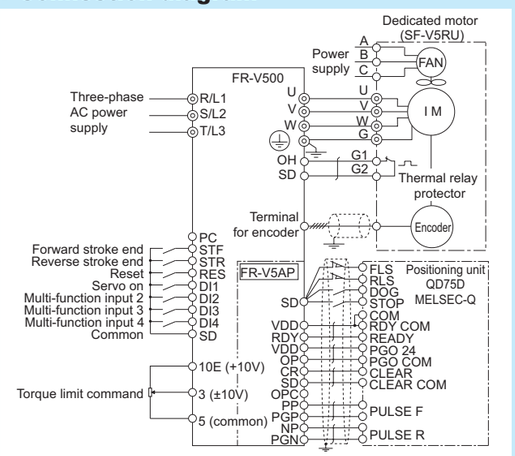
Position control FR-V5AP (V500)

Position control : Position control can be performed by pulse train input.

● Specifications

Function		Description
Position control	Pulse input type	Forward rotation pulse train + reverse rotation pulse train Pulse train + sign A phase pulse train + B phase pulse train
	Repeated positioning accuracy	±1.5° (motor shaft end)
	Power supply	24V power supply output for interface driver is provided
	Maximum input pulse frequency	Differential line receiver: 500kpps Open collector: 200kpps
	Electronic gear setting	1/50 to 20

● Connection diagram



16-bit digital input / 12-bit digital input

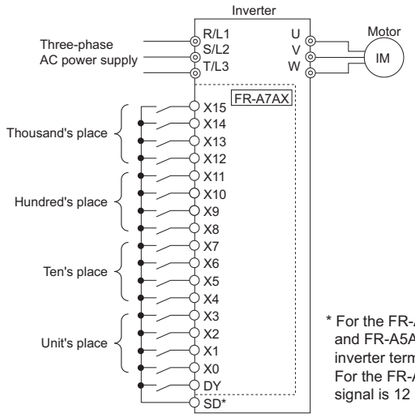
FR-A7AX (A700) (F700) FR-A7AX E kit (E700) FR-V5AH (V500)
FR-A5AX (V500)

Digital input : Frequency setting of the inverter can be performed using digital signal such as BCD or binary code from controller.

● Specifications

Function	Description	
Digital input	Digital input signal type	<<FR-A7AX, FR-V5AH>> BCD code 3 digits or 4 digits Binary 12 bit or binary 16 bit
		<<FR-A5AX>> BCD code 3 digits Binary 12 bits
	Input specifications	Contact signal or open collector input

● Connection diagram



* For the FR-A7AX (E kit) and FR-A5AX, use the inverter terminal SD. For the FR-A5AX, digital signal is 12 bits.

Analog output/digital output

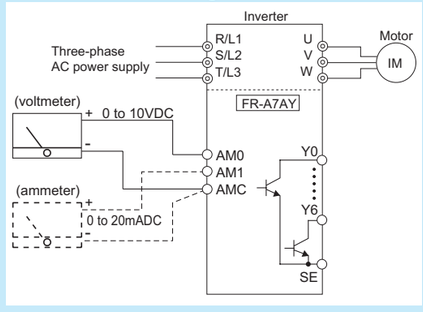
FR-A7AY (A700) (F700) FR-A7AY E kit (E700) FR-A5AY (V500)

Digital output : Output signal (RUN, SU, etc.) provided with the inverter as standard can be output from the open collector terminal.
Analog output : Analog signals such as the output frequency and output current can be output from the voltage output terminal (AM0) and current output terminal (AM1).

● Specifications

Function	Description	
Digital output	Open collector output specifications	Permissible load 24VDC 0.1A
	Circuit logic	Same as the inverter (sink when shipped from factory)
Analog output	Output signal	Voltage output (across terminals AM0-AMC): 0 to 10VDCMAX Current output (across terminals AM1-AMC): 0 to 20mADC
	Wiring length	Maximum 10m

● Connection diagram



Relay output

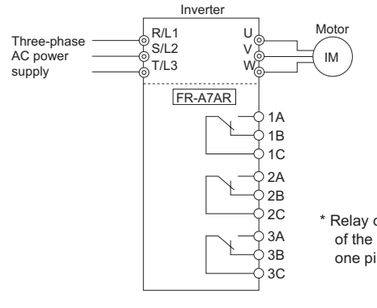
FR-A7AR (A700) (F700) FR-A7AR E kit (E700) FR-A5AR (V500)
FR-A5NR (V500)

Relay output : You can select any three (one for the FR-A5NR) output signals (RUN, SU, IPF, etc.) available with an inverter as standard, and output them as relay contact (1C) signals. (FR-A5NR has RS-485 communication function also)

● Specifications

Function	Description	
Relay output	Contact capacity	AC230V... 0.3A DC30V 0.3A

● Connection diagram



* Relay contact (1C) of the FR-A5NR is one pint only.

Analog output with sign/high resolution analog input/motor thermistor interface

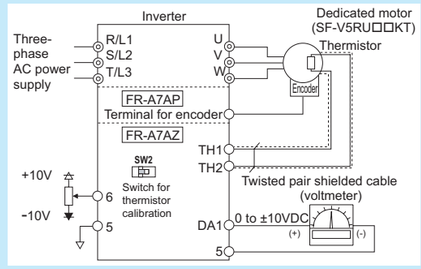
FR-A7AZ (A700)

Bipolar analog output : Outputting 0 to ±10VDC enables output frequency, output voltage, etc. to be monitored with a DC voltage meter.
High resolution analog input : Inputting 0 to ±10VDC voltage enables speed command, torque limit command, torque command, etc.
Motor thermistor interface : When using a dedicated motor with thermistor for vector control (SF-V5RU□□KT), feeding back the motor temperature detected by the motor side thermistor to the inverter can reduce fluctuation of torque generated due to temperature change.

● Specifications

Function	Description	
Bipolar analog output	Output signal	Voltage output (between terminal DA1 to 5): -10V to +10VDC
High resolution analog input	Resolution	-10 to +10V/16 bit
	Input resistance	10kΩ
	Maximum input voltage	±20VDC
Motor thermistor interface	Detectable motor temperature	-50°C to 200°C
	Torque accuracy	±3%

● Connection diagram



Extension contact input/high resolution analog input/motor themistor interface

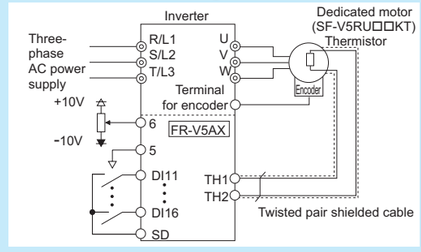
FR-V5AX (V500)

Extension contact input : Enter any 6 signals selected from among input signals (except for X10 signal) provided as standard. In addition, it is used to enter 6 bit data (binary) as external position command under position control.
High resolution analog input : Inputting 0 to ±10VDC voltage enables speed command, torque limit command, torque command, etc.
Motor thermistor interface : When using a dedicated motor with thermistor for vector control (SF-V5RU□□KT), feeding back the motor temperature detected by the motor side thermistor to the inverter can reduce fluctuation of torque generated due to temperature change.

● Specifications

Function	Description	
Extension contact input	Input specifications	Contact signal or open collector input
High resolution analog input	Resolution	-10 to +10V/16 bit
	Input resistance	14kΩ
	Maximum input voltage	±20VDC
Motor thermistor interface	Detectable motor temperature	-50°C to 200°C
	Torque accuracy	±3%

● Connection diagram



Extension open collector output/encoder pulse dividing output

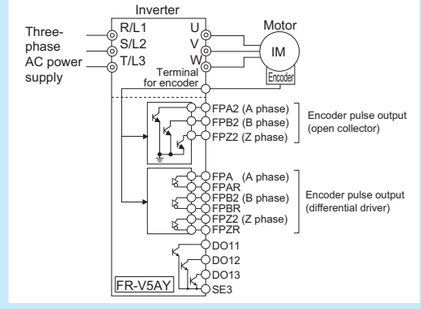
FR-V5AY (V500)

Extension open collector output : You can select any three output signals (RUN, SU, IPF etc.) available with an inverter as standard, and output them as open collector signals.
Encoder pulse dividing output : Pulse input of encoder connected to the inverter is divided and output from the option terminal.

● Specifications

Function	Description	
Extension open collector output	Permissible load	24VDC, max100mA
Encoder pulse dividing output	Output circuit method	Open collector and differential line driver.
	Permissible load	Open collector output: 24VDC, max 50mA Differential line driver output: 0.1A

● Connection diagram

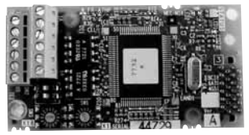


Trace card

T-TRC50 (V500)

Connecting a trace card to the inverter enables each data to be traced using setup software (FR-SW1-SETUP-WJ).

Plug-in option (for communication)



700 series plug-in option example : FR-A7NP

This option can be mounted in the 700 series inverter. For the communication option, only one option is connectable. The FR-E700 has "E kit" in the end of the name and sold as a package set with a dedicated front cover, etc.

FR-V500 series plug-in option example : FR-A5NC

This option can be mounted in the V500 series inverter. For the communication option, only one option is connectable.

FR-E540 plug-in option example : FR-E5NL

This option can be mounted in the E540 series inverter.

Dedicated product for FR-E520 : FR-E520-0.1KN

For the FR-E520 series, dedicated products are available.

RS-485 communication

FR-A5NR (V500)

When connected with a personal computer or PLC computer link unit by a communication cable, a user program can run and monitor the inverter or read and write to parameters.

● Specifications

Item		Description
Conforming standard		EIA-485 (RS-485)
Number of connectable devices		RS-422: 10 inverters maximum RS-485: 32 inverters maximum
Communication speed		Selectable from 19200/9600/4800/2400/1200/600/300bps
Control procedure		Asynchronous
Communication method		Half-duplex
Communication	Character system	ASCII (7 bits or 8 bits can be selected)
	Stop bit length	1 bit and 2 bits can be selected
	Terminator	CR/LF (presence/absence selectable)
	Parity check	Check (even, odd) or no check can be selected
	Sum check	Check
Waiting time setting		Set/or not set can be selected.

CC-Link communication

FR-A7NC (A700) (F700) FR-A7NC E kit (E700) FR-A5NC (V500)
FR-E5NC (E540) Dedicated inverter FR-E520-□□KN (E520)

High speed communication of 10Mbps maximum is realized. Because the system employs the bus connection method, even if a module system fails due to power off, it will not affect the communication with other normal modules.

● Specifications

Item	Description
Network topology	Bus
Station type	Remote device station
Number of connectable devices	42 units maximum (occupy 1 station/unit), can be shared with other models
Supported version	FR-A5NC, FR-E5NC, dedicated product FR-E520-□□KN: Ver.1.10 supported FR-A7NC: Ver. 2.00 supported
Communication speed	Selectable from among 156kbps/625kbps/2.5Mbps/5Mbps/10Mbps
Overall extension	1200m/600m/200m/150m/100m (corresponding to the above communication speed)
Connection cable	Twisted pair cable

LonWorks communication

FR-A7NL (A700) (F700) (FP700) FR-E5NL (E540)

Decentralized control without master assures that the whole system will not stop even if any of the station fails. In addition, communication traffic can be restricted.

● Specifications

Item	Description
Network topology	Bus, free topology
Number of nodes occupied	One inverter occupies one node.
Number of connectable devices	64 units maximum including inverters in the same segment
Communication speed	78kbps
Overall extension	Free topology: 500m maximum, bus topology: 2700m maximum
Connection cable	Twisted pair cable

DeviceNet communication

FR-A7ND (A700) (F700) FR-A5ND (V500)
FR-E5ND (E540) Dedicated inverter FR-E520-□□KND (E520)

DeviceNet employs CAN (Controller Area Network) and is widely used in the automotive industry.

● Specifications

Item	Description
Network topology	Bus (trunk line . branch line)
Number of connectable devices	64 inverters (including master)
Communication speed	Selectable from among 125kbps/250kbps/500kbps
Overall extension	500m/250m/100m (corresponding to the above communication speed)
Connection cable	DeviceNet standard thick cable or thin cable (5 wire twisted pair cable)

PROFIBUS-DP communication

FR-A7NP (A700) (F700) FR-A5NPA (V500)

Profibus-DP realizes high speed communication of 12Mbps maximum and is widely used in FA industry such as automotive, conveyance.

● Specifications

Item	Description
Network topology	Bus, tree, star
Number of connectable devices	126 inverters (including master and repeater)
Communication speed	9.6kbps, 19.2kbps, 93.75kbps/187.5kbps/500kbps, 1.5Mbps/3.0Mbps, 6.0Mbps,12.0Mbps
Overall extension	1200m/600m/200m/100m (corresponding to the above communication speed)
Connection cable	Profibus communication cable

Modbus Plus communication

FR-A5NM (V500)
*Supports FR-V500L only

Modbus Plus is configured in a simple protocol and used in a wide range of fields.

● Specifications

Item	Description
Network topology	Bus
Number of connectable devices	32 units (without repeater), 64 units (with repeater)
Communication speed	1Mbps
Overall extension	450m
Connection cable	Twisted pair cable

Ethernet communication

FR-V5NE (V500)
*Supports FR-V500 only

Parameter setting, monitoring, diagnosis, and mailing through LAN can be effectively performed with Web browser. Connect to the network using LAN cable.

SSCNET communication

FR-V5NS (V500)

By communication with the Mitsubishi motion controller, inverter operation (speed control and position control under vector control with encoder), monitoring, and parameter setting from the program on the motion controller are enabled. SSCNET realizes reduction in wiring length, reliability improvement, synchronous control performance improvement, and multi-axis batch control using a motion controlor.

● Specifications

Item	Description
Number of connectable devices	8 axis maximum (Q172CPU) 32 axis maximum (Q173CPU)
Calculation cycle at default setting of SV13 motion control	0.88ms/1 to 8 axis (Q172CPU) 0.88ms/1 to 8 axis, 1.77ms/9 to 16 axis, 3.55ms/17 to 32 axis (Q173CPU)
Overall extension	30m
Connection cable	SSCNET cable (refer to page 13) Q172J2BCBL□M (0.5m, 1m, 5m) : Q172CPU(N)⇔FR-V5NS FR-V5NSCBL□ (0.5m, 1m, 5m, 10m, 20m) : FR-V5NS⇔FR-V5NS

SSCNET III communication

FR-A7NS (A700)

By communication with the Mitsubishi motion controller, inverter operation (speed control, position control, torque control under vector control with encoder), monitoring, and parameter setting from the program on the motion controller are enabled. SSCNET III, which is optical network, realizes reduction in wiring length, reliability improvement, synchronous control performance improvement, and multi-axis batch control using a motion controller.
When using SSCNET III, the FR-A7AP plug-in option is required as control system of the inverter is vector control with encoder.

● Specifications

Item	Description
Number of connectable devices	8 axis maximum (Q172HCPU) 32 axis maximum (Q173HCPU)
Calculation cycle at default setting of SV13 motion control	0.44ms/1 to 3 axis, 0.88ms/4 to 8 axis (Q172HCPU) 0.44ms/1 to 3 axis, 0.88ms/4 to 10 axis, 1.77ms/11 to 20 axis, 3.55ms/21 to 32 axis (Q173HCPU)
Connection cable	SSCNET III cable (refer to page 14) MR-J3BUS□M (0.15m, 0.3m, 0.5m, 1m, 3m) : standard code for enclosure MR-J3BUS□M-A (5m, 10m, 20m) : standard cable for outside enclosure MR-J3BUS□M-B, 30m, 40m, 50m) : long-distance cable

Dedicated cable option

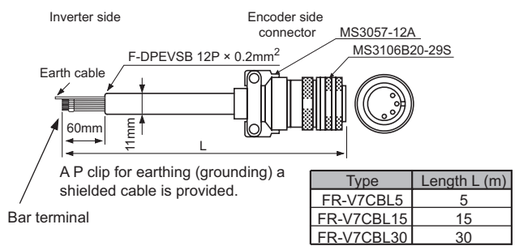
Cable for encoder

SF-V5RU⇔FR-A7AP FR-V7CBL□□ (A700)
SF-V5RU⇔FR-V500 FR-V5CBL□□ (V500)
SF-JR with encoder⇔FR-A7AP, FR-V500 FR-JCBL□□ * (A700) (V500)
* Crimping terminals need to be modified.

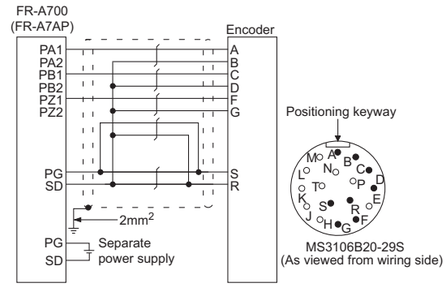
Dedicated cable for connecting encoder signal from the motor to the inverter.

● Outline dimension drawings, connection diagram

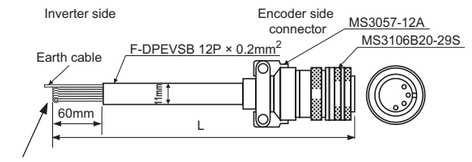
<<FR-V7CBL□□>> (SF-V5RU⇔FR-A7AP)



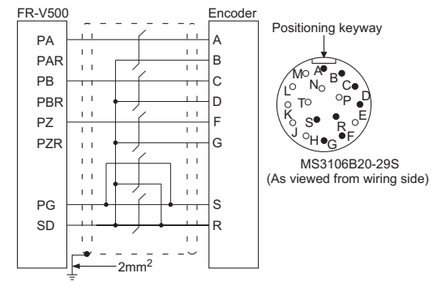
Type	Length L (m)
FR-V7CBL5	5
FR-V7CBL15	15
FR-V7CBL30	30



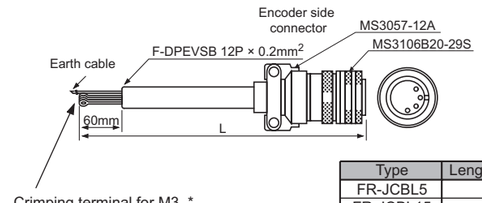
<<FR-V5CBL□□>> (SF-V5RU⇔FR-V500)



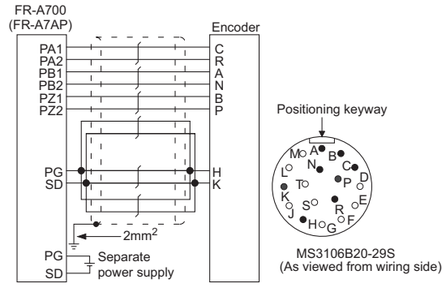
Type	Length L (m)
FR-V5CBL5	5
FR-V5CBL15	15
FR-V5CBL30	30



<<FR-JCBL□□>> (SF-JR with encoder⇔FR-A7AP, FR-V500)



Type	Length L (m)
FR-JCBL5	5
FR-JCBL15	15
FR-JCBL30	30



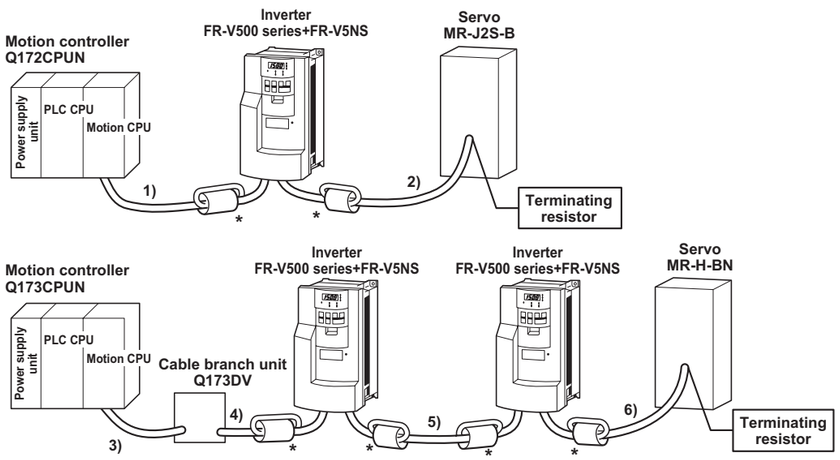
* Change to bar terminal when used with the FR-A7AP.
Change to crimping terminal for M3.5 when using the FR-V500.

SSCNET cable

FR-V5NSCBL□□ (V500)

A dedicated cable for connecting the FR-V500 series inverter with FR-V5NS plug-in option to SSCNET.

● Connection diagram, specifications



*** Use a ferrite core enclosed so that noises circulate through network cable without affecting SSCNET communication. A ferrite core should be wound at both input and output side of the communication cable for one time (2T, two turns).**

	No.	Type	Length (m)	Cable Type	Applications
Cable	1), 5)	FR-V5NSCBL□	0.5, 1, 5, 10, 20	UL20276 AWG#28 7 pair (ivory)	For connection of the Q172CPUN and FR-V5NS, for connection of the FR-V5NS and FR-V5NS
	2), 4)	Q172J2BCBL□M(-B)	0.5, 1, 5	UL20276 AWG#28 7 pair (cream)	For connection of the Q172CPUN/FR-V5NS and MR-J2-B/MR-J2S-B・MR-J2-03B5, for connection of the Q173DV and FR-V5NS
	6)	Q172H2BCBL□M(-B)			For connection of the Q172CPUN/FR-V5NS and MR-H-BN
	3)	Q173DVCBL□M	0.5, 1	UL20276 AWG#28 13 pair (cream)	For connection of the Q173CPUN and Q173DV

* □ of type indicates the cable length.

SSCNET III cable

MR-J3BUS□M(-A, B) (A700)

A dedicated cable for connecting the FR-A700 series inverter with FR-A7AP and FR-A7NS plug-in option to SSCNET III.

● Specifications

Type *1		MR-J3BUS□M		MR-J3BUS□M-A	MR-J3BUS□M-B
Applications		Standard code for enclosure		Standard cable for outside enclosure	Long distance cable
Flexing life		Standard		Standard	High flexion
Length (m)		0.15	0.3 to 3	5 to 20	30 to 50
Optical cable (code)	Minimum bending radius (mm) *2	25		Reinforced sheath portion of cable : 50 Code section : 25	Reinforced sheath portion of cable : 50 Code section : 30
	Tension strength	70N	140N	420N (Reinforced sheath portion of cable)	980N (Reinforced sheath portion of cable)
	Operating temperature range *3	-40 to 85°C			-20 to 70°C
	Atmosphere	Indoor (avoid direct sunlight) No medium nor oil should be attached			
	Appearance (mm)	2.2 ± 0.07	2.2 ± 0.07 4.4 ± 0.1	4.4 ± 0.1 2.2 ± 0.07 7.6 ± 0.1	4.4 ± 0.4 2.2 ± 0.2 7.6 ± 0.5

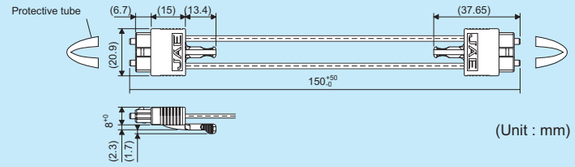
*1 □ of type indicates the cable length.

Symbol	015	03	05	1	3	5	10	20	30	40	50
Length (m)	0.15	0.3	0.5	1	3	5	10	20	30	40	50

*2 Make sure to lay the cable with greater radius than the minimum bend radius. Do not press the cable to edges of equipment or others.
*3 This operating temperature range is the value for optical cable (code) only. The temperature conditions of the connector section is the same as the inverter.

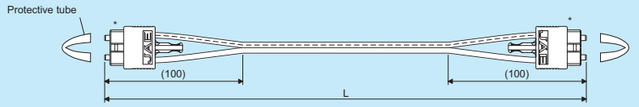
● Outline dimension drawings

<<MR-J3BUS015M>>



(Unit : mm)

<<MR-J3BUS03M to MR-J3BUS3M>>

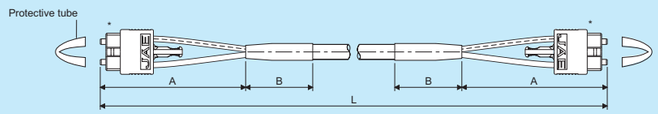


(Unit : mm)

* The size of the connector section is the same as the MR-J3BUS015M.

Cable Type	MR-J3BUS03M	MR-J3BUS05M	MR-J3BUS1M	MR-J3BUS3M
Length L (m)	0.3	0.5	1	3

<<MR-J3BUS5M-A to MR-J3BUS20M-A, MR-J3BUS30M-B to MR-J3BUS50M-B>>



* The size of the connector section is the same as the MR-J3BUS015M.

Cable Type	MR-J3BUS5M-A	MR-J3BUS10M-A	MR-J3BUS20M-A	MR-J3BUS30M-B	MR-J3BUS40M-B	MR-J3BUS40M-B
Length A (mm)	100			150		
Length B (mm)	30			50		
Length L (m)	5	10	20	30	40	50

Options for operation

Parameter unit

FR-PU07 A700 F700 E700 FP700
FR-PU04 A700 F700 E700 E500 S500 F500J FP700 FP500J
FR-PU04V V500

Interactive parameter unit with LCD display.

● Features

<<FR-PU07/FR-PU04>>
- Remove an operation panel to connect a parameter unit.
- Setting such as direct input method with a numeric keypad, operation status indication, and help function are usable.
- Eight languages can be displayed.
- The FR-PU07 can store parameter settings of up to three inverters and the FR-PU04 can store one inverter.

<<FR-PU04V>>
- A parameter unit dedicated for the FR-V500 with the above features.
- The FR-PU04V can store parameter settings of one inverter.


FR-PU07


FR-PU04V

Parameter unit with battery pack (available soon)

FR-PU07BB A700 F700 E700

This parameter unit enables parameter setting without connecting the inverter to power supply. Use four AA batteries as power source. It can be driven* with 100VAC. (*AC adaptor is separately available.) The parameter unit connection cable FR-CB20□ is required for connecting to the inverter.

● Specifications

Item	Description
Power supply	· When driven by batteries: AA batteries four (nickel hydride(NiMH)/alkali) · When driven by external power supply (100VAC): AC adaptor (separately available) · When power is applied to the inverter: Power is supplied from the PU connector of the inverter.
Driving time by battery (continuous operating time reference value)	· When using the FR-A700/F700 series Nickel hydride (NiMH) battery: Approx. 120 minutes Alkali battery: Approx. 90 minutes · When using the FR-E700 series Nickel hydride(NiMH) battery: Approx. 300 minutes Alkali battery: Approx. 150 minutes
Switch · connector	Battery ON/OFF switch Modular connector for inverter connection and connector for AC adaptor connection
Display functions	Alarm LED for battery exhaustion, Other display is the same as the FR-PU07.
Provided appliances	AA alkali battery (for operation check) four


FR-PU07BB

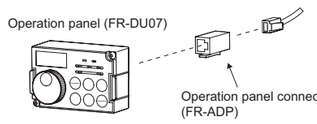
Operation panel connection connector
Operation panel rear cover · adaptor set

FR-ADP A700 F700 FP700
FR-E5P E500

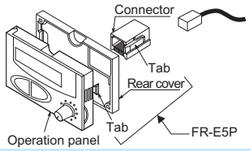
FR-ADP is a connector used when installing the operation panel removed from the inverter, such as FR-A700, FR-F700 series inverter and FR-FP700 series energy saving drive, to the enclosure surface, etc.
FR-E5P is an operation panel rear cover and connector used when installing the operation panel removed from the FR-E500 series inverter to the enclosure surface, etc.

● Appearance diagram

<<FR-ADP>>



<<FR-E5P>>



Parameter unit connection cable

FR-CB20□ ALL

This cable is for connection of operation panel or parameter unit.

● Specifications

Type	Length
FR-CB201	1m
FR-CB203	3m
FR-CB205	5m

Software

FR Configurator

FR-SW3-SETUP-WE *1 E700
FR-SW2-SETUP-WE *2 A700 F700
FR-SW1-SETUP-WE V500 E500 S500 F500J

*1 The CD-ROM of the FR-SW3-SETUP-WE contains the FR-SW2, SW1-SETUP-WE software. (available soon)
*2 The CD-ROM of the FR-SW2-SETUP-WE contains the FR-SW1-SETUP-WE software.

FR Configurator is software offers an easy operating environment.
It can be utilized effectively from inverter setting up to maintenance. Parameter setting, monitoring, etc. can be performed on a display of Windows * personal computer.
It is connected to the inverter through RS-485 communication. The FR-A700 and E700 series can be easily connected to the personal computer with USB cable.
* Windows is a registered trademark of Microsoft Corporation.

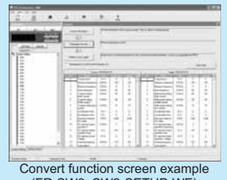
● Specifications

Type	FR-SW1-SETUP-WE	FR-SW2-SETUP-WE	FR-SW3-SETUP-WE
Supported inverters	FR-A500 (L) FR-F500 (L) FR-V500 (L) FR-E500 *1 FR-S500 *2 FR-F500J FR-C500 FR-F700 *3	FR-A700 FR-F700	FR-E700
Supported OS	Windows 95, 98, ME	Windows 98, ME, 2000 Professional, XP Home Edition, XP Professional	Windows 2000 Professional SP4 or later, XP Home Edition SP2 or later, XP Professional SP2 or later.

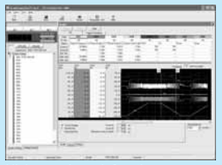
*1 Except for FR-E520-□□K-KN, KND.
*2 Except for model without communication function. For the FR-S500E, only the FR-S520E is supported.
*3 Up to 55K of the 200V class and up to 160K of the 400V class are supported.

● Function

- Parameter read, write
- Inverter operating status monitor
- Test operation
- High speed graph function with minimum of 1ms sampling (only when using the FR-SW3-SETUP-WE connected with the USB cable)
- Easy setup function (FR-SW3-SETUP-WE only)
- Convert function which automatically converts parameters of the conventional series inverters to the 700 series inverters. (FR-SW3, SW2-SETUP-WE)
- I/O terminal function assignment function (FR-SW2-SETUP-WE only)
- Life check function (FR-SW2-SETUP-WE only)


Convert function screen example (FR-SW3, SW2-SETUP-WE)


Set wizard function screen example (FR-SW3-SETUP-WE)


High speed graph function screen example (FR-SW3-SETUP-WE)

RS232C⇔485 converter

FA-T-RS40 (introduced product) A700 F700 E700 V500 E500 S500 F500J

RS232C⇔485 converter is used for communication with the inverter using the RS232C port of the personal computer. Cables for inverter side and personal computer side are enclosed.
Introduced product : FA-T-RS40V series Maker : Mitsubishi Electric Engineering Co., Ltd.

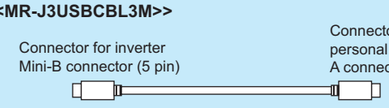
USB cable

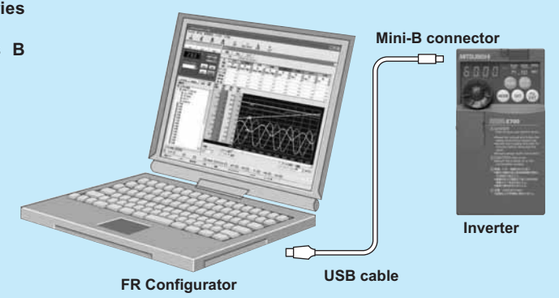
MR-J3USBCBL3M E700

USB cable for communication with the FR-E700 series inverter using the USB port of the PC.
(Since an USB connector for the FR-A700 series is B connector, this cable can not be used.)

● Appearance diagram

<<MR-J3USBCBL3M>>





Reactor

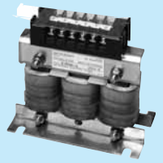
AC reactor

FR-HAL ALL

An AC reactor connected on the input side of the inverter improves power factor and reduces harmonic currents on the input side.

● Specifications

Type FR-HAL-□□	200V	400V
	0.4K to 110K *1	H0.4K to H560K *1
Power factor improvement effect *2	Power factor 88% or more (at 100% load)	
Vibration	5.9m/s^2 or less	H110K or less : 5.9m/s^2 or less H185K or more : 2.9m/s^2 or less
Installation procedure	(H)55K or less : horizontal plane installation or vertical plane installation (H)75K or more : horizontal plane installation	

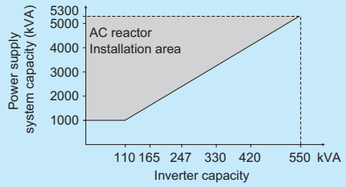


FR-HAL

*1 Refer to the type in the table of outline dimension drawing for details of capacity.
*2 Power factor stated above is the value when considering the power supply impedance is 1%. The value changes according to the power supply capacity and power supply impedance.
The load is considered as 100% when the fundamental current value specified in JEM-TR201 is 100%. The power factor improving effect is slightly lower when the motor below 0.4kW is used.

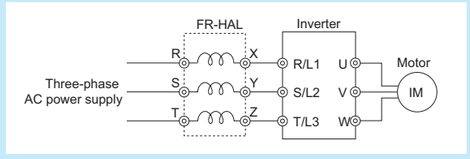
● Selection

- Make selection according to the applicable motor capacity. (When the inverter capacity is larger than the motor capacity, make selection according to the motor capacity.)
- When the inverter is connected under a large-capacity power transformer (1000kVA or more transformer) or when a power capacitor is to be switched over, an excessive peak current may flow in the power input circuit, damaging the inverter. Be sure to install an AC reactor in such a case.

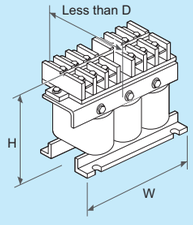


<Selection of reactor when using the large-capacity power transformer>

● Connection diagram



● Outline dimension drawings



* The appearance of a one of typical model. The shape differs according to each model.

(Unit : mm)

	Type	W	H	D	Mass (kg)
200V	0.4K	104	99	72	0.6
	0.75K	104	99	74	0.8
	1.5K	104	99	77	1.1
	2.2K	115	115	77	1.5
	3.7K	115	115	83	2.2
	5.5K	115	115	83	2.3
	7.5K	130	135	100	4.2
	11K	160	164	111	5.2
	15K	160	167	126	7.0
	18.5K	160	128	175	7.1
	22K	185	150	158	9.0
	30K	185	150	168	9.7
	37K	210	175	174	12.9
	45K	210	175	191	16.4
	55K	210	175	201	17.4
	75K	240	210	213	23
	110K	330	325	258	40

	Type	W	H	D	Mass (kg)
400V	H0.4K	135	115	59.6	1.5
	H0.75K	135	115	59.6	1.5
	H1.5K	135	115	59.6	1.5
	H2.2K	135	115	59.6	1.5
	H3.7K	135	115	70.6	2.5
	H5.5K	160	142	72	3.5
	H7.5K	160	142	91	5.0
	H11K	160	146	91	6.0
	H15K	220	195	105	9.0
	H18.5K	220	215	170	9.0
	H22K	220	215	170	9.5
	H30K	220	215	170	11
	H37K	220	214	170	12.5
	H45K	280	245	165	15
	H55K	280	245	170	18
	H75K	205	170	208	20
	H110K	240	225	220	28
	H185K	330	325	270	55
	H280K	330	325	320	80
	H355K	330	325	340	80
	H560K	450	540	635	190

DC reactor

FR-HEL ALL

A DC reactor connected on the DC side of the inverter improves power factor and reduces harmonic currents on the input side.

● Specifications

Type FR-HEL-□□	200V	400V
	0.4K to 55K *1	H0.4K to H55K *1
Power factor improvement effect *2	Power factor 93% or more (at 100% load)	
Vibration	5.9m/s^2 or less	
Installation procedure	Horizontal plane installation or vertical plane installation	

FR-HEL

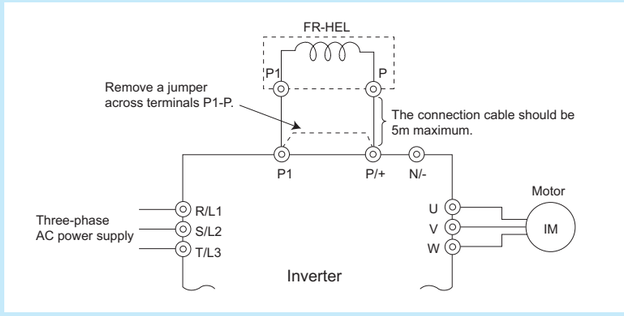
*1 Refer to the type in the table of outline dimension drawing for details of capacity.
*2 Power factor stated above is the value when considering the power supply impedance is 1%.
The value changes according to the power supply capacity and power supply impedance. The load is considered as 100% when the fundamental current value specified in JEM-TR201 is 100%.
The power factor improving effect is slightly lower when the motor below 0.4kW is used.
*3 A DC reactor is enclosed with the inverter of 75K or more, be sure to connect the reactor to the inverter.

● Selection

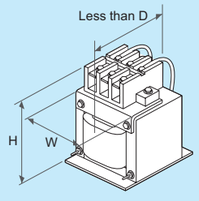
- Make selection according to the applicable motor capacity. (When the inverter capacity is larger than the motor capacity, make selection according to the motor capacity.)

● Connection diagram

- Connect the reactor to terminal P1 and P of the inverter. Make sure to remove a jumper across terminal P1-P before connecting. (A failure to do so will produce no power factor improving effect.)
- The wiring length between the reactor and inverter should be 5m maximum and minimized.



● Outline dimension drawings



* The appearance of a one of typical model. The shape differs according to each model.

(Unit : mm)

	Type	W	H	D	Mass (kg)
200V	0.4K	70	71	61	0.4
	0.75K	85	81	61	0.5
	1.5K	85	81	70	0.8
	2.2K	85	81	70	0.9
	3.7K	77	92	82	1.5
	5.5K	77	92	92	1.9
	7.5K	86	113	98	2.5
	11K	105	133	112	3.3
	15K	105	133	115	4.1
	18.5K	105	93	165	4.7
	22K	105	93	175	5.6
	30K	114	100	200	7.8
	37K	133	117	195	10
	45K	133	117	205	11
	55K	153	132	209	12.6

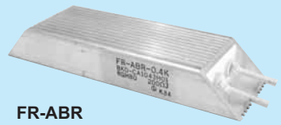
	Type	W	H	D	Mass (kg)
400V	H0.4K	90	78	60	0.6
	H0.75K	66	100	70	0.8
	H1.5K	66	100	80	1
	H2.2K	76	110	80	1.3
	H3.7K	86	120	95	2.3
	H5.5K	96	128	100	3
	H7.5K	96	128	105	3.5
	H11K	105	137	110	4.5
	H15K	105	152	125	5
	H18.5K	114	162	120	5
	H22K	133	178	120	6
	H30K	133	178	120	6.5
	H37K	133	187	155	8.5
	H45K	133	187	170	10
	H55K	152	206	170	11.5

Braking unit

Brake resistor
High-duty brake resistor

MRS, MYS (E700) (E500) (S500)
FR-ABR (A700) (E700) (V500) (E500) (S500)
*Only models with a built-in brake transistor can be used.

Larger value of the regenerative brake duty can be set by connecting this high-duty brake resistor to the inverter.



FR-ABR

● Specifications

Type MRS Type, MYS Type	200V				
	MRS120W	MRS120W	MRS120W	MRS120	MYS220W50
Applicable inverter capacity (kW)	0.4	0.75	1.5, 2.2	2.2, 3.7	3.7
Permissible duty *1	3%ED				6%ED
Resistance value (Ω)	200	100	60	40	50 (×1/2)

Type FR-ABR-□□	200V								
	0.4K	0.75K	2.2K	3.7K	5.5K	7.5K	11K	15K *2	22K *2
Applicable inverter capacity (kW)	0.4	0.75	1.5, 2.2	3.7	5.5	7.5	11	15	18.5, 22
Braking torque	150% 5s		100% 5s						
Permissible duty *1	10%ED						6%ED		
Resistance value (Ω)	200	100	60	40	25	20	13	18 (×1/2)	13 (×1/2)
Approximate mass (kg)	0.2	0.4	0.5	0.8	1.3	2.2	3.5	2.4 (×2)	3.3 (×2)

Type FR-ABR-□□	400V									
	H0.4K	H0.75K	H1.5K	H2.2K	H3.7K	H5.5K	H7.5K	H11K	H15K *3	H22K *2
Applicable inverter capacity (kW)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5, 22
Braking torque	100% 5s									
Permissible duty *1	10%ED							6%ED		
Resistance value (Ω)	1200	700	350	250	150	110	75	52	18 (×2)	52 (×1/2)
Approximate mass (kg)	0.2	0.2	0.4	0.5	0.8	1.3	2.2	3.2	2.4 (×2)	3.3 (×2)

*1 The permissible duty indicates braking capability including the motor loss, and thereby the actual duty of the resistor is slightly smaller.
*2 Use two units in parallel.
*3 Use two units in series. FR-ABR-15K is indicated on the resistor. (same resistor as the 200V class 15K)

● Selection

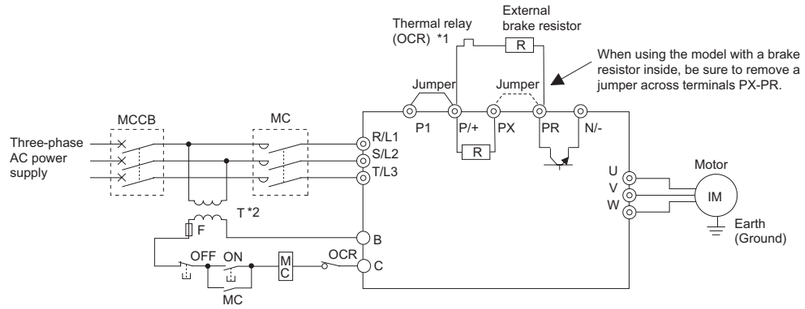
・Make selection according to the applicable motor capacity of the above specifications.
・The model with built-in brake resistor and external brake resistor

Inverter, Energy Saving Drive		Built-in Brake Resistor	External Brake Resistor (built-in brake transistor)
FR-A700	0.4K to 7.5K	○	○
	11K to 22K	×	○
	30K or more	×	×
FR-F700	All capacities	×	×
FR-E700	0.1K, 0.2K	×	×
	0.4K or more	×	○
FR-V500 (L)	1.5K to 5.5K	○	○
	7.5K to 15K	×	○
	22K or more	×	×
FR-E500	0.1K, 0.2K	×	×
	0.4K or more	×	○
FR-S500 EVOLUTION	200V class 4K to 3.7K *1	×	○ *1
	Other than the above	×	×
FR-F500J	All capacities	×	×
FR-FP700	All capacities	×	×
FR-FP500J	All capacities	×	×

*1 It can be used with the FR-S520E-0.4K to 3.7K. However, it can not be used with the FR-S520-0.4K to 3.7K without E in the inverter type name.

● Connection diagram

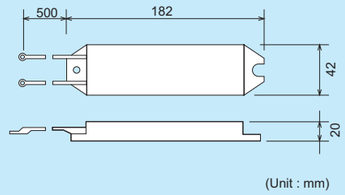
・Connect across terminals P-PR of the inverter.
・When using the model with a brake resistor inside, be sure to remove a jumper across terminals PX-PR. (Note that a jumper across terminals P1-P should not be removed by mistake.)
・The temperature of the MRS type and MYS type brake resistor becomes 200°C or more and the FR-ABR becomes 300°C or more, care must be taken for installation and heat dissipation.
・The following sequence is recommended to prevent overheat and burnout of the brake resistor in case the brake transistor is damaged.



*1 Always install a thermal relay when using the FR-ABR-11K, 15K, 22K, H11K, H15K, and H22K.
*2 When the power supply is 400V class, install a step-down transformer.

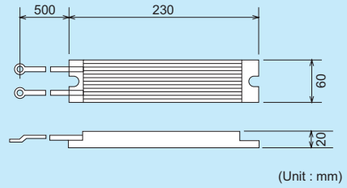
● Outline dimension drawings

<<MRS type>>



(Unit : mm)

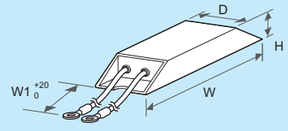
<<MYS type>> *



(Unit : mm)

* Outline dimension drawing of one resistor.

<<FR-ABR>>



(Unit : mm)

	Brake Resistor Type	Outline Dimension W	W1	H	D		Brake Resistor Type	Outline Dimension W	W1	H	D
200V	FR-ABR-0.4K	140	500	21	40	400V	FR-ABR-H0.4K	115	500	21	40
	FR-ABR-0.75K	215	500	21	40		FR-ABR-H0.75K	140	500	21	40
	FR-ABR-2.2K	240	500	26	50		FR-ABR-H1.5K	215	500	21	40
							FR-ABR-H2.2K	240	500	26	50
	FR-ABR-3.7K	215	500	33	61		FR-ABR-H3.7K	215	500	33	61
	FR-ABR-5.5K	335	500	33	61		FR-ABR-H5.5K	335	500	33	61
	FR-ABR-7.5K	400	500	40	80		FR-ABR-H7.5K	400	500	40	80
	FR-ABR-11K	400	700	50	100		FR-ABR-H11K	400	700	50	100
	FR-ABR-15K *	300	700	50	100		FR-ABR-H15K *	300	700	50	100
	FR-ABR-22K *	400	700	50	100		FR-ABR-H22K *	450	700	50	100

* Outline dimension drawing of one resistor.

Brake unit
Discharging resistor or resistor unit

FR-BU2 (ALL)

GRZG (ALL) FR-BR (A700) (F700) (E700) (V500) (E500) (FP700) (FP500J)

MT-BR5 (A700) (F700) (V500)

Option for larger braking capability than the external brake resistor. This option can be connected to the inverter with or without a built-in brake transistor. Select from three discharging resistors according to the required braking torque.

● Specifications

<<Brake unit>>

Type FR-BU2-☐	200V						400V				
	1.5K	3.7K	7.5K	15K	30K	55K	H7.5K	H15K	H30K	H55K	H75K
Applicable motor capacity	Capacity of the motor to be used with differs according to the braking torque and duty (%ED)										
Connected brake resistor	GRZG type, FR-BR, MT-BR5 (Refer to the table below for combination.)										
Multiple (parallel) operation	Up to 10 units (Note that torque generated is not more than the tolerable overcurrent amount of connected inverter.)										
Approximate mass (kg)	0.9	0.9	0.9	0.9	1.4	2.0	0.9	0.9	1.4	2.0	2.0

FR-BU2

<<Resistor unit>>

Type GRZG type	200V				400V		
	GZG300W-50Ω	GRZG200-10Ω	GRZG300-5Ω	GRZG400-2Ω	GRZG200-10Ω	GRZG300-5Ω	GRZG400-2Ω
Number of resistors	One	Three in series	Four in series	Six in series	Six in series	Eight in series	Twelve in series
Resistance value (Ω)	50	30	20	12	60	40	24
Continuous permissible power (W)	100	300	600	1200	600	1200	2400

Type FR-BR-☐	200V			400V		
	15K	30K	55K	H15K	H30K	H55K
Resistance value (Ω)	8	4	2	32	16	8
Continuous permissible power (W)	990	1990	3910	990	1990	3910
Approximate mass (kg)	15	30	70	15	30	70

Type MT-BR5-☐	200V	400V
	55K	H75K
Resistance value (Ω)	2	6.5
Continuous permissible power (W)	5500	7500
Approximate mass (kg)	50	70

● Table of combination of the brake unit and resistor unit

Brake Unit Type		Discharging Resistor or Resistor Unit Type		
		GRZG type	FR-BR	MT-BR5
200V class	FR-BU2-1.5K	GZG 300W-50Ω (1)	—	—
	FR-BU2-3.7K	GRZG 200-10Ω (3 in series)	—	—
	FR-BU2-7.5K	GRZG 300-5Ω (4 in series)	—	—
	FR-BU2-15K	GRZG 400-2Ω (6 in series)	FR-BR-15K	—
	FR-BU2-30K	—	FR-BR-30K	—
	FR-BU2-55K	—	FR-BR-55K	MT-BR5-55K
400V class	FR-BU2-H7.5K	GRZG 200-10Ω (6 in series)	—	—
	FR-BU2-H15K	GRZG 300-5Ω (8 in series)	FR-BR-H15K	—
	FR-BU2-H30K	GRZG 400-2Ω (12 in series)	FR-BR-H30K	—
	FR-BU2-H55K	—	FR-BR-H55K	—
	FR-BU2-H75K	—	—	MT-BR5-H75K

● Selection

<<When GRZG type is connected>>

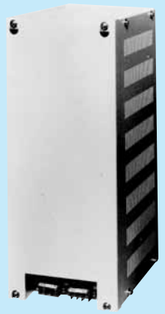
Power Supply Voltage	Motor(kW) / Braking Torque	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
200V class	50% 30s	FR-BU2-1.5K			FR-BU2-3.7K		FR-BU2-7.5K		FR-BU2-15K		2×FR-BU2-15K *1			3×FR-BU2-15K *1		4×FR-BU2-15K *1
	100% 30s	FR-BU2-1.5K		FR-BU2-3.7K	FR-BU2-7.5K		FR-BU2-15K		2×FR-BU2-15K *1		3×FR-BU2-15K *1		4×FR-BU2-15K *1	5×FR-BU2-15K *1	6×FR-BU2-15K *1	7×FR-BU2-15K *1
400V class	50% 30s	—*2			FR-BU2-H7.5K				FR-BU2-H15K		FR-BU2-H30K			2×FR-BU2-H30K *1		
	100% 30s	—*2			FR-BU2-H7.5K		FR-BU2-H15K		FR-BU2-H30K		2×FR-BU2-H30K *1			3×FR-BU2-H30K *1		4×FR-BU2-H30K *1

*1 The number before the model name explains the number of connectable units in parallel.
*2 The inverter of 1.5K or less with 400V class can not be used in combination with a brake unit. To use in combination with a brake unit, use the inverter of 2.2K or more.

<<When the FR-BR is connected>>

%ED at short-time rating when braking torque is 100%

Motor Capacity			5.5kW	7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW
200V	FR-BU2-15K	%ED	80	40	15	10	—	—	—	—	—	—
	FR-BU2-30K		—	—	65	30	25	15	10	—	—	—
	FR-BU2-55K		—	—	—	—	90	60	30	20	15	10
400V	FR-BU2-H15K	%ED	80	40	15	10	—	—	—	—	—	—
	FR-BU2-H30K		—	—	65	30	25	15	10	—	—	—
	FR-BU2-H55K		—	—	—	—	90	60	30	20	15	10

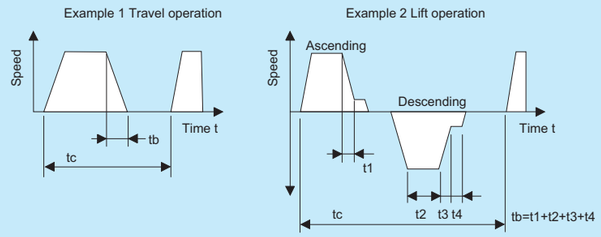


FR-BR

Braking torque (%) at 10%ED in 15s

Motor Capacity			5.5kW	7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW
200V	FR-BU2-15K	Braking torque (%)	280	200	120	100	80	70	—	—	—	—
	FR-BU2-30K		—	—	260	180	160	130	100	80	70	—
	FR-BU2-55K		—	—	—	—	300	250	180	150	120	100
400V	FR-BU2-H15K	Braking torque (%)	280	200	120	100	80	70	—	—	—	—
	FR-BU2-H30K		—	—	260	180	160	130	100	80	70	—
	FR-BU2-H55K		—	—	—	—	300	250	180	150	120	100

Regeneration load time factor (operating duty) $\%ED = \frac{tb}{tc} \times 100$ tb<15s (continuous operating time)



<<When the MT-BR5 is connected>>

%ED at short-time rating when braking torque is 100%

Motor Capacity			75kW	90kW	110kW	132kW	160kW	185kW	220kW	280kW	375kW
200V class	FR-BU2-55K	%ED	5	—	—	—	—	—	—	—	—
	2×FR-BU2-55K *1		20	15	10	—	—	—	—	—	—
400V class	FR-BU2-H75K		10	5	—	—	—	—	—	—	—
	2×FR-BU2-H75K *1		40	25	20	10	5	5	—	—	—
	3×FR-BU2-H75K *1		80	60	40	25	15	10	10	5	—
	4×FR-BU2-H75K *1		—	80	65	40	30	20	15	10	5
	5×FR-BU2-H75K *1		—	—	—	80	50	40	20	15	10

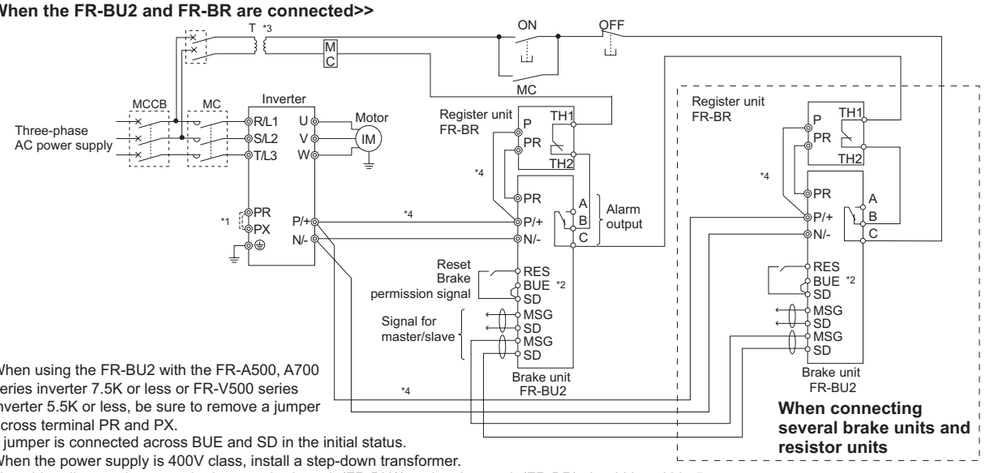
Braking torque (%) at 10%ED in 15s

Motor Capacity			75kW	90kW	110kW	132kW	160kW	185kW	220kW	280kW	375kW
200V class	FR-BU2-55K	Braking torque (%)	70	60	50	—	—	—	—	—	—
	2×FR-BU2-55K *1		150	120	100	—	—	—	—	—	—
400V class	FR-BU2-H75K		100	80	70	55	45	40	35	25	20
	2×FR-BU2-H75K *1		150	150	135	110	90	80	70	50	40
	3×FR-BU2-H75K *1		150	150	150	150	135	115	100	80	55
	4×FR-BU2-H75K *1		150	150	150	150	150	150	125	100	70
	5×FR-BU2-H75K *1		150	150	150	150	150	150	150	130	100

*1 The number before the model name explains the number of connectable units in parallel.
*2 To obtain a large braking torque, the motor has to have a torque characteristic that meets the braking torque. Check the torque characteristic of the motor.

● Connection diagram

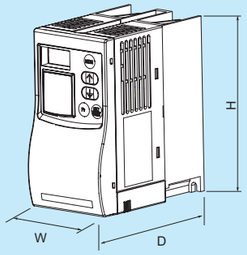
<<When the FR-BU2 and FR-BR are connected>>



*1 When using the FR-BU2 with the FR-A500, A700 series inverter 7.5K or less or FR-V500 series inverter 5.5K or less, be sure to remove a jumper across terminal PR and PX.
*2 A jumper is connected across BUE and SD in the initial status.
*3 When the power supply is 400V class, install a step-down transformer.
*4 The wiring distance between the inverter, brake unit (FR-BU2) and resistor unit (FR-BR) should be within 5m. If twisted wires are used, the distance should be within 10m. When connecting several FR-BU2 to one inverter, connect P/+ of each FR-BU2 and of the inverter and N/- respectively. Do not pass wires from terminal P/+ and N/- of the FR-BU2 to terminals of other FR-BU2.

● Outline dimension drawings

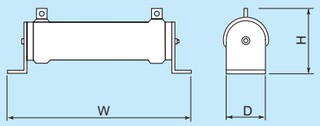
<<FR-BU2>>



(Unit : mm)

Type	W	H	D
FR-BU2-1.5K to 15K	68	128	132.5
FR-BU2-30K	108	128	129.5
FR-BU2-55K	170	128	142.5
FR-BU2-H7.5K, H15K	68	128	132.5
FR-BU2-H30K	108	128	129.5
FR-BU2-H55K, H75K	170	128	142.5

<<GRZG type>>

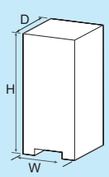


(Unit : mm)

Type	W	H	D
GZG300W	335	78	40
GRZG200	306	55	26
GRZG300	334	79	40
GRZG400	411	79	40

* The maximum temperature rise of the discharging resistors is approximately 100°C. Use heat-resistant wires to perform wiring and make sure that they will not make contact with resistors.

<<FR-BR>>



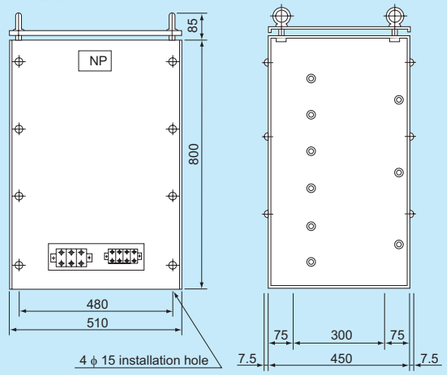
(Unit : mm)

Resistor Unit			
Type	W	H	D
FR-BR-15K	170	450	220
FR-BR-30K	340	600	220
FR-BR-55K	480	700	450
FR-BR-H15K	170	450	220
FR-BR-H30K	340	600	220
FR-BR-H55K	480	700	450

* The temperature rise of the resistor unit is about a maximum of 100°C. Therefore, use heat-resistant wires (such as glass wires).

<<MT-BR5>>

(Unit : mm)



*1 Be sure to select the well-ventilated place for installation of the resistor unit. Ventilation is necessary when installing the resistor in a place, e.g. enclosure, where heat is not well diffused.
*2 The temperature rise of the resistor unit is about a maximum of 150°C. Therefore, wire the cable so as not to touch the resistor. Also, separate a component, which is low in heat-resistant property, at least 40 to 50cm from the resistors.
*3 The temperature of the resistor unit abnormally increases if the brake unit is operated exceeding the specified duty. Since the resistor unit may result in overheat if the temperature of the brake unit is left unchanged, switch off the inverter.

Power regeneration converter

FR-RC ALL MT-RC A700 F700

Energy generated at braking operation of the inverter can be regenerated to the power supply. Since a converter does not require a discharging resistor necessary in the case of a brake unit, it is effective in space and energy saving and it provides a large peak braking torque.

FR-RC

● Specifications

<<FR-RC>>

Type FR-RC-☐	200V			400V		
	15K	30K	55K	H15K	H30K	H55K
Rated current (A) *1	31	63	91	16	31	58
Rated input AC power supply	Three phase 200V 50Hz/ three phase 200 to 230V 60Hz			Three-phase 400V 50Hz/ three phase 400 to 460V 60Hz		
Permissible AC voltage fluctuation	Three-phase 180 to 220V 50Hz/ three phase 180 to 253V 60Hz			Three-phase 360 to 400V 50Hz/ three phase 360 to 506V 60Hz		
Approximate mass (kg)	19	31	55	31	33	56

*1 The rated current indicates the current flows in the main circuit DC bus (terminal P/+, N/-).

<<MT-RC>>

Type MT-RC-☐	400V			
	H75K	H160K	H220K	H280K
Rated current (A) *1	102	218	300	382
Rated input AC power supply	Three-phase 380 to 460V 50/60Hz			
Permissible AC voltage fluctuation	Three-phase 323 to 506V 50/60Hz			
Approximate mass (kg)	65	115	155	235
AC reactor type MT-RCL-☐ (standard accessory)	H75K	H160K	H220K	H280K
Approximate mass (kg)	130	240	410	580

*1 The rated current indicates the current flows in the main circuit DC bus (terminal P/+, N/-).

● Selection

<<FR-RC>>

1) Select the power supply regeneration unit according to the motor capacity.
2) Even when only the inverter one or more larger capacity is selected, braking torque and %ED are the values in the table below.

150% braking torque %ED at 30s short time rating

Motor Capacity			7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW
Inverter		200V	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K
		400V	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K
200V	FR-RC-15K	%ED	45	45	25	—	—	—	—	—	—
	FR-RC-30K		—	—	45	30	25	25	—	—	—
	FR-RC-55K		—	—	—	—	—	45	35	25	25
400V	FR-RC-H15K	%ED	45	45	25	—	—	—	—	—	—
	FR-RC-H30K		—	—	45	45	45	25	—	—	—
	FR-RC-H55K		—	—	—	—	—	45	45	45	25

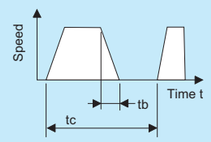
50%ED Braking torque (%) at short time rating

Motor Capacity			7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW
Inverter		200V	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K
		400V	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K
200V	FR-RC-15K	Braking torque (%)	140	140	100	80	70	—	—	—	—
	FR-RC-30K		—	—	140	110	100	100	80	70	—
	FR-RC-55K		—	—	—	—	—	140	120	100	100
400V	FR-RC-H15K	Braking torque (%)	140	140	100	80	70	—	—	—	—
	FR-RC-H30K		—	—	140	140	140	100	80	70	—
	FR-RC-H55K		—	—	—	—	—	140	140	140	100

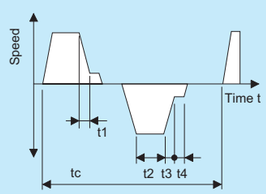
Braking torque (%) at continuous rating

Motor Capacity			7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW
Inverter		200V	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K
		400V	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K
200V	FR-RC-15K	Braking torque (%)	100	100	75	55	50	—	—	—	—
	FR-RC-30K		—	—	100	80	75	75	55	50	—
	FR-RC-55K		—	—	—	—	—	100	85	75	75
400V	FR-RC-H15K	Braking torque (%)	100	100	75	55	50	—	—	—	—
	FR-RC-H30K		—	—	100	100	100	75	55	50	—
	FR-RC-H55K		—	—	—	—	—	100	100	100	75

● Example 1 Travel operation



● Example 2 Lift operation



tb=t1+t2+t3+t4

Regeneration load time factor (operation duty) $\%ED = \frac{tb}{tc} \times 100$

tb < 30s (continuous operation time)

<<MT-RC>>

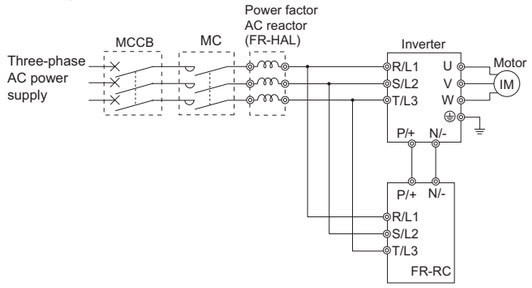
1) Select the unit according to the motor capacity and magnitude of the braking torque referring to the table below.
2) Do not use the MT-RC whose capacity is larger than the stated combination in the table below.
(Even if the MT-RC larger in capacity is selected, continuous braking torque will not exceed 100% of the rated motor.)

Braking torque (%) at continuous rating (% value on the assumption that the rated motor torque is 100%.)

Motor Capacity (kW)	75	90	110	132	150	160	185	200	220	250	280
Inverter type	75K	110K	110K	160K	160K	160K	220K	220K	220K	280K	280K
MT-RC-H75K	100	80	65	55	50	45	40	35	30	30	25
MT-RC-H160K	—	100	100	100	100	100	85	80	70	60	55
MT-RC-H220K	—	—	—	—	—	—	100	100	100	85	75
MT-RC-H280K	—	—	—	—	—	—	—	—	—	100	100

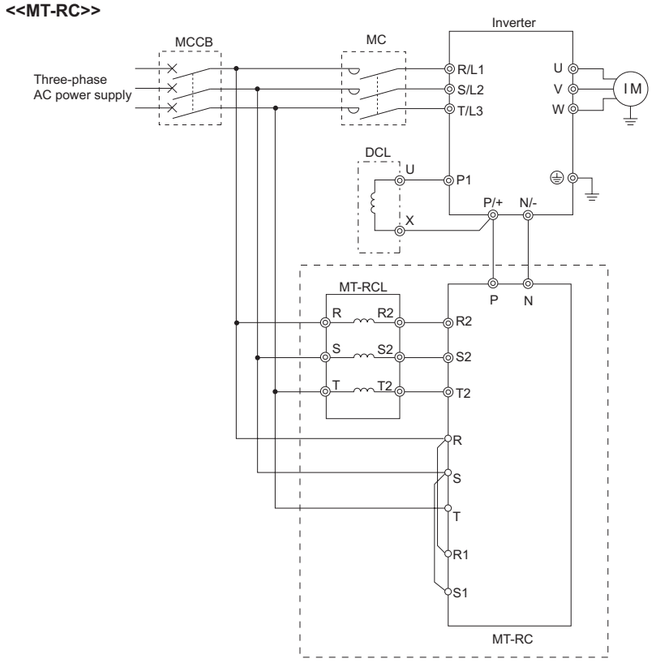
● Connection diagram

<<FR-RC>>



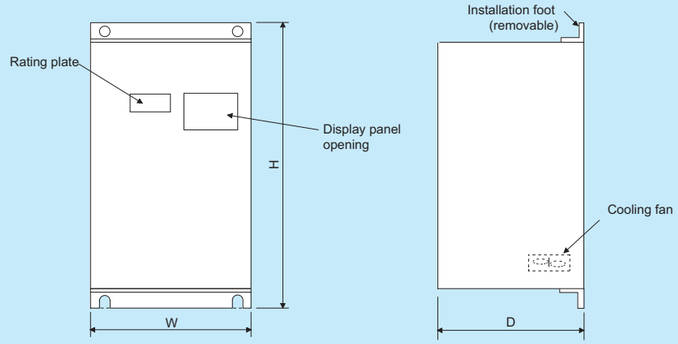
*1 Be sure to remove the brake resistor if connected to the inverter. (When using the model with a built-in brake resistor, be sure to remove a jumper across terminals PX-PR.)
*2 If power is supplied to the inverter, RDY (ready output) signal of the power regeneration converter is not output. Always supply power to the inverter.
*3 Be sure to install an AC reactor FR-HAL (separately available) for power coordination.

<<MT-RC>>



● Outline dimension drawings

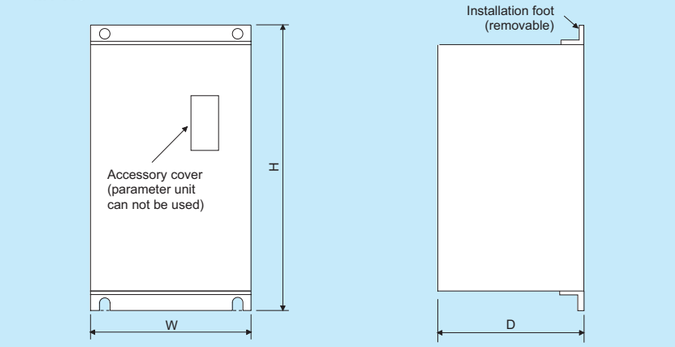
<<FR-RC>>



(Unit : mm)

	Type	W	H	D
200V	FR-RC-15K	270	450	195
	FR-RC-30K	340	600	195
	FR-RC-55K	480	700	250
400V	FR-RC-H15K	340	600	195
	FR-RC-H30K	340	600	195
	FR-RC-H55K	480	700	250

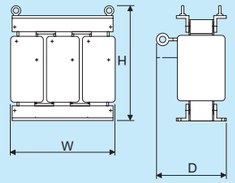
<<MT-RC>>



(Unit : mm)

	Type	W	H	D
400V	MT-RC-H75K	480	740	360
	MT-RC-H160K	498	1010	380
	MT-RC-H220K	680	1010	380
	MT-RC-H280K	790	1330	440

<<MT-RCL>>



(Unit : mm)

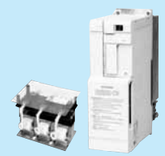
	Type	W	H	D
400V	MT-RCL-H75K	390	385	358
	MT-RCL-H160K	515	465	380
	MT-RCL-H220K	630	655	565
	MT-RCL-H280K	690	690	620

Power regeneration common converter FR-CV ALL
Dedicated standalone reactor FR-CVL ALL

Enables 100%-torque continuous regeneration to support continuous regenerative operation for line control, etc. Saves energy since regeneration energy is used for the other inverters and excess energy is returned to the power supply.

● Specifications

200V class type	Heatsink protrusion attachment structure FR-CV-☐	7.5K	11K	15K	22K	30K	37K	55K
	Enclosure mounting structure FR-CV-☐-AT	7.5K	11K	15K	22K	30K	— *1	— *1
Applicable inverter capacity (kW) *2		7.5	11	15	22	30	37	55
Applicable current (A) *2		33	46	61	90	115	145	215
Regenerative braking torque		Short-time rating 150% torque 60s Continuous rating 100% torque						
Rated input AC power supply		Three-phase 200 to 220V 50Hz/three phase 200 to 230V 60Hz						
Permissible AC voltage fluctuation		Three-phase 170 to 242V 50Hz/three phase 170 to 253V 60Hz						
Approximate mass (kg)	Heatsink protrusion attachment structure	5.0	5.0	6.0	9.5	10.5	34	38
	Enclosure mounting structure	6.5	6.5	7.5	12.5	13.5		
AC reactor type FR-CVL-☐ (separately available)		7.5K	11K	15K	22K	30K	37K	55K
	Approximate mass (kg)	4.5	4.0	5.5	6.5	11.0	16.0	20.0

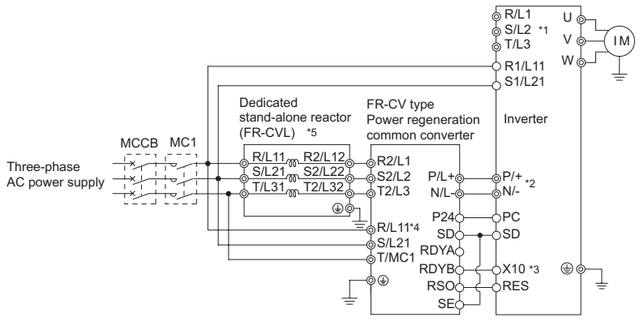


FR-CVL FR-CV

400V class type	Heatsink protrusion attachment structure FR-CV-☐	H7.5K	H11K	H15K	H22K	H30K	H37K	H55K
	Enclosure mounting structure FR-CV-☐-AT	H7.5K	H11K	H15K	H22K	H30K	— *1	— *1
Applicable inverter capacity (kW) *2		7.5	11	15	22	30	37	55
Applicable current (A) *2		17	23	31	43	57	71	110
Regenerative braking torque		Short-time rating 150% torque 60s Continuous rating 100% torque						
Rated input AC power supply		Three-phase 380 to 480V 50Hz/60Hz						
Permissible AC voltage fluctuation		Three-phase 323 to 528V 50Hz/60Hz						
Approximate mass (kg)	Heatsink protrusion attachment structure	6.0	6.0	6.0	10.0	10.0	32.5	32.5
	Enclosure mounting structure	7.5	7.5	7.5	13.0	13.0		
AC reactor type FR-CVL-☐ (separately available)		H7.5K	H11K	H15K	H22K	H30K	H37K	H55K
	Approximate mass (kg)	7.0	7.5	8.0	10.5	12.0	16.0	22.5

*1 Changing the position of installation foot allows either heatsink protrusion type or enclosure-mounting type to be installed. The position of installation foot is fixed for heatsink protrusion structure when shipped from the factory.
*2 The applicable inverter capacity is the total capacity (6 units maximum) of the inverters. Select the converter so that the total of the rated current of the motor will not exceed the applicable current.

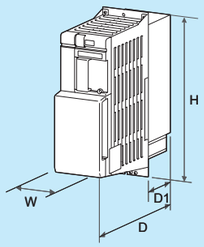
● Connection diagram



*1 Remove the jumpers across the inverter terminals R/L1-R1/L11, S/L2-S1/L21, and connect the control circuit power supply to the R1/L11 and S1/L21 terminals. Always keep the power input terminals R/L1, S/L2, T/L3 open. Incorrect connection will damage the inverter. Opposite polarity of terminals N/-, P/+ will damage the inverter.
*2 Do not insert an MCCB between the terminals P/+-N/- (between P/L+-P/+, between N/L--N/-).
*3 Assign the terminal for X10 signal using input terminal function selection.
*4 Always connect the power supply and terminals R/L11, S/L21, T/MC1.If the inverter is operated without connection, the power regeneration common converter will be damaged.
*5 Install the dedicated stand-alone reactor (FR-CVL) on horizontal plane.
*6 Use of power factor AC reactor (FR-HAL), power regeneration function may be reduced.
*7 Do not use a power factor improvement DC reactor (FR-HEL).

● Outline dimension drawings

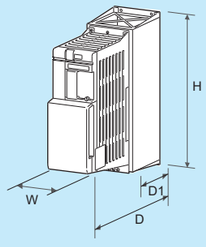
<<FR-CV-(H)>>



FR-CV-(H) (Unit : mm)

Voltage/Capacity		W	H	D	D1
200V	7.5K/11K	90	300	303	103
	15K	120	300	305	105
	22K/30K	150	380	322	122
	37K/55K	400	620	250	135
400V	7.5K/11K/15K	120	300	305	105
	22K/30K	150	380	305	105
	37K/55K	400	620	250	135

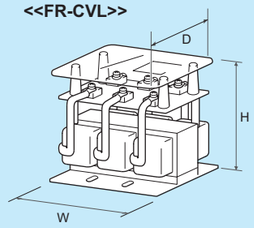
<<FR-CV-(H)-AT>>



FR-CV-(H)-AT (Unit : mm)

Voltage/Capacity		W	H	D	D1
200V	7.5K/11K	110	330	315	115
	15K	130	330	320	120
	22K/30K	160	410	350	150
400V	7.5K/11K/15K	130	330	320	120
	22K/30K	160	410	350	150

<<FR-CVL>>



FR-CVL (Unit : mm)

Voltage/Capacity		W	H	D
200V	7.5K/11K/15K	165	155	130
	22K	165	155	140
	30K	215	175	160
	37K	220	200	320
	55K	250	225	335
400V	7.5K/11K	220	200	135
	15K	220	205	135
	22K	220	215	150
	30K	245	220	185
	37K	245	265	230
	55K	290	280	230

* Indicates maximum outside

High power factor converter

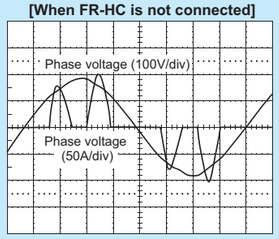
FR-HC ALL MT-HC A700 F700 V500

Substantially suppresses power harmonics to realize the equivalent capacity conversion coefficient K5 = 0 in the "Japanese harmonic suppression guideline for consumers who receive high voltage or special high voltage". Power regeneration function featured as standard enables common converter system operation with multiple inverters connected.

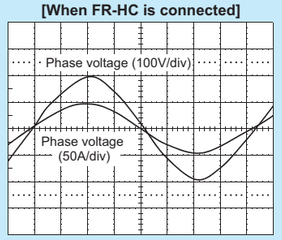
● Suppressions of power-supply harmonics

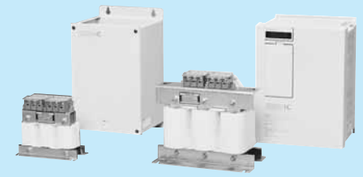
(Example) FR-HC-7.5K
(Environment) Load; 100% Power factor; 1

[When FR-HC is not connected]



[When FR-HC is connected]





(FR-HCL01) (FR-HCB) (FR-HCL02) FR-HC

Provided appliances

● Specifications

<<FR-HC>>

Type FR-HC-☐		200V				400V			
		7.5K	15K	30K	55K	H7.5K	H15K	H30K	H55K
Applicable inverter capacity (kW) *1		3.7 to 7.5	7.5 to 15	15 to 30	30 to 55	3.7 to 7.5	7.5 to 15	15 to 30	30 to 55
Rated input current (A)		33	61	115	215	17	31	57	110
Input power factor		0.99 or more (when load factor is 100%)							
Rated input AC power supply		Three-phase 200 to 220V 50Hz/three phase 200 to 230V 60Hz				Three-phase 380 to 460V 50Hz/60Hz			
Permissible AC voltage fluctuation		Three-phase 170 to 242V 50Hz/three phase 170 to 253V 60Hz				Three phase 323 to 506V 50Hz/60Hz			
Approximate mass (kg)	Unit	8	15	29	70	9	16	35	72
	Provided appliances	20.3	30.8	66.6	96.3	22.7	31.9	51.3	93.3

*1 Up to six inverters may be connected to one high power factor converter. The capacity of the high power factor converter should always be higher than the sum of those of the inverters connected. Note that if the sum of the inverter capacities is less than half of the high power factor converter capacity, the high power factor converter may be used as a common converter or regenerative converter, but its capability to suppress power harmonics will decrease.
For the FR-V500 series, the inverter may not be used up to the same capacity with the high power factor converter.
*2 In the order of the FR-HC-☐, FR-HCL01, FR-HCL02, and FR-HCB are included as accompanying appliances.

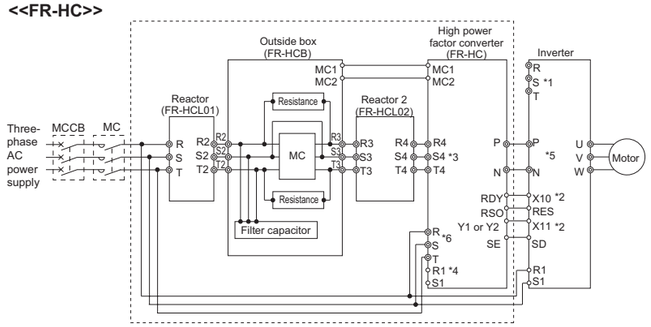
<<MT-HC>>

Type MT-HC-☐-S		400V				
		H75K	H110K	H150K	H220K	H375K
Applicable inverter capacity (kW) *1		75	110	150	220	375
Rated input current (A)		144	216	288	432	722
Input power factor		0.99 or more (when load factor is 100%)				
Rated input AC power supply		Three-phase 380 to 460V 50Hz/60Hz				
Approximate mass (kg)	Unit	67	115	155	235	500
	Provided appliances	246	423	605	755	—

*1 Up to six inverters may be connected to one high power factor converter. The capacity of the high power factor converter should always be higher than the sum of those of the inverters connected.
Note that if the sum of the inverter capacities is less than half of the high power factor converter capacity, the high power factor converter may be used as a common converter or regenerative converter, but its capability to suppress power harmonics will decrease.
For the FR-V500(L) series, the inverter may not be used up to the same capacity with the high power factor converter.
*2 In the order of MT-HC-☐, MT-HCL01, MT-HCL02, MT-HCB (except for H375K), and MT-HCTR are included as accompanying appliances.

● Connection diagram

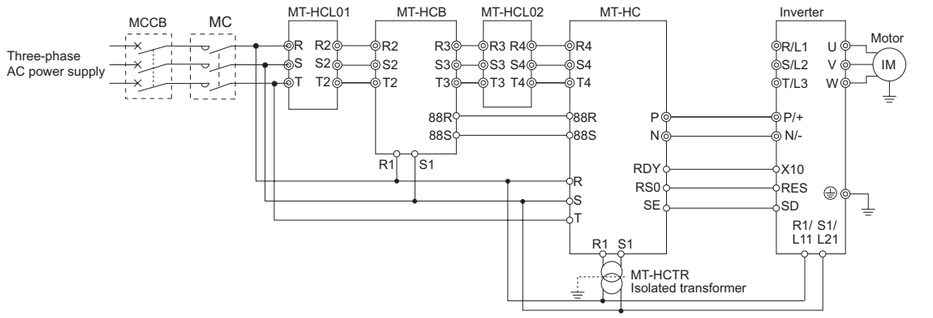
<<FR-HC>>



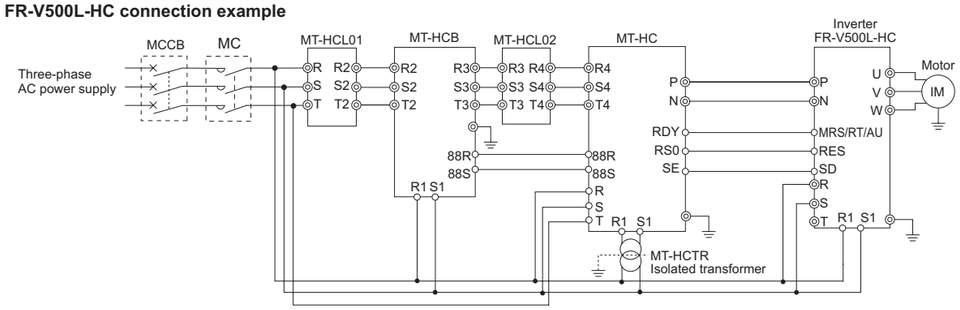
*1 Be sure to open the power supply input terminal R, S, T of the inverter. Incorrect connection will damage the inverter. Opposite polarity of terminals N, P will damage the high power factor converter and inverter.
*2 For the terminals used for X10 and X11 signal, function setting is necessary.
*3 Wire terminals R4, S4, T4 and terminals R, S, T so that the voltage phases are same.
*4 Keep terminals R1 and S1 of high power factor converter open.
*5 Do not insert the MCCB between terminals P-N (P-P, N-N).
*6 Be sure to connect terminals R, S, T of high power factor converter (FR-HC) to the power supply. If the inverter is operated without connection, the high power factor converter (FR-HC) will be damaged.

<<MT-HC>>

・FR-A700 connection example



・FR-V500L-HC connection example

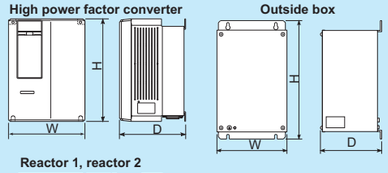


● Outline dimension drawings

<<FR-HC>>

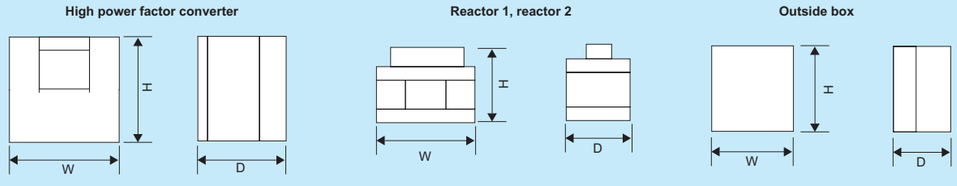
(Unit : mm)

Voltage	Capacity	High Power Factor Converter FR-HC W	H	D	Reactor 1 FR-HCL01 W	H	D	Reactor 2 FR-HCL02 W	H	D	Outside Box FR-HCB W	H	D
200V	7.5K	220	300	190	160	155	100	240	230	160	190	320	165
	15K	250	400	190	190	205	130	260	270	170			
	30K	340	550	195	220	230	170	340	320	180	270	450	203
	55K	480	700	250	210	260	225	430	470	360			
400V	H7.5K	220	300	190	160	150	100	240	220	160	190	320	165
	H15K	250	400	190	190	195	130	260	260	170			
	H30K	340	550	195	220	215	140	340	310	180			
	H55K	480	700	250	280	255	190	400	380	285	270	450	203



* Install the reactor (FR-HCL01, 02) on horizontal place.

<<MT-HC>>

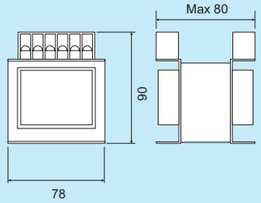


(Unit : mm)

Voltage	Capacity	High Power Factor Converter MT-HC-S W	H	D	Reactor 1 MT-HCL01 W	H	D	Reactor 2 MT-HCL02 W	H	D	Outside Box MT-HCB W	H	D
400V	75K	480	740	354	240	215	223	455	435	340	300	350	320
	110K	480	740	354	270	255	246	510	580	455	350	450	480
	150K	498	1010	374	330	275	266	570	600	510	400	450	480
	220K	680	1010	374	330	292	318	630	665	565	550	500	500
	375K	1100	1500	500	570	605	640	690	695	725	—*	—*	—*

* The MT-HCB is not available for the 375K. Only a filter capacitor and a charging resistor are provided.

Isolated transformer MT-HCTR



Noise filter

Common mode filter

FR-BSF01 ALL **FR-BLF** ALL

RC5128 (recommended product) A700 F700 V500

A common mode filter is used to suppress radio noise and line noise emitted from the inverter power supply side or output side.

Introduced product: RC5128 Maker: Soshin Electric Co., Ltd.

● Specifications

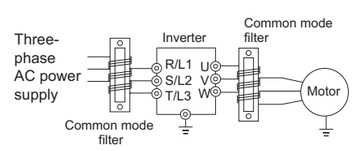
Type	FR-BSF01				FR-BLF				RC5128 (recommended product)		
Applicable inverter capacity	For small capacity inverter *1				For general inverter *1				For large capacity inverter *1		
Compatible wire size (mm^2)	2, 3.5	5.5	8, 14	22	2 to 22	30 to 60	80	100 to 150	100 to 125	150 to 200	250
Number of times of wire to be passed through (T)	4	3	2	1	4	3	2	1	3	2	1
Improvement effect	Greater effect between 0.5 to 5MHz The greater the number of turns, the more effective result is obtained.										
Rated input AC power supply	Three phase 200V 50Hz/three phase 200/220V 60Hz										
	Three phase 400V 50Hz/three phase 400/440V 60Hz										
Approximate mass (kg)	0.2				1.2				1.1		

FR-BLF

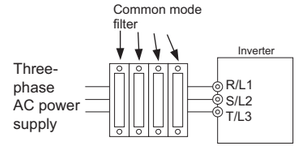
*1 Used up to the cable thickness (applicable wire size) less than the size of wire passing hole.
*2 For the 55K or less of the FR-A700, F700, FP700 series, a corresponding appliance (common mode reactor) is built-in on the input side.

● Connection diagram

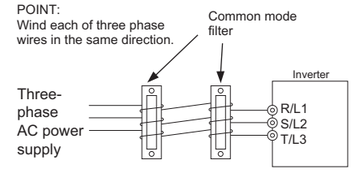
・Ensure that each phase is wounded one time in the same direction.
・When connecting to the input side, it is recommended that the wire should be turned three times or more (4T, 4 turns). The greater the number of turns, the more effective result is obtained.
・Since heat generated from the filter itself may become great if connected to the output side, the number of turns each should be three times maximum (4T, 4 turns).
・Do not wind earth cable.
・When the wire size is too thick to wind, use more than four filters in series.



Connection example to input side and output side



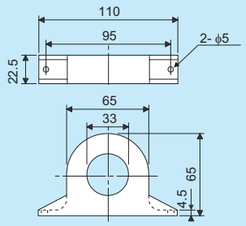
When using common mode filters in series



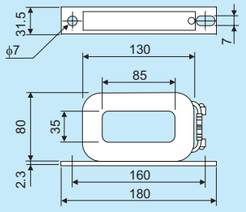
When using several common mode filters

● Outline dimension drawings

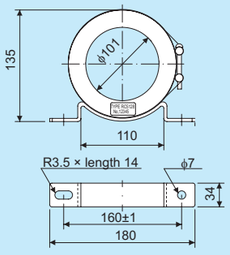
<<FR-BSF01>>



<<FR-BLF>>



<<RC5128 (introduced product)>>



(unit : mm)

Capacitor type filter

FR-BIF E700 V500 E500 S500 F500J FP500J

A capacitor type filter is used to suppress radio noise emitted from the inverter power supply side.

● Specifications

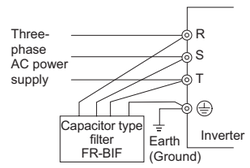
Type	200V	400V
	FR-BIF	FR-BIF-H
Applicable inverter capacity	Usable regardless of the inverter capacity (For the FR-A700, FR-F700, FR-FP700, a corresponding appliances is built-in.)	
Improvement effect	Greater effect at 10MHz or less (note that the effect differs according to region.)	
Rated input AC power supply	Three phase 200V 50Hz/ three phase 200/220V 60Hz	Three-phase 400V 50Hz/ three phase 400/440V 60Hz
Approximate mass (kg)	0.1	0.1

* For the FR-A700, F700, FP700 series, a corresponding filter (capacitive filter) is built-in.

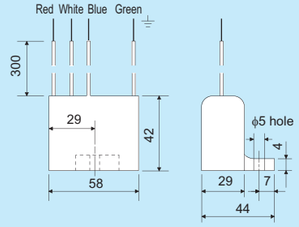
FR-BIF-H

● Connection diagram

· Connect to the inverter input side. Connect the filter directly to the inverter input terminal.
· Since long connection wire reduces effect, the wire length should be minimized. Make sure to perform earthing with resistance of 100Ω or less.



● Outline dimension drawings



(unit : mm)

EMC Directive compliant EMC filter

SF□□ V500 E500 S500 F500J
FR-E5NF E500 S500 F500J FR-S5NFSA S500

This EMC filter complies with the European EMC Directive.

● Selection

· Select a filter in accordance with the inverter type

FR-V500 Series Inverter Type		EMC Filter Type
200V class	FR-V520-1.5K to 2.2K	SF1259
	FR-V520-3.7K to 7.5K	SF1260
	FR-V520-11K	SF1261
	FR-V520-15K to 18.5K	SF1262
	FR-V520-22K	SF1263
	FR-V520-30K to 55K	SF1265
400V class	FR-V540-1.5K to 2.2K	SF1197
	FR-V540-3.7K to 5.5K	SF1174B
	FR-V540-7.5K to 11K	SF1175
	FR-V540-15K to 18.5K	SF1176
	FR-V540-22K	SF1177
	FR-V540-30K to 37K	SF1178
	FR-V540-45K to 55K	SF1179

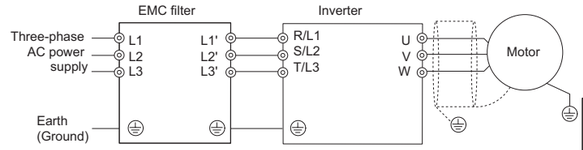
FR-E500 Series Inverter Type		EMC Filter Type
Single phase 200V class	FR-E520S-0.1K to 0.4K	SF1320
	FR-E520S-0.75K	SF1321
200V class	FR-E520-0.1K to 1.5K	SF1306
	FR-E520-2.2K to 3.7K	SF1309
	FR-E520-5.5K to 7.5K	SF1260
400V class	FR-E540-0.4K to 0.75K	FR-E5NF-H0.75K
	FR-E540-1.5K to 3.7K	FR-E5NF-H3.7K
	FR-E540-5.5K to 7.5K	FR-E5NF-H7.5K

FR-S500 Series Inverter Type		EMC Filter Type
Single phase 100V class	FR-S510WE-0.1K to 0.4K	FR-S5NFSA-0.75K
	FR-S510WE-0.75K	FR-S5NFSA-1.5K
Single phase 200V class	FR-S520SE-0.1K to 0.75K	FR-S5NFSA-0.75K
	FR-S520SE-1.5K	FR-S5NFSA-1.5K
200V class	FR-S520E-0.1K to 1.5K	SF1306
	FR-S520E-2.2K to 3.7K	SF1309
400V class	FR-S540E-0.4K to 0.75K	FR-E5NF-H0.75K
	FR-S540E-1.5K to 3.7K	FR-E5NF-H3.7K

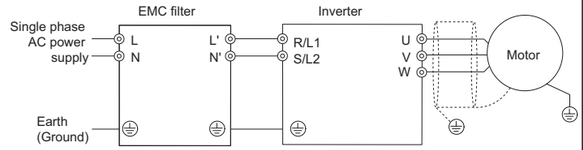
FR-F500J Inverter Type		EMC Filter Type
200V class	FR-F520J-0.4K(F) to 1.5K(F)	SF1306
	FR-F520J-2.2K(F) to 3.7K(F)	SF1309
	FR-F520J-5.5K(F) to 11K(F)	SF1260
	FR-F520J-15K(F)	SF1261
400V class	FR-F540J-0.4K(F) to 0.75K(F)	FR-E5NF-H0.75K
	FR-F540J-1.5K(F) to 3.7K(F)	FR-E5NF-H3.7K
	FR-F540J-5.5K(F) to 7.5K(F)	SF1174B
	FR-F540J-11K(F) to 15K(F)	SF1175

● Connection diagram

· Connect to the inverter input side. Refer to EMC Installation Guidelines (BCN-A21041-202) for details of wiring method.



Connection diagram of three-phase power supply

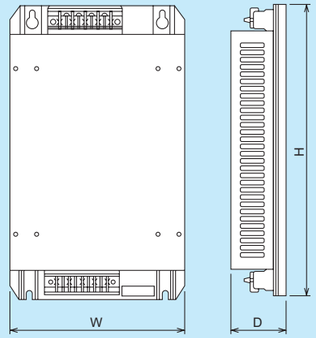


Connection diagram of single-phase power supply

*** Take the following measures to prevent a peripheral device malfunction or electric shock accident from occurring due to a leakage current.**
1) Ground (earth) the EMC filter before connecting the power supply. In that case, make certain that grounding (earthing) is securely performed via the grounding (earthing) part of the panel.
2) Select the earth leakage circuit breaker or earth leakage relay in consideration of the EMC filter's leakage current. A leakage current breaker may not be used when leakage current of EMC filter become large. When using an earth leakage relay which has great sensitivity current or when not using a leakage circuit breaker and earth leakage relay, connect the equipment to the earth securely as shown in 1).

● Outline dimension drawings

EMC Filter Type		Outline Dimension W	H	D	Approximate Mass (kg)	Leakage Current Reference Value (mA)
Single phase 100V	FR-S5NFSA-0.75K	70	168	35	0.7	4.5
Single phase 200V	FR-S5NFSA-1.5K	110	168	35	1.1	9.5
Single phase 200V	SF1320	70	168	30.5	0.4	10
	SF1321	110	168	36.5	0.6	10
Three phase 200V	SF1259	142	410	65	2.4	33
	SF1260	222	468	80	5	440
	SF1261	253	600	86	9.3	71
	SF1262	303	650	86	11	71
	SF1263	327	730	86	15	71
	SF1265	468	913	110	22	1500
	SF1306	110	200	36	0.7	10
	SF1309	200	282	57	2.1	15
Three phase 400V	SF1197	144	360	47.5	1.5	57
	SF1174B	213	360	38	1.8	51
	SF1175	253	530	60	4.7	76
	SF1176	303	600	60	5.9	108
	SF1177	327	700	80	9.4	156
	SF1178	450	770	80	16	156
	SF1179	467	920	80	19	156
	FR-E5NF-H0.75K	140	210	46	1.1	22.6
	FR-E5NF-H3.7K	140	210	46	1.2	44.5
	FR-E5NF-H7.5K	220	210	47	2	68.4



*1 The leakage current indicated is equivalent to one-phase of cable for the three-phase three wire 人 connection. For a three-phase, three-wire, delta-connection power supply, the value is about three times greater than the indicated.
*2 An installation intercompatibility attachment and an EMC filter installation attachment may be necessary to install the inverter.
In such a case, note that the width equivalent to the intercompatibility attachment length increases.

Output filter

Surge voltage suppression filter

FR-ASF A700 F700 E500 S500 F500J
FR-BMF A700 F700 E500 S500 F500J

This product limits surge voltage applied to motor terminal when driving the 400V class motor by the inverter,

● Specifications

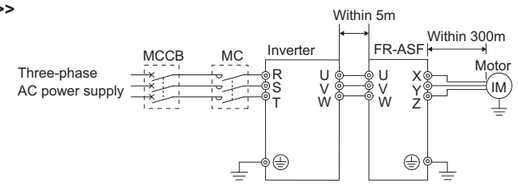
Type	400V						
FR-ASF-☐	H1.5K	H3.7K	H7.5K	H15K	H22K	H37K	H55K
Applicable inverter capacity (kW)	0.4 to 1.5	2.2 to 3.7	5.5 to 7.5	11 to 15	18.5 to 22	30 to 37	45 to 55
Rated input current (A)	4.0	9.0	17.0	31.0	43.0	71.0	110.0
Rated input AC voltage	Three-phase 380V to 460V 50/60Hz						
Maximum AC voltage fluctuation	Three-phase 506V 50Hz/60Hz						
Maximum frequency	400Hz						
PWM frequency permissible range	0.5kHz to 14.5kHz						
Maximum wiring length between the filter-motor	300m						
Approximate mass (kg)	8.0	11.0	20.0	28.0	38.0	59.0	78.0

Type	400V			
FR-BMF-☐	H7.5K	H15K	H22K	H37K
Applicable inverter capacity (kW)	5.5 to 7.5	11 to 15	18.5 to 22	30 to 37
Rated input current (A)	17.0	31.0	43.0	71.0
Rated input AC voltage	Three-phase 380 to 480V 50Hz/60Hz			
Maximum AC voltage fluctuation	Three-phase 323 to 528V 50Hz/60Hz			
Maximum frequency	120Hz			
PWM frequency permissible range	2kHz or less *			
Maximum wiring length between the filter-motor	100m			
Approximate mass (kg)	5.5	9.5	11.5	19

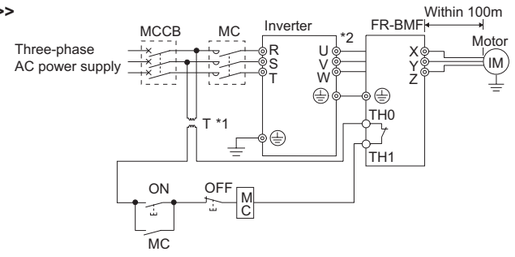
* Always set the inverter PWM frequency to 2kHz or less.

● Connection diagram

<<FR-ASF>>



<<FR-BMF>>



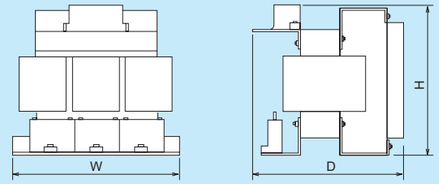
*1 Install a step-down transformer.
*2 Connect the FR-BMF wire to output terminal (U, V, W) of the inverter.
Do not increase the wiring length.

● Outline dimension drawings

<<FR-ASF>>

(Unit : mm)

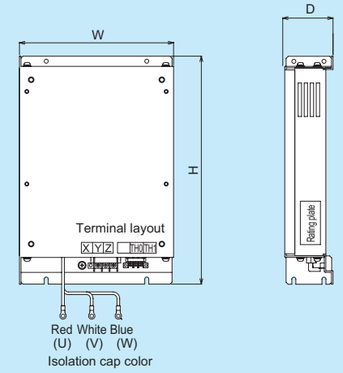
Surge Voltage Suppression Filter Type	W	H *1	D *1
FR-ASF-H1.5K	220	193	160
FR-ASF-H3.7K	220	200	180
FR-ASF-H7.5K	280	250	215
FR-ASF-H15K *2	335	260	285
FR-ASF-H22K *2	335	340	349
FR-ASF-H37K *2	375	445	388
FR-ASF-H55K *2	395	445	568



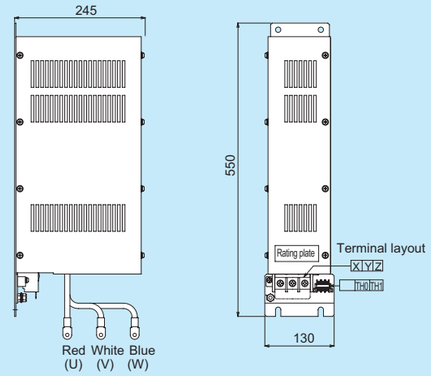
*1 Maximum size
*2 For the H15K or more, the shape is partially different.

<<FR-BMF>>

● FR-BMF-H7.5K to H22K



● FR-BMF-H37K



(Unit : mm)

Surge Voltage Suppression Filter Type	W	H	D
FR-BMF-H7.5K	230	340	75
FR-BMF-H15K, H22K	260	500	100

Sine wave filter

MT-BSL, MT-BSC (A700) (F700)

Installing the filter on the inverter output side converts the motor voltage/current into a nearly sine wave. Effect such as 1) acoustic noise reduction, 2) surgeless, and 3) reduction of the motor loss (use of standard motor) is expected.

● Specifications

Type	200V		400V				
MT-BSL-□□	75K	90K	H75K	H110K	H150K	H220K	H280K
MT-BSC-□□	75K	90K	H75K	H110K	—	—	—
Applicable inverter capacity	Refer to the selection method below.						
Maximum frequency	60Hz						
PWM frequency permissible range	2.5kHz *1						
Vibration	5.9m/s^2 or less						
Approximate mass (kg)	Refer to the outline dimension drawing.						

*1 Always set the inverter PWM frequency to 2.5kHz.

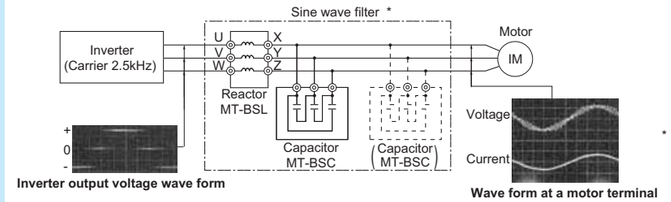
● Selection

・ Select the inverter whose capacity is one rank larger in size of the motor capacity as stated in the table below. Note that an inverter with same kW with a motor can be used if the rated motor current × (1.05 to 1.1) is less than 90% of the inverter rated current.
・ Use the MT-BSL-HC when using a sine wave filter with the MT-HC.

Motor Capacity (kW)		Type		Applicable Inverter	
		Reactor for filter	Capacitor for filter *1	FR-A700	FR-F700
200V class	75	MT-BSL-75K	1 × MT-BSC-75K	FR-A720-90K	FR-F720-90K
	90	MT-BSL-90K	1 × MT-BSC-90K	—	FR-F720-110K
400V class	75	MT-BSL-H75K(-HC)	1 × MT-BSC-H75K	FR-A740-90K	FR-F740-90K
	90	MT-BSL-H110K(-HC)	1 × MT-BSC-H110K	FR-A740-110K	FR-F740-110K
	110	MT-BSL-H110K(-HC)	1 × MT-BSC-H110K	FR-A740-132K	FR-F740-132K
	132	MT-BSL-H150K(-HC)	2 × MT-BSC-H75K	FR-A740-160K	FR-F740-160K
	160	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-A740-185K	FR-F740-185K
	185	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-A740-220K	FR-F740-220K
	220	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-A740-250K	FR-F740-250K
	250	MT-BSL-H280K(-HC)	3 × MT-BSC-H110K	FR-A740-280K	FR-F740-280K
	280	MT-BSL-H280K(-HC)	3 × MT-BSC-H110K	FR-A740-315K	FR-F740-315K

*1 When using several capacitors for filter, connect them in parallel as in the connection diagram.

● Connection diagram



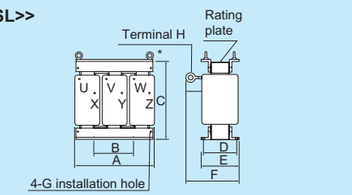
Inverter output voltage wave form

Wave form at a motor terminal

* Install the filter near the inverter.
For a capacitor cable, use a cable with size larger than indicated in the table below "recommended cable size".

● Outline dimension drawings

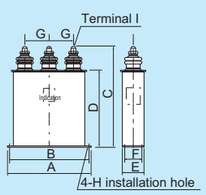
<<MT-BSL>>



* Remove the eye nut after installation of the product.

Type	A	B	C	D	E	F	G	H	Mass (kg)
200V class MT-BSL-75K	330	150	285	185	216	328	M10	M12	80
200V class MT-BSL-90K	390	150	320	180	220	330	M12	M12	120
400V class MT-BSL-H75K	330	150	285	185	216	318	M10	M10	80
400V class MT-BSL-H110K	390	150	340	195	235	368	M12	M12	140
400V class MT-BSL-H150K	455	200	397	200	240	380	M12	M12	190
400V class MT-BSL-H220K	495	200	405	250	300	420	M12	M12	240
400V class MT-BSL-H280K	575	200	470	310	370	485	M12	M12	340
400V class MT-BSL-H75K-HC	385	150	345	185	216	315	M10	M10	110
400V class MT-BSL-H110K-HC	420	170	400	195	235	370	M12	M12	180
400V class MT-BSL-H150K-HC	450	300	455	390	430	500	M12	M12	250
400V class MT-BSL-H220K-HC	510	350	540	430	485	555	M12	M12	310
400V class MT-BSL-H280K-HC	570	400	590	475	535	620	M12	M12	480

<<MT-BSC>>



Type	A	B	C	D	E	F	G	H	I	Mass (kg)
200V class MT-BSC-75K	207	191	285	233	72	41	45	ϕ7	M8	3.9
200V class MT-BSC-90K	282	266	270	183	92	56	85	ϕ7	M12	5.5
400V class MT-BSC-H75K	207	191	220	173	72	41	55	ϕ7	M6	3.0
400V class MT-BSC-H110K	207	191	280	233	72	41	55	ϕ7	M6	4.0

* Leave more than 25mm space between capacitors.

Recommended cable size

The cable sizes between the Inverter and MT-BSL and between the MT-BSL and IM should be the same as the U, V, W wiring size. The cable size to the MT-BSC is as table below.

MT-BSC-75K	MT-BSC-90K	MT-BSC-H75K	MT-BSC-H110K
38mm^2	38mm^2	22mm^2	22mm^2

Structure option

Heatsink protrusion attachment

FR-A7CN (A700) (F700) (FP700)
FR-A5CN (V500) MT-A5CN (V500)

With this attachment the heatsink which is the exothermic section of the inverter can be placed outside of the enclosure. Since the heat generated in the inverter can be radiated to the rear of the enclosure, the enclosure can be downsized.

● Selection

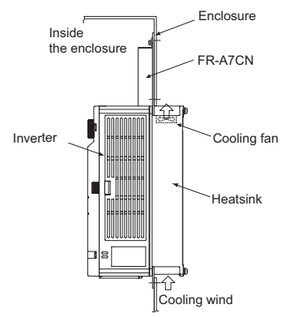
Attachment Type	Applicable Inverter			
	FR-A700		FR-F700	
	200V class	400V class	200V class	400V class
FR-A7CN01	FR-A720-1.5K to 3.7K	FR-A740-0.4K to 3.7K	FR-F720-2.2K to 5.5K	FR-F740-0.75K to 5.5K
FR-A7CN02	FR-A720-5.5K, 7.5K	FR-A740-5.5K, 7.5K	FR-F720-7.5K, 11K	FR-F740-7.5K, 11K
FR-A7CN03	FR-A720-11K	FR-A740-11K, 15K	FR-F720-15K	FR-F740-15K, 18.5K
FR-A7CN04	FR-A720-15K to 22K	FR-A740-18.5K, 22K	FR-F720-18.5K to 30K	FR-F740-22K, 30K
FR-A7CN05	FR-A720-30K	—	FR-F720-37K	—
FR-A7CN06	—	FR-A740-30K	—	FR-F740-37K
FR-A7CN07	FR-A720-37K, 45K	FR-A740-37K to 55K	FR-F720-45K, 55K	FR-F740-45K to 75K
FR-A7CN08	—	FR-A740-75K	—	FR-F740-90K
FR-A7CN09	—	FR-A740-90K	—	FR-F740-110K
FR-A7CN10	FR-A720-75K, 90K	FR-A740-110K, 132K	FR-F720-75K to 110K	FR-F740-132K, 160K
FR-A7CN11	FR-A720-55K	—	—	—

Attachment Type	Applicable Inverter	
	FR-V500 (L)	
	200V class	400V class
FR-A5CN01	FR-V520-1.5K, 2.2K	FR-V540-1.5K, 2.2K
FR-A5CN02	FR-V520-3.7K to 7.5K	FR-V540-3.7K, 5.5K
FR-A5CN03	—	—
FR-A5CN04	FR-V520-11K, 15K	FR-V540-7.5K to 18.5K
FR-A5CN05	FR-V520-22K	FR-V540-22K
FR-A5CN06	FR-V520-30K, 37K	FR-V540-30K, 37K
FR-A5CN07	FR-V520-45K, 55K	FR-V540-45K, 55K
FR-A5CN08	FR-V520-18.5K	—
MT-A5CN01	—	—
MT-A5CN02	FR-V520L-75K	FR-V540L-75K, 90K
MT-A5CN03	—	FR-V540L-110K, 132K
MT-A5CN04	—	FR-V540L-160K
MT-A5CN05	—	FR-V540L-200K, 250K

Attachment Type	Applicable Driving Unit	
	FR-FP700	
	200V class	400V class
FR-A7CN01	FR-FP720-2.2K to 5.5K	FR-FP740-0.75K to 5.5K
FR-A7CN02	FR-FP720-7.5K, 11K	FR-FP740-7.5K, 11K
FR-A7CN03	FR-FP720-15K	FR-FP740-15K

● Installation procedure

Using this attachment increases installation size as the attachment required additional place.



Totally-enclosed structure attachment

FR-A5CV (V500)
Totally-enclosed structure type FR-E520/E540-□□K-C (E500) FR-S520E-□□K-C (S500)

For the FR-V500 series, installing attachment to slits on the left and right of the inverter changes the structure to a totally-enclosed specification (IP40).
For the FR-E500 and FR-S500E, totally-enclosed structure type inverters are available.

● Specifications

Item	Description
Protective structure	Totally-enclosed structure (IP40)
Permissible ambient temperature	-10°C to +40°C

● Selection

Attachment Type	Applicable Inverter FR-V500	
	200V class	400V class
FR-A5CV01	FR-V520-1.5K to 7.5K	FR-V540-1.5K to 5.5K
FR-A5CV02	FR-V520-11K, 15K	FR-V540-7.5K to 18.5K

● Totally-enclosed structure type

Totally-enclosed Structure Type
FR-E520-0.1K to 7.5K-C
FR-E540-0.4K to 7.5K-C
FR-S520E-0.1K to 3.7K-C

Attachment for cable conduit connection

FR-A5FN (V500)

This attachment allows a conduit to be directly connected to the inverter.

● Selection

Attachment Type	Applicable Inverter FR-V500	
	200V class	400V class
FR-A5FN01	FR-V520-22K	FR-V540-22K
FR-A5FN02	FR-V520-30K, 37K	FR-V540-30K, 37K
FR-A5FN03	FR-V520-45K	FR-V540-45K
FR-A5FN04	FR-V520-18.5K	—
FR-A5FN05	FR-V520-55K	FR-V540-55K

Intercompatibility attachment EMC filter installation attachment

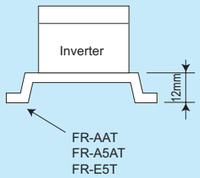
FR-AAT, FR-A5AT (A700) (F700) (V500) (F500J)
FR-E5T (E500) (S500) (F500J)

When replacing with a new inverter, the attachment make the new inverter to be installed using holes of conventional model.

● Specifications

Attachment Type	Installation Size of Mountable Model (W×H unit mm)	Installation Size of Compatible Conventional Model (W×H unit mm)
FR-AAT01	1) 95×245 2) 125×245 3) 95×285 4) 125×285	200×280
FR-AAT02	1) 125×245 2) 195×245 3) 125×285 4) 195×285	230×380
FR-AAT03	1) 195×285 2) 230×380	230×510
FR-AAT04	1) 195×285 2) 230×380 3) 280×430	290×570
FR-AAT05	1) 230×380 2) 280×430 3) 270×530	290×670
FR-AAT06	1) 270×530 2) 380×525	420×720
FR-AAT07	1) 380×525 2) 410×675	420×860
FR-AAT08	1) 380×525	420×860
FR-AAT09	1) 270×530	380×525
FR-AAT21	1) 95×245	125×245
FR-AAT22	1) 125×245	195×245
FR-AAT23	1) 270×530	380×525
FR-AAT24	1) 195×285	230×380
FR-AAT27	1) 230×380	270×530
FR-A5AT01	1) 95×245	95×285
FR-A5AT02	1) 95×245 2) 125×245	125×285
FR-A5AT03	1) 125×245 2) 195×245	195×285
FR-A5AT04	1) 195×285 2) 230×380	280×430
FR-A5AT05	1) 380×525	410×675
FR-E5T *	1) 96×118 2) 158×118	188×138
FR-E5T-02 *	1) 164×244	195×285

* This is sold as the FR-E500 series attachment with EMC filter.



* The depth increases after installation of the inverter when the attachment is used.

● Selection

<<List of replacement with FR-A720>>

Model name and capacity of conventional model			FR-A720 0.4K/0.75K	1.5K to 3.7K	5.5K/7.5K	11K	15K to 22K	30K	37K/45K	55K
	FR-A220E	0.4K/0.75K	FR-A5AT01	—	—	—	—	—	—	—
		1.5K to 3.7K	FR-A5AT02	FR-A5AT02	—	—	—	—	—	—
		5.5K to 11K	—	FR-A5AT03	FR-A5AT03	○	—	—	—	—
		15K	—	—	FR-AAT02	FR-AAT24	○	—	—	—
		18.5K/22K	—	—	—	FR-A5AT04	FR-A5AT04	—	—	—
		30K	—	—	—	—	FR-AAT27	○	—	—
		37K/45K	—	—	—	—	—	FR-AAT23	○	—
		55K	—	—	—	—	—	—	FR-A5AT05	○
	FR-A520	0.4K/0.75K	○	—	—	—	—	—	—	—
		1.5K to 3.7K	FR-AAT21	○	—	—	—	—	—	—
		5.5K/7.5K	—	FR-AAT22	○	—	—	—	—	—
		11K	—	—	FR-A5AT03	○	—	—	—	—
		15K to 22K	—	—	—	FR-AAT24	○	—	—	—
		30K	—	—	—	—	FR-AAT27	○	—	—
		37K/45K	—	—	—	—	—	FR-AAT23	○	—
		55K	—	—	—	—	—	—	FR-A5AT05	○

○: Mountable without an intercompatibility attachment
FR-A5AT□□, FR-AAT□□: Easily replaceable with a stated intercompatibility attachment.

<<List of replacement with FR-A740>>

Model name and capacity of conventional model			FR-A740 0.4K to 3.7K	5.5K/7.5K	11K/15K	18.5K/22K	30K	37K to 55K
	FR-A240E	0.4K to 3.7K	FR-A5AT02	—	—	—	—	—
		5.5K/7.5K	FR-A5AT03	FR-A5AT03	—	—	—	—
		11K/15K	—	FR-AAT02	FR-AAT24	—	—	—
		18.5K/22K	—	—	FR-A5AT04	FR-A5AT04	—	—
		30K	—	—	—	FR-AAT27	○	—
		37K/45K	—	—	—	—	FR-AAT23	○
		55K	—	—	—	—	—	FR-A5AT05
	FR-A540	0.4K to 3.7K	○	—	—	—	—	—
		5.5K/7.5K	FR-AAT22	○	—	—	—	—
		11K to 22K	—	FR-AAT02	FR-AAT24	○	—	—
		30K	—	—	—	FR-AAT27	○	—
		37K to 55K	—	—	—	—	FR-AAT23	○

○: Mountable without an intercompatibility attachment
FR-A5AT□□, FR-AAT□□: Easily replaceable with a stated intercompatibility attachment.

<<List of replacement with FR-F720>>

Model name and capacity of conventional model			FR-F720 0.75K/1.5K	2.2K to 5.5K	7.5K/11K	15K	18.5K to 30K	37K	45K/55K
	FR-A120E	0.75K	FR-A5AT01	—	—	—	—	—	—
		1.5K to 3.7K	FR-A5AT02	FR-A5AT02	—	—	—	—	—
		5.5K to 11K	—	FR-A5AT03	FR-A5AT03	—	—	—	—
		15K/18.5K	—	—	FR-AAT02	FR-AAT24	○	—	—
		22K/30K	—	—	—	FR-A5AT04	FR-A5AT04	—	—
		37K	—	—	—	—	FR-AAT27	○	—
		45K	—	—	—	—	—	FR-AAT23	○
		55K	—	—	—	—	—	—	FR-A5AT05
	FR-F520	0.75K	○	—	—	—	—	—	—
		1.5K to 3.7K	FR-AAT21	○	—	—	—	—	—
		5.5K/7.5K	—	FR-AAT22	○	—	—	—	—
		11K	—	FR-A5AT03	FR-A5AT03	—	—	—	—
		15K to 22K	—	—	FR-AAT02	FR-AAT24	○	—	—
		30K	—	—	—	FR-A5AT04	FR-A5AT04	—	—
		37K	—	—	—	—	FR-AAT27	○	—
		45K	—	—	—	—	—	FR-AAT23	○
		55K	—	—	—	—	—	—	FR-A5AT05

○ : Mountable without an intercompatibility attachment
FR-A5AT□□, FR-AAT□□: Easily replaceable with a stated intercompatibility attachment.

<<List of replacement with FR-F740>>

			FR-F740					
			0.75K to 5.5K	7.5K/11K	15K/18.5K	22K/30K	37K	45K/55K
Model name and capacity of conventional model	FR-A140E	0.75K to 3.7K	FR-A5AT02	—	—	—	—	—
		5.5K to 11K	FR-A5AT03	FR-A5AT03	—	—	—	—
		15K/18.5K	—	FR-AAT02	FR-AAT24	—	—	—
		22K	—	—	FR-A5AT04	FR-A5AT04	—	—
		30K	—	—	—	FR-AAT27	—	—
		37K/45K	—	—	—	—	FR-AAT23	○
		55K	—	—	—	—	—	FR-A5AT05
	FR-F540	0.75K to 3.7K	○	—	—	—	—	—
		5.5K to 11K	FR-AAT22	○	—	—	—	—
		15K to 22K	—	FR-AAT02	FR-AAT24	○	—	—
		30K/37K	—	—	—	FR-AAT27	○	—
		45K/55K	—	—	—	—	FR-AAT23	○

○: Mountable without an intercompatibility attachment
FR-A5AT□□, FR-AAT□□: Easily replaceable with a stated intercompatibility attachment.

<<List of replacement with FR-V520>>

			FR-V520						
			1.5K/2.2K	3.7K to 7.5K	11K/15K	18.5K	22K	30K/37K	45K/55K
Model name and capacity of conventional model	FR-V220E	1.5K/2.2K	FR-A5AT02	—	—	—	—	—	—
		3.7K to 7.5K	—	FR-A5AT03	—	—	—	—	—
		11K	—	—	○	—	—	—	—
		15K/18.5K	—	—	FR-A5AT04	○	—	—	—
		22K	—	—	—	—	○	—	—
		30K/37K	—	—	—	—	—	○	—
		45K	—	—	—	—	—	—	○

○: Mountable without an intercompatibility attachment
FR-A5AT□□, FR-AAT□□: Easily replaceable with a stated intercompatibility attachment.

<<List of replacement with FR-V540>>

			FR-V540					
			1.5K/2.2K	3.7K/5.5K	7.5K to 18.5K	22K	30K/37K	45K/55K
Model name and capacity of conventional model	FR-V240E	1.5K/2.2K	FR-A5AT02	—	—	—	—	—
		3.7K/5.5K	—	FR-A5AT03	—	—	—	—
		7.5K/11K	—	—	○	—	—	—
		15K/18.5K	—	—	FR-A5AT04	—	—	—
		22K	—	—	—	○	—	—
		30K/37K	—	—	—	—	○	—
		45K	—	—	—	—	—	○

○: Mountable without an intercompatibility attachment
FR-A5AT□□, FR-AAT□□: Easily replaceable with a stated intercompatibility attachment.

DIN rail installation attachment

FR-UDA E700 S500 F500J FP500J

Use of attachment enables the inverter to be installed on DIN rail.

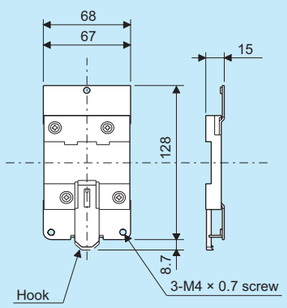
● Selection

· Make selection according to the applicable inverter or energy saving drive capacity in the table.

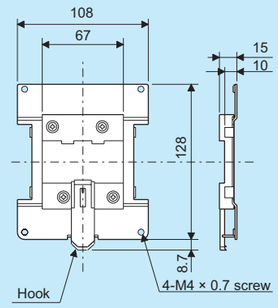
Inverter/Energy Saving Drive		Applicable Inverter/Energy Saving Drive Capacity		
		FR-UDA01	FR-UDA02	FR-UDA03
FR-E700	200V class	FR-E720-0.1K to 0.75K	FR-E720-1.5K, 2.2K	FR-E720-3.7K
FR-S500	Single phase 100V class	FR-S510WE-0.1K to 0.4K	FR-S510WE-0.75K	—
	Single phase 200V class	FR-S520SE-0.1K to 0.75K	FR-S520SE-1.5K	—
	200V class	FR-S520E-0.1K to 0.75K	FR-S520E-1.5K, 2.2K	FR-S520E-3.7K
	400V class	—	FR-S540E-0.4K to 3.7K	—
FR-F500J	200V class	FR-F520J-0.4K, 0.75K	FR-F520J-1.5K, 2.2K	FR-F520J-3.7K
	400V class	—	FR-F540J-0.4K to 3.7K	—
FR-FP500J	200V class	—	FR-FP520J-0.4K to 2.2K	FR-FP520J-3.7K
	400V class	—	FR-FP540J-0.4K to 3.7K	—

● Approximate dimension

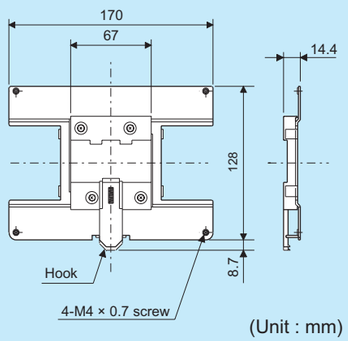
<<FR-UDA01>>



<<FR-UDA02>>



<<FR-UDA03>>



(Unit : mm)

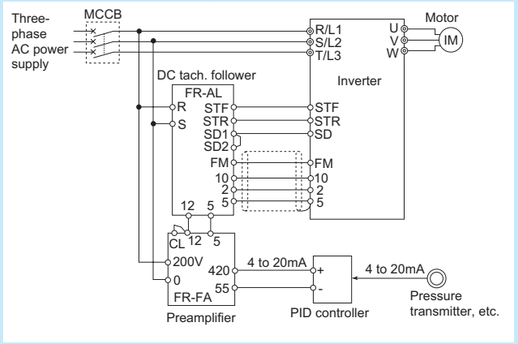
FR series manual controller/speed controller

Preamplifier

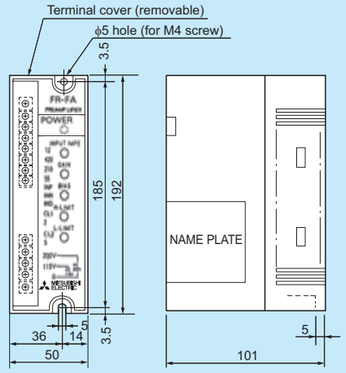
FR-FA ALL

Preamplifier is used to convert and amplify the controller current signal to voltage signal when making the controller output applicable as frequency setting signal to the inverter.

● Connection diagram



● Outline dimension drawings

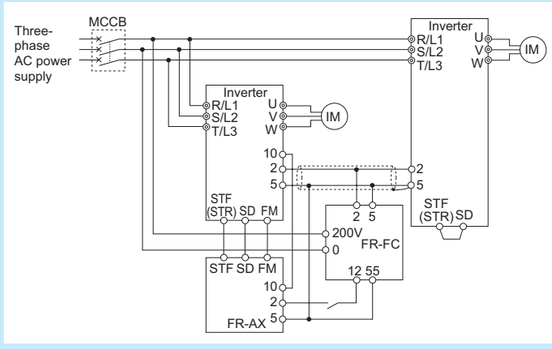


Soft starter

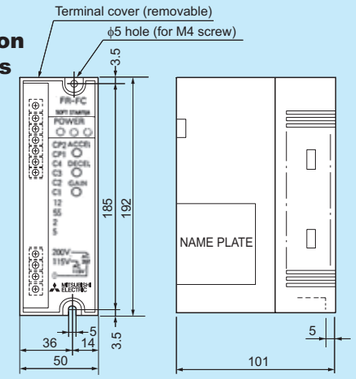
FR-FC ALL

Soft starter is used with the inverter to gradually increase or decrease the frequency setting signal level at starting and stopping the inverter, or changing frequency, in order to eliminate a shock that otherwise will be given to the machine, or to synchronize starting or stopping of two or more motors to accelerate and decelerate in accordance with the largest load inertia, etc.
Although the inverter has soft start/stop function as standard, use this device to batch-coordinate all inverters, etc.

● Connection diagram



● Outline dimension drawings

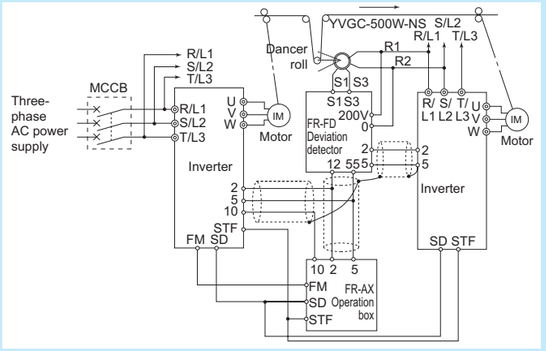


Deviation detector

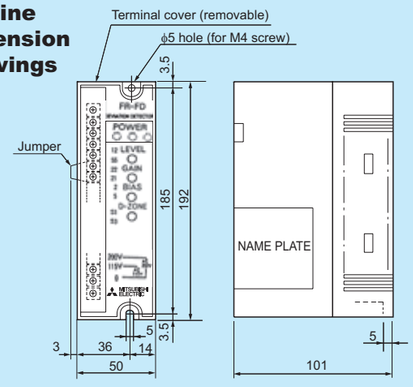
FR-FD ALL

The deviation detector is a converter that changes angular displacement, detected by synchronizer, to DC voltage signal. Beside mechanical displacement, the synchronizer is capable of detecting tension, weight and angular difference between two rotating shafts. Therefore, it can be used in a control system with the inverter.

● Connection diagram



● Outline dimension drawings

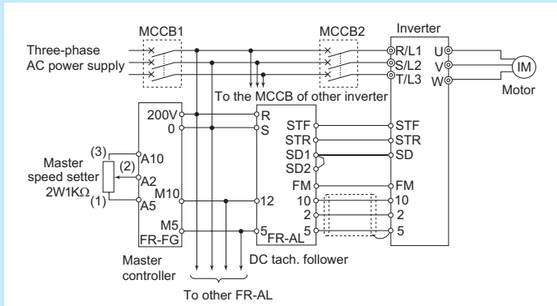


Master controller

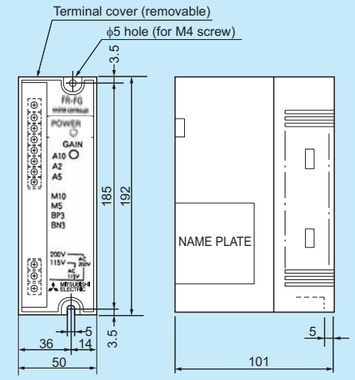
FR-FG ALL

Master controller is a variable-voltage power supply unit, and used to deliver frequency setting signal to the inverters (up to 35 inverters), or to control a maximum of 175 inverters with ratio setter "FR-FH" in proportional speed control operation.

● Connection diagram



● Outline dimension drawings

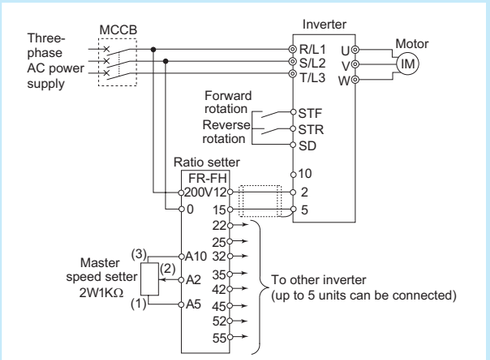


Ratio setter

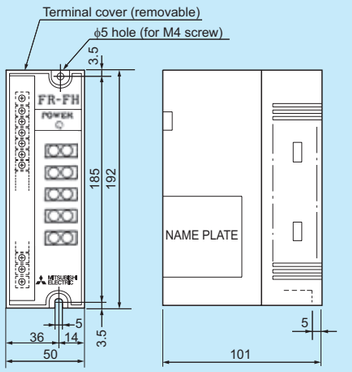
FR-FH ALL

This device has five ratio setting circuit consists of operational amplifier and performs ratio operation of five inverters.

● Connection diagram



● Outline dimension drawings

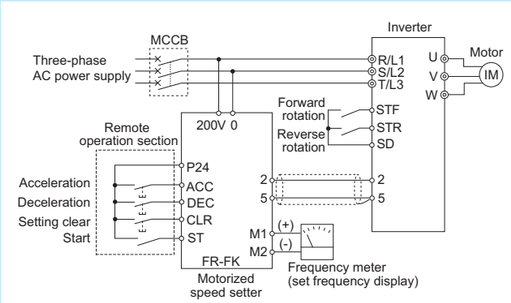


Remote speed setter

FR-FK ALL

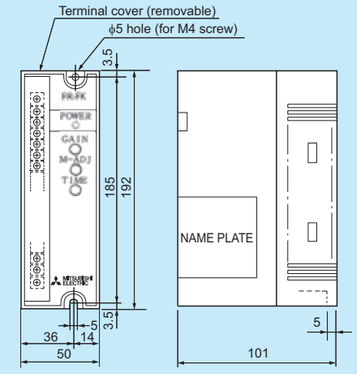
Use this device to start and stop the motor, change speed, etc. from several remote locations. Note that the frequency setting values are stored even if the power is shut off, the inverter operates at the previous frequency at power restoration.

● Connection diagram



* The wiring length between the remote operation section and the FR-FK should be 200m maximum.

● Outline dimension drawings

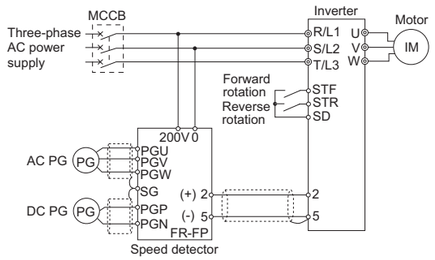


Speed detector

FR-FP ALL

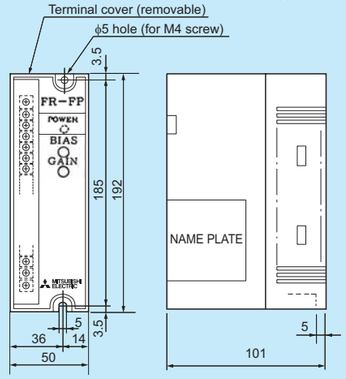
Speed, mechanical displacement etc. of other equipment is converted into an electrical signal using a PG (pulse generator) and the signal is then entered into the FR-FP speed detector which converts it into the frequency setting signal of the inverter.

● Connection diagram



* AC PG and DC PG can not be used together.

● Outline dimension drawings

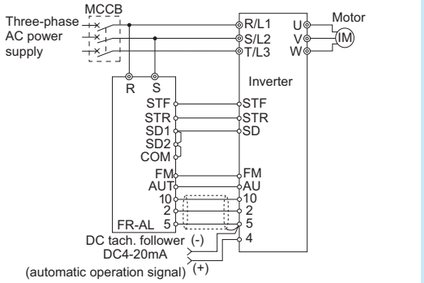


DC tach. follower

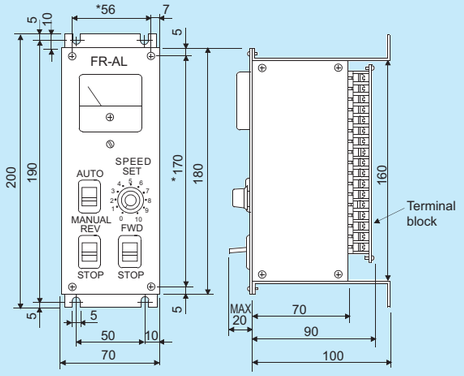
FR-AL ALL

Setting the select switch in "AUTO" position makes the frequency setting output to the inverter follow the voltage signal from other equipment and "MANUAL" position allows independent manual operation with the knob provided on the controller. This can be used as auto/manual switching controller.

● Connection diagram



● Outline dimension drawings



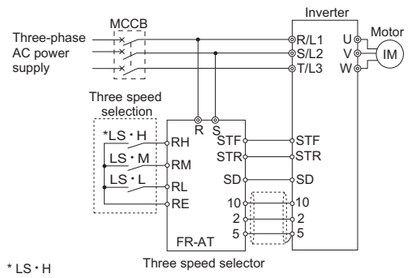
* Mounting dimensions when embedding in an enclosure, etc.

Three speed selector

FR-AT ALL

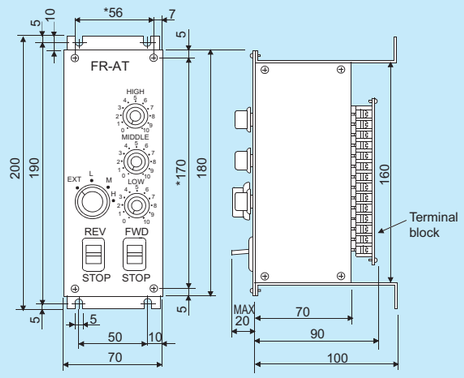
The "FR-AT" speed selector can be used with the FR series inverters to start/stop a motor and also allows you to perform operation at three different preset frequencies using the setting select switch, frequency selecting limit switch etc.

● Connection diagram



* LS・H
High speed command contact
LS・M
Middle-speed command contact
LS・L
Low-speed command contact

● Outline dimension drawings



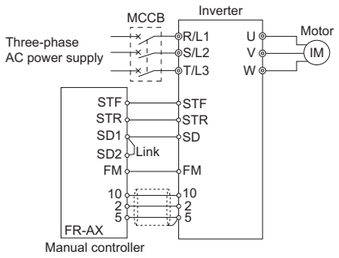
* Mounting dimensions when embedding in an enclosure, etc.

Manual controller

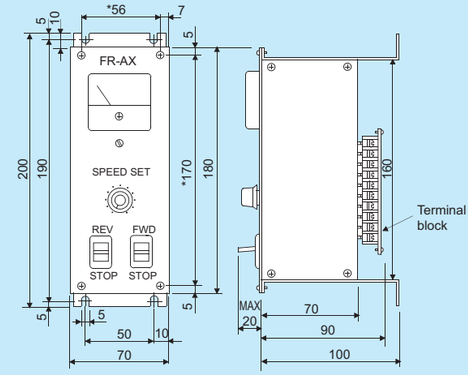
FR-AX ALL

Equipped with the frequency setting potentiometer, frequency meter and start/stop switches, the "FR-AX" manual controller can be used in the most general applications where independent operation is performed manually.

● Connection diagram



● Outline dimension drawings



* Mounting dimensions when embedding in an enclosure, etc.

Other options

Pilot generator

QVAH-10 (A700) (F700) (E700) (V500) (E500) (S500) (F500J)

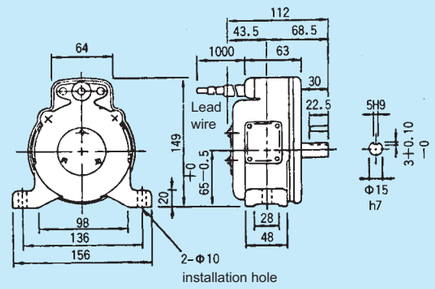
In combination with the speed detector FR-FP, tracking operation, etc. of the base motor and sub-motor can be performed.

● Specifications

Item	Description
Output voltage	70V/35VAC at 2500r/min
Output	10W/5W *1
Linearity	1% or less
Maximum speed	5000r/min *2
Number of poles	Single phase 24 poles
Rotation torque	At starting 0.14N・m During running 0.05N・m

*1 When outputting 10W between terminal U-V, output 1W or less between terminal U-0 (or 0-V).
*2 Operating at 2500r/min or more degrades linearity.

● Outline dimension drawings



Deviation sensor

YVGC-500W-NS (A700) (F700) (E700) (V500) (E500) (S500) (F500J)

This detector detects the angular displacement of motor shaft and output as AC voltage. It has a built-in limit switch for both end detection.

● Specifications

Item	Description
Power supply voltage	200V/220VAC 50Hz/60Hz
Contact capacity	250VAC 6A
Used angular displacement *1	±60°
Maximum angular displacement *2	±140° ±10°
Maximum output voltage	At 200VAC input ... 82VAC/90° At 200VAC input ... 90VAC/90°
Rotation torque	0.02N・m or less

*1 Used angular displacement indicates the rotation angle until the limit switch operates.
*2 Maximum displacement angle indicates the maximum rotation angle of the machine (to the stopper) of the deviation sensor.

● Outline dimension drawings

Digital frequency meter

HZ-1N (recommended product) (A700) (F700) (E700) (E500) (S500) (F500J)

Connect the frequency meter between terminal FM-SD of the inverter to indicate the inverter output frequency by FM output (pulse).

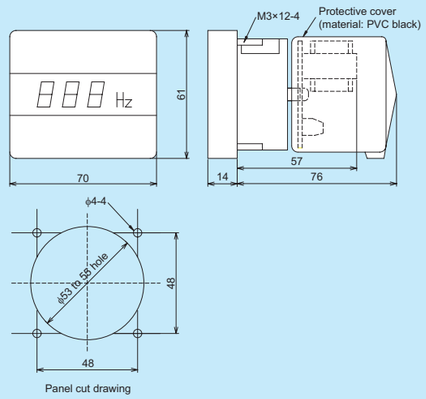
Introduced product : HZ-1N Maker : Mitsubishi FA center

HZ-1N (introduced product)

● Specifications

Item	Description
Display digit	3 digits
Minimum resolution	1Hz
Sampling period	Approx. 166ms
Frequency display switching	0 to 60Hz, 0 to 120Hz, 0 to 240Hz switching function
Power supply voltage	100/200VAC ±10% 50/60Hz

● Outline dimension drawings



Analog frequency meter

YM206NRI 1mA (A700) (F700) (E700) (E500) (S500) (F500J) (FP700) (FP500J)
KY-452 (recommended product) (A700) (F700) (E700) (E500) (S500) (F500J) (FP700) (FP500J)

Connect a full-scale 1mA ammeter to the inverter terminal FM-SD to instruct the inverter output frequency.

Introduced product : KY-452 Maker : Mitsubishi FA center

● Specifications

<<YM206NRI 1mA>>

Item	Description
Principle of operation	Moving-coil type
Scale specifications	0 to 65Hz, 130Hz double scale

<<KY-452 (recommended product)>>

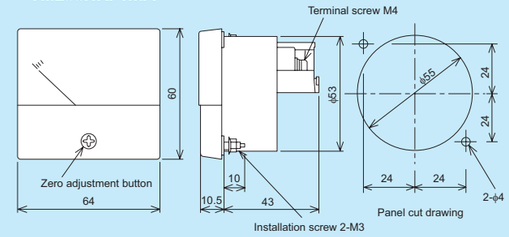
Item	Description
Principle of operation	Moving-coil type
Scale specifications	0 to 60Hz, 120Hz double scale

YM206NRI 1mA

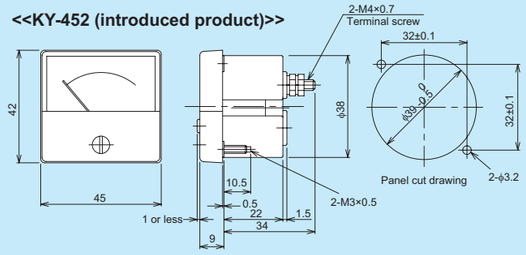
KY-452 (recommended product)

● Outline dimension drawings

<<YM206NRI 1mA>>



<<KY-452 (introduced product)>>



Calibration resistor

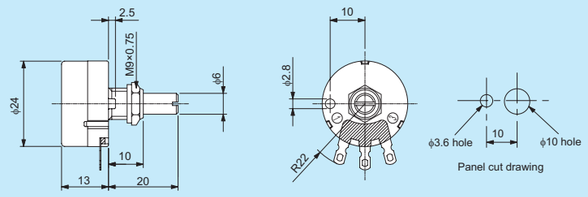
RV24YN 10kΩ (A700) (F700) (E700) (E500) (S500) (F500J) (FP700) (FP500J)

Calibrate analog frequency meter with this variable resistor. Connect this resistor between the inverter and frequency meter to change the value of current flowing. (It is not necessary when calibrating the meter from the operation panel/parameter unit.)

● Specifications

Item	Description
Characteristic	Wire wound variable resistor 2W 1kΩ B characteristic
Shaft rotation angle	300° ±5°

● Outline dimension drawings



Frequency setting potentiometer
Pointer scale
Knob

WA2W 1kΩ (ALL)
MEM-40 (recommended product) (ALL)
K-3 (recommended product) (ALL)

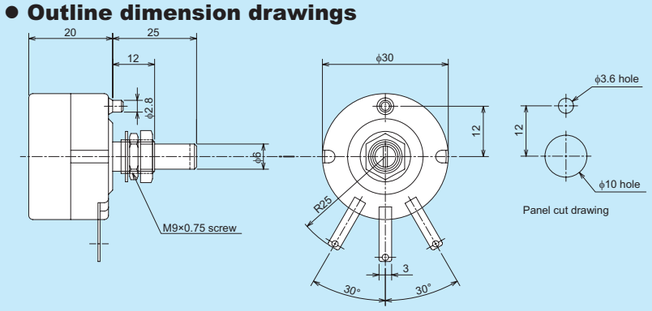
Connect the variable resistor between terminal 10-2-5 of the inverter to set the inverter running frequency.

Introduced product : MEM-40, K-3 Maker : Mitsubishi FA center

● Specifications

Item	Description
Characteristic	Wire wound variable resistor 2W 1kΩ B characteristic
Shaft rotation angle	300° ±5°

● Outline dimension drawings



WA2W 1kΩ

MEM-40 (introduced product)

K-3 (introduced product)