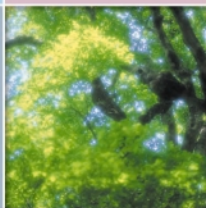
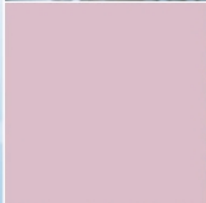


*Changes for the Better*

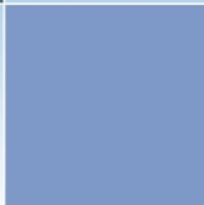
**MITSUBISHI INVERTER  
OPTION CATALOG**



**OPTIONAL  
PARTS**



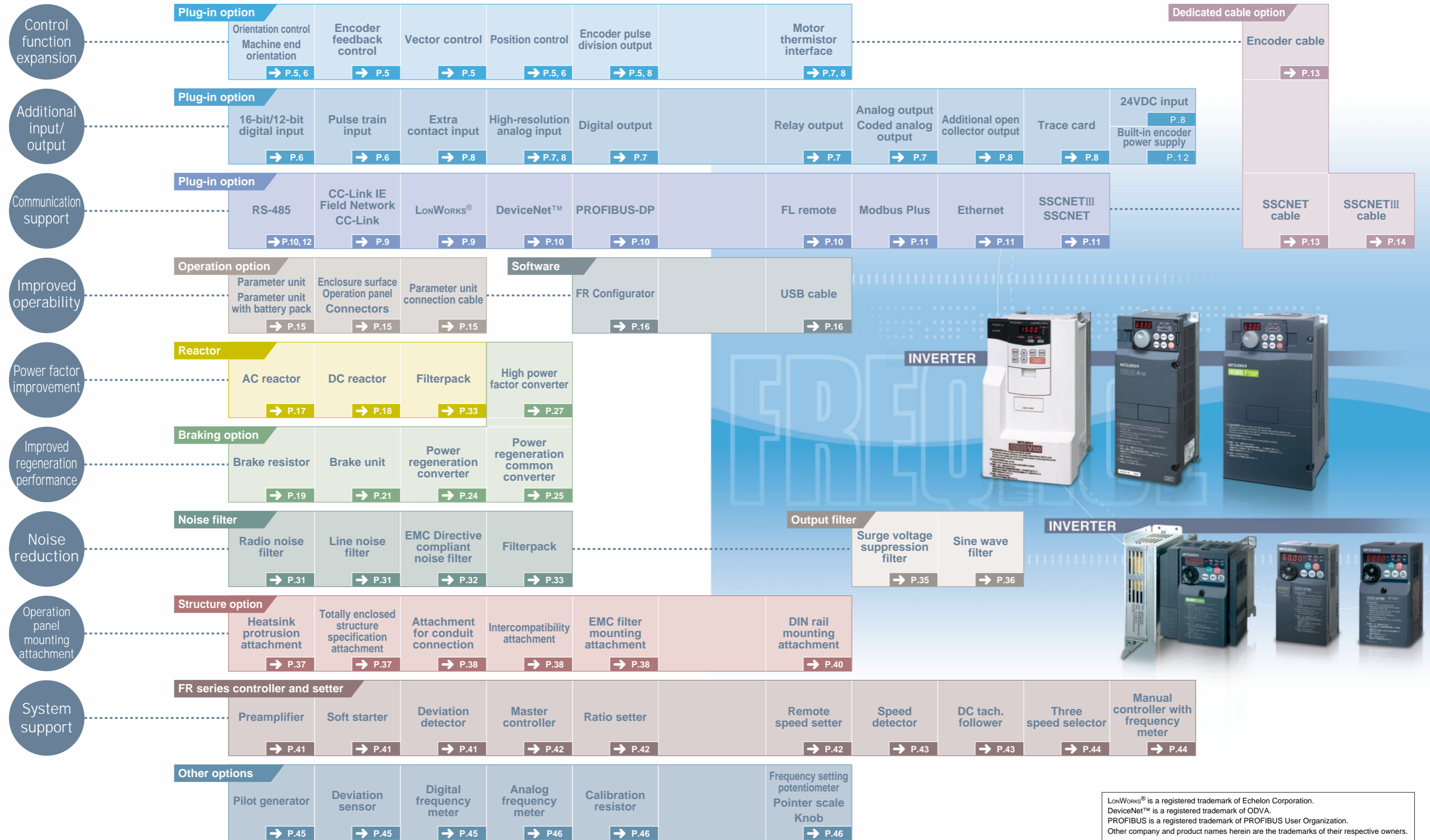
**FREQROL**



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



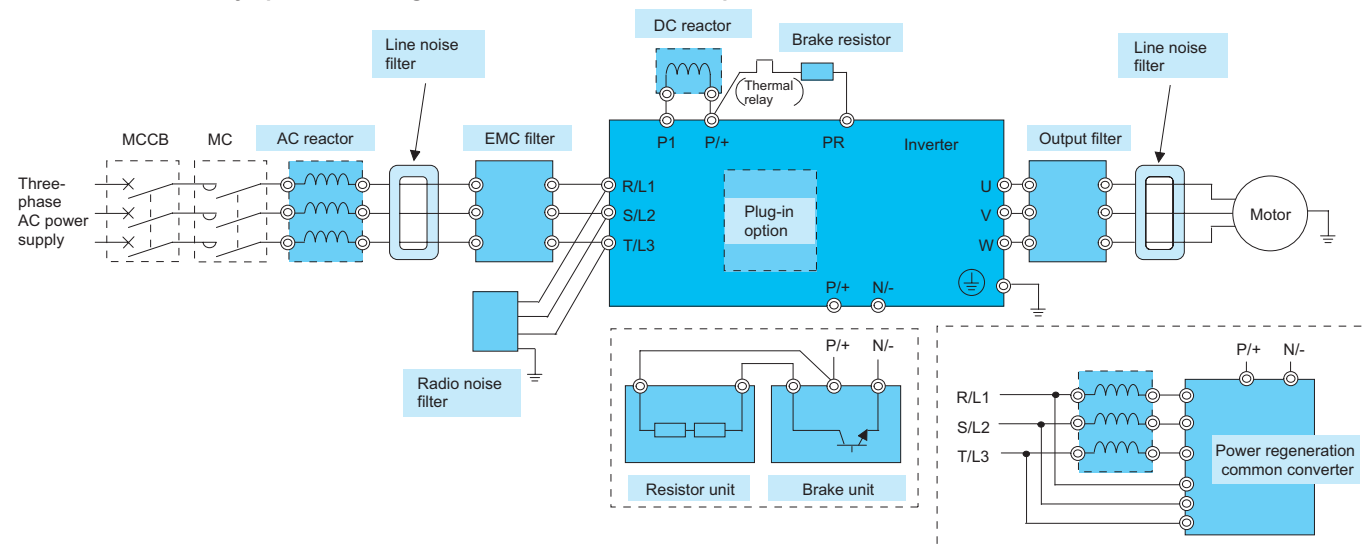
# A wide variety of options which improve function and performance, such as installation attachments, are available for the FR series lineup.



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## Connection example

This diagram shows the 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	Line noise filter Radio noise filter	EMC filter	Brake resistor	Brake unit Resistor unit	Power regeneration common converter High power factor converter		
Use when power harmonic 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 EU 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

○: Available ×: Not available

Name	Type	Applicable Inverter						Refer to Page
		FR-A700	FR-F700(P)	FR-E700	FR-F700PJ	FR-D700	FR-V500(L)	
<b>Plug-in option (control function expansion, additional input/output)</b>								
Orientation control	FR-A7AP	○	×	×	×	×	×	*1 5
Encoder feedback control								
Vector control	FR-A7AL	○	×	×	×	×	×	*1 5
Machine end orientation	FR-V5AM	×	×	×	×	×	○	6
Machine end orientation control	FR-A5AP	×	×	×	×	×	○	6
Pulse train input								
Position control	FR-V5AP	×	×	×	×	×	○	6
16-bit digital input	FR-A7AX	○	○	○ E kit	×	×	×	6
12-bit digital input	FR-V5AH	×	×	×	×	×	○	6
Analog output (2 terminals)	FR-A7AY	○	○	○ E kit	×	×	×	7
Digital output (7 terminals)	FR-A5AY	×	×	×	×	×	○	7
Relay output (3 terminals)	FR-A7AR	○	○	○ E kit	×	×	×	7
Relay output (1 terminal) (RS-485 communication)	FR-A5AR	×	×	×	×	×	○	7
Coded analog output	FR-A5NR	×	×	×	×	×	○	7
High-resolution analog input	FR-A7AZ	○	×	×	×	×	×	8
Motor thermistor interface	FR-E7DS	×	×	○ *3	×	×	×	8
24VDC input								
Extra contact input (6 terminals)	FR-V5AX	×	×	×	×	×	○	8
High-resolution analog input								
Motor thermistor interface								
Additional open collector output	FR-V5AY	×	×	×	×	×	○	8
Encoder pulse division output								
Trace card	T-TRC50	×	×	×	×	×	○	8
<b>Plug-in option (for communication)</b>								
USB	USB connector (inverter)	Equipped as standard	×	Equipped as standard	×	×	×	—
	PU connector (inverter)	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	Equipped as standard	—
RS-485	Dedicated terminal (inverter)	Equipped as standard	Equipped as standard	FR-E7TR	×	×	×	—
	FR-A5NR	×	×	×	×	×	○	10
CC-Link IE Field Network	FR-A7NCE	○	×	×	×	×	×	9
	FR-A7NC	○	○	○ E kit	×	×	×	9
CC-Link	FR-A5NC	×	×	×	×	×	○	9
	Dedicated inverter	×	×	FR-E7□□-□KNC	×	×	×	9
LONWORKS	FR-A7NL	○	○	○ E kit	×	×	×	10

\*1 Vector control/orientation control are built-in functions already available for this inverter model.  
 \*2 One phase pulse train input is a built-in function already available for this inverter model.  
 \*3 Available for FR-E7□□-□KSC (safety stop function model).

Name	Type	Applicable Inverter						Refer to Page
		FR-A700	FR-F700(P)	FR-E700	FR-F700PJ	FR-D700	FR-V500(L)	
<b>Plug-in option (for communication)</b>								
DeviceNet™	FR-A7ND	○	○	○ E kit	×	×	×	10
	FR-A5ND	×	×	×	×	×	○	10
PROFIBUS-DP	FR-A7NP	○	○	○ E kit	×	×	×	10
	FR-A5NPA	×	×	×	×	×	○	10
FL remote	FR-A7NF	○	○	×	×	×	×	10
	Dedicated inverter	×	×	FR-E7□□-□KNF	×	×	×	10
Modbus Plus	FR-A5NM	×	×	×	×	×	Support V500L only	11
Ethernet	FR-V5NE	×	×	×	×	×	Support V500 only	11
SSCNET	FR-V5NS	×	×	×	×	×	○	11
SSCNET III	FR-A7NS	○	×	×	×	×	×	11
<b>Control terminal option</b>								
12V control circuit terminal block with encoder power supply	FR-A7PS	○	×	×	×	×	×	12
RS-485 2-port terminal block	FR-E7TR	×	×	○	×	×	×	12
<b>Dedicated cable option</b>								
Encoder cable	FR-V7CBL□□	○	×	×	×	×	×	13
	FR-V5CBL□□	×	×	×	×	×	○	13
	FR-JCBL□□	○	×	×	×	×	○	13
SSCNET cable	FR-V5NSCBL□□	×	×	×	×	×	○	13
SSCNET III cable	MR-J3USBCM-□	○	×	×	×	×	×	14
<b>Operation option</b>								
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
Enclosure surface operation panel	FR-PA07	×	×	○	○	○	×	15
Parameter unit connection cable	FR-CB20□	○	○	○	○	○	○	15
<b>Software</b>								
FR Configurator	FR-SW3-SETUP-WE	○	○	○	×	○	×	16
	FR-SW2-SETUP-WE	○	○	×	×	×	×	16
	FR-SW1-SETUP-WE	×	×	×	×	×	○	16
USB cable	MR-J3USBCBL3M	×	×	○	×	×	×	16
<b>Reactor</b>								
AC reactor	FR-HAL	○	○	○	○	○	○	17
DC reactor	FR-HEL	○ *4	○ *4	○	○	○	○ *4	18
<b>Braking option</b>								
Brake resistor	MRS, MYS	×	×	○ *5	○	○ *5	×	19
High-duty brake resistor	FR-ABR	○ *5	×	○ *5	○	○ *5	○ *5	19
Brake unit	FR-BU2	○ *6	○ *6	○ *6	○ *6	○ *6	○ *6	21
	Resistor	GRZG	○	○	○	○	○	21
	Resistor unit	FR-BR	○	○	○	○	○	21
		MT-BR5	○	○	×	×	○	21
Power regeneration converter	MT-RC	○	○	×	×	×	○	24
Power regeneration common converter	FR-CV	○	○	○	○	○	○	25
	Dedicated, standalone reactor	FR-CVL	○	○	○	○	○	25
		FR-HC2	○	○	○	○	○	27
High power factor converter	FR-HC	○	○	○	○	○	○	29
		MT-HC	○	○	×	×	○	29
<b>Noise filter</b>								
Radio noise filter	FR-BIF	Corresponding filter is built-in	Corresponding filter is built-in	○	○	○	○	31
	FR-BSF01	○ *7	○ *7	○	○	○	○	31
Line noise filter	FR-BLF	○ *7	○ *7	○	○	○	○	31
	Built-in filter	Standard equipped	(2nd Environment)	×	×	×	×	—
	SF□□	×	×	○	○	○	○	32
EMC Directive compliant EMC filter	FR-E5NF	×	×	○	○	○	×	32
	FR-S5NFSA	×	×	○	×	×	×	32
Filterpack (DC reactor/noise filter)	FR-BFP2	×	×	○	○ *8	○	×	33
<b>Output filter</b>								
Surge voltage suppression filter	FR-ASF	○ *9	○	○	○	○	×	35
	FR-BMF	○ *9	○	○	○	○	×	35
Sine wave filter	Reactor	MT-BSL(-HC)	○ *9	○	×	×	×	36
	Capacitor	MT-BSC	○ *9	○	×	×	×	36
<b>Structure option</b>								
Heatsink protrusion attachment	FR-A7CN	○	○	×	×	×	×	37
	FR-E7CN	×	×	×	×	×	×	37
	FR-A5CN	×	×	×	×	×	○	37
	MT-A5CN	×	×	×	×	×	○	37
Totally-enclosed structure attachment	FR-A5CV	×	×	×	×	×	○	37
Attachment for cable conduit connection	FR-A5FN	×	×	×	×	×	○	38
	FR-AAT	○	○	×	×	×	×	38
Intercompatibility attachment	FR-A5AT	○	○	×	×	×	○	38
	FR-E7AT	×	×	○	×	×	×	38
EMC filter installation attachment	FR-E5T	×	×	○	○	○	×	38
DIN rail installation attachment	FR-UDA	×	×	○ *10	○ *10	○ *10	×	40
<b>FR series manual controller/speed controller</b>								
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
<b>Other options</b>								
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

\*4 For the 75K or higher, a DC reactor is supplied as standard.  
 \*5 Only models with a built-in brake transistor can be used. Refer to the text (page 19) for details.  
 \*6 For the 200V class 0.2K or less, 400V class 1.5K or lower, they can not be used in combination with a brake unit.  
 \*7 For the 55K or lower, a corresponding appliance is built-in on the input side.  
 \*8 Filterpack (FR-BFP2) is enclosed for the FR-F7□□PJ-□KF inverters.  
 \*9 They cannot be used under vector control and Real sensorless vector control operation.  
 \*10 Only 3.7K or lower is supported.

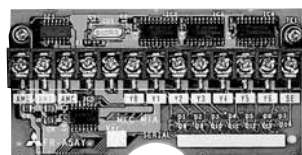
## Plug-in option (control function expansion/additional I/O)



### 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/encoder feedback control/vector control/position control/encoder pulse division output/machine end orientation control FR-A7AL 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.

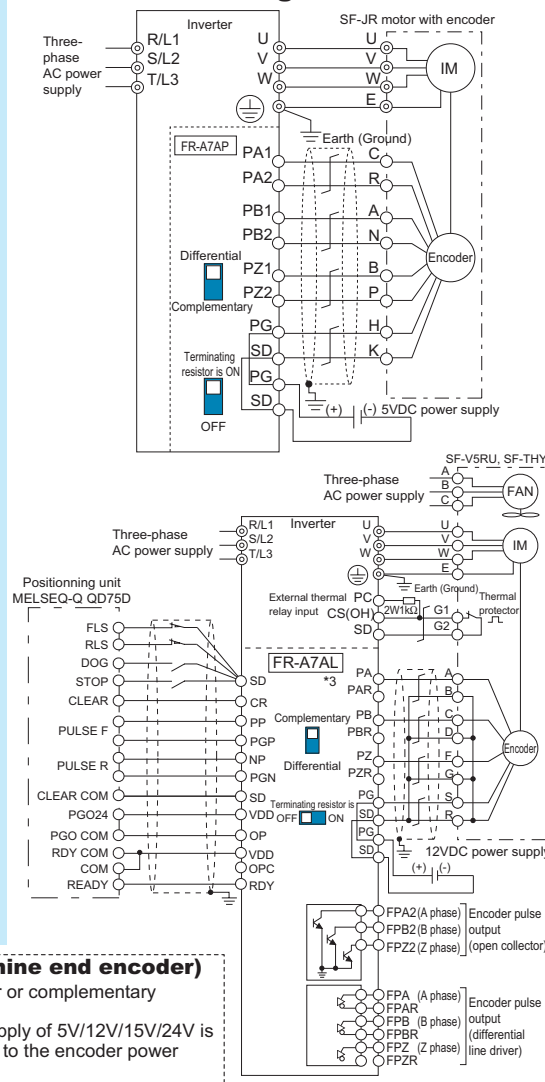
**Position control** : Position control can be performed by pulse train input.

**Encoder pulse division output** : Pulse input of encoder connected to the inverter is divided and output from the option terminal.

### Specifications

Function	Description	
Orientation control	Repeated positioning accuracy	±1.5°
	Permissible speed	Encoder-mounted shaft speed (6000r/min with 1024 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)
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
Vector control	Absolute torque accuracy	±10% *2
	Repeated torque accuracy	±5% *2
Position control (Available for FR-A7AL)	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
Encoder pulse division output (Available for FR-A7AL)	Output circuit method	Open collector and differential line driver
	Permissible load	Open collector output: 24VDC, max 50mA Differential line driver output: 0.1A
Machine end orientation control (Available for FR-A7AL)	Repeated positioning accuracy	±1.5°
	Permissible speed	Encoder-mounted shaft speed (6000r/min)

### Connection diagram



### (Applicable machine end encoder)

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

\*1 Regeneration unit (option) is necessary for regeneration.  
\*2 With online auto tuning (adaptive magnetic flux observer), dedicated motor, rated load  
\*3 FR-A7AL uses two option connectors of an inverter. When using FR-A7AL, only one more built-in option can be used.

## 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.

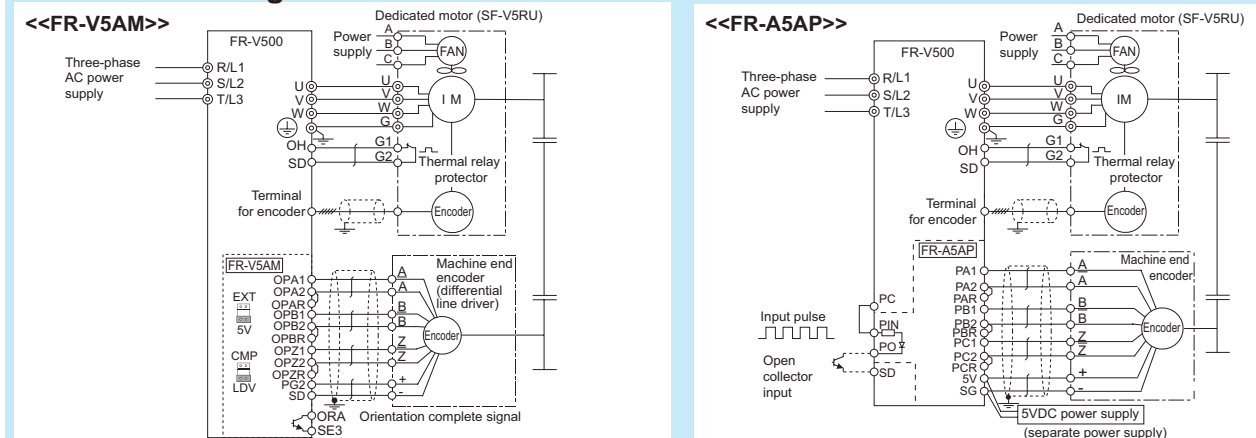
**Pulse train input** : Speed setting to the inverter can be input as pulse train signal.

### 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



### (Applicable machine end encoder)

- Differential line driver or complementary
- 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.

### (Applicable machine end encoder)

- Differential line driver
- 1000P/R to 4096P/R
- Separate power supply of 5V is necessary.

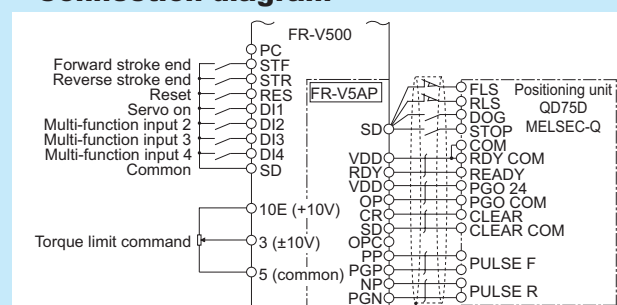
## Position control FR-V5AP V500

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

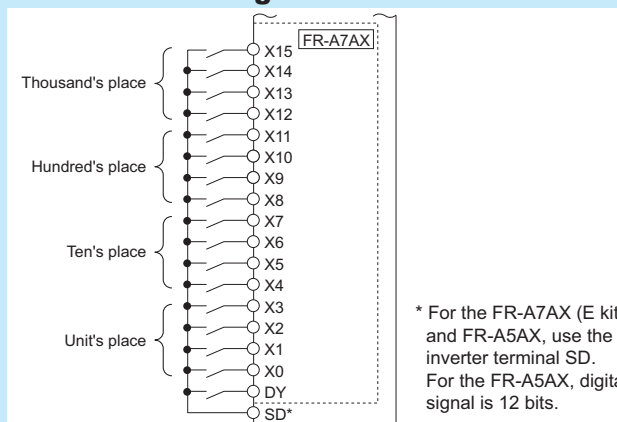
## 12-bit digital input FR-A5AX V500

**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
	Input specifications	<<FR-A5AX>> BCD code 3 digits Binary 12 bits
		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(P)) FR-A7AY E kit (E700) FR-A5AY (V500)

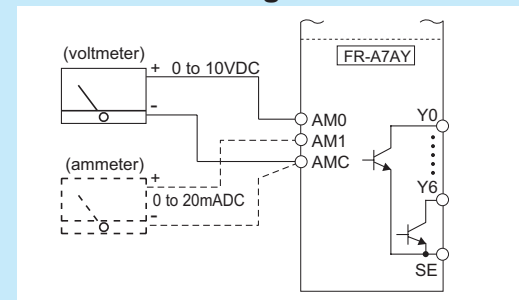
**Digital output** : Output signal (RUN, SU, etc.) provided with the inverter as standard can be output from the open collector terminal.

**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



## 24VDC input FR-E7DS (E700)

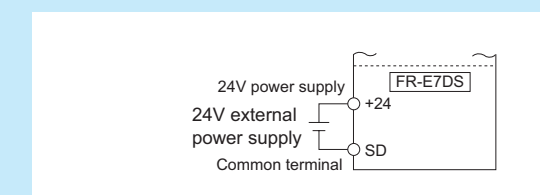
\* Supports FR-E7□0-□KSC only.

Instead of the main circuit power supply, external power can be supplied to an inverter. Connect the 24V external power supply across terminals +24 and SD. The 24V external power supply enables I/O terminal operation, operation panel displays, and control functions even while the inverter's main circuit power supply is OFF. When the main circuit power supply is turned ON, the power supply changes from the 24V external power supply to the main circuit power supply.

### ● Specifications

Function	Description	
24VDC input	Input voltage	23.5V to 26.5VDC
	Input current	0.7A or lower

### ● Connection diagram



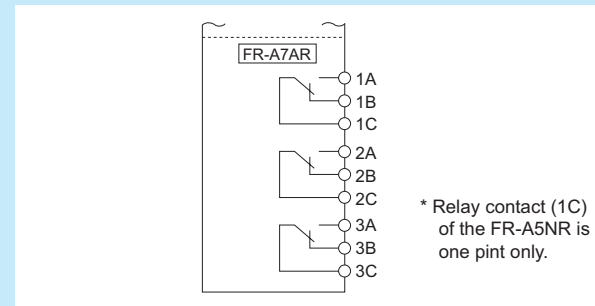
## Relay output FR-A7AR (A700) (F700(P)) FR-A7AR E kit (E700) FR-A5AR (V500) FR-A5NR (V500)

**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



## Extra contact input/high-resolution analog input/motor thermistor interface FR-V5AX (V500)

**Extra 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.

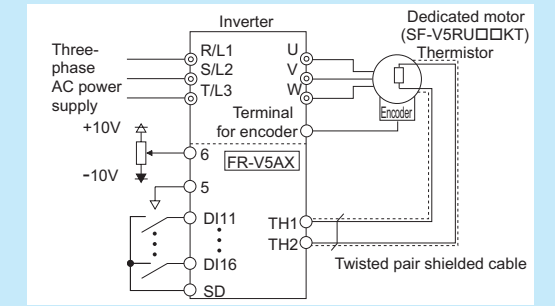
**High resolution analog input** : Inputting 0 to ±10VDC voltage enables speed command, torque limit command, torque command, etc.

**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	
Extra 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



## Coded analog output/high-resolution analog input/motor thermistor interface FR-A7AZ (A700)

**Coded analog output** : Outputting 0 to ±10VDC enables output frequency, output voltage, etc. to be monitored with a DC voltage meter.

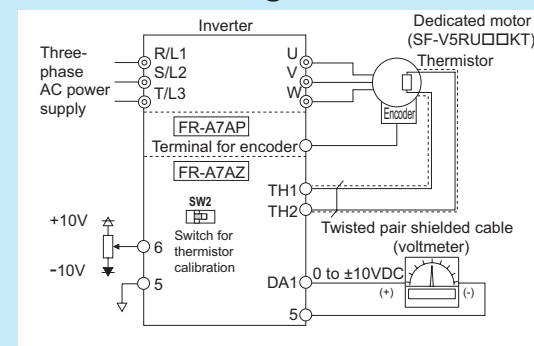
**High-resolution analog input** : Inputting 0 to ±10VDC voltage enables speed command, torque limit command, torque command, etc.

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

### ● Connection diagram



## Additional open collector output/encoder pulse division output FR-V5AY (V500)

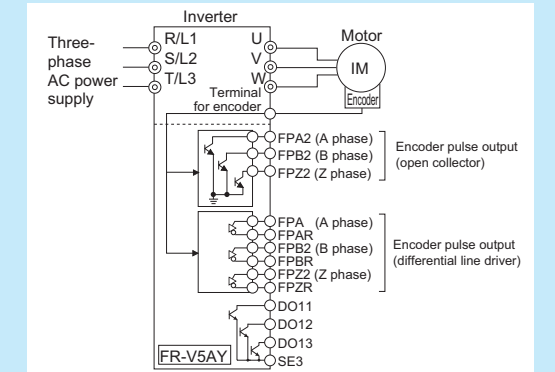
**Additional open collector** : You can select any three output signals (RUN, SU, IPF etc.) available with an inverter as standard, and output them as open collector signals.

**Encoder pulse division** : Pulse input of encoder connected to the inverter is divided and output from the option terminal.

### ● Specifications

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

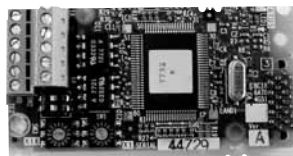
### ● Connection diagram



## Trace card T-TRC50 (V500)

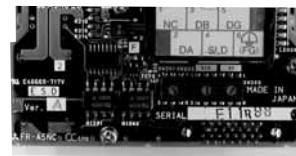
Connecting a trace card to the inverter enables data to be traced using setup software (FR-SW1-SETUP-WJ).

## 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.



**Dedicated product for FR-E720 : FR-E720-0.2KNF**

For the FR-E700 series, dedicated products are also available.

## CC-Link IE Field Network communication

FR-A7NCE (A700)

Gigabit transmission (1 Gbps) enables super-high speed communication. Network configuration is flexible with different types of topologies. CC-Link IE Field Network uses widely available Ethernet components, such as Ethernet cables and connectors.

### Specifications

Item	Description		
Network topology	Star, line, ring or a combination of line and star		
Station type	Intelligent device station	Maximum cyclic size (per node)	RX 64 bits
			RY 64 bits
			RWr 128 words
			RWw 128 words
		Transient transmission	Not supported
Number of connectable devices	120 units at maximum (64 units when all stations are inverters handling 128-word transmissions)		
Communication speed	1Gbps		
Maximum distance between stations	100m		
Connection cable	Ethernet cable (IEEE 802.3 1000BASE-T compliant cable or ANSI/TIA/EIA-568-B (Category 5e) compliant shielded 4-pair branched cable)		
Connector	Shielded RJ-45		

## CC-Link communication

FR-A7NC (A700) (F700(P)) FR-A7NC E kit (E700) FR-A5NC (V500)  
Dedicated inverter FR-E7□0-□KNC (E700)

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: Ver.1.10 supported FR-A7NC, FR-E7□0-□KNC: 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(P)) FR-A7NL E kit (E700)

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(P)) FR-A7ND E kit (E700) FR-A5ND (V500)

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(P)) FR-A7NP E kit (E700) 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

## FL remote communication

FR-A7NF (A700) (F700(P))

Dedicated inverter FR-E7□0-□KNC (E700)

A high speed communication of 100Mbps is obtained with an Ethernet-based network.

### Specifications

Item	Description
Network topology	Star (connection with a hub in the center), Star bus (connection with multiple hubs)
Number of connectable devices	64 units
Communication speed	10Mbps/100Mbps (auto detection)
Overall extension	2000m (Between node-hub: 100m maximum, between hubs:100m maximum)
Connection cable	FL-net dedicated cable

## 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.	

## 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) and monitoring 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 controller.

### ● 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□ (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) and monitoring 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 or FR-A7AL 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 (Q172DCPU) 32 axis maximum (Q173DCPU)
Calculation cycle at default setting of SV13 motion control	0.44ms/1 to 3 axis, 0.88ms/4 to 8 axis (Q172DCPU) 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□ (0.15m, 0.3m, 0.5m, 1m, 3m) : standard code for enclosure MR-J3BUS□-A (5m, 10m, 20m) : standard cable for outside enclosure MR-J3BUS□-B (30m, 40m, 50m) : long-distance cable

## Control terminal option

### Control circuit terminal block with 12V encoder power supply FR-A7PS (A700)

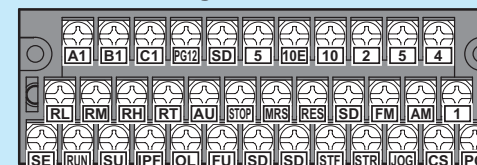
Use the option in exchange with standard control circuit terminals. This option enables the inverter to supply the 12V power source for the encoder.

### ● Specifications

Terminal Symbol	Terminal Name	Rated Specifications
PG12	Encoder power supply terminal (Positive side)	12VDC±10% Permissible maximum load current 150mA
SD	Contact input common (sink), Power supply ground terminal	Power supply common

The control circuit terminal specifications not shown above are the same as the specifications of the standard terminal block.

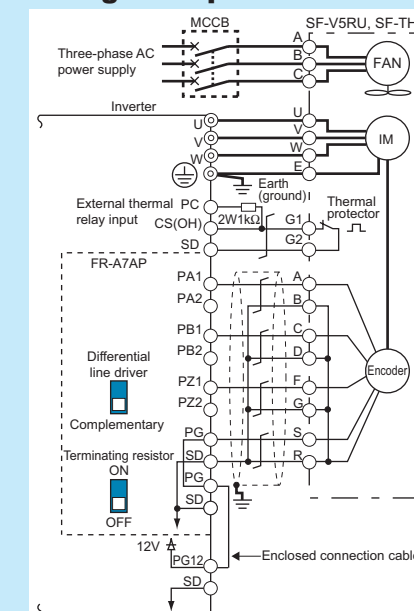
### ● Terminal layout



### ● Main differences and compatibilities with the standard terminal block

Standard Terminal Block	FR-A7PS
Without 12VDC power supply for encoder	With 12VDC power supply for encoder
Two relay contact terminals (terminal A1, B1, C1, A2, B2, C2)	One relay contact terminal (terminal A1, B1, C1)
Pr. 196 ABC2 terminal function selection	The Pr. 196 setting is invalid.
One terminal 5	Two terminal 5

### ● Wiring example of FR-A7AP



## RS-485 2-port terminal block

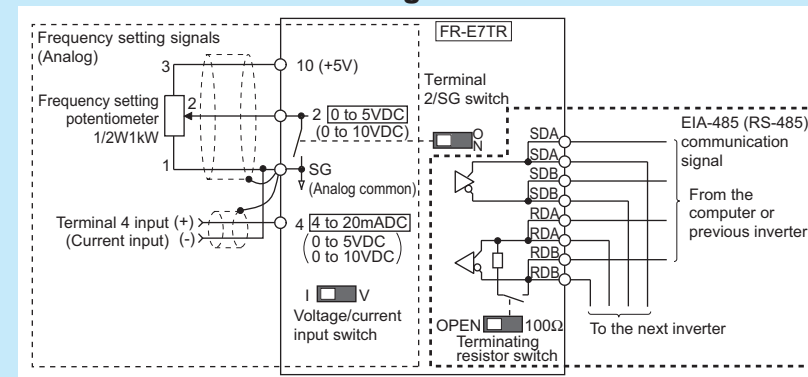
FR-E7TR (E700)

Use the option in exchange with standard control circuit terminals. (This option cannot be used simultaneously with the operation panel (FR-PA07) or parameter unit (FR-PU04/FR-PU07).) This terminal block enables RS-485 communication. Multi-drop connection can be easily performed with separate input and output terminals.

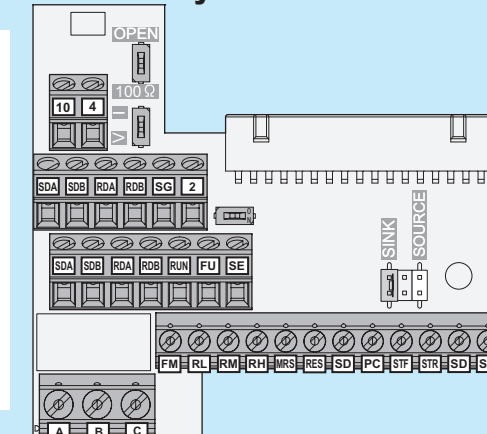
### ● Control terminal specifications

Terminal Symbol	Terminal Name	Rated Specifications	
RS-485 communication	SDA (2 terminals)	Inverter send+	
	SDB (2 terminals)	Inverter send-	
	RDA (2 terminals)	Inverter receive+	
	RDB (2 terminals)	Inverter receive-	
	10	Frequency setting power supply	5.2VDC±0.2V Permissible load current 10mA
Frequency setting	2	Frequency setting (voltage) /Common terminal	When voltage is input: input resistance 10kΩ ± 1kΩ Permissible maximum load voltage 20VDC When selected with SG: common terminal
	4	Frequency setting (current)	When current is input: input resistance 233Ω ± 5Ω Permissible load current 30mA When voltage is input: input resistance 10kΩ ± 1kΩ Permissible maximum load voltage 20VDC
SG	RS-485 communication common, Analog common	Common terminal	

### ● Terminal connection diagram



### ● Terminal layout



## Dedicated cable option

### Encoder cable

SF-V5RU ⇔ FR-A7AP/FR-A7AL FR-V7CBL□□ (A700)

SF-V5RU ⇔ FR-V500 FR-V5CBL□□ (V500)

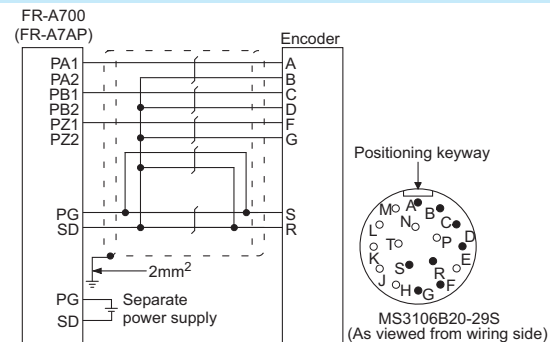
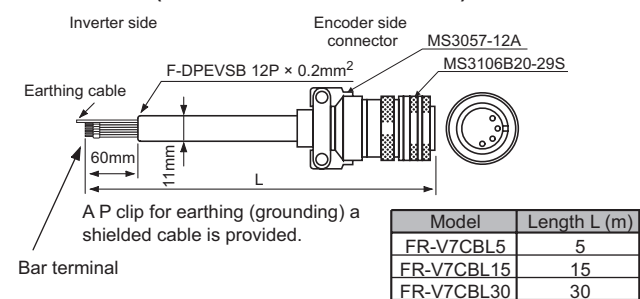
SF-JR with encoder ⇔ FR-A7AP/FR-A7AL, FR-V500 FR-JCBL□□ \* (A700) (V500)

\* Crimping terminals need to be modified.

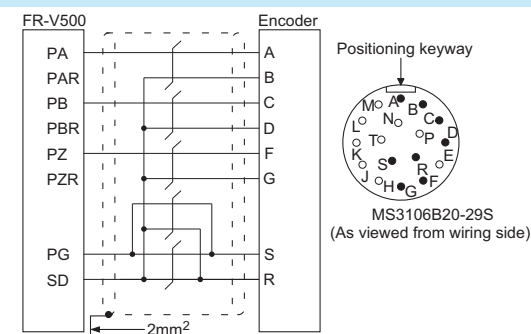
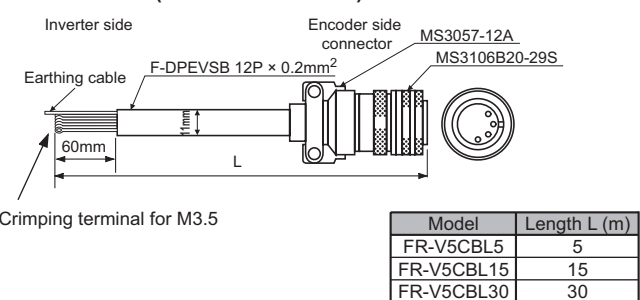
Dedicated cable for connecting encoder signal from the motor to the inverter.

#### ● Outline dimension drawings, connection diagram

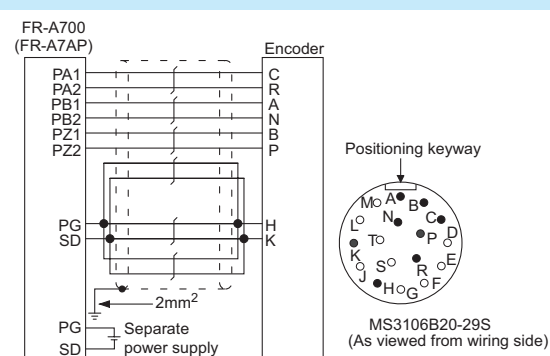
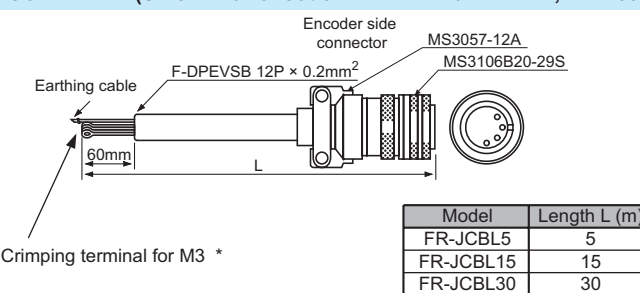
##### <<FR-V7CBL□□>> (SF-V5RU⇔FR-A7AP/FR-A7AL)



##### <<FR-V5CBL□□>> (SF-V5RU⇔FR-V500)



##### <<FR-JCBL□□>> (SF-JR with encoder⇔FR-A7AP/FR-A7AL, FR-V500)



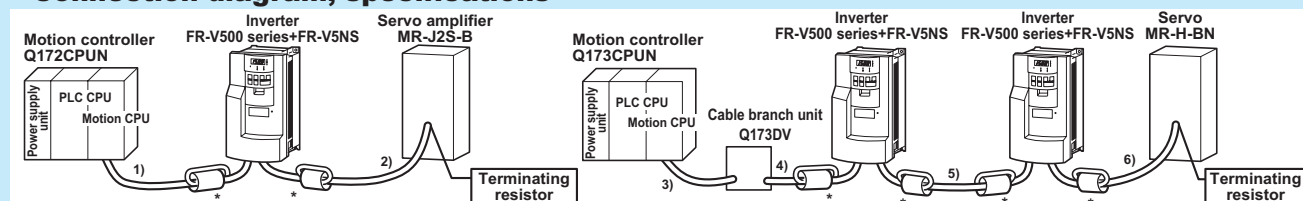
\* Change to bar terminal when used with the FR-A7AP/FR-A7AL. Change to crimping terminal for M3.5 when using the FR-V500.

## 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 sides of the communication cable for one time (2T, two turns).

No.	Model	Length (m)	Cable Type	Applications
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□□(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□□(B)			For connection of the Q172CPUN/FR-V5NS and MR-H-BN
3)	Q173DVCBL□□	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□□(-A, B) (A700)

A dedicated cable for connecting the FR-A700 series inverter with FR-A7AP/FR-A7AL and FR-A7NS plug-in option to SSCNET III.

#### ● Specifications

Model *1	MR-J3BUS□□	MR-J3BUS□□-A	MR-J3BUS□□-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
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		
Atmosphere	Indoor (avoid direct sunlight) No medium nor oil should be attached		
Appearance (mm)			

\*1 □ of model indicates the cable length.

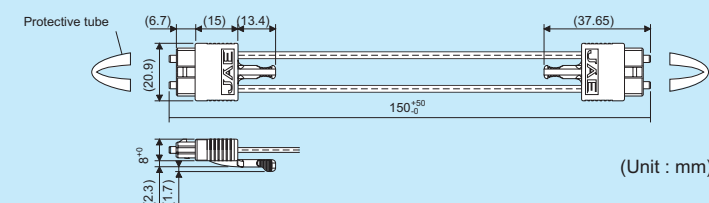
Symbol	015	03	05	1	3	5	10	20	30	40	50
Length (m)	0.15	0.3	0.5	1	3	5	10	20	30	40	50

\*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.

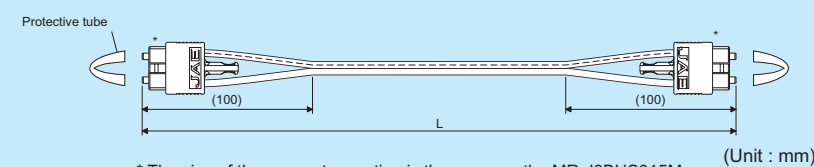
\*3 This operating temperature range is the value for optical cable (code) only. The temperature conditions of the connector section is the same as the inverter.

#### ● Outline dimension drawings

##### <<MR-J3BUS015M>>



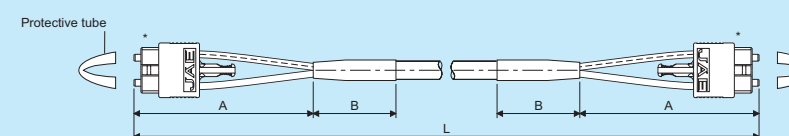
##### <<MR-J3BUS03M to MR-J3BUS3M>>



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

Cable Model	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 Model	MR-J3BUS5M-A	MR-J3BUS10M-A	MR-J3BUS20M-A	MR-J3BUS30M-B	MR-J3BUS40M-B	MR-J3BUS50M-B
Length A (mm)	100			150		
Length B (mm)	30			50		
Length L (m)	5	10	20	30	40	50



## Operation panel option

### Parameter unit

FR-PU07 (A700) (F700(P)) (E700) (F700PJ) (D700)  
 FR-PU04 (A700) (F700(P)) (E700) (F700PJ) (D700)  
 FR-PU04V (V500)

Interactive parameter unit with LCD display.

#### ● Features

<<FR-PU07/FR-PU04>>

- Remove an operation panel to connect a parameter unit.
- Setting functionality 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.
- Some limitations exist for the use of FR-PU04 with the 700 series inverters. (For details, refer to the Instruction Manual of the inverter.)

<<FR-PU04V>>

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



FR-PU07 FR-PU04V

### Parameter unit with battery pack

FR-PU07BB(-L) (A700) (F700(P)) (E700)

This parameter unit enables parameter setting without connecting the inverter to power supply. It uses four AA batteries as the power source, but can also be powered with 100VAC. An AC adaptor is separately available.

#### ● Specifications

Item	Description
Power supply	<ul style="list-style-type: none"> <li>When driven by batteries: AA batteries four (nickel hydride(NiMH)/alkali)</li> <li>When driven by external power supply (100VAC): AC adaptor (separately available *1)</li> <li>When power is applied to the inverter: Power is supplied from the PU connector of the inverter.</li> </ul>
Driving time by battery (continuous operating time reference value)	<ul style="list-style-type: none"> <li>When using the FR-A700/F700 series:                             <ul style="list-style-type: none"> <li>Nickel hydride (NiMH) battery: Approx. 120 minutes</li> <li>Alkali battery: Approx. 90 minutes</li> </ul> </li> <li>When using the FR-E700 series:                             <ul style="list-style-type: none"> <li>Nickel hydride(NiMH) battery: Approx. 300 minutes</li> <li>Alkali battery: Approx. 150 minutes</li> </ul> </li> </ul>
Switch · connector	<ul style="list-style-type: none"> <li>Battery ON/OFF switch</li> <li>Modular connector for inverter connection and connector for AC adaptor connection</li> </ul>
Display functions	Alarm LED for battery exhaustion. Other display is the same as the FR-PU07.
Provided appliances	<ul style="list-style-type: none"> <li>AA alkali battery (for operation check): four *2</li> <li>Connection cable (FR-CB203): one</li> </ul>



FR-PU07BB

\*1 Dedicated 100VAC adaptor (separately available): TAS2900-PUA (introduced product). (Please contact your sales representative or the nearest Mitsubishi FA Center.)

\*2 Batteries are not included in FR-PU07BB-L.

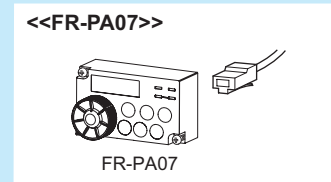
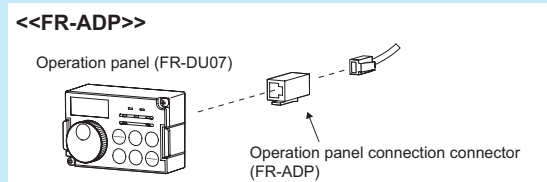
### Operation panel connection connector Enclosure surface operation panel

FR-ADP (A700) (F700(P))  
 FR-PA07 (E700) (F700PJ) (D700)

FR-ADP :Use this connector to mount an operation panel, which is detached from a FR-A700 or F700(P) series inverter, to an enclosure surface.

FR-PA07:This operation panel can be mounted to an enclosure surface to enable inverter operation and monitoring of frequency, etc.

#### ● Appearance diagram



### Parameter unit connection cable

FR-CB20□ (ALL)

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

#### ● Specifications

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

## Software

### FR Configurator

FR-SW3-SETUP-WE \*1 (A700) (F700(P)) (E700) (D700)  
 FR-SW2-SETUP-WE \*2 (A700) (F700)  
 FR-SW1-SETUP-WE (V500) (E500) (F500J)

\*1 The CD-ROM of the FR-SW3-SETUP-WE contains the FR-SW1-SETUP-WE software.

\*2 The CD-ROM of the FR-SW2-SETUP-WE contains the FR-SW1-SETUP-WE software.

FR Configurator software offers an easy and convenient operating platform.

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.

Use FR-SW3-SETUP-WE (CC-Link seamless) to facilitate setups via CC-Link communication.

\* Windows is a registered trademark of Microsoft Corporation.

#### ● Specifications

Type	FR-SW1-SETUP-WE	FR-SW2-SETUP-WE	FR-SW3-SETUP-WE	FR-SW3-SETUP-WE (CC-Link Seamless)
Supported inverters	FR-A500 (L) FR-F500 (L) FR-V500 (L) FR-E500 *1 FR-F500J FR-C500 FR-F700 *2	FR-A700 FR-F700	FR-A700 FR-F700(P) FR-E700 *3 FR-D700	FR-A700 FR-F700(P) FR-E700 *3
Supported OS	Windows XP Professional, XP Home Edition, 2000 Professional, ME, 98, 95	Windows XP Professional, XP Home Edition, 2000 Professional, ME, 98	Windows 7 (32bit ver.), Vista SP1 or later (32bit ver.), XP Professional SP2 or later (32bit ver.), XP Home Edition SP2 or later, 2000 Professional SP4 or later	

\*1 Except for FR-E520-□□□-KN, KND.

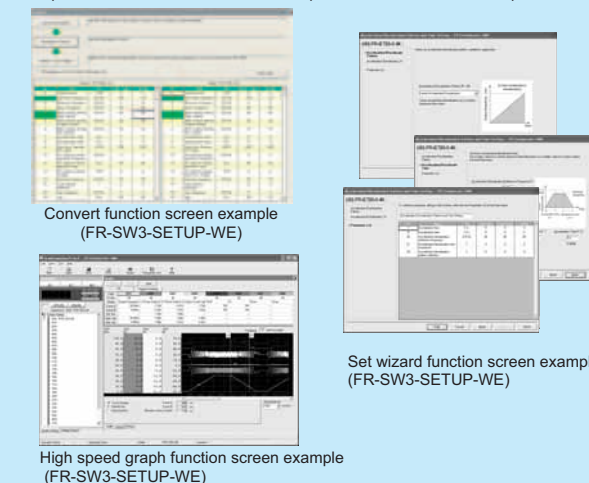
\*2 Up to 55K of the 200V class and up to 160K of the 400V class are supported.

\*3 Excluding FR-E7□0-□□KSC (safety stop function model), FR-E7□0-□□KNC (CC-Link communication model), and FR-E7□0-□□KNF (FL remote communication model).

#### ● 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, FR-SW2-SETUP-WE\*)
- I/O terminal function assignment function (FR-SW3, FR-SW2-SETUP-WE only\*)
- Life check function (FR-SW3, FR-SW2-SETUP-WE only)

\* Not supported by FR-SW3-SETUP-WE (CC-Link seamless).



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

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

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

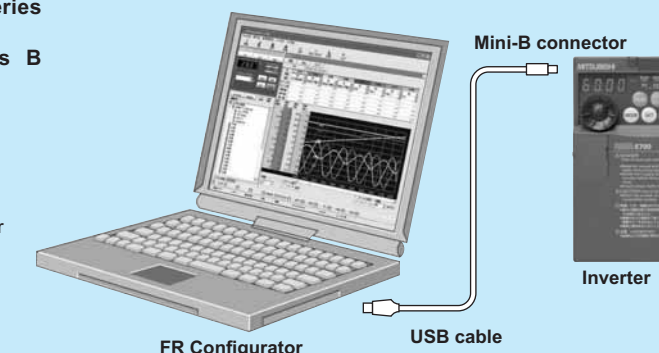
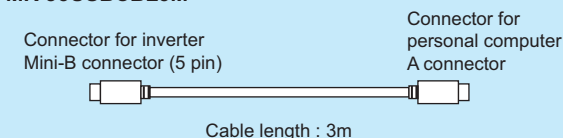
### USB cable

MR-J3USBCBL3M (E700)

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

#### ● Appearance diagram

<<MR-J3USBCBL3M>>



FR Configurator

USB cable

Inverter

## Reactor

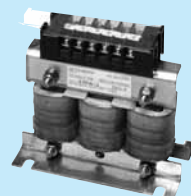
### AC reactor

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

Model FR-HAL-□□	200V	400V
		0.4K to 110K *1
Power factor improvement effect *2	Power factor at power supply: About 88% (92.3% *3) with 100% load	
Vibration	5.9m/s <sup>2</sup> or less 10 to 55Hz (directions of X, Y, Z axes)	H110K or less : 5.9m/s <sup>2</sup> or less H185K or more : 2.9m/s <sup>2</sup> or less 10 to 55Hz (directions of X, Y, Z axes)
Installation procedure	(H)55K or less : horizontal plane installation or vertical plane installation (H)75K or more : horizontal plane installation	

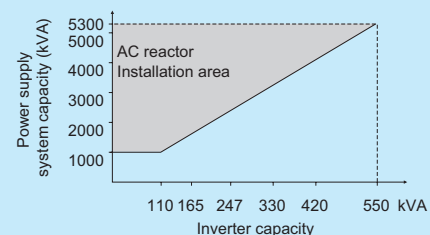


FR-HAL

- \*1 Refer to the model 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 Improved power factor is about 88%. (It is 92.3% when calculated by applying 1 power factor to the reference waveform according to the Architectural Standard Specifications (Electrical Installation) (2010 revisions) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan.)

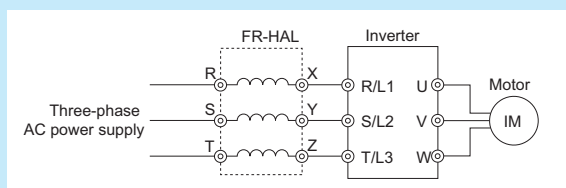
#### ● Selection

- 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.

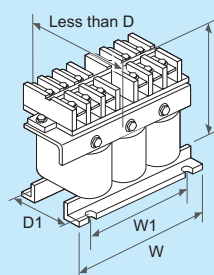


<Selection of reactor when using the large-capacity power transformer>

#### ● Connection diagram



#### ● Outline dimension drawings



\* The appearance of a typical model. The shape differs according to each model. W1 and D1 indicate distances between installation holes. H The installation hole size is indicated by d.

(Unit : mm)

Model	W	W1	H	D	D1	d	Mass (kg)	Model	W	W1	H	D	D1	d	Mass (kg)
0.75K	104	84	99	74	44	M5	0.8	H0.75K	135	120	115	59.6	45	M4	1.5
1.5K	104	84	99	77	50	M5	1.1	H1.5K	135	120	115	59.6	45	M4	1.5
2.2K	115	40	115	77	57	M6	1.5	H2.2K	135	120	115	59.6	45	M4	1.5
3.7K	115	40	115	83	67	M6	2.2	H3.7K	135	120	115	70.6	57	M4	2.5
5.5K	115	40	115	83	67	M6	2.3	H5.5K	160	145	142	72	55	M4	3.5
7.5K	130	50	135	100	86	M6	4.2	H7.5K	160	145	142	91	75	M4	5.0
11K	160	75	164	111	92	M6	5.2	H11K	160	145	146	91	75	M4	6.0
15K	160	75	167	126	107	M6	7.0	H15K	220	200	195	105	70	M5	9.0
18.5K	160	75	128	175	107	M6	7.1	H18.5K	220	200	215	170	70	M5	9.0
22K	185	75	150	158	87	M6	9.0	H22K	220	200	215	170	70	M5	9.5
30K	185	75	150	168	87	M6	9.7	H30K	220	200	215	170	75	M5	11
37K	210	75	175	174	82	M6	12.9	H37K	220	200	214	170	100	M5	12.5
45K	210	75	175	191	97	M6	16.4	H45K	280	255	245	165	80	M6	15
55K	210	75	175	201	97	M6	17.4	H55K	280	255	245	170	90	M6	18
75K	240	150	210	213	109	M8	23	H75K	205	75	170	208	105	M6	20
110K	330	170	325	258	127	M10	40	H110K	240	150	225	220	99	M8	28
								H185K	330	170	325	270	142	M10	55
								H280K	330	170	325	320	192	M10	80
								H355K	330	170	325	340	192	M10	80
								H560K	450	300	540	635	345	M12	190

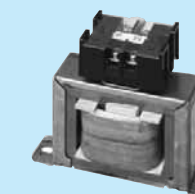
### DC reactor

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
Power factor improvement effect *2	Power factor at power supply: About 93% (94.4% *3)	
Vibration	5.9m/s <sup>2</sup> or less, 10 to 55Hz (directions of X, Y, Z axes)	
Installation procedure	Horizontal plane installation or vertical plane installation	



FR-HEL

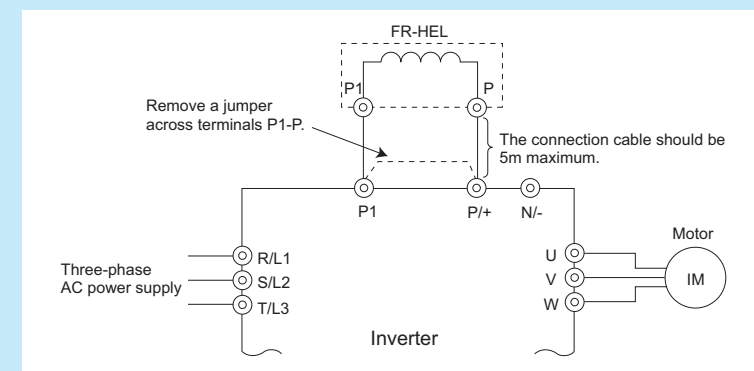
- \*1 Refer to the type in the table of outline dimension drawing for details of capacity.
- \*2 Power factor stated above is the value when considering the power supply impedance is 1%. The value changes according to the power supply capacity and power supply impedance. The load is considered as 100% 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 Improved power factor is about 93%. (It is 94.4% when calculated by applying 1 power factor to the reference waveform according to the Architectural Standard Specifications (Electrical Installation) (2010 revisions) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan.)

#### ● Selection

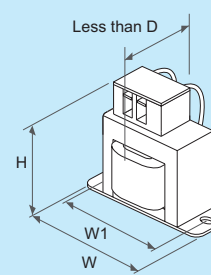
- Make selection according to the applicable motor capacity. (When the inverter capacity is larger than the motor capacity, make selection according to the motor capacity.)
- A DC reactor is enclosed with the inverter of 75K or more, be sure to connect the reactor to the inverter.

#### ● Connection diagram

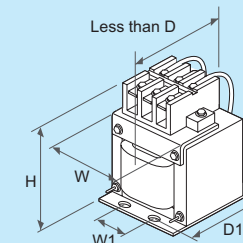
- Connect the reactor to terminal P1 and P of the inverter. Make sure to remove a jumper across terminal P1-P before connecting. (A failure to do so will produce no power factor improving effect.)
- The wiring length between the reactor and inverter should be 5m maximum and minimized.



#### ● Outline dimension drawings



FR-HEL-0.4K to 2.2K  
FR-HEL-H0.4K



FR-HEL-3.7K to 55K  
FR-HEL-H0.75K to H55K

\* The appearance of a typical model. The shape differs according to each model. W1 and D1 indicate distances between installation holes. The installation hole size is indicated by d.

Model	W	W1	H	D	D1	d	Mass (kg)	Model	W	W1	H	D	D1	d	Mass (kg)
0.75K	85	74	81	61	-	M4	0.5	H0.75K	66	50	100	70	48	M4	0.8
1.5K	85	74	81	70	-	M4	0.8	H1.5K	66	50	100	80	54	M4	1
2.2K	85	74	81	70	-	M4	0.9	H2.2K	76	50	110	80	54	M4	1.3
3.7K	77	55	92	82	57	M4	1.5	H3.7K	86	55	120	95	69	M4	2.3
5.5K	77	55	92	92	67	M4	1.9	H5.5K	96	60	128	100	75	M5	3
7.5K	86	60	113	98	72	M4	2.5	H7.5K	96	60	128	105	80	M5	3.5
11K	105	64	133	112	79	M6	3.3	H11K	105	75	137	110	85	M5	4.5
15K	105	64	133	115	84	M6	4.1	H15K	105	75	152	125	95	M5	5
18.5K	105	64	93	165	94	M6	4.7	H18.5K	114	75	162	120	80	M5	5
22K	105	64	93	175	104	M6	5.6	H22K	133	90	178	120	75	M5	6
30K	114	72	100	200	101	M6	7.8	H30K	133	90	178	120	80	M5	6.5
37K	133	86	117	195	98	M6	10	H37K	133	90	187	155	100	M5	8.5
45K	133	86	117	205	108	M6	11	H45K	133	90	187	170	110	M5	10
55K	153	126	132	209	122	M6	12.6	H55K	152	105	206	170	106	M6	11.5

(Unit : mm)

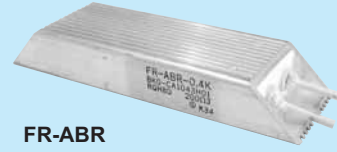
## Braking option

### Brake resistor High-duty brake resistor

MRS, MYS (E700) (F700PJ) (D700)  
FR-ABR (A700) (E700) (F700PJ) (D700) (V500)

\*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.



#### Specifications

Model MRS Type, MYS Type	200V				
	MRS120W	MRS120W	MRS120W	MRS120	MYS220W50 *2
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)

Model 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)

Model 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

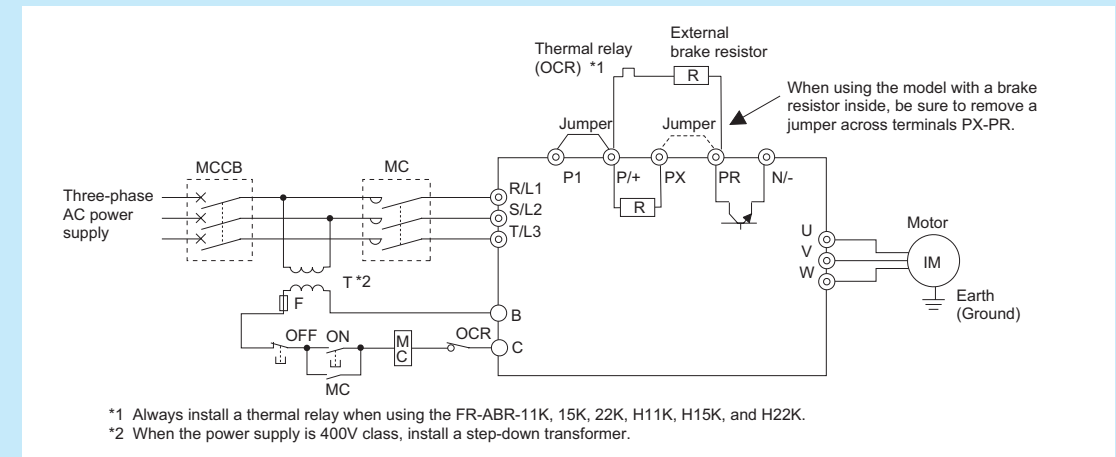
- Make selection according to the applicable motor capacity of the above specifications.
- The model with built-in brake resistor and external brake resistor

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 higher	×	×
FR-F700(P)	All capacities	×	×
FR-E700	0.1K, 0.2K	×	×
	0.4K or higher	×	○
FR-F700PJ	All capacities	×	○
FR-D700	0.1K, 0.2K	×	×
	0.4K or higher	×	○
FR-V500(L)	1.5K to 5.5K	○	○
	7.5K to 15K	×	○
	22K or higher	×	×

○ : Available × : Not available

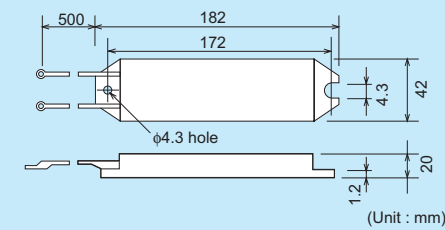
#### Connection diagram

- Connect across terminals P and PR of the inverter.
- When using the model with a brake resistor inside, be sure to remove a jumper across terminals PX and PR. (Note that a jumper across terminals P1 and 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.

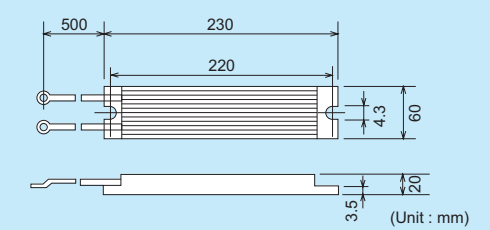


#### Outline dimension drawings

<<MRS type>>



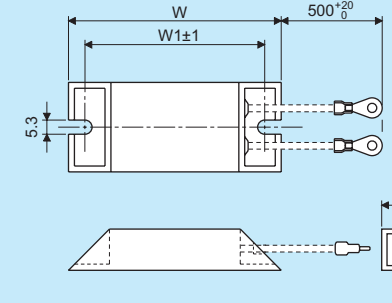
<<MYS type>> \*



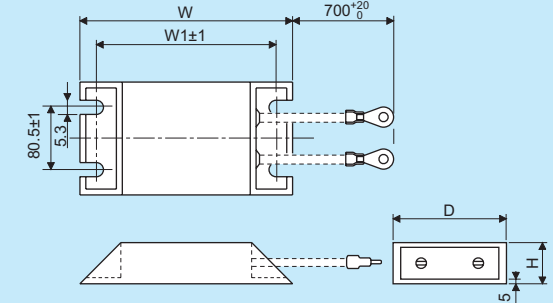
\* Outline dimension drawing of one resistor.

<<FR-ABR>>

FR-ABR-0.4K to 7.5K, H0.4K to H7.5K



FR-ABR-11K to 22K, H11K to H22K



Brake Resistor Model	Outline Dimension				Brake Resistor Model	Outline Dimension				
	W	W1	H	D		W	W1	H	D	
200V	FR-ABR-0.4K	140	125	21	40	FR-ABR-H0.4K	115	100	21	40
	FR-ABR-0.75K	215	200	21	40	FR-ABR-H0.75K	140	125	21	40
	FR-ABR-2.2K	240	225	26	50	FR-ABR-H1.5K	215	200	21	40
						FR-ABR-H2.2K	240	225	26	50
	FR-ABR-3.7K	215	200	33	61	FR-ABR-H3.7K	215	200	33	61
	FR-ABR-5.5K	335	320	33	61	FR-ABR-H5.5K	335	320	33	61
	FR-ABR-7.5K	400	385	40	80	FR-ABR-H7.5K	400	385	40	80
	FR-ABR-11K	400	385	50	100	FR-ABR-H11K	400	385	50	100
	FR-ABR-15K *	300	285	50	100	FR-ABR-H15K *	300	285	50	100
	FR-ABR-22K *	400	385	50	100	FR-ABR-H22K *	450	435	50	100

\* Outline dimension drawing of one resistor.

## Brake unit Discharging resistor or resistor unit

FR-BU2 (ALL)  
GRZG (ALL)  
FR-BR (ALL)  
MT-BR5 (A700) (F700(P)) (V500)

Braking options have larger braking capability than the external brake resistor. These options 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>>

Model FR-BU2-□	200V						400V						
	1.5K	3.7K	7.5K	15K	30K	55K	H7.5K	H15K	H30K	H55K	H75K	H220K	H280K
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.)											MT-BR5 *	
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	13	13



FR-BU2

\* Please contact your sales representative to use a brake resistor other than MT-BR5.

#### <<Discharging Resistor>>

Model 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

#### <<Resistor unit>>

Model 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

Model 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 Model		Discharging Resistor or Resistor Unit Model		
		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
	FR-BU2-H220K	—	—	3×MT-BR5-H75K *1
	FR-BU2-H280K	—	—	4×MT-BR5-H75K *1

\*1 The number before the model name explains the number of connectable units in parallel.

### 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		7×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		—		—		—	

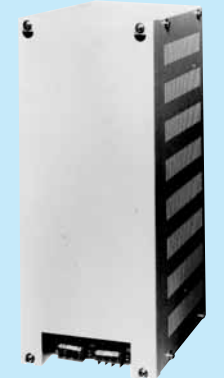
\*1 The number before the model name explains the number of connectable units in parallel.

\*2 The inverter of 1.5K or lower in the 400V class cannot be used in combination with a brake unit. To use in combination with a brake unit, use the inverter of 2.2K or higher.

#### <<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	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	80	40	15	10	—	—	—	—	—	—
	FR-BU2-H30K	—	—	65	30	25	15	10	—	—	—
	FR-BU2-H55K	—	—	—	—	90	60	30	20	15	10

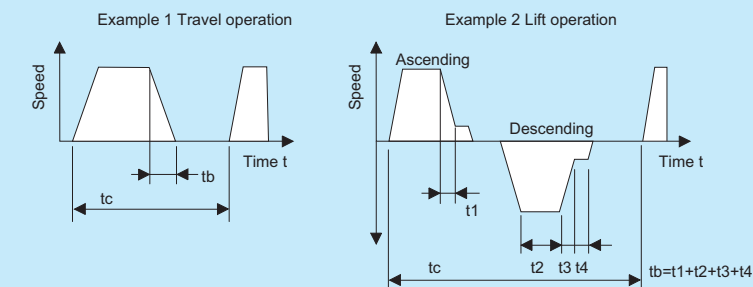


FR-BR

#### 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	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	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

$$\text{Regeneration load time factor (operating duty) \%ED} = \frac{t_b}{t_c} \times 100 \quad t_b < 15s \text{ (continuous operating time)}$$



#### <<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	250kW	280kW	315kW	355kW	375kW	400kW	450kW	500kW	560kW
200V class	FR-BU2-55K	1	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	FR-BU2-75K	2	20	15	10	—	—	—	—	—	—	—	—	—	—	—	—
400V class	FR-BU2-H220K	1	10	5	—	—	—	—	—	—	—	—	—	—	—	—	—
	FR-BU2-H280K	2	40	25	20	10	5	5	—	—	—	—	—	—	—	—	—
400V class	FR-BU2-H220K	1	80	60	40	25	15	10	5	—	—	—	—	—	—	—	—
	FR-BU2-H280K	2	—	—	—	—	—	—	20	20	15	15	15	10	10	10	5
400V class	FR-BU2-H280K	1	—	80	65	40	30	20	15	10	10	5	—	—	—	—	—
	FR-BU2-H280K	2	—	—	—	—	—	—	—	—	20	20	15	15	15	10	10

#### Braking torque (%) at short-time rating in 15s

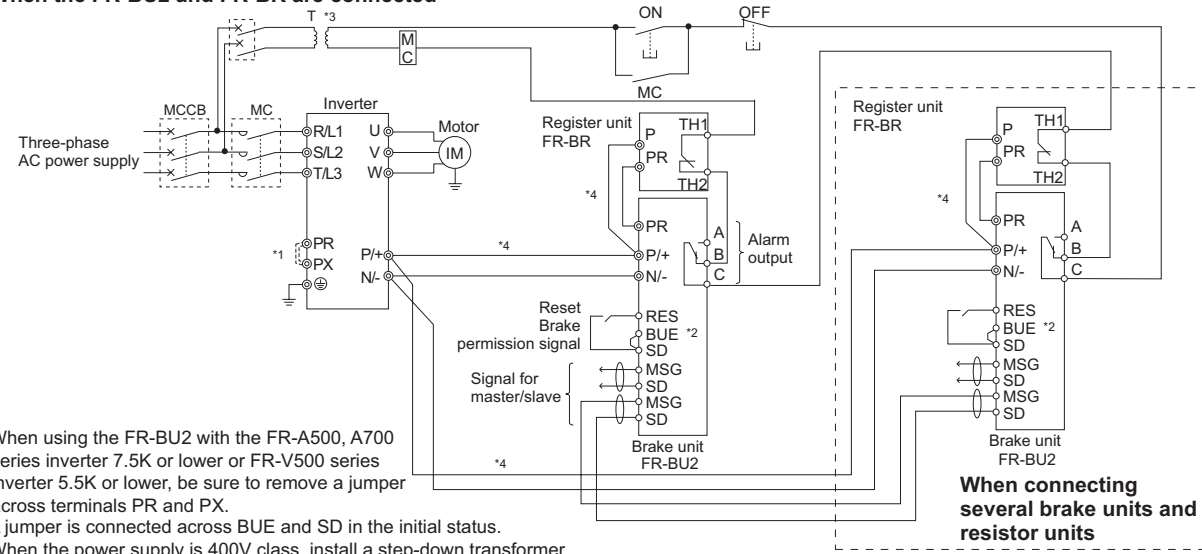
Motor Capacity		75kW	90kW	110kW	132kW	160kW	185kW	220kW	250kW	280kW	315kW	355kW	375kW	400kW	450kW	500kW	560kW
200V class	FR-BU2-55K	1	70	60	50	—	—	—	—	—	—	—	—	—	—	—	—
	FR-BU2-75K	2	150	120	100	—	—	—	—	—	—	—	—	—	—	—	—
400V class	FR-BU2-H220K	1	100	80	70	55	45	40	35	—	25	—	—	20	—	—	—
	FR-BU2-H280K	2	150	150	135	110	90	80	70	60	50	45	40	40	—	—	—
400V class	FR-BU2-H220K	1	—	—	150	150	135	115	100	80	55	—	—	—	—	—	—
	FR-BU2-H280K	2	—	—	—	—	—	—	—	—	150	150	140	120	110	100	90
400V class	FR-BU2-H280K	1	—	—	—	150	150	150	125	100	70	—	—	—	—	—	—
	FR-BU2-H280K	2	—	—	—	—	—	—	—	—	—	—	150	150	130	115	100

\*1 The number 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 lower or FR-V500 series inverter 5.5K or lower, be sure to remove a jumper across terminals 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.

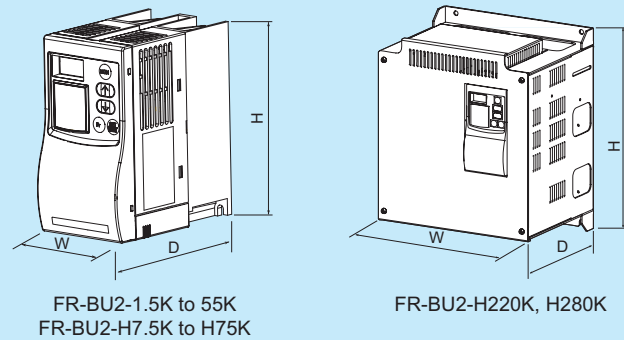
\*4 The wiring distance between the inverter, brake unit (FR-BU2) and resistor unit (FR-BR) should be within 5m. If twisted wires are used, the distance should be within 10m.

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.

**When connecting several brake units and resistor units**

## ● Outline dimension drawings

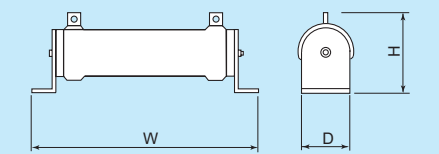
<<FR-BU2>>



(Unit : mm)

Model	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
FR-BU2-H220K, H280K	250	300	200

<<GRZG type>>

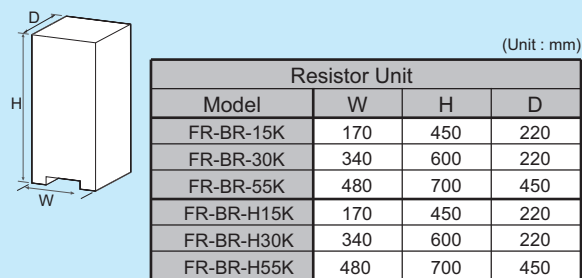


(Unit : mm)

Model	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>>

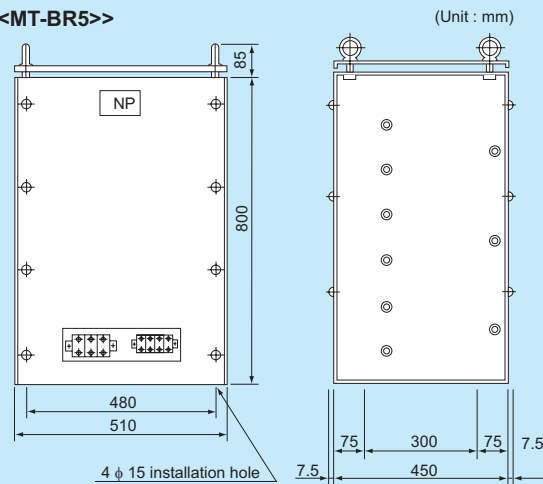


(Unit : mm)

Resistor Unit			
Model	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>>



\*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

MT-RC (A700) (F700(P))

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

### ● Specifications

Model 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 flow in the main circuit DC bus (terminal P/+, N/-).

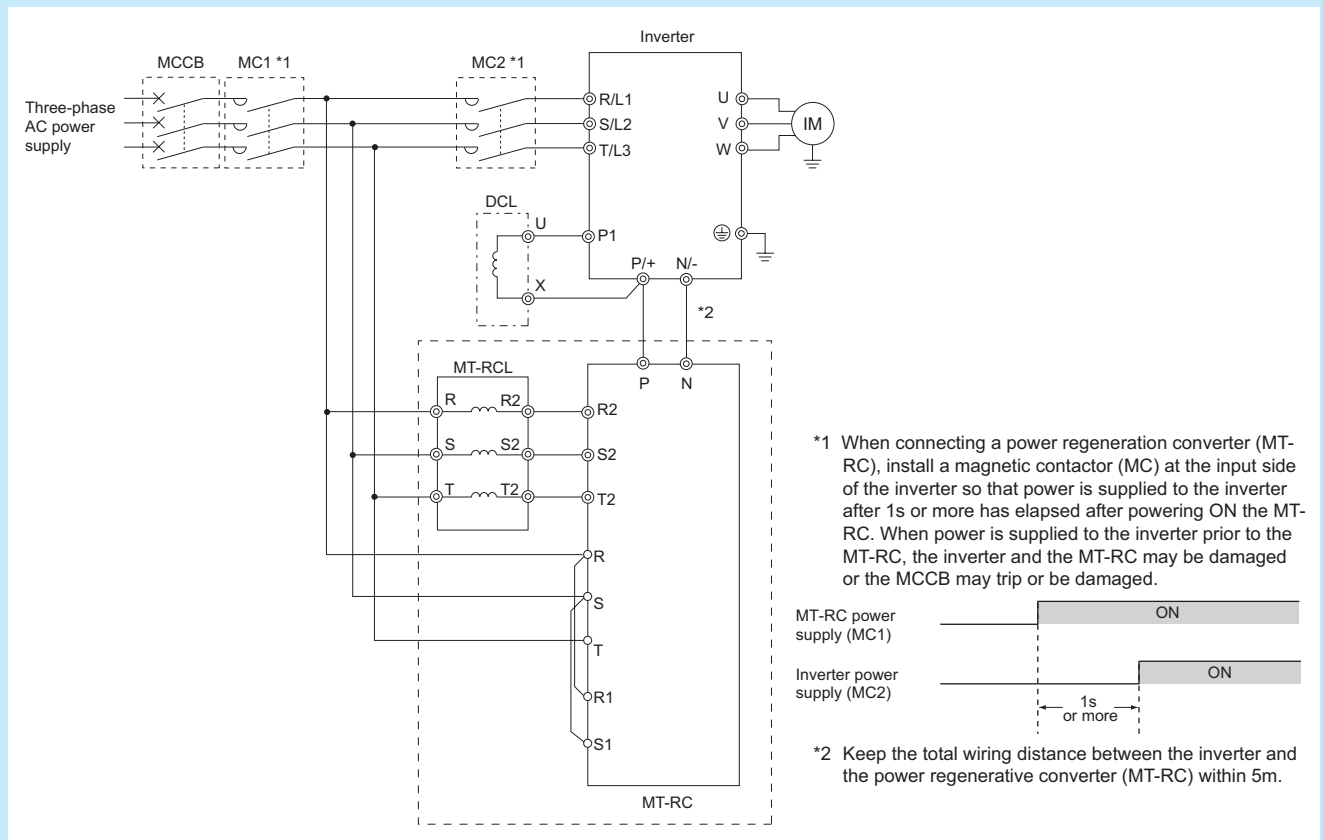
### ● Selection

- 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.)

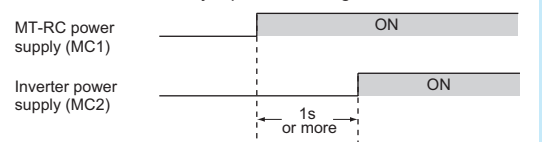
Braking torque (%) at continuous rating (% value on the assumption that the rated motor torque is 100%.)

Motor Capacity (kW)	75	90	110	132	150	160	185	200	220	250	280
Inverter model	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



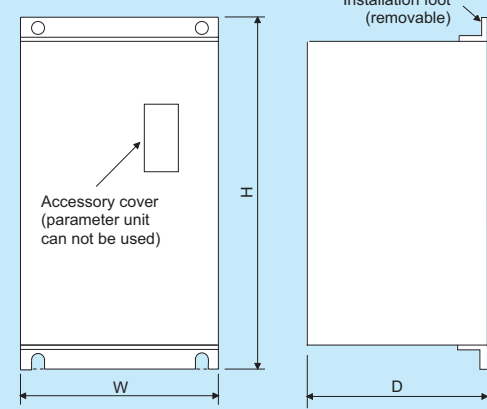
\*1 When connecting a power regeneration converter (MT-RC), install a magnetic contactor (MC) at the input side of the inverter so that power is supplied to the inverter after 1s or more has elapsed after powering ON the MT-RC. When power is supplied to the inverter prior to the MT-RC, the inverter and the MT-RC may be damaged or the MCCB may trip or be damaged.



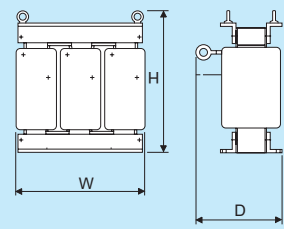
\*2 Keep the total wiring distance between the inverter and the power regenerative converter (MT-RC) within 5m.

## ● Outline dimension drawings

<<MT-RC>>



<<MT-RCL>>



(Unit : mm)

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

(Unit : mm)

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

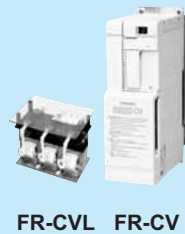
## Power regeneration common converter Dedicated standalone reactor

FR-CV ALL  
FR-CVL ALL

A power regeneration common converter and dedicated standalone reactor enable 100%-torque continuous regeneration to support continuous regenerative operation for line control, etc. These options save 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



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.

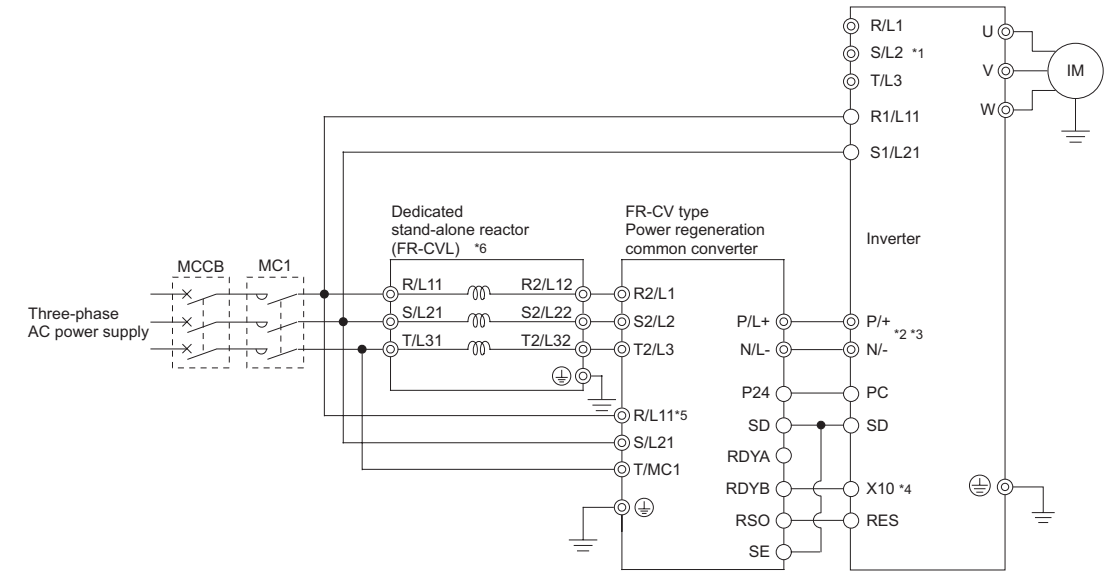
Select the converter so that the total rated currents of the motors will not exceed the applicable current.

To use an FR-V500 series inverter, select a capacity that is one rank lower than the FR-CV capacity (except 55kW).

(Example) When using FR-CV-15K, the applicable FR-V500 series inverter capacity would be: 1) FR-V520-11K

2) FR-V520-7.5K + FR-V520-2.2K

## ● 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 Keep the total wiring distance between the inverter and the power regeneration common converter (FR-CV) within 5m.

\*4 Assign the terminal for X10 signal using input terminal function selection.

\*5 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.

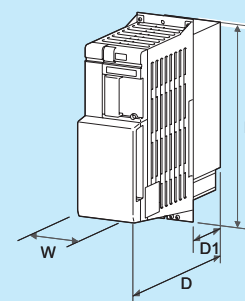
\*6 Install the dedicated stand-alone reactor (FR-CVL) on horizontal plane.

\*7 The use of a power factor AC reactor (FR-HAL) may reduce the effect of the power regeneration function. Do not use it.

\*8 Do not use a power factor improvement DC reactor (FR-HEL).

## ● Outline dimension drawings

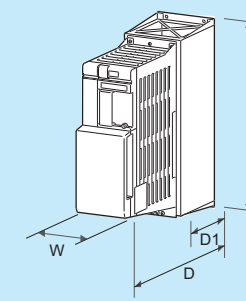
<<FR-CV(H)>>



(Unit : mm)

FR-CV(H)	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
400V	37K/55K	400	620	250	135
	7.5K/11K/15K	120	300	305	105
	22K/30K	150	380	305	105
	37K/55K	400	620	250	135

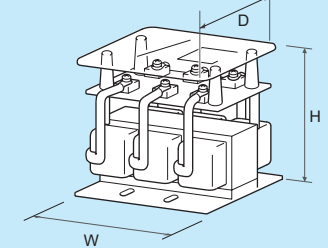
<<FR-CV(H)-AT>>



(Unit : mm)

FR-CV(H)-AT	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>>



(Unit : mm)

FR-CVL	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

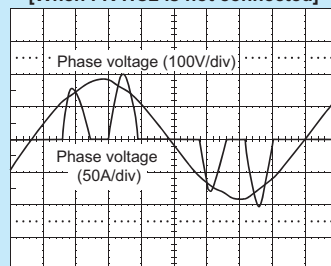
FR-HC2 **ALL**

A high power factor converter substantially suppresses power harmonics to realize the equivalent capacity conversion coefficient  $K5 = 0$  in "the Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage" in Japan. Power regeneration function featured as standard enables common converter system operation with multiple inverters connected.

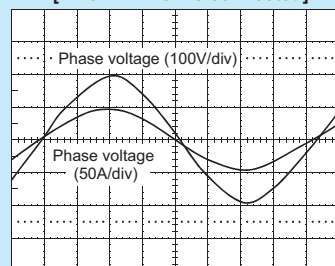
### ● Suppressions of power-supply harmonics

(Example) FR-HC2-7.5K  
(Environment) Load; 100% Power factor; 1

[When FR-HC2 is not connected]



[When FR-HC2 is connected]



(FR-HCL21) (FR-HCB2) (FR-HCL22) FR-HC2

Provided appliances

### ● Specifications

<<FR-HC2>>

Model FR-HC2-□	200V					400V	
	7.5K	15K	30K	55K	75K	H560K	
Applicable inverter capacity (kW) *1	3.7 to 7.5	7.5 to 15	15 to 30	30 to 55	37 to 75	280 to 560	
Rated input current (A)	33	61	115	215	278	993	
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	7	12	24	39	53	250
	Provided appliances	21.0	33.0	56.7	95.4	148.0	—

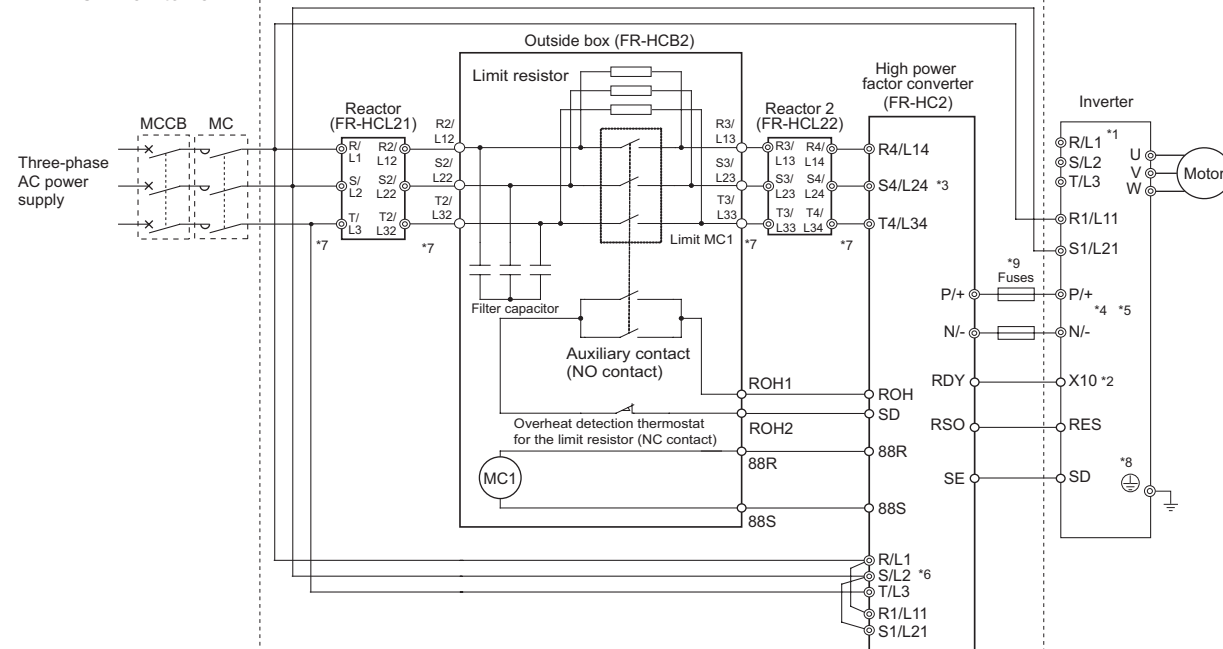
\*1 Up to ten inverters may be connected to one high power factor converter. The capacity of the high power factor converter should always be higher than the sum of those of the inverters connected. Note that if the sum of the inverter capacities is less than half of the high power factor converter capacity, 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-HC2-□, FR-HCL21, FR-HCL22, and FR-HCB2 (FR-HCC2, FR-HCR2, and FR-HCM2 for H560K) are included as accompanying appliances.

### ● Connection diagram

<<FR-HC2-7.5K to 75K>>



\*1 Always keep the inverter power input terminals R, S, T open. Incorrect connection will damage the inverter. Connecting opposite polarity of terminals P and N will damage the converter and the inverter.

\*2 Use input terminal function selection to assign the terminal used for X10 signal.

\*3 The power phases of terminals R4/L14, S4/L24, T4/L34 and terminals R/L1, S/L2, T/L3 must be matched.

\*4 Do not insert MCCB between terminals P and N (P and P, N and N).

\*5 Keep the total wiring distance between the inverter and the high power factor converter (FR-HC2) within 50m.

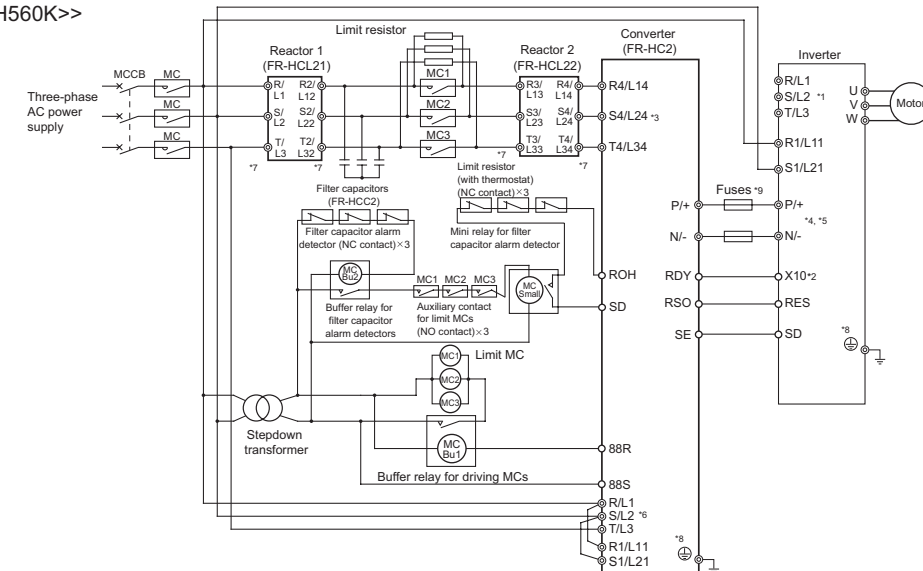
\*6 Always connect the terminal R/L1, S/L2, T/L3 of the converter to the power supply. If the inverter is operated without connecting the terminals to the power supply, the converter will be damaged.

\*7 Do not insert MCCB or MC between terminal R/L1, S/L2, T/L3 input of the Reactor 1 and terminal R4/L14, S4/L24, T4/L34 input of the converter of the above diagram. It will not operate properly.

\*8 Securely perform grounding (earthing) by using the grounding (earthing) terminal.

\*9 Installation of a fuse is recommended.

<<FR-HC2-H560K>>



\*1 Always keep the inverter power input terminals R/L1, S/L2, T/L3 open. Incorrect connection will damage the inverter. Connecting opposite polarity of terminals P and N will damage the converter and the inverter.

\*2 Use input terminal function selection to assign the terminal used for X10 signal.

\*3 The power phases of terminals R4/L14, S4/L24, T4/L34 and terminals R/L1, S/L2, T/L3 must be matched.

\*4 Do not insert MCCB between terminals P/+ and N/- (P and P, N and N).

\*5 Keep the total wiring distance between the inverter and the high power factor converter (FR-HC2) within 50m.

\*6 Always connect the terminal R, S, and T of the converter to the power supply. If the inverter is operated without connecting the terminals to the power supply, the converter will be damaged.

\*7 Do not insert MCCB or MC between terminal R/L1, S/L2, T/L3 input of the converter and terminal R4/L14, S4/L24, T4/L34 input of the converter of the above diagram. It will not operate properly (except for the limit MC).

\*8 Securely perform grounding (earthing) by using the grounding (earthing) terminal.

\*9 Installation of a fuse is recommended.

### ● Outline dimension drawings

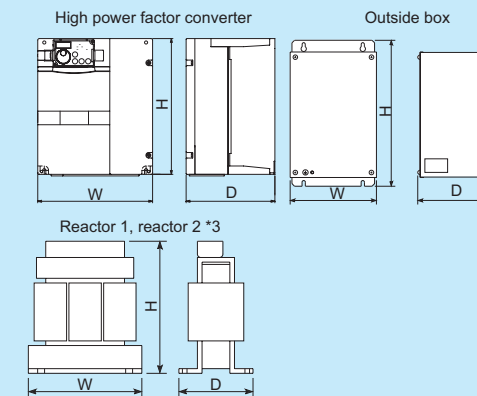
(Unit : mm)

Voltage	Capacity	High Power Factor Converter FR-HC2			Reactor 1 FR-HCL21			Reactor 2 FR-HCL22			Outside Box FR-HCB2		
		W	H	D	W *1	H *1	D *1	W *1	H *1	D *1	W	H	D
200V	7.5K	220	260	170	132	150	100	237.5	230	140	190	320	165
	15K	250	400	190	162	172	126	257.5	260	165			
	30K	325	550	195	195	210	150	342.5	305	180			
	55K	370	620	250	210	180	200.5	432.5	380	280			
	75K	465	620	300	240	215	215.5	474	460	280			
400V	H560K*2	790	1330	440	452	545	645	632	720	745	—	—	—

\*1 The sizes indicated by W, H, and D are not the sizes of legs. These indicate sizes of whole reactors only.

\*2 FR-HCB2 is not provided for H560K. A filter capacitor and inrush current limit resistors are provided instead.

\*3 Install reactors (FR-HCL21 and 22) on a horizontal surface.



### ● Fuse

For safety, installation of a fuse is recommended between a high power factor converter and an inverter. Select a fuse according to the capacity of the connected motor.

Select a fuse from the table below, and install it to the P side and the N side between the high power factor converter and the inverter.

<<Fuse selection table>>

Manufacturer: Mersen Japan K.K. Osaka branch  
Contact: Sun-Wa Technos Corporation Nagoya branch

\* Fuse holder (2 poles): US102 (without fuse light melting indicator) or US1021 (with fuse light melting indicator)

<<200V class>>

Motor capacity (kW)	Rating (A)	Model
0.1	5	6.900 CP GR 10.38 0005 *
0.2	10	6.900 CP GR 10.38 0010 *
0.4	16	6.900 CP GR 10.38 0016 *
0.75	20	6.900 CP GR 10.38 0020 *
1.5	25	6.900 CP GR 10.38 0025 *
2.2	50	6.9 URD 30 TTF 0050
3.7	63	6.9 URD 30 TTF 0063
5.5	100	6.9 URD 30 TTF 0100
7.5	125	6.9 URD 30 TTF 0125
11	160	6.9 URD 30 TTF 0160
15	200	6.9 URD 30 TTF 0200
18.5	250	6.9 URD 30 TTF 0250
22	315	6.9 URD 30 TTF 0315
30	400	6.9 URD 30 TTF 0400
37	500	6.9 URD 30 TTF 0500
45	630	6.9 URD 31 TTF 0630
55	700	6.9 URD 31 TTF 0700
75	800	6.9 URD 31 TTF 0800

<<400V class>>

Motor capacity (kW)	Rating (A)	Model
0.4	12.5	6.900 CP GR 10.38 0012 *
0.75	16	6.900 CP GR 10.38 0016 *
1.5	16	6.900 CP GR 10.38 0016 *
2.2	20	6.900 CP GR 10.38 0020 *
3.7	30	6.900 CP GR 10.38 0030 *
5.5	50	6.9 URD 30 TTF 0050
7.5	50	6.9 URD 30 TTF 0050
11	80	6.9 URD 30 TTF 0080
15	125	6.9 URD 30 TTF 0125
18.5	125	6.9 URD 30 TTF 0125
22	160	6.9 URD 30 TTF 0160
30	200	6.9 URD 30 TTF 0200
37	250	6.9 URD 30 TTF 0250
45	315	6.9 URD 30 TTF 0315
55	350	6.9 URD 30 TTF 0350
75	450	6.9 URD 30 TTF 0450
90	500	6.9 URD 30 TTF 0500
110	550	6.9 URD 31 TTF 0550

Motor capacity (kW)	Rating (A)	Model
132	630	6.9 URD 31 TTF 0630
160	800	6.9 URD 31 TTF 0800
185	900	6.9 URD 32 TTF 0900
220	1000	6.9 URD 32 TTF 1000 or 6.9 URD 31 TTF 0630 × 2 in parallel
250	1250	6.9 URD 33 TTF 1250 or 6.9 URD 31 TTF 0700 × 2 in parallel
280	1400	6.9 URD 33 TTF 1400 or 6.9 URD 31 TTF 0800 × 2 in parallel
315	1600	6.9 URD 232 TTF 1600 or 6.9 URD 31 TTF 0800 × 2 in parallel
355	1800	6.9 URD 232 TTF 1800 or 6.9 URD 32 TTF 0900 × 2 in parallel
400	1800	6.9 URD 232 TTF 1800 or 6.9 URD 32 TTF 0900 × 2 in parallel
450	2500	6.9 URD 33 TTF 1250 × 2 in parallel
500	2700	6.9 URD 32 TTF 0900 × 3 in parallel
560	2700	6.9 URD 32 TTF 0900 × 3 in parallel

## High power factor converter

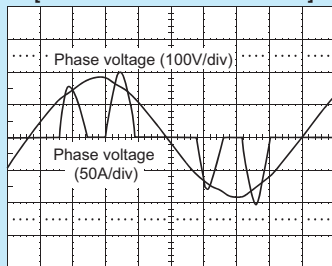
FR-HC (ALL) MT-HC (A700) (F700(P)) (V500)

A high power factor converter substantially suppresses power harmonics to realize the equivalent capacity conversion coefficient  $K5 = 0$  in "the Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage" in Japan. Power regeneration function featured as standard enables common converter system operation with multiple inverters

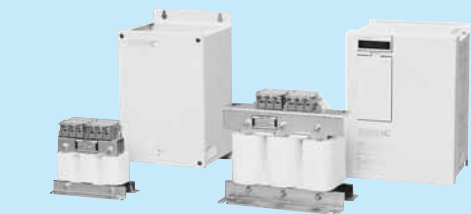
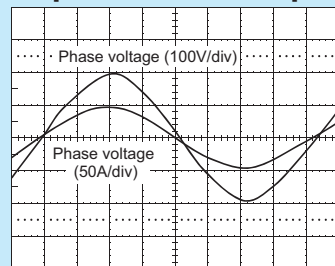
### ● Suppressions of power-supply harmonics

(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>>

Model 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>>

Model 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	75	75	100	140	325
	Provided appliances	197	325	477	614	932

\*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.

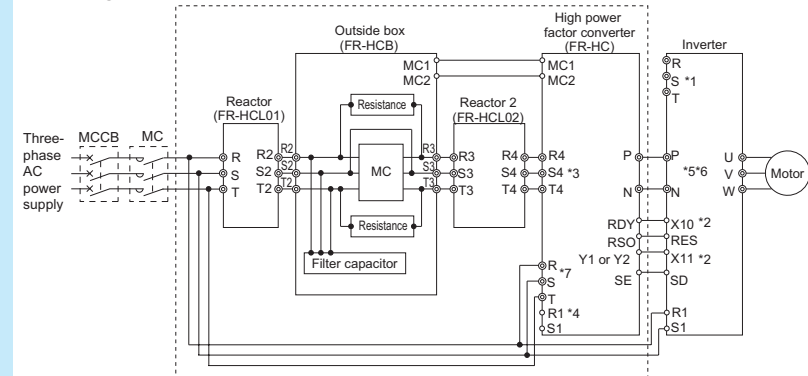
Note that if the sum of the inverter capacities is less than half of the high power factor converter capacity, the high power factor converter may be used as a common converter or regenerative converter, but its capability to suppress power harmonics will decrease.

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

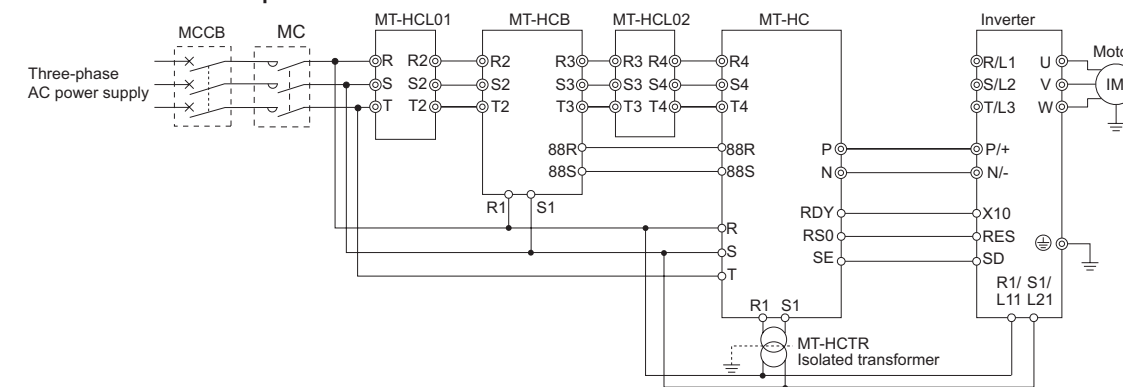
<<FR-HC>>



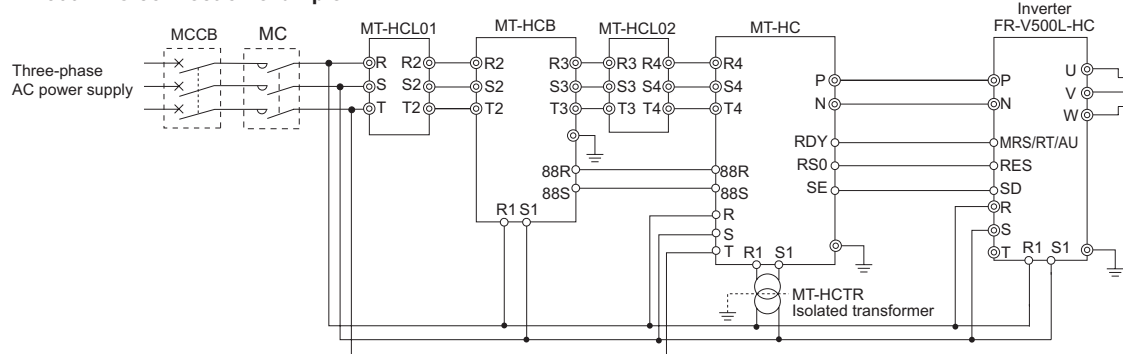
- \*1 Be sure to open the power supply input terminal R, S, T of the inverter. Incorrect connection will damage the inverter. Opposite polarity of terminals N, P will damage the high power factor converter and inverter.
- \*2 For the terminals used for X10 and X11 signal, function setting is necessary.
- \*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 Keep the total wiring distance between the inverter and the high power factor converter (FR-HC) within 50m.
- \*7 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

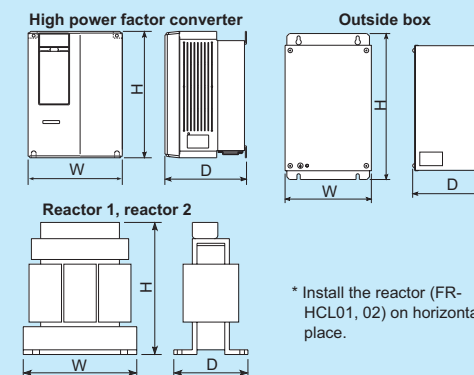


### ● Outline dimension drawings

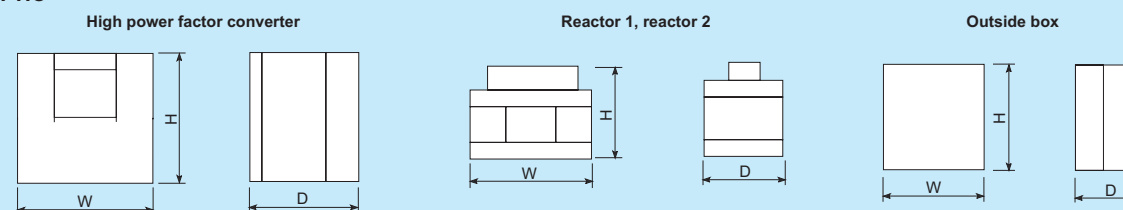
<<FR-HC>>

(Unit : mm)

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

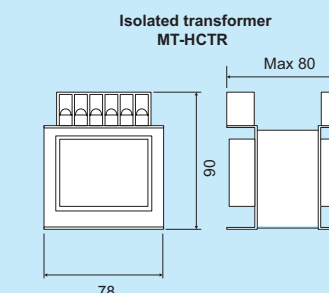


<<MT-HC>>



Voltage	Capacity	High Power Factor Converter MT-HC-S			Reactor 1 MT-HCL01			Reactor 2 MT-HCL02			Outside Box MT-HCB		
		W	H	D	W	H	D	W	H	D	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.





## Noise filter

### Line noise filter

FR-BSF01 **ALL** FR-BLF **ALL**  
 RC5128ZZ (introduced product) **A700** **F700(P)** **V500**

A filter is used to suppress radio noise and line noise emitted from the inverter power supply side or output side.  
 Introduced product: RC5128ZZ Manufacturer: Soshin Electric Co., Ltd.

#### Specifications

Model	FR-BSF01				FR-BLF				RC5128ZZ (introduced product)						
Applicable inverter capacity	For small capacity inverter *1				For general inverter *1				For large capacity inverter *1						
Compatible wire size (mm <sup>2</sup> )	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						

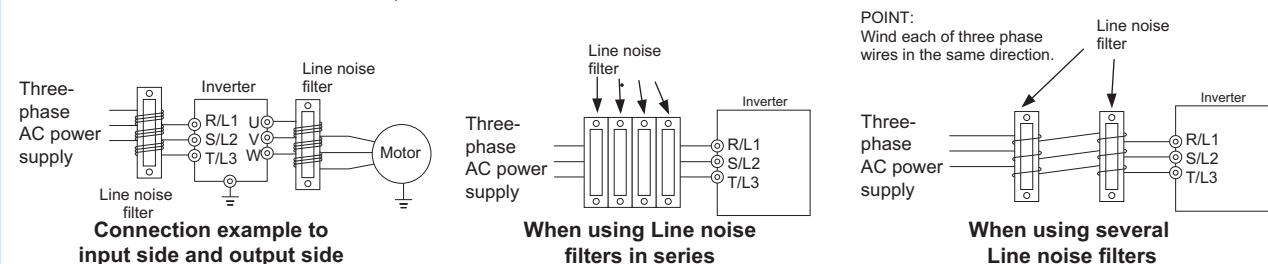


FR-BLF

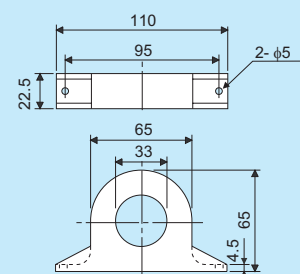
\*1 Used up to the cable thickness (applicable wire size) less than the size of wire passing hole.  
 \*2 For the 55K or less of the FR-A700, F700(P) series, a corresponding appliance (common mode choke) is built-in on the input side.

#### Connection diagram

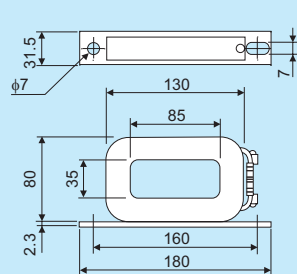
- Ensure that each phase is wound one time in the same direction.
- When connecting to the input side, it is recommended that the wire should be turned three times or more (4T, 4 turns). The greater the number of turns, the more effective result is obtained.
- When using several line noise filters to make 4T or more, wind the phases (cables) together. Do not use different line noise filter for different phases.
- 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 earthing cable.
- When the wire size is too thick to wind, use more than four filters in series.



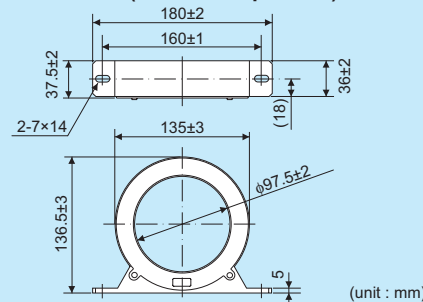
#### Outline dimension drawings <<FR-BSF01>>



#### <<FR-BLF>>



#### <<RC5128ZZ (introduced product)>>



### Radio noise filter

FR-BIF **E700** **F700P** **D700** **V500**

A 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 *	
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

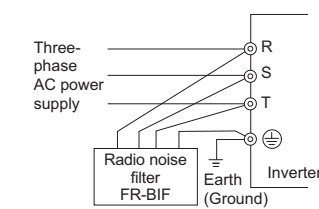
\* For the FR-A700, F700(P) series, a corresponding filter (capacitive filter) is built-in.



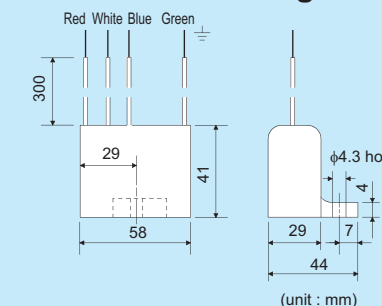
FR-BIF-H

#### 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



### EMC Directive compliant EMC filter

SF□□ **E700** **F700P** **D700** **V500**  
 FR-E5NF **E700** **F700P** **D700** FR-S5NFSA **E700** **D700**

This EMC filter complies with the EU EMC Directive.

#### Selection

- Select a filter in accordance with the inverter type

FR-E700 Series Inverter Model	EMC Filter Model	
Single phase 100V class	FR-E710W-0.1K to 0.4K FR-E710W-0.75K	FR-S5NFSA-0.75K FR-S5NFSA-1.5K
Single phase 200V class	FR-E720S-0.1K to 0.4K FR-E720S-0.75K FR-E720S-1.5K FR-E720S-2.2K	SF1320 SF1321 FR-S5NFSA-1.5K SF1309
200V class	FR-E720-0.1K to 1.5K FR-E720-2.2K, 3.7K FR-E720-5.5K to 11K FR-E720-15K	SF1306 SF1309 SF1260 SF1261
400V class	FR-E740-0.4K, 0.75K FR-E740-1.5K to 3.7K FR-E740-5.5K, 7.5K FR-E740-11K, 15K	FR-E5NF-H0.75K FR-E5NF-H3.7K FR-E5NF-H7.5K SF1175

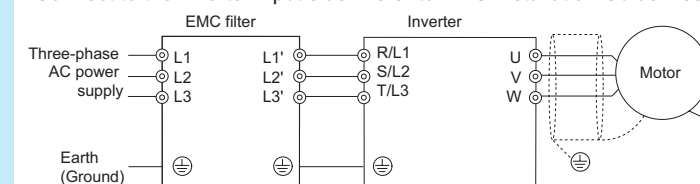
FR-F700PJ Series Inverter Model	EMC Filter Model	
200V class	FR-F720PJ-0.4K to 1.5K FR-F720PJ-2.2K, 3.7K FR-F720PJ-5.5K to 11K FR-F720PJ-15K	SF1306 SF1309 SF1260 SF1261
400V class	FR-F740PJ-0.4K, 0.75K FR-F740PJ-1.5K to 3.7K FR-F740PJ-5.5K, 7.5K FR-F740PJ-11K, 15K	FR-E5NF-H0.75K FR-E5NF-H3.7K FR-E5NF-H7.5K SF1175

FR-D700 Series Inverter Model	EMC Filter Model	
Single phase 100V class	FR-D710W-0.1K to 0.4K FR-D710W-0.75K	FR-S5NFSA-0.75K FR-S5NFSA-1.5K
Single phase 200V class	FR-D720S-0.1K to 0.75K FR-D720S-1.5K FR-D720S-2.2K	FR-S5NFSA-0.75K FR-S5NFSA-1.5K SF1309
200V class	FR-D720-0.1K to 1.5K FR-D720-2.2K, 3.7K FR-D720-5.5K to 11K FR-D720-15K	SF1306 SF1309 SF1260 SF1261
400V class	FR-D740-0.4K, 0.75K FR-D740-1.5K to 3.7K FR-D740-5.5K, 7.5K FR-D740-11K, 15K	FR-E5NF-H0.75K FR-E5NF-H3.7K FR-E5NF-H7.5K SF1175

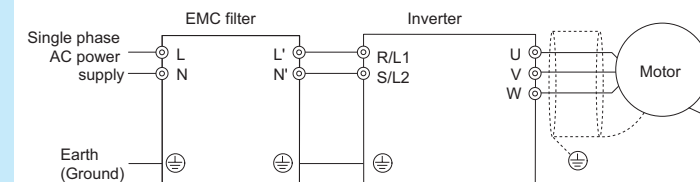
FR-V500 Series Inverter Model	EMC Filter Model	
200V class	FR-V520-1.5K to 2.2K FR-V520-3.7K to 7.5K FR-V520-11K FR-V520-15K to 18.5K FR-V520-22K FR-V520-30K to 55K	SF1259 SF1260 SF1261 SF1262 SF1263 SF1265
400V class	FR-V540-1.5K to 2.2K FR-V540-3.7K to 5.5K FR-V540-7.5K to 11K FR-V540-15K to 18.5K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

#### Connection diagram

- Connect to the inverter input side. Refer to EMC Installation Guidelines (BCN-A21041-202/204) for details of wiring method.



Connection diagram of three-phase power supply



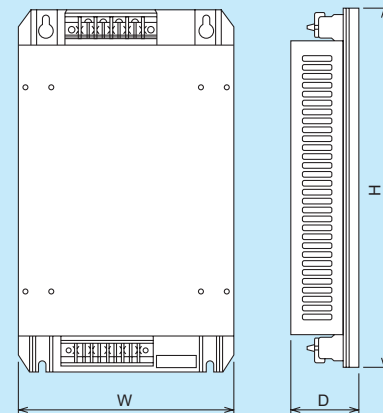
Connection diagram of single-phase power supply

\* Take the following measures to prevent a peripheral device malfunction or electric shock accident from occurring due to a leakage current.

- 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.
- 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 Model		Outline Dimension			Approximate Mass (kg)	Leakage Current Reference Value (mA)
		W	H	D		
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
Three phase 200V	SF1259	70	168	30.5	0.4	10
	SF1260	110	168	36.5	0.6	10
	SF1261	142	410	65	2.4	33
	SF1262	222	468	80	5	440
	SF1263	253	600	86	9.3	71
	SF1265	303	650	86	11	71
	SF1306	327	730	86	15	71
Three phase 400V	SF1265	468	913	110	22	1500
	SF1309	110	200	36	0.7	10
	SF1197	200	282	57	2.1	15
	SF1174B	144	360	47.5	1.5	57
	SF1175	213	360	38	1.8	51
	SF1176	253	530	60	4.7	76
	SF1177	303	600	60	5.9	108
	SF1178	327	700	80	9.4	156
	SF1179	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  $\Delta$  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.

## Filterpack

FR-BFP2 (E700) (F700PJ) (D700)

\* Filterpack is enclosed for the FR-F7□0PJ-□KF inverters.

Power factor improving AC reactor, common mode choke, and capacitor type filter are combined into one as Filterpack. Using the option, the inverter may conform to the Japanese guideline for reduction of harmonic emission. The option is available for three-phase 200V/400V class inverters with 0.4K to 15K capacity. Filterpack can be installed on the side or on the rear. (Rear panel installation is not available for FR-E720-5.5K, 7.5K, and FR-E740-0.4K to 3.7K.)

### ● Specifications

<<For three-phase 200V class>>

Model FR-BFP2-□K	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Permissible inverter output current (A) *1	2.5	4.2	7	10	16.5	23.8	31.8	45	58
Approximate mass (kg)	1.3	1.4	2.0	2.2	2.8	3.8	4.5	6.7	7.0
Power factor improving reactor	Install a DC reactor on the DC side. (93% to 95% of power supply power factor under 100% load (94.4% *2))								
Noise filter	Common mode choke	Install a ferrite core on the input side.							
	Capacitive filter	About 4mA of capacitor leakage current *3							
Protective structure (JEM1030)	Open type (IP00)								

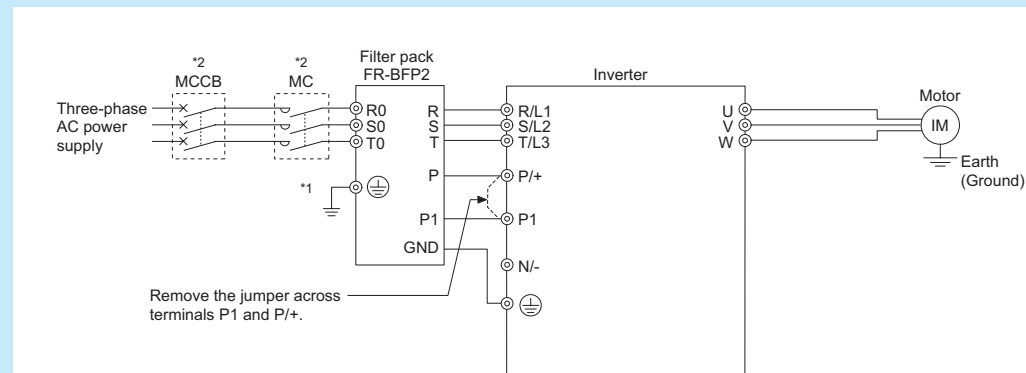


<<For three-phase 400V class>>

Model FR-BFP2-H□K	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Permissible inverter output current (A) *1	1.2	2.2	3.7	5	8.1	12	16.3	23	29.5
Approximate mass (kg)	1.6	1.7	1.9	2.3	2.6	4.5	5.0	7.0	8.2
Power factor improving reactor	Install a DC reactor on the DC side. (93% to 95% of power supply power factor under 100% load (94.4% *2))								
Noise filter	Common mode choke	Install a ferrite core on the input side.							
	Capacitive filter	About 8mA of capacitor leakage current *3							
Protective structure (JEM1030)	Open type (IP00)								

- \*1 To use with an FR-E700 series inverter, select a capacity that makes the load (inverter output) current to be the same with the permissible inverter output current or lower.
- \*2 The values in parentheses are calculated by applying 1 power factor to the reference waveform in accordance with the Architectural Standard Specifications (Electrical Installation) (2010 revisions) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan.)
- \*3 The indicated leakage current is for one phase of the three-phase, three-wire,  $\Delta$ -connection power supply.

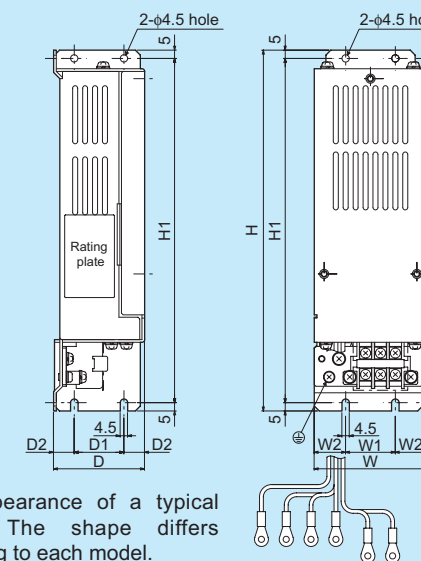
## ● Connection diagram



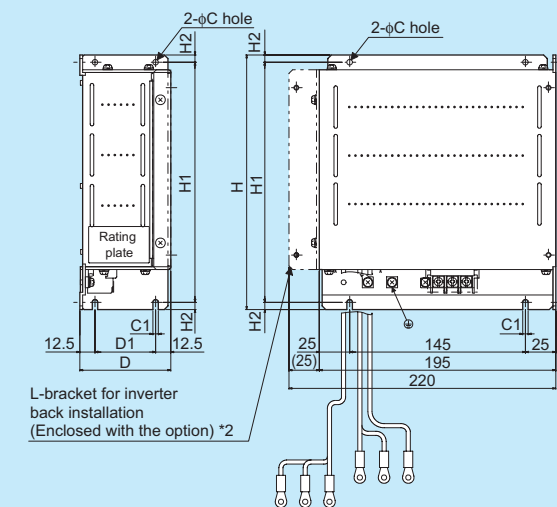
- \*1 Connect the GND cable of the filter pack to the earth (ground) terminal of the inverter. Use the earth (ground) terminal of the filter pack to earth (ground). The inverter is earthed (grounded) through the filter pack.
- \*2 For cable size for MCCB, MC and filter pack, refer to the inverter Instruction Manuals. MCCB and MC should be selected with reactor connection.

## ● Outline dimension drawings

- FR-BFP2-0.4K to 3.7K
- FR-BFP2-H0.4K to H3.7K



- FR-BFP2-5.5K to 15K
- FR-BFP2-H5.5K to H15K



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

Capacity	W	W1	W2	H	H1	D	D1	D2	
									200V
	1.5K, 2.2K	108	55	26.5	188	178	80	55	12.5
	3.7K	170	120	25	188	178	65	40	12.5
400V	H0.4K, H0.75K*1, *3	108	55	26.5	188	178	55	30	12.5
	H1.5K, H2.2K, H3.7K*3	108	55	26.5	188	178	80	55	12.5

Capacity	H	H1	H2	D	D1	C	C1	C2	
									200V
	11K	320	305	7.5	85	60	6	6	5.3
	15K	320	305	7.5	85	60	6	6	6.4
400V	H5.5K, H7.5K	210	198	6	75	50	4.5	4.5	4.3
	H11K	320	305	7.5	85	60	6	6	4.3
	H15K	320	305	7.5	85	60	6	6	6.4

- \*1 The 400V class H0.4K and H0.75K have no slit.
- \*2 LL-bracket is not attached when shipped from the factory but is enclosed with the option. L-bracket is required to install the option to the back of inverter.
- \*3 Rear panel installation is not available for FR-E720-5.5K, 7.5K, and FR-E740-0.4K to 3.7K.

## Output filter

### Surge voltage suppression filter

FR-ASF (A700) (F700(P)) (E700) (F700P) (D700)  
FR-BMF (A700) (F700(P)) (E700) (F700P) (D700)

A surge voltage suppression filter limits surge voltage applied to motor terminals when driving the 400V class motor by the inverter.

This filter cannot be used under vector control, Real sensorless vector control, and IPM motor control.

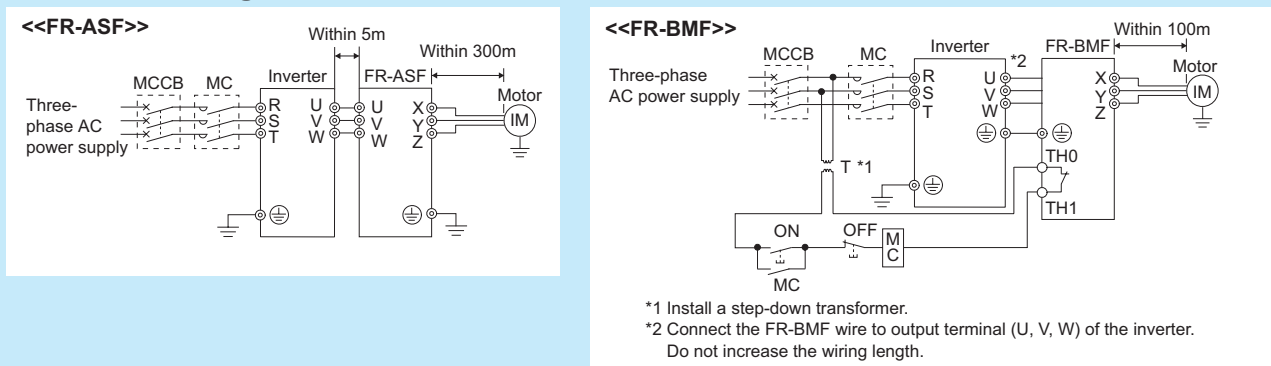
#### Specifications

Model FR-ASF-□	400V						
	H1.5K	H3.7K	H7.5K	H15K	H22K	H37K	H55K
Applicable motor 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

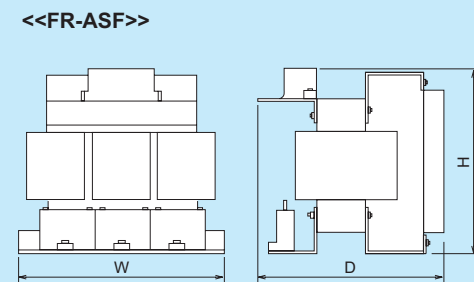
Model FR-BMF-□	400V			
	H7.5K	H15K	H22K	H37K
Applicable motor capacity (kW)	5.5 to 7.5	11 to 15	18.5 to 22	30 to 37
Rated input current (A)	17.0	31.0	43.0	71.0
Rated input AC voltage	Three-phase 380 to 480V 50Hz/60Hz			
Maximum AC voltage fluctuation	Three-phase 323 to 528V 50Hz/60Hz			
Maximum frequency	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

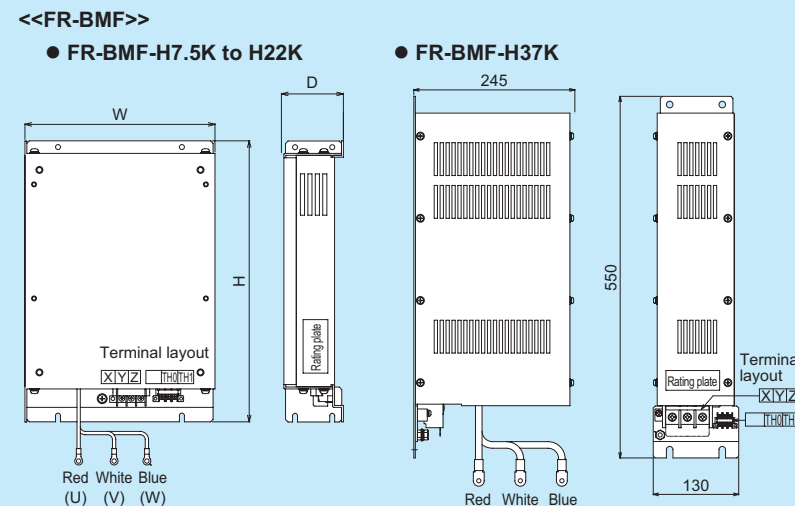


\*1 Install a step-down transformer.  
\*2 Connect the FR-BMF wire to output terminal (U, V, W) of the inverter. Do not increase the wiring length.



Surge Voltage Suppression Filter Model	W	H <sub>1</sub>	D <sub>1</sub>
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 higher, the shape is partially different.



Surge Voltage Suppression Filter Model	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(P))

Installing the sine wave filter on the inverter output side converts the motor voltage/current into a nearly sine wave. Effects such as 1) acoustic noise reduction, 2) surgeless, and 3) reduction of the motor loss (use of standard motor) could be expected. Always use this filter under V/F control.

#### Specifications

Model	200V		400V				
	75K	90K	H75K	H110K	H150K	H220K	H280K
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 <sup>2</sup> or less, 10 to 55Hz (directions of X, Y, Z axes)						
Approximate mass (kg)	Refer to the outline dimension drawing.						

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

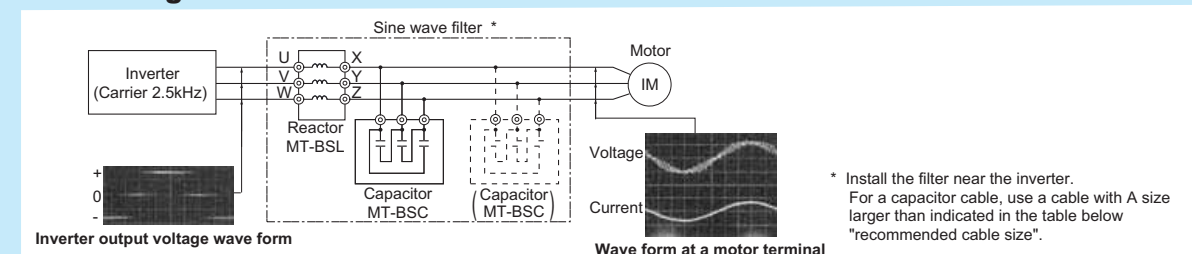
#### Selection

- 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)	Model	Applicable Inverter			
		FR-A700	FR-F700(P)		
200V class	75	MT-BSL-75K	1 × MT-BSC-75K	FR-A720-90K	FR-F720(P)-90K
	90	MT-BSL-90K	1 × MT-BSC-90K	—	FR-F720(P)-110K
400V class	75	MT-BSL-H75K(-HC)	1 × MT-BSC-H75K	FR-A740-90K	FR-F740(P)-90K
	90	MT-BSL-H110K(-HC)	1 × MT-BSC-H110K	FR-A740-110K	FR-F740(P)-110K
	110	MT-BSL-H110K(-HC)	1 × MT-BSC-H110K	FR-A740-132K	FR-F740(P)-132K
	132	MT-BSL-H150K(-HC)	2 × MT-BSC-H75K	FR-A740-160K	FR-F740(P)-160K
	160	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-A740-185K	FR-F740(P)-185K
	185	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-A740-220K	FR-F740(P)-220K
	220	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-A740-250K	FR-F740(P)-250K
	250	MT-BSL-H280K(-HC)	3 × MT-BSC-H110K	FR-A740-280K	FR-F740(P)-280K
280	MT-BSL-H280K(-HC)	3 × MT-BSC-H110K	FR-A740-315K	FR-F740(P)-315K	

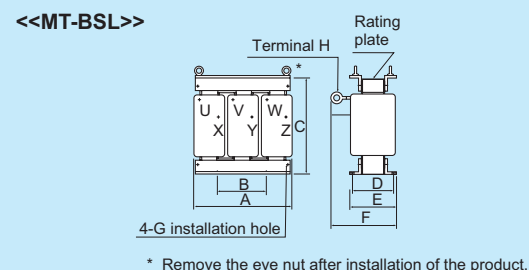
\*1 When using several capacitors for filter, connect them in parallel as in the connection diagram.

#### Connection diagram

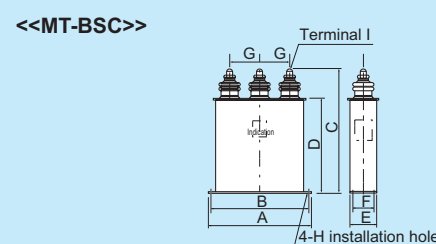


\* Install the filter near the inverter. For a capacitor cable, use a cable with A size larger than indicated in the table below "recommended cable size".

#### Outline dimension drawings



\* Remove the eye nut after installation of the product.



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

Model	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
	MT-BSC-90K	282	266	240	183	92	56	85	φ7	M12	5.5
400V class	MT-BSC-H75K	207	191	220	173	72	41	55	φ7	M6	3.0
	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 <sup>2</sup>	38mm <sup>2</sup>	22mm <sup>2</sup>	22mm <sup>2</sup>

## Structure option

### Heatsink protrusion attachment

FR-A7CN (A700) (F700(P))  
 FR-E7CN (E700) (F700PJ) (D700)  
 FR-A5CN (V500) MT-A5CN (V500)

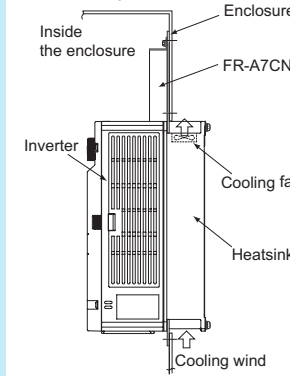
With this attachment, the heatsink, which is the exothermic section of the inverter, can be placed outside of the enclosure. Since the heat generated in the inverter can be radiated to the rear of the enclosure, the enclosure can be downsized.

#### ● Selection

Attachment Model	Applicable Inverter			
	FR-A700		FR-F700(P)	
	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(P)-2.2K to 5.5K	FR-F740(P)-0.75K to 5.5K
FR-A7CN02	FR-A720-5.5K, 7.5K	FR-A740-5.5K, 7.5K	FR-F720(P)-7.5K, 11K	FR-F740(P)-7.5K, 11K
FR-A7CN03	FR-A720-11K	FR-A740-11K, 15K	FR-F720(P)-15K	FR-F740(P)-15K, 18.5K
FR-A7CN04	FR-A720-15K to 22K	FR-A740-18.5K, 22K	FR-F720(P)-18.5K to 30K	FR-F740(P)-22K, 30K
FR-A7CN05	FR-A720-30K	—	FR-F720(P)-37K	—
FR-A7CN06	—	FR-A740-30K	—	FR-F740(P)-37K
FR-A7CN07	FR-A720-37K, 45K	FR-A740-37K to 55K	FR-F720(P)-45K, 55K	FR-F740(P)-45K to 75K
FR-A7CN08	—	FR-A740-75K	—	FR-F740(P)-90K
FR-A7CN09	—	FR-A740-90K	—	FR-F740(P)-110K
FR-A7CN10	FR-A720-75K, 90K	FR-A740-110K, 132K	FR-F720(P)-75K to 110K	FR-F740(P)-132K, 160K
FR-A7CN11	FR-A720-55K	—	—	—

#### ● Installation procedure

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



Attachment Model	Applicable Inverter					
	FR-E700		FR-F700PJ		FR-D700	
	200V class	400V class	200V class	400V class	200V class	400V class
FR-E7CN01	FR-E720-1.5K, 2.2K FR-E720S-0.75K, 1.5K	—	FR-F720PJ-1.5K, 3.7K	FR-F740PJ-1.5K to 3.7K	FR-D720-1.5K, 2.2K FR-D720S-1.5K	FR-D740-1.5K to 3.7K
FR-E7CN02	FR-E720-3.7K	—	FR-F720PJ-3.7K	—	FR-D720-3.7K	—
FR-E7CN03	FR-E720-5.5K, 7.5K	—	—	—	—	—
FR-E7CN04	FR-E720S-2.2K	FR-E740-1.5K to 3.7K	—	—	FR-D720S-2.2K	—
FR-E7CN05	—	FR-E740-5.5K, 7.5K	FR-F720PJ-5.5K, 7.5K	FR-F740PJ-5.5K, 7.5K	FR-D720-5.5K, 7.5K	FR-D740-5.5K, 7.5K
FR-E7CN06	FR-E720-11K, 15K	FR-E740-11K, 15K	FR-F720PJ-11K, 15K	FR-F740PJ-11K, 15K	FR-D720-11K, 15K	FR-D740-11K, 15K

Attachment Model	Applicable Inverter	
	FR-V500	
	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	—

Attachment Model	Applicable Inverter	
	FR-V500L	
	200V class	400V class
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

### Totally-enclosed structure attachment

FR-A5CV (V500)

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).

#### ● Specifications

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

#### ● Selection

Attachment Model	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

### Attachment for cable conduit connection

FR-A5FN (V500)

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

#### ● Selection

Attachment Model	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

FR-AAT, FR-A5AT (A700) (F700(P)) (V500)

### EMC filter installation attachment

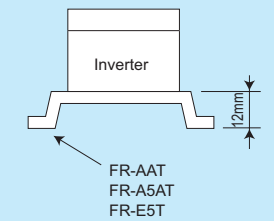
FR-E7AT (E700)

FR-E5T (E700) (F700PJ) (D700)

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

#### ● Specifications

Attachment Model	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



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

\* This is sold as the FR-E700 series, F700PJ series and D700 series attachment with EMC filter.

#### ● 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(P)>>

Model name and capacity of conventional model		FR-F720(P)						
		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(P)>>

Model name and capacity of conventional model		FR-F740(P)					
		0.75K to 3.7K	0.75K/1.5K	7.5K/11K	15K/18.5K	22K/30K	37K
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-E720>>

Model name and capacity of conventional model		FR-E720		
		0.1K to 0.75K	1.5K	2.2K/3.7K
FR-A024	0.1K to 0.75K	FR-E7AT01	—	—
	1.5K	—	FR-E7AT02	—
	2.2K/3.7K	—	—	FR-E7AT03

## <<List of replacement with FR-E740>>

Model name and capacity of conventional model		FR-E740	
		0.4K/0.75K	1.5K to 3.7K
FR-A044	0.4K/0.75K	—	—
	1.5K to 3.7K	—	FR-E7AT03

FR-E7AT□□: Easily replaceable with a stated intercompatibility attachment.

## <<List of replacement with FR-V520>>

Model name and capacity of conventional model		FR-V520					
		1.5K/2.2K	3.7K to 7.5K	11K/15K	18.5K	22K	30K/37K
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>>

Model name and capacity of conventional model		FR-V540					
		1.5K/2.2K	3.7K/5.5K	7.5K to 18.5K	22K	30K/37K	45K/55K
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 F700PJ D700

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

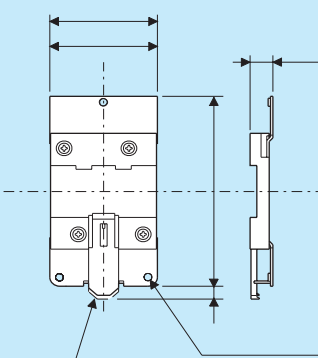
### ● Selection

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

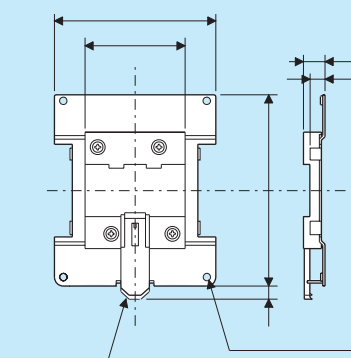
Inverter	Applicable Inverter Capacity	FR-UDA		
		FR-UDA01	FR-UDA02	FR-UDA03
FR-E700	Single phase 100V class	FR-E710W-0.1K to 0.4K	FR-E710W-0.75K	—
	Single phase 200V class	FR-E720S-0.1K to 0.4K	FR-E720S-0.75K, 1.5K	—
FR-F700PJ	200V class	FR-E720-0.1K to 0.75K	FR-E720-1.5K, 2.2K	FR-E720-3.7K
	400V class	FR-F720PJ-0.4K, 0.75K	FR-F720PJ-1.5K, 2.2K	FR-F720PJ-3.7K
FR-D700	Single phase 100V class	FR-D710W-0.1K to 0.4K	FR-D710W-0.75K	—
	Single phase 200V class	FR-D720S-0.1K to 0.75K	FR-D720S-1.5K	—
	200V class	FR-D720-0.1K to 0.75K	FR-D720-1.5K, 2.2K	FR-D720-3.7K
	400V class	—	FR-D740-0.4K to 3.7K	—

### ● Approximate dimension

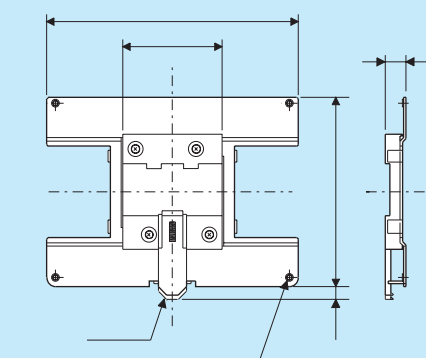
<<FR-UDA01>>



<<FR-UDA02>>



<<FR-UDA03>>



(Unit : mm)

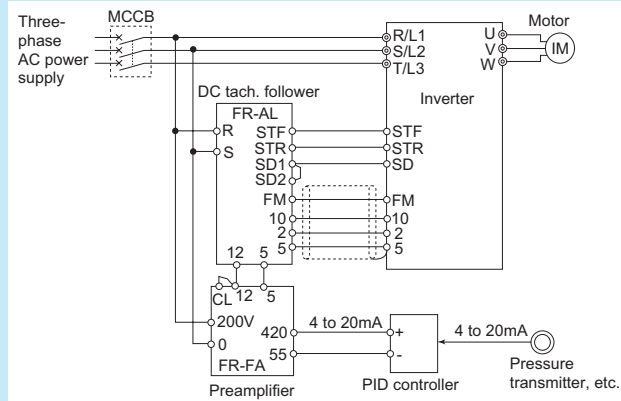
## FR series manual controller/speed controller

### Preamplifier

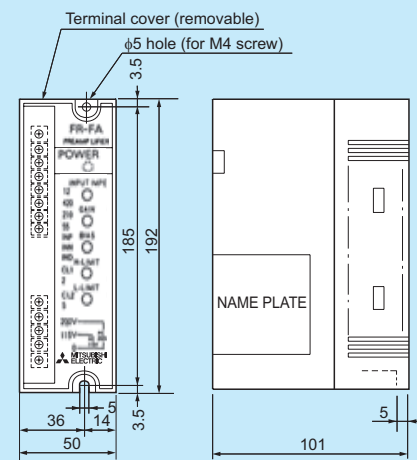
FR-FA ALL

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



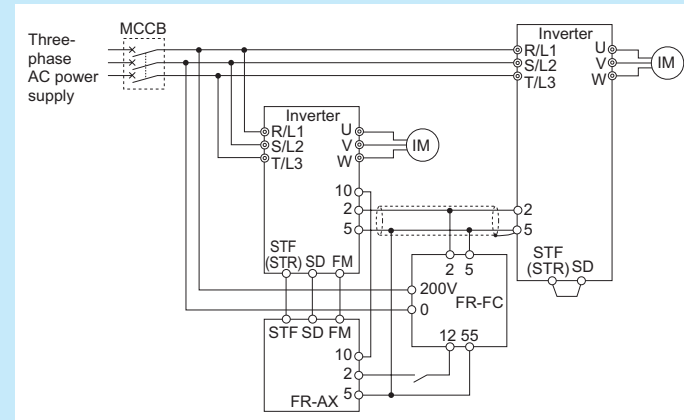
### Soft starter

FR-FC ALL

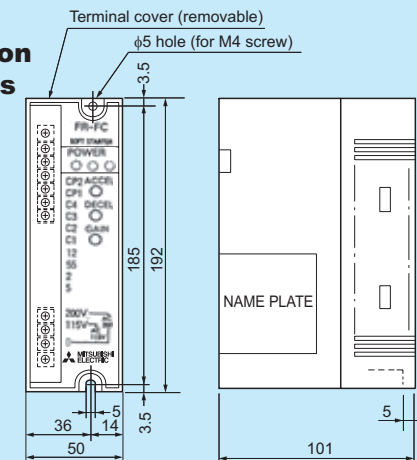
Soft starter is used with the inverter to gradually increase or decrease the frequency setting signal level at starting and stopping the inverter, or changing frequency, in order to eliminate a shock that otherwise will be given to the machine, or to synchronize starting or stopping of two or more motors 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

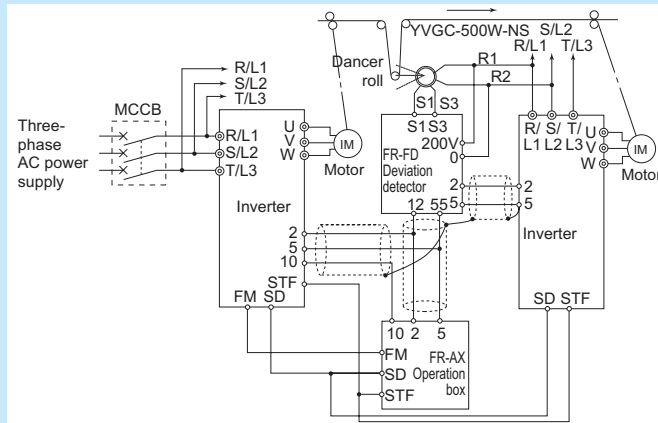


### Deviation detector

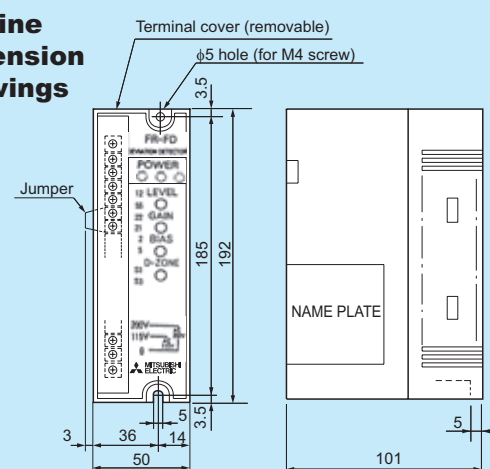
FR-FD ALL

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

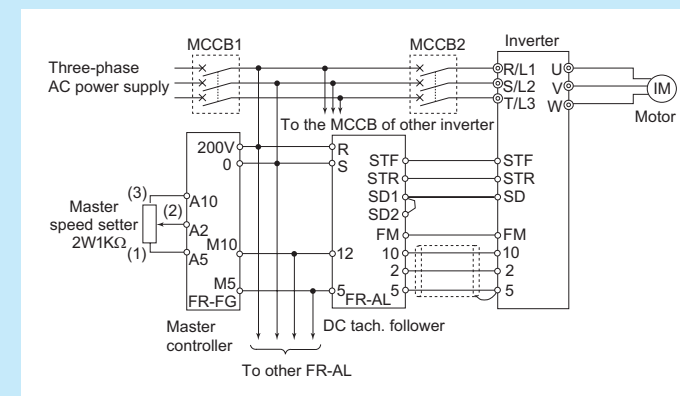


### Master controller

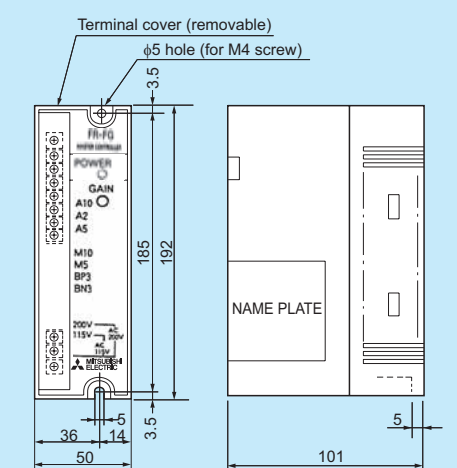
FR-FG ALL

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

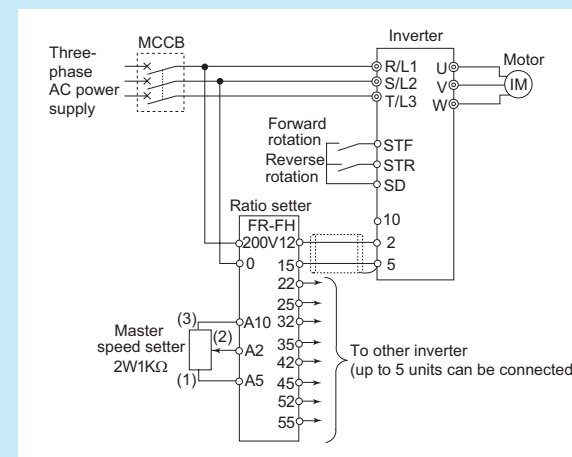


### Ratio setter

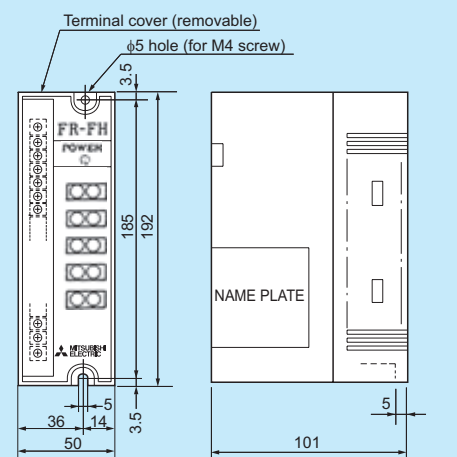
FR-FH ALL

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

#### ● Connection diagram



#### ● Outline dimension drawings

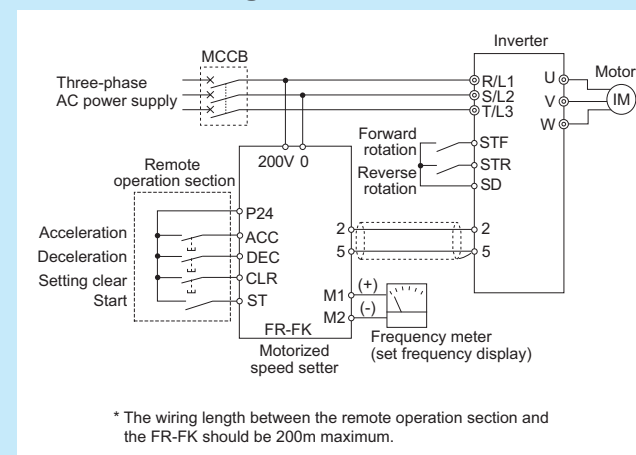


### Remote speed setter

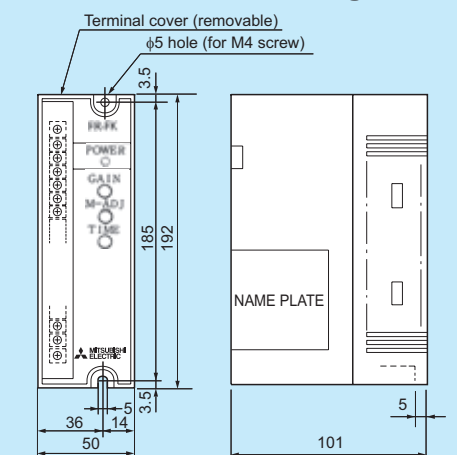
FR-FK ALL

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



#### ● Outline dimension drawings



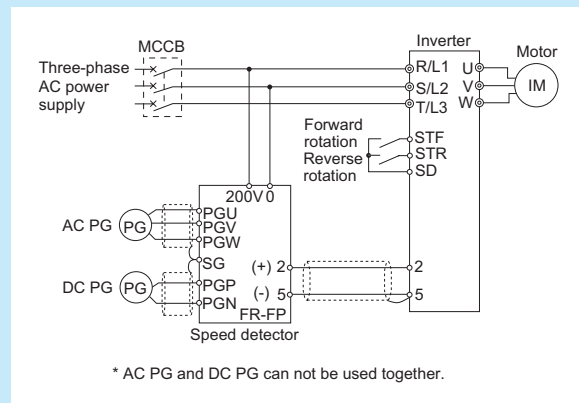
\* The wiring length between the remote operation section and the FR-FK should be 200m maximum.

## Speed detector

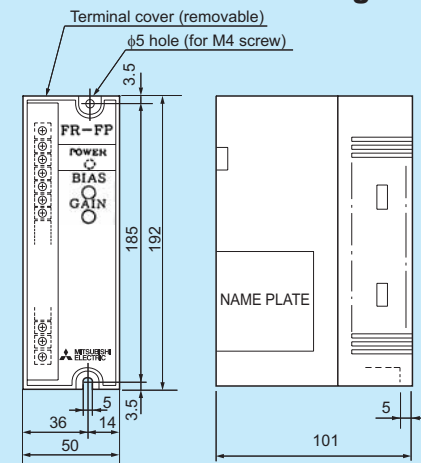
FR-FP ALL

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



### ● Outline dimension drawings

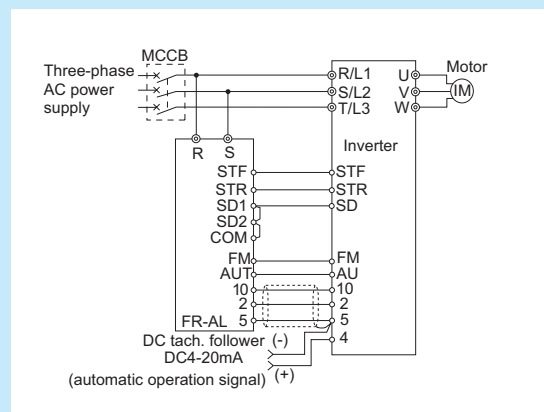


## DC tach. follower

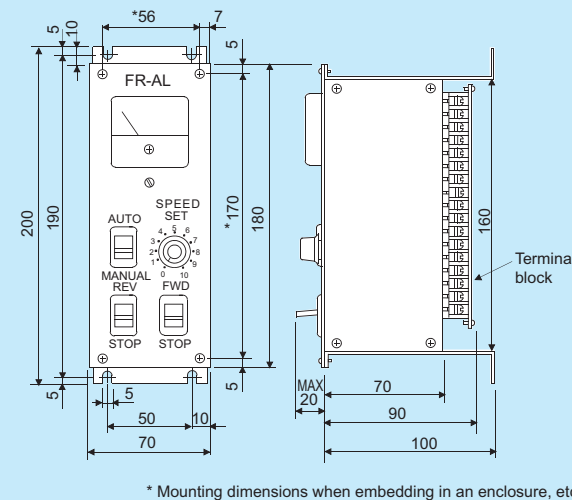
FR-AL ALL

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



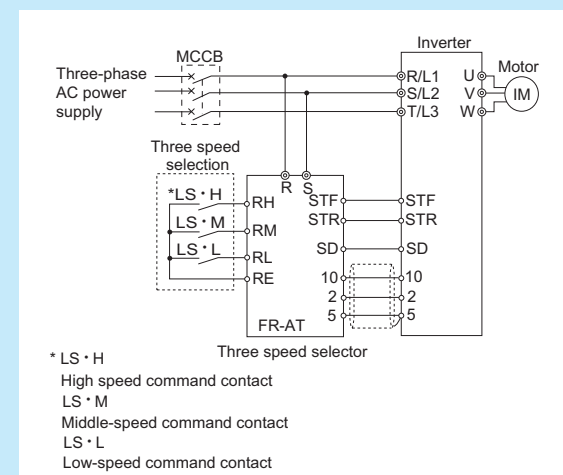
\* Mounting dimensions when embedding in an enclosure, etc.

## Three speed selector

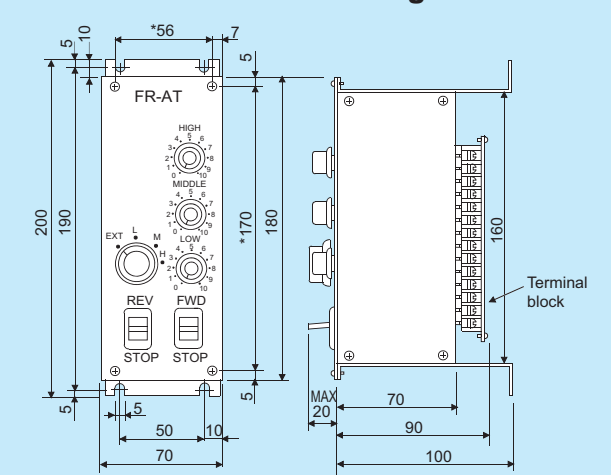
FR-AT ALL

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



### ● Outline dimension drawings



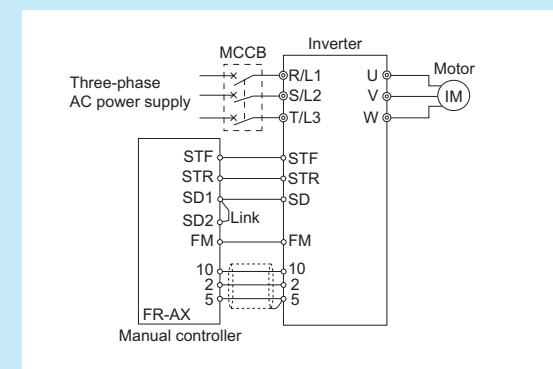
\* Mounting dimensions when embedding in an enclosure, etc.

## Manual controller

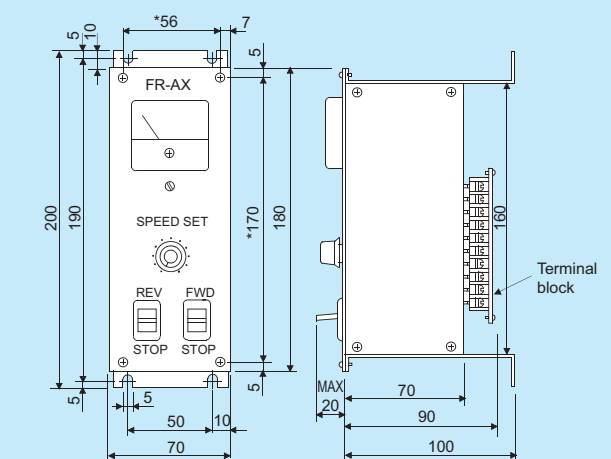
FR-AX ALL

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 **ALL**

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

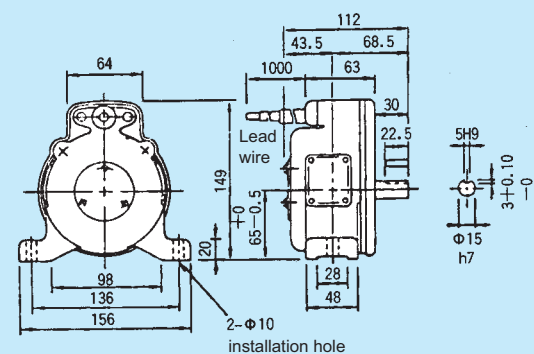
#### ● Specifications

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 **ALL**

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.

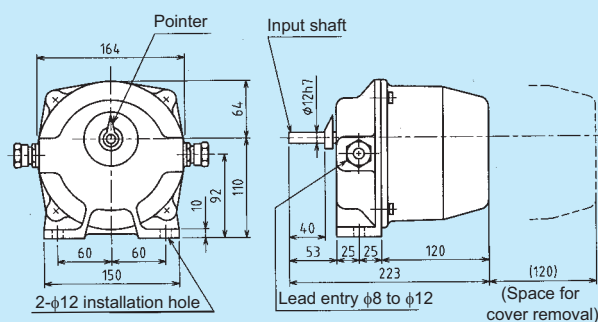
#### ● Specifications

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 (introduced product) **A700** **F700(P)** **E700** **F700PJ** **D700**

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 \*

\* Please contact your sales representative or the nearest Mitsubishi FA Center.

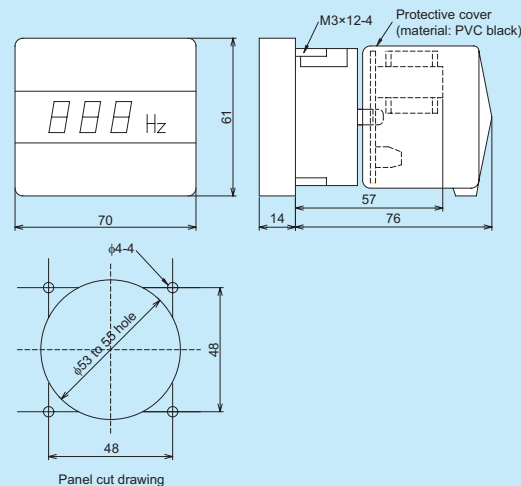


HZ-1N (introduced product)

#### ● 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(P)** **E700** **F700PJ** **D700**  
KY-452 (introduced product) **A700** **F700(P)** **E700** **F700PJ** **D700**

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

#### ● Specifications

Introduced product : KY-452 \*

\* Please contact your sales representative or the nearest Mitsubishi FA center.

##### <<YM206NRI 1mA>>

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

##### <<KY-452 (introduced product)>>

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



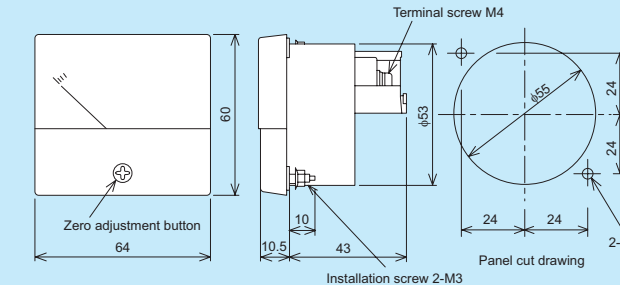
YM206NRI 1mA



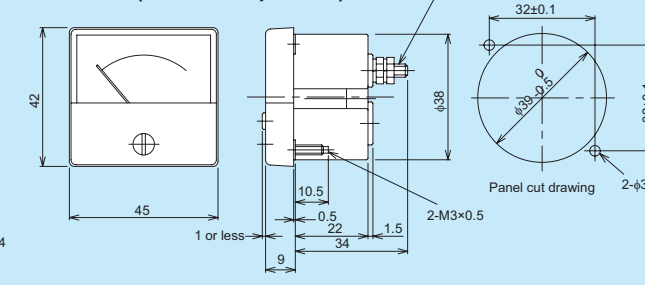
KY-452 (introduced product)

#### ● Outline dimension drawings

##### <<YM206NRI 1mA>>



##### <<KY-452 (introduced product)>>



### Calibration resistor

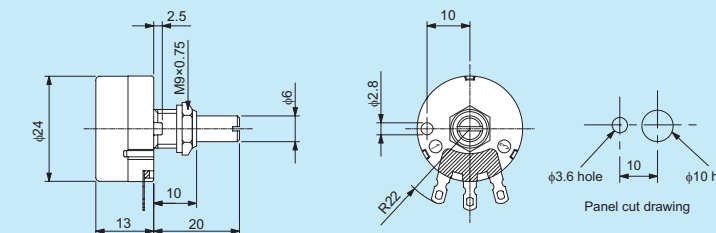
RV24YN 10kΩ **A700** **F700(P)** **E700** **F700PJ** **D700**

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

#### ● Specifications

Item	Description
Characteristic	Carbon film variable resistor 1/3W 10kΩ B characteristic
Shaft rotation angle	300° ±5°

#### ● Outline dimension drawings



### Frequency setting potentiometer Pointer scale Knob

WA2W 1kΩ **ALL**  
MEM-40 (introduced product) **ALL**  
K-3 (introduced product) **ALL**  
WA-2W40SET-S (introduced product) **ALL**

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

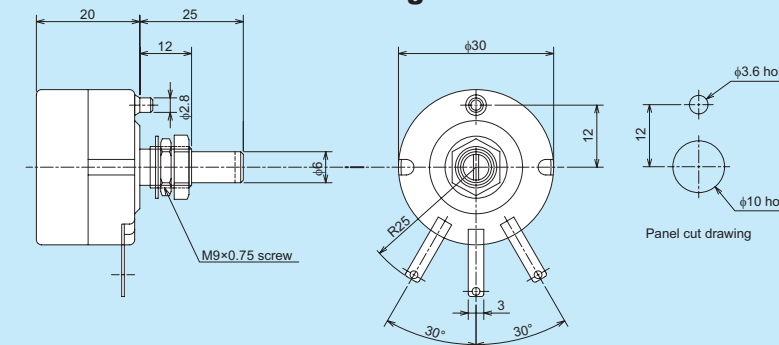
#### ● Specifications

Introduced product : MEM-40, K-3, WA-2W40SET-S \*

\* Please contact your sales representative or the nearest Mitsubishi FA center.

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)

WA-2W40SET-S includes WA2W, MEM-40, and K-3.



 **Safety Warning**

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.



**for a greener tomorrow**

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.



**MITSUBISHI ELECTRIC CORPORATION**

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