MITSUBISHI ELECTRIC
Changes for the Better

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INVERTER

New Product RELEASE No.20-1E

Parallel Operation Function
Release of the FR-A872-P Inverter, FR-CC2-N-P Converter unit, and FR-POL-N Balance Reactor

To support parallel operation functions, the 690 V class inverters (separated converter type) and the converter units, and the compatible balance reactors are newly released.

Features

Operation of two or three inverters in parallel*1

Driving a large capacity motor is possible without increasing the size of the inverter or converter unit, facilitating installation into the enclosure.

Enlarged range of applicable motor capacity

A motor of up to 1300 kW can be driven by operating the inverters in parallel, enhancing the application to larger scale systems.*1

*1: Some functions same as those in the standard inverter are limited or not available.
(For example, communication through the RS-485 terminals, upper limit frequency setting during high-speed operation, multiple rating setting, and PM motor driving.)
For the details of each function, refer to the A800 Parallel Operation Function Manual.

Benefits

Contributing to the cost reduction of the enclosure

Side by side installation and bus bar connection improve the storage efficiency. Downsizing of the enclosure contributes to cost reduction.

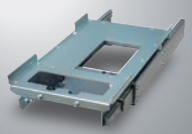
Approximately 40% smaller space

Comparison with the 400 V class inverter of the same capacity

Enclosure wire connection attachment

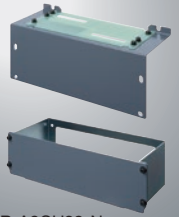
FR-A8CW39-N

Enclosure slide rail



FR-A8SR39

IP20 compliant attachment



FR-A8CU39-N

Release schedule June 2020

Rated specifications

Inverter

■690 VAC power input

Model FR-A872-[ ]-P			Single			Two in parallel			Three in parallel		
			05690	06470	07150	05690	06470	07150	05690	06470	07150
Applicable motor capacity (kW)*1		ND	450	500	560	710	800	900	1000	1200	1300
Output	Rated capacity (kVA)*2	ND	612	680	773	979	1088	1237	1468	1631	1855
	Rated current (A)*3	ND	512	569	647	819	910	1035	1228	1365	1552
	Overload current rating*4	ND	150% 60 s, 200% 3 s (inverse-time characteristics) at surrounding air temperature of 40°C								
	Rated voltage*5		Three-phase 600 to 690 V								
Input power	Power supply voltage		849 to 1025 VDC								
	Control power supply auxiliary input		Single-phase 525 to 690 V, 50/60 Hz								
	Permissible control power supply auxiliary input fluctuation		Frequency ±5%, voltage ±10%								
Protection rating of structure (IEC 60529)*6			Open type (IP00)								
Cooling system			Forced air								
Approx. mass (kg)*7			186	186	186	372	372	372	558	558	558

■575 VAC power input

Model FR-A872-[ ]-P			Single			Two in parallel			Three in parallel		
			05690	06470	07150	05690	06470	07150	05690	06470	07150
Applicable motor capacity (kW)*1		ND	355	400	450	560	630	710	800	900	1100
Output	Rated capacity (kVA)*2	ND	510	567	644	816	906	1031	1223	1359	1546
	Rated current (A)*3	ND	512	569	647	819	910	1035	1228	1365	1552
	Overload current rating*4	ND	150% 60 s, 200% 3 s (inverse-time characteristics) at surrounding air temperature of 40°C								
	Rated voltage*5		Three-phase 525 to 600 V								
Input power	Power supply voltage		742 to 891 VDC								
	Control power supply auxiliary input		Single-phase 525 to 690 V, 50/60 Hz								
	Permissible control power supply auxiliary input fluctuation		Frequency ±5%, voltage ±10%								
Protection rating of structure (IEC 60529)*6			Open type (IP00)								
Cooling system			Forced air								
Approx. mass (kg)*7			186	186	186	372	372	372	558	558	558

*1: The values in the "690 VAC power input" table indicate the maximum applicable motor capacity at a power input of 690 V. The values in the "575 VAC power input" table indicate the one at a power input of 575 V.
*2: The values in the "690 VAC power input" table indicate the rated output capacity at a power input of 690 V. The values in the "575 VAC power input" table indicate the one at a power input of 575 V.
*3: Total output current of the inverters operated in parallel.
*4: The percentage of the overload current rating is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
*5: The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the maximum point of the voltage waveform at the inverter output side is the power supply voltage multiplied by about √2.
*6: FR-DU08: IP40 (except for the PU connector)
*7: Total mass of the inverters operated in parallel

Converter unit

■690 VAC power input

Model FR-CC2-N[ ]-P		Single			Two in parallel			Three in parallel		
		450K	500K	560K	450K	500K	560K	450K	500K	560K
Applicable motor capacity (kW)		450	500	560	710	800	900	1000	1200	1300
Output	Overload current rating*1	150% 60 s, 200% 3 s at surrounding air temperature of 40°C								
	Rated DC voltage*2	849 to 976 VDC*4								
Power supply	Power supply capacity (kVA)*3	612	680	773	979	1088	1237	1468	1631	1855
	Rated input current (A)*5	512	569	647	819	910	1035	1228	1365	1552
	Rated input AC voltage/ frequency	Three-phase 600 V to 690 V 50/60 Hz								
	Permissible AC voltage fluctuation	Three-phase 540 V to 759 V 50/60 Hz								
	Permissible frequency fluctuation	±5%								
Protective structure (IEC60529)		Open type (IP00)								
Cooling system		Forced air								
DC reactor		Built-in								
Approx. mass (kg)*6		237	241	245	474	482	490	711	723	735

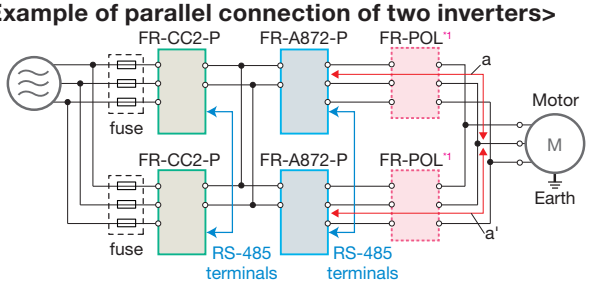
■575 VAC power input

Model FR-CC2-N[ ]-P		Single			Two in parallel			Three in parallel		
		450K	500K	560K	450K	500K	560K	450K	500K	560K
Applicable motor capacity (kW)		355	400	450	560	630	710	800	900	1100
Output	Overload current rating*1	150% 60 s, 200% 3 s at surrounding air temperature of 40°C								
	Rated DC voltage*2	742 to 849 VDC*4								
Power supply	Power supply capacity (kVA)*3	510	567	644	816	906	1031	1223	1359	1546
	Rated input current (A)*5	512	569	647	819	910	1035	1228	1365	1552
	Rated input AC voltage/ frequency	Three-phase 525 V to 600 V 50/60 Hz								
	Permissible AC voltage fluctuation	Three-phase 472 V to 660 V 50/60 Hz								
	Permissible frequency fluctuation	±5%								
Protective structure (IEC60529)		Open type (IP00)								
Cooling system		Forced air								
DC reactor		Built-in								
Approx. mass (kg)*6		237	241	245	474	482	490	711	723	735

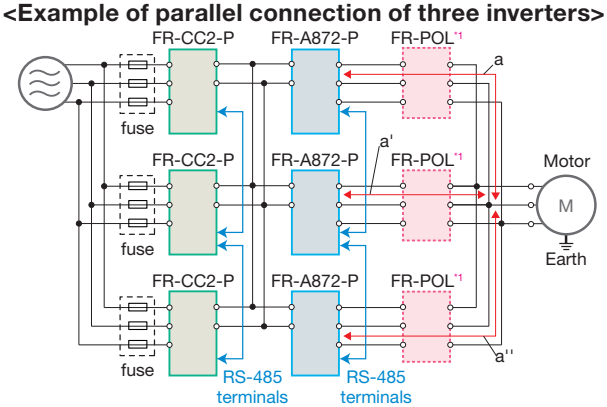
*1: The percentage of the overload current rating is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the converter unit and the inverter to return to or below the temperatures under 100% load.
*2: The converter unit output voltage varies according to the input power supply voltage and the load. The maximum point of the voltage waveform at the converter unit output side is approximately the power supply voltage multiplied by √2.
*3: The power supply capacity is the value at the rated output current. The input power impedances (including those of the input reactor and cables) affect the value.
*4: The permissible voltage imbalance ratio is 3% or less.
(Imbalance ratio = (highest voltage between lines - average voltage between three lines) / average voltage between three lines × 100)
*5: Total input current of the converter units operated in parallel.
*6: Total mass of the converter units operated in parallel.

System configuration example

<Example of parallel connection of two inverters>



<Example of parallel connection of three inverters>



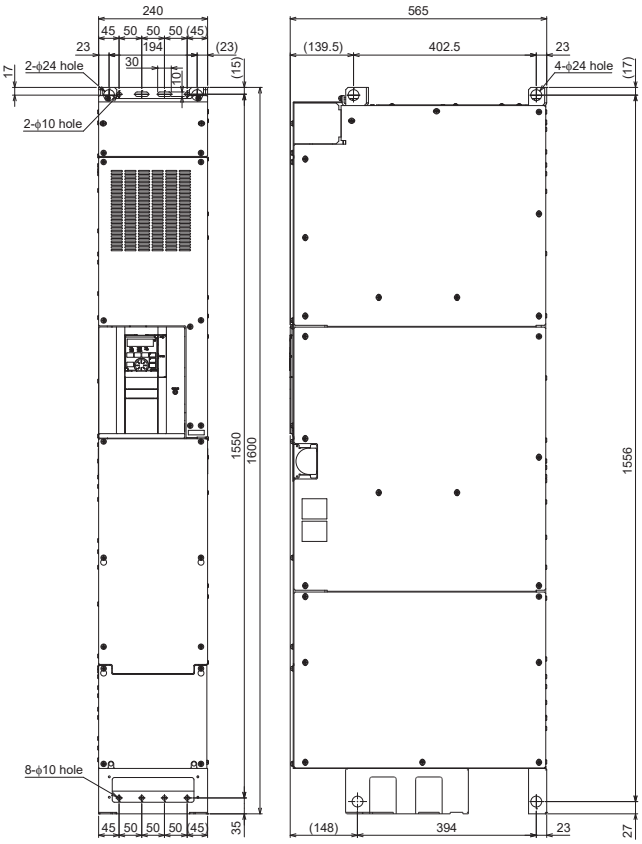
*1: When the cable length from an inverter to the node point (a/a'/a") is less than 10 m, install the FR-POL.

Outline dimensions

(Unit: mm)

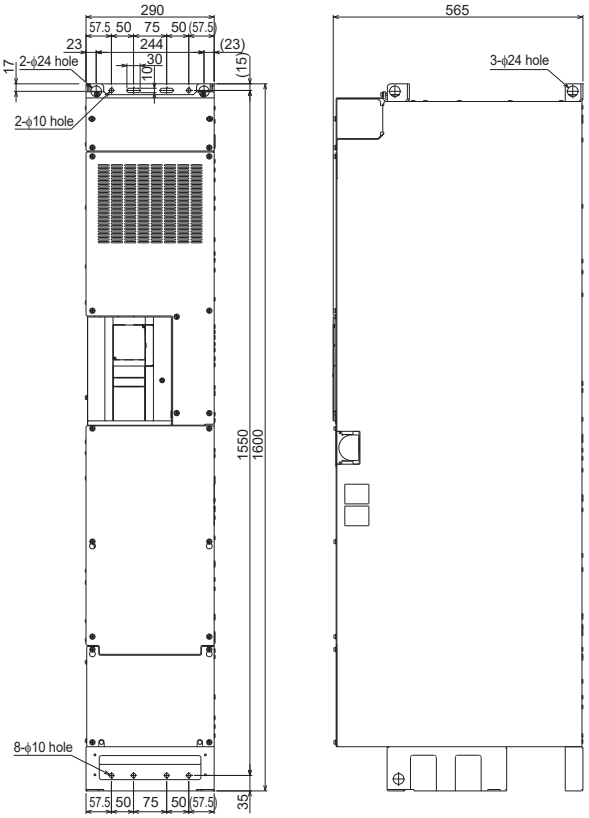
Inverter

FR-A872-05690 to 07150-P



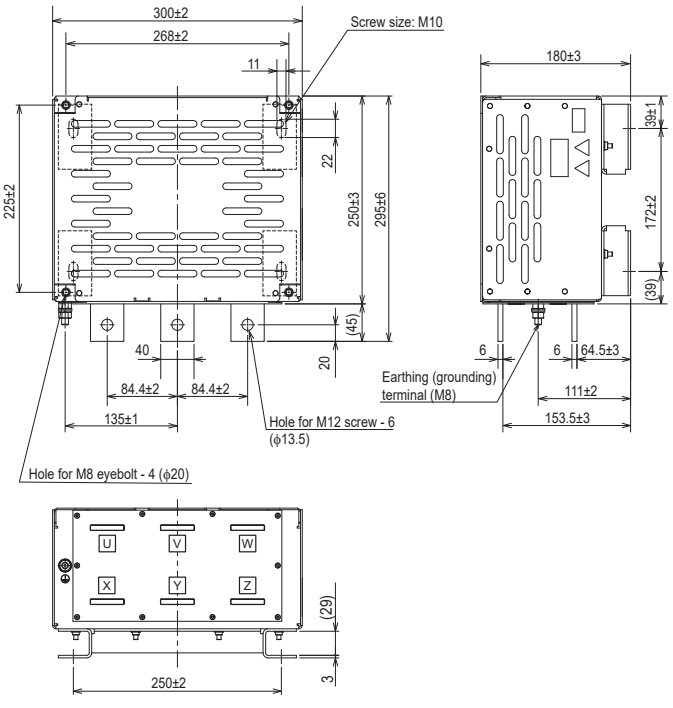
Converter unit

FR-CC2-N450K to N560K-P



Balance Reactor For Inverter Parallel Operation

FR-POL-N560K



Outline dimensions

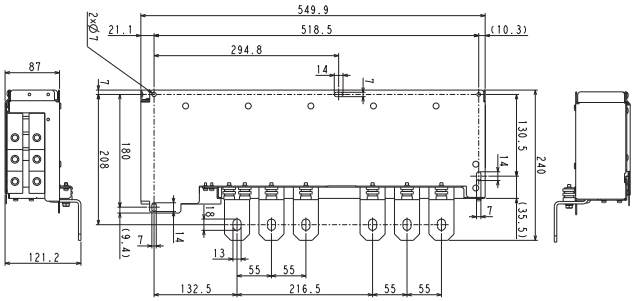
(Unit: mm)

Dedicated options

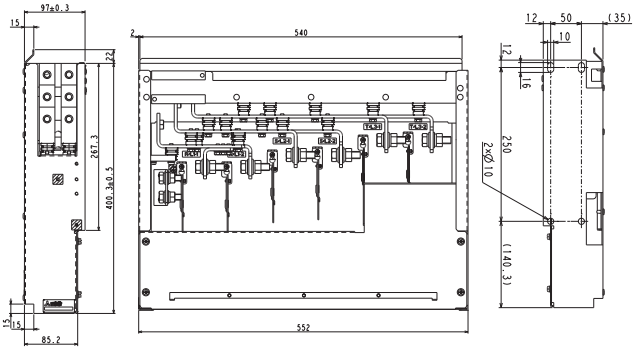
Enclosure wire connection attachment

FR-A8CW29-N/FR-A8CW39-N

Upper attachment (FR-A8CW29-N-A/FR-A8CW39-N-A)

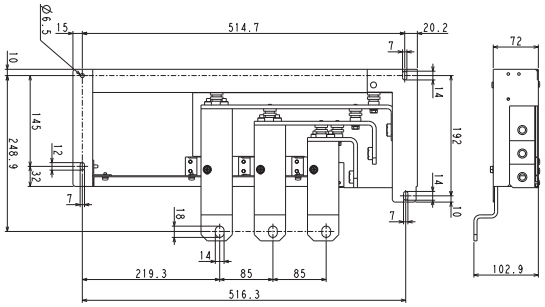


Lower attachment (FR-A8CW29-N-B/FR-A8CW39-N-B)

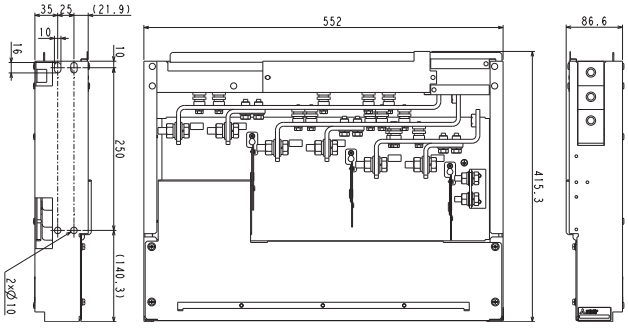


FR-A8CW59-N

Upper attachment (FR-A8CW59-N-A)



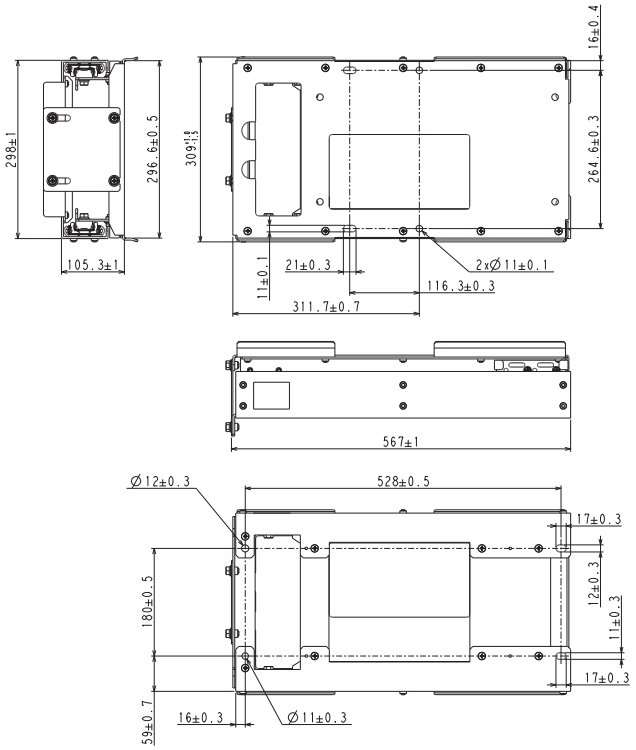
Lower attachment (FR-A8CW59-N-B)



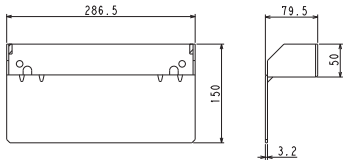
Enclosure slide rail

FR-A8SR39

Slide rail unit (FR-A8SR39-A)

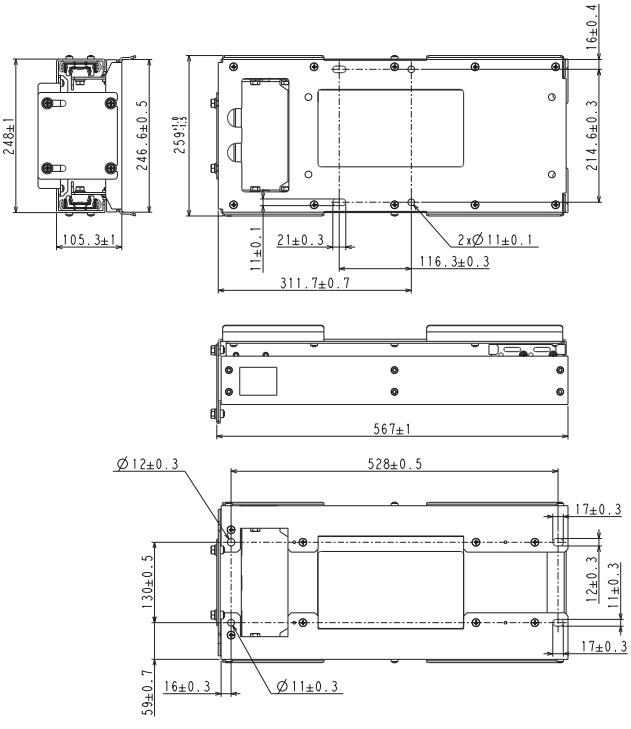


Lifter guide (FR-A8SR39-B)

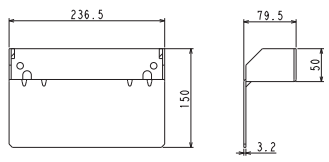


FR-A8SR59

Slide rail unit (FR-A8SR59-A)



Lifter guide (FR-A8SR59-B)

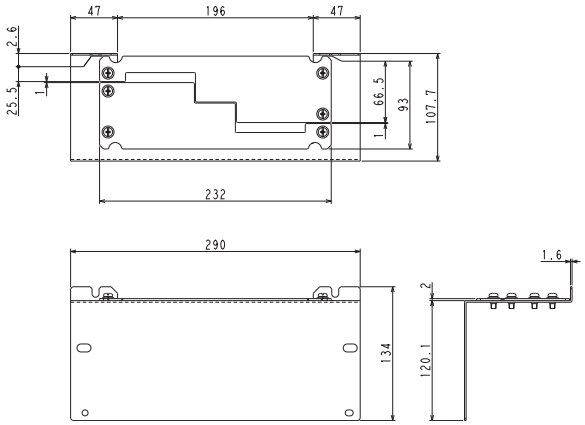


(Unit: mm)

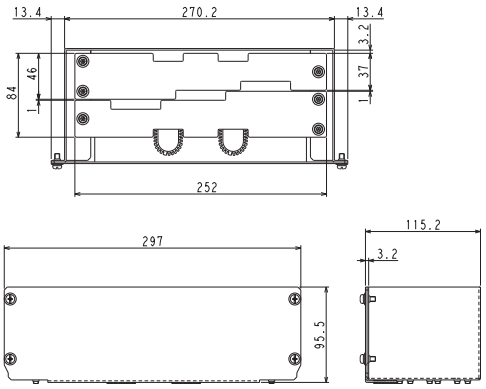
IP20 compliant attachment

FR-A8CU39-N

Upper IP20 cover (644H02)

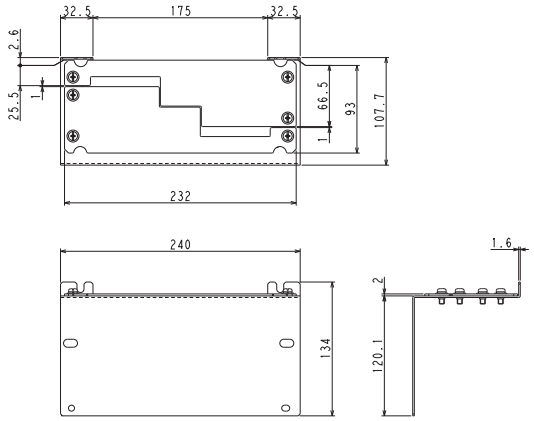


Lower IP20 cover (644H05)

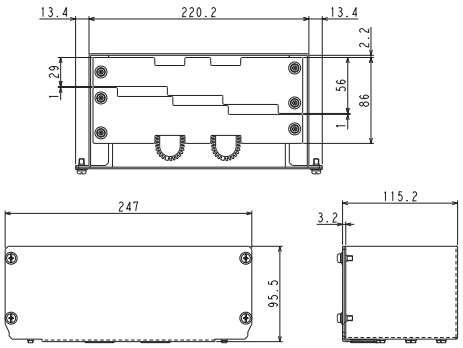


FR-A8CU59-N

Upper IP20 cover (644H01)

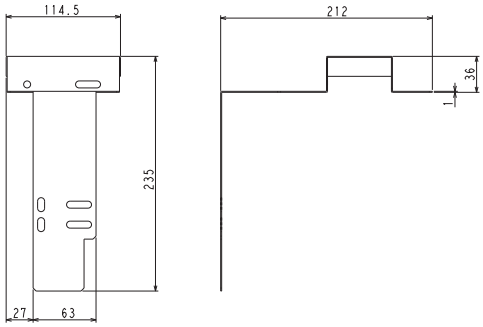


Lower IP20 cover (644H04)

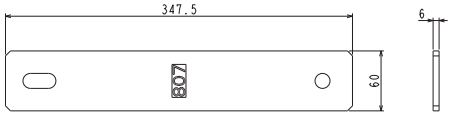


FR-A8CU79-N

Upper IP20 cover (644H03)



Bus bar for terminals P/+ and N/- (807)



Terminal Connection Diagram

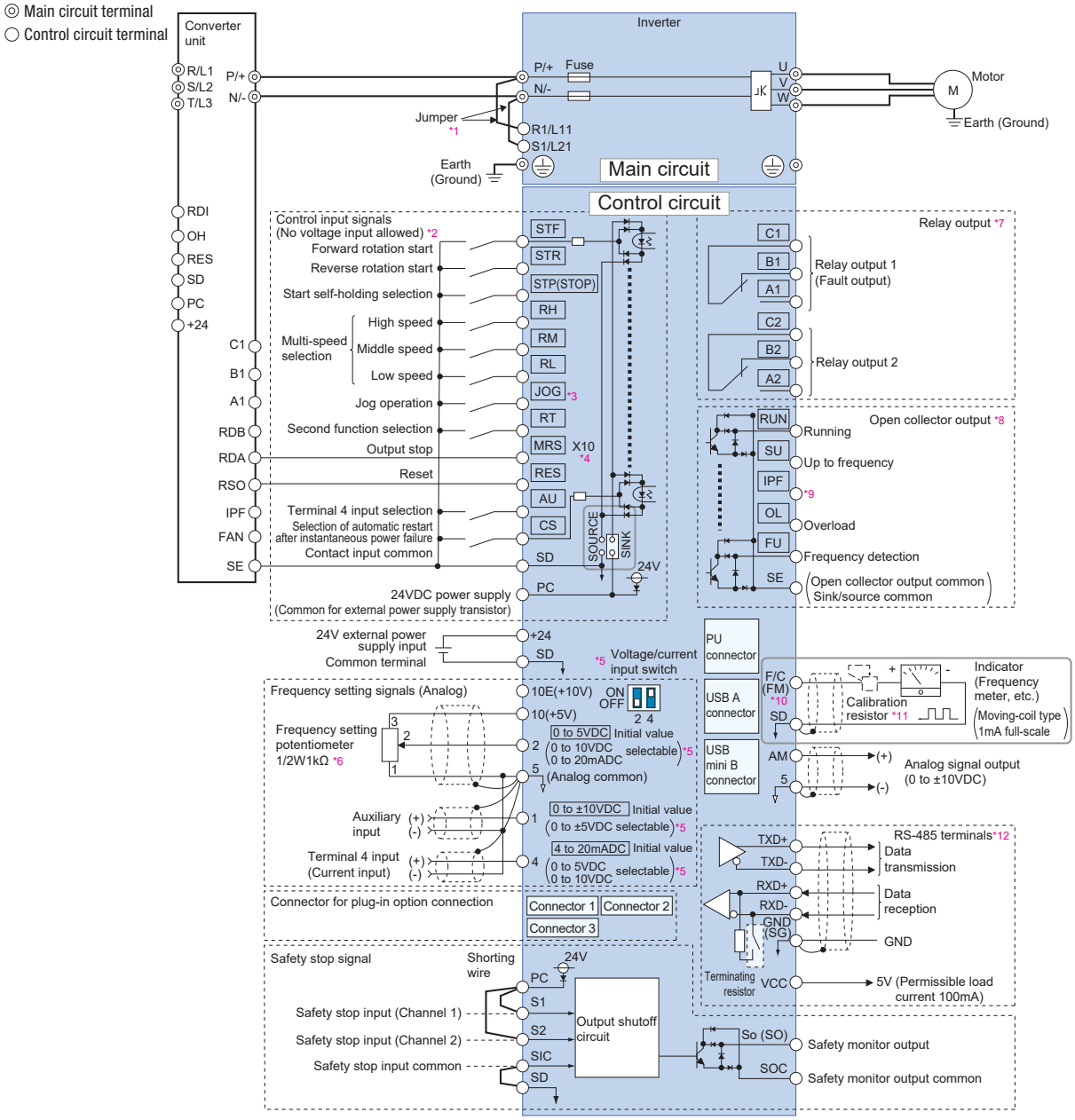
Inverter

■FM type

Sink logic

◎ Main circuit terminal

○ Control circuit terminal



*1: A jumper is installed across terminal R1/L11 and terminal P/+, and across terminal S1/L21 and terminal N/-. When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21.

*2: The function of these terminals can be changed using the Input terminal function selection (Pr.178 to Pr.189).

*3: Terminal JOG is also used as a pulse train input terminal. Use Pr.291 to choose JOG or pulse.

*4: The X10 signal (NC contact input specification) is assigned to the terminal MRS in the initial setting. Set Pr.599 = "0" to change the input specification of the X10 signal to NO contact.

*5: Terminal input specifications can be changed by analog input specification switchover (Pr.73, Pr.267). To input voltage (0 to 5 V/0 to 10 V), set the voltage/current input switch OFF. To input current (4 to 20 mA), set the voltage/current input switch ON. Terminals 10 and 2 are also used as a PTC input terminal. (Pr.561)

*6: It is recommended to use 2 W 1 kΩ when the frequency setting signal is changed frequently.

*7: The function of these terminals can be changed using the Output terminal function selection (Pr.195 or Pr.196).

*8: The function of these terminals can be changed using the Output terminal function selection (Pr.190 to Pr.194).

*9: No function is assigned in the initial setting. Use Pr.192 for function assignment.

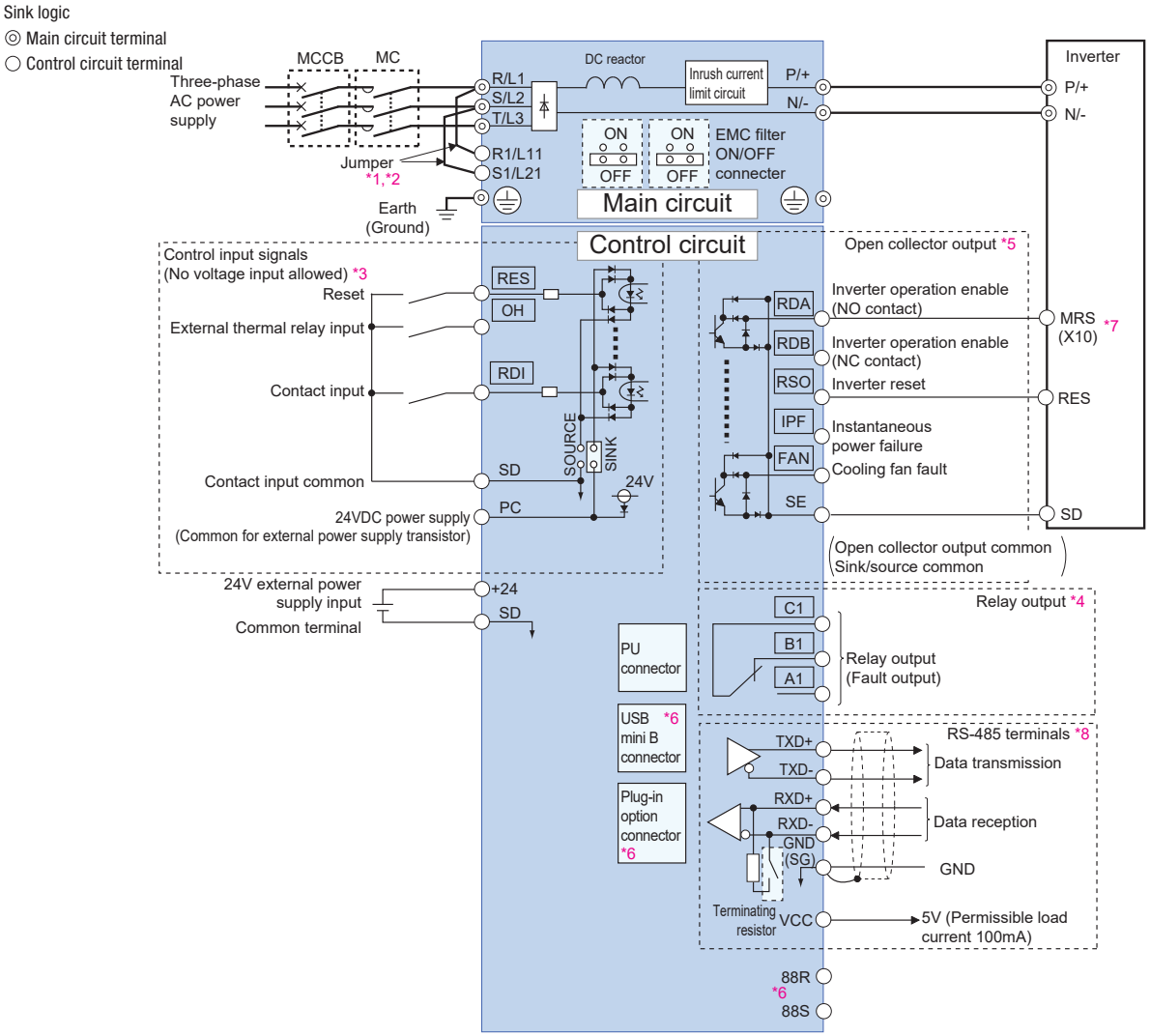
*10: Terminal FM can be used to output pulse trains as open collector output by setting Pr.291.

*11: Not required when calibrating the scale with the operation panel.

*12: RS-485 terminals are used for RS-485 communication between the master and the slave for the parallel operation. (For details, refer to the Instruction Manual.)

Converter unit

■When the sink logic is selected



*1: To use separate power supply for the control circuit, remove each jumper at terminal R1/L11 and terminal S1/L21.

*2: To use the power failure time deceleration-to-stop function, remove the jumpers connected to terminals R1/L11 and S1/L21, and connect terminal R1/L11 and the terminal P/+ bus bar and terminal S1/L21 and the terminal N/- bus bar.Pass wires between the converter unit and the inverter and through the rubber bush on the side face of the converter unit to the terminals inside.

*3: The function of these terminals can be changed using the Input terminal function selection (Pr.178, Pr.187, Pr.189).

*4: The function of these terminals can be changed using the Output terminal function selection (Pr.195).

*5: The function of these terminals can be changed using the Output terminal function selection (Pr.190 to Pr.194).

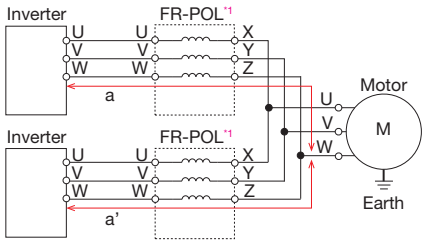
*6: For manufacturer setting. Do not use.

*7: To use the RDA signal of the converter unit, select the normally-closed contact input specification for the input logic of the MRS signal or X10 signal of the inverter. To use the RDB signal of the converter unit, select the normally-open contact input specification for the input logic of the MRS signal or X10 signal of the inverter. (For changing the input logic, refer to the Instruction Manual of the inverter.)

*8: RS-485 terminals are used for RS-485 communication between the master and the slave for the parallel operation. (For details, refer to the Instruction Manual.)

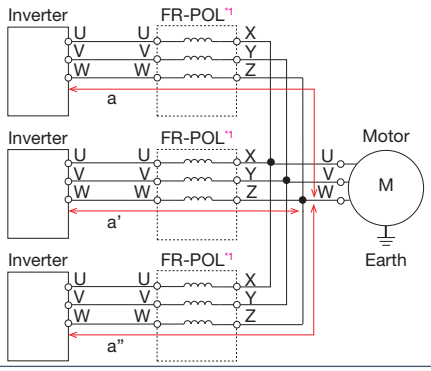
Balance Reactor For Inverter Parallel Operation

<Example of parallel connection of two inverters>



*1: When the cable length from an inverter to the node point (a/a'/a") is less than 10 m, install the FR-POL.

<Example of parallel connection of three inverters>



Lineup

Inverter

FR-A872-05690-1-60-P

Symbol	Voltage class
7	690 V class*1

Symbol	Description
05690 to 07150	Inverter SLD rated current (A)

Symbol	Type	Communication type
1	FM	RS-485 communication
2	CA	

Symbol	Circuit board coating*2	Plated conductor
60	With	Without
06	With	With

Symbol	Function
P	Parallel operation

Converter unit

FR-CC2-N450K-60-P

Symbol	Voltage class
N	690 V class

Symbol	Description
450K to 560K	Rated converterunit capacity (kW)

Symbol	Circuit board coating*2	Plated conductor
60	With	Without
06	With	With

Symbol	Function
P	Parallel operation

*1: The insulation distance conforms to IEC 61800.
*2: Conforming to IEC60721-3-3 3C2/3S2.

Dedicated options

Balance Reactor For Inverter Parallel Operation

FR-POL-N560K

Symbol	Voltage class
N	690 V class

Symbol	Description
560K	Reactor capacity (kW)

IP20 compliant attachment

Attachment specially made for the FR-A872(-P) and FR-CC2-N(-P) to satisfy IP20 structural protection requirements.

FR-A8CU□-N

Symbol	Application	Applicable model
39	Makes the main circuit terminals IP20 rated when connecting terminals with bus bars.	FR-CC2-N450K(-P) to N560K(-P), N630K
59		FR-A872-05690(-P) to 07150(-P)
79	Makes the main circuit terminals IP20 rated when installing the inverter and the converter unit side by side.	FR-A872-05690 to 07150 + FR-CC2-N450K to N630K

Enclosure wire connection attachment

Attachment for wire connection for the FR-A872(-P) and FR-CC2-N(-P) (used with the FR-A8SR slide rail).
Use the FR-A8CW29-N for the FR-CC2-N(-P) to enable the 6-phase rectification, and use the FR-A8CW39-N to enable the 12-phase rectification.

FR-A8CW□-N

Symbol	Application	Applicable model
29	Attachment for cable connection for the converter unit (for 6-phase rectification).	FR-CC2-N450K(-P) to N560K(-P), N630K
39	Attachment for cable connection for the converter unit (for 12-phase rectification).	FR-CC2-N450K(-P) to N560K(-P), N630K
59	Attachment for cable connection for the inverter.	FR-A872-05690(-P) to 07150(-P)

Enclosure slide rail

Attachment to facilitate the installation in the enclosure, maintenance, and unit replacement when a fault occurs.

FR-A8SR□

Symbol	Applicable model
39	FR-CC2-N450K(-P) to N560K(-P), N630K
59	FR-A872-05690(-P) to 07150(-P)

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