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.

Comparison with the 400 V class inverter of the same capacity

Release schedule

June 2020
## Rated specifications

### Inverter

#### 690 VAC power input

<table>
<thead>
<tr>
<th>Model</th>
<th>Single</th>
<th>Two in parallel</th>
<th>Three in parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR-A872-[ ]-P</td>
<td>150% 60 s, 200% 3 s (inverse-time characteristics) at surrounding air temperature of 40°C</td>
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### 575 VAC power input

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#### Applicable motor capacity

- FR-A872-[ ]-P
- FR-POL

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### Converter unit

#### 690 VAC power input

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### System configuration example

#### Example of parallel connection of two inverters

- **FR-CC2-P**
- **FR-A872-P**
- **FR-POL**

#### Example of parallel connection of three inverters

- **FR-CC2-P**
- **FR-A872-P**
- **FR-POL**

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*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 overload 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 0.9.

*6* Total mass of the inverters operated in parallel.
**Inverter**

FR-A872-05690 to 07150-P

**Converter unit**

FR-CC2-N450K to N560K-P

**Balance Reactor For Inverter Parallel Operation**

FR-POL-N560K

(Unit: mm)

Outline dimensions
Dedicated options

Enclosure wire connection attachment
FR-A8CW29-N/FR-A8CW39-N
Upper attachment (FR-A8CW29-N-A/FR-A8CW39-N-A)

FR-A8CW59-N
Upper attachment (FR-A8CW59-N-A)

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

Lower attachment (FR-A8CW59-N-B)

Enclosure slide rail
FR-A8SR39
Slide rail unit (FR-A8SR39-A)

FR-A8SR59
Slide rail unit (FR-A8SR59-A)

Lifter guide (FR-A8SR39-B)

Lifter guide (FR-A8SR59-B)
IP20 compliant attachment

**FR-A8CU39-N**
Upper IP20 cover (644H02)

**FR-A8CU59-N**
Upper IP20 cover (644H01)

**FR-A8CU79-N**
Upper IP20 cover (644H03)

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

**Lower IP20 cover (644H05)**

**Lower IP20 cover (644H04)**

**Lower IP20 cover (644H04)**

(Unit: mm)
Inverter

### Terminal Connection Diagram

#### FM type

**Sink logic**
- Main circuit terminal
- Control circuit terminal

**Converter unit**
- R/L1, S/L2, T/L3
- P+/N+
- RDI, RES, SD, PC
- +24

**Control circuit**
- Relay output 1
- Relay output 2
- Running
- Overload
- Frequency detection
- Open collector output common

**Main circuit**
- Inverter
- Motor
- Earth (Ground)
- Terminal 4 input selection
- Selection of automatic restart
- Safety stop input (Channel 1)
- Safety stop input (Channel 2)
- Safety stop input (Channel 2)
- Open collector output common

**Safety monitor output**
- Safety monitor output common

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1. A jumper is installed across terminal R/L1 and terminal P+/N+. When using a separate power supply for the control circuit, remove the jumpers connected to terminals R/L1, S/L2 and T/L3.

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. 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.

5. 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.

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

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

8. 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).

9. Terminal 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.

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

- **Sink logic**
  - Main circuit terminal
  - Control circuit terminal

### Main circuit section
- Three-phase AC power supply
- MCCB
- Jumpers R/L1, S/L2, T/L3
- Earth (Ground)

- Converter unit
- DC reactor
- Inrush current limit circuit
- Sink/source common
- Relay output
- USB mini B connector
- Plug-in option connector "E"
- RS-485 terminals "G"

### Control circuit section
- Control input signals
  - (No voltage input allowed) *3
  - External thermal relay input
- Inverter operation enable (NO contact)
- Inverter operation enable (NC contact)
- Inverter reset
- Instantaneous power failure
- Cooling fan fault
- 24V external power supply input

### Miscellanea
- 24VDC power supply
  - (Common for external power supply transistor)
- PC
- SD
- +24V
- PC24VDC power supply
  - (Common for external power supply transistor)
- Reset
- Contact input common

### Important Notes
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 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>
- Inverter
  - U
  - W
  - X
  - Motor

#### <Example of parallel connection of three inverters>
- Inverter
  - U
  - W
  - X
  - Motor

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

Inverter

FR-A872-05690-1-60-P

Symbol | Voltage class | Description | Symbol | Communication type | Symbol | Circuit board coating | Plated conductor | Symbol | Function
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
7 | 690 V class | 05690 to 07150 | 1 | FM | 60 | With | With | P | Parallel operation
2 | CA | | 2 | RS-485 | 06 | With | | Parallel operation | |

Converter unit

FR-CC2-N450K-60-P

Symbol | Voltage class | Description | Symbol | Circuit board coating | Plated conductor | Symbol | Function
--- | --- | --- | --- | --- | --- | --- | ---
N | 690 V class | 450K to 560K | 60 | With | Without | P | Parallel operation
560K | Reactor capacity (kW) | 06 | With | | Parallel operation |

Dedicated options

Balance Reactor For Inverter Parallel Operation

FR-POL-N560K

Symbol | Voltage class | Description | Symbol | Function
--- | --- | --- | --- | ---
N | 690 V class | 560K | | Parallel operation
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-A8CW2-N

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

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).

FR-A8CW3-N

Symbol | Application | Applicable model
--- | --- | ---
29 | Attachment for cable connection for the inverter. | FR-A872-05690(-P) to 07150(-P)
39 | 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

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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