

Upgrade of the FR-CC2 Series Converter Unit

Thank you for your continued patronage of the Mitsubishi drive control products.
 The 12-phase rectifier power supply is now supported for the FR-CC2 series converter unit.

1. Target Models

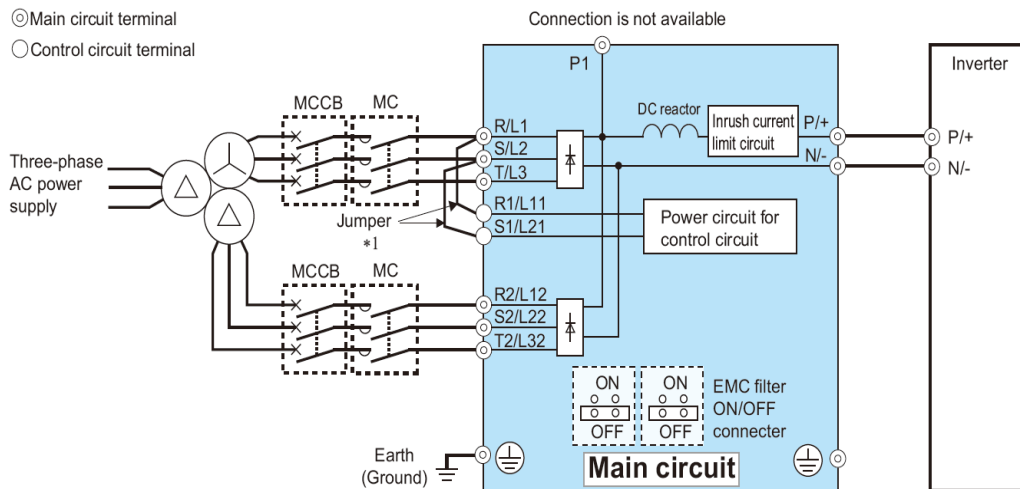
FR-CC2 series

2. Details of the Change

(1) Supporting 12-phase rectifier power supply

The 12-phase rectifier power supply is now supported as part of countermeasures for the harmonic current suppression. Refer to page 5 for the conversion coefficient and harmonics contents in 12-phase applications. By default, the converter unit is connected for 6-phase rectifier applications. For the 12-phase rectifier connection, remove the jumpers connected to terminals R/L1-R2/L12, etc. and use the converter unit in the 12-phase rectifier connection. For details on wiring, refer to the Instruction Manual.

• Connection diagram with 12-phase rectifier power transformer



*1 When using separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21.

• 12-phase rectifier power transformer

For 12-phase applications, a 12-phase rectifier power transformer (3-winding transformer) is required (customer's purchase).

To prevent imbalances in output current from the power transformers, adjust the current as follows.

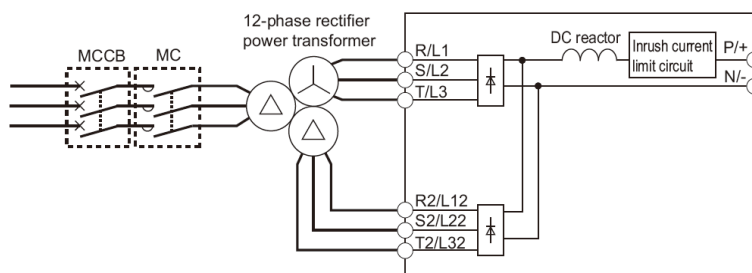
- Control imbalances in output voltage from the power transformers to within the range of $\pm 0.5\%$.
- Control an imbalance in power impedance ($\%Z$) to within the range of $\pm 10\%$.

| | | | | |
|----------------------|---|--------------|---|---|
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· Selecting the breaker / magnetic contactor

Check the model name of the inverter and the converter unit you purchased. Appropriate peripheral devices must be selected according to each capacity.

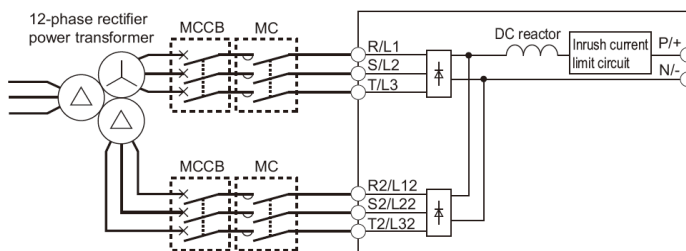
- 1) For connecting the power distribution control equipment to the input side of the 12-phase rectifier power transformer (no voltage drop at the 12-phase rectifier power transformer)



Refer to the following table to prepare appropriate peripheral devices.

| Motor output (kW)*1 | Applicable converter model | Molded case circuit breaker (MCCB)*2 or earth leakage circuit breaker (ELB) (NF, NV type) | Input-side magnetic contactor *3 |
|---------------------|----------------------------|---|----------------------------------|
| 315 | FR-CC2-H315K | 700 A | S-N600 |
| 355 | FR-CC2-H355K | 800 A | S-N600 |
| 400 | FR-CC2-H400K | 900 A | S-N800 |
| 450 | FR-CC2-H450K | 1000 A | 1000 A rated product |
| 500 | FR-CC2-H500K | 1200 A | 1000 A rated product |
| 560 | FR-CC2-H560K | 1500 A | 1200 A rated product |
| 630 | FR-CC2-H630K | 2000 A | 1400 A rated product |

- 2) For connecting the power distribution control equipment to the output side of the 12-phase rectifier power transformer (voltage drops at the 12-phase rectifier power transformer)



Refer to the following table to prepare appropriate peripheral devices.

| Motor output (kW)*1 | Applicable converter model | Rated input current in each star/delta connection | Molded case circuit breaker (MCCB)*2 (NF type) | Input-side magnetic contactor *3 |
|---------------------|----------------------------|---|--|----------------------------------|
| 315 | FR-CC2-H315K | 406 A | 500 A | S-N400 |
| 355 | FR-CC2-H355K | 454 A | 600 A | S-N400 |
| 400 | FR-CC2-H400K | 512 A | 600 A | S-N600 |
| 450 | FR-CC2-H450K | 576 A | 700 A | S-N600 |
| 500 | FR-CC2-H500K | 640 A | 800 A | S-N600 |
| 560 | FR-CC2-H560K | 728 A | 900 A | S-N800 |
| 630 | FR-CC2-H630K | 806 A | 1000 A | S-N800 |

*1 Assumes the use of a Mitsubishi 4-pole standard motor with the power supply of 400 VAC 50 Hz.

*2 Select an MCCB according to the power supply capacity.

Install one MCCB per delta/star connection in the converter unit.

*3 The magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stops during motor driving, the electrical durability is 25 times. When using an MC for emergency stop during driving the motor, select the MC with JEM1038-AC-3 class rated current for the converter unit input current. When providing an MC on the inverter output side for switching to commercial power supply during general-purpose motor operation, select the MC with JEM1038-AC-3 class rated current for the rated motor current.

· Applicable cables

Select a recommended size cable to ensure that the voltage drop ratio is within 2%.

The following table indicates a selection example for the wiring length of 20 m (440 V input power supply, 150% overload current rating for 1 minute).

| Converter model FR-CC2-[] | Terminal screw size *4 | Tightening torque N·m | Crimping terminal | Cable gauge | | | | | |
|------------------------------|---------------------------|--------------------------|-------------------|--|-----------------------------------|----------|----------------------------|---------------------------------------|-----------------------------------|
| | | | | HIV cables, etc. (mm ²) *1 | | | AWG/MCM *2 | PVC cables, etc. (mm ²)*3 | |
| | | | | R/L1, S/L2, T/L3 (per circuit) *5 | R/L1, S/L2, T/L3 (per circuit) *5 | P/+, N/- | Earthing (grounding) cable | R/L1, S/L2, T/L3 (per circuit) *5 | R/L1, S/L2, T/L3 (per circuit) *5 |
| H315K | M12 (M10) | 46 | 100-12 | 2 × 100 | 2 × 150 | 100 | 2 × 3/0 | 2 × 95 | 150 |
| H355K | M12 (M10) | 46 | 100-12 | 2 × 100 | 2 × 200 | 100 | 2 × 3/0 | 2 × 95 | 2 × 95 |
| H400K | M12 (M10) | 46 | 150-12 | 2 × 150 | 2 × 200 | 100 | 2 × 4/0 | 2 × 95 | 2 × 95 |
| H450K | M12 (M10) | 46 | 150-12 | 2 × 150 | 2 × 250 | 100 | 2 × 250 | 2 × 120 | 2 × 120 |
| H500K | M12 (M10) | 46 | 150-12 | 2 × 150 | 3 × 200 | 2 × 100 | 2 × 300 | 2 × 150 | 2 × 120 |
| H560K | M12 (M10) | 46 | C2-200 | 2 × 200 | 3 × 200 | 2 × 100 | 2 × 350 | 2 × 185 | 2 × 150 |
| H630K | M12 (M10) | 46 | C2-200 | 2 × 200 | 3 × 200 | 2 × 100 | 2 × 400 | 2 × 185 | 2 × 150 |

- *1 It is the gauge of the cable with the continuous maximum permissible temperature of 90°C or higher (LMFC (heat resistant flexible cross-linked polyethylene insulated cable), etc.). It assumes a surrounding air temperature of 50°C or lower and in-enclosure wiring.
- *2 It is the gauge of the cable with continuous maximum permissible temperature of 90°C (THHN cable). It assumes a surrounding air temperature of 40°C or lower and in-enclosure wiring.
(Selection example mainly for use in the United States.)
- *3 It is the gauge of the cable with continuous maximum permissible temperature of 90°C (XLPE cable). It assumes a surrounding air temperature of 40°C or lower and in-enclosure wiring.
(Selection example mainly for use in Europe.)
- *4 It is applied to the screws for terminals R/L1, S/L2, T/L3, P/+, and N/-, and a screw for earthing (grounding).
Screw size for earthing (grounding) is indicated in parentheses.
- *5 Terminals R2/L12, S2/L22, and T2/L32 are the same size.

(2) Instantaneous power failure (E.IPF), input phase loss (E.ILF)

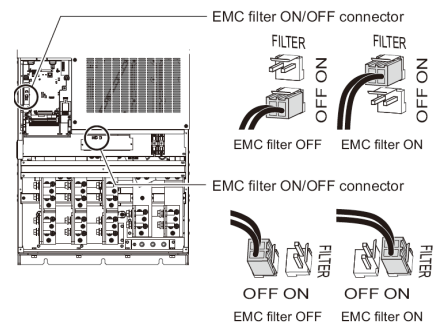
E.IPF is not activated in the delta connection (for terminals R2/L12, S2/L22, and T2/L32) even if the power fails for longer than 15 ms while the converter unit is used in 12-phase applications. Also, E.ILF is not activated even if the three-phase power input is lost in the delta connection (for terminals R2/L12, S2/L22, and T2/L32).

(3) Built-in EMC filter

Another EMC filter ON/OFF connector is now equipped in the FR-CC2-H315K and H355K, too.

The both connectors are initially set to the "disabled" (OFF) position.



To enable the EMC filter, fit both of the EMC filter ON/OFF connectors to the "enabled" (ON) position.



(4) Leakage currents for normal use in 6-phase applications

The leakage current values of the FR-CC2-H315K and H355K in 6-phase applications is now changed as shown in the table below.

400 V class (input power condition: 440 V/60 Hz, power supply imbalance within 3%)


| EMC filter | ON | OFF |
|--|------|-----|
| Phase earthing (grounding)  | 70 * | 2 |
| Earthed-neutral system  | 2 | 1 |

(mA)

* The leakage current before change is 35 mA.

(5) Leakage currents in 12-phase applications

Refer to the following table for leakage currents of the converter unit in 12-phase applications.
400 V class (input power condition: 440 V/60 Hz, power supply imbalance within 3%)

| EMC filter | ON | OFF |
|---|----|-----|
| Earthed-neutral system  | 37 | 3 |

(mA)

* While the converter unit is used in 12-phase applications, earth (ground) the cable in the star connection earthed-neutral system.

(6) Harmonic suppression guidelines

Refer to the following tables for the conversion coefficient and harmonics contents in 12-phase applications.

Conversion coefficient

| Classification | Circuit type | | Conversion coefficient Ki |
|----------------|---|--|---------------------------|
| 3 | Three-phase bridge (Capacitor smoothing) | For 12-pulse transducer with reactor (on DC side) | K37=0.8 |

Harmonics contents (values that the fundamental wave current is 100% in 12-phase applications)

| Reactor | 5th | 7th | 11th | 13th | 17th | 19th | 23rd | 25th |
|-------------------|-----|-----|------|------|------|------|------|------|
| Used (on DC side) | 1.4 | 1.5 | 7.2 | 4.1 | 0.8 | 0.7 | 1.6 | 1.4 |

*For details, refer to "the Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage".

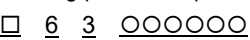
3. Date of Change

The change will be sequentially applied to the March 2016 production or later.

4. Product Identification

The upgraded products will have the following SERIAL or later on their rating plates.

Rating plate example


 Symbol Year Month Control number
 SERIAL

The SERIAL consists of one symbol, two characters indicating the production year and month, and six characters indicating the control number. The last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).