Tough & Stylish

Please read the instruction manual before using the device.

Specifications are subject to change without notice.

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http://Global.MitsubishiElectric.com

TYPE-B MOTOR CONTROL CENTER
Unleashing the power of the seamless integration of functionality and durability at the cutting edge of technological development

Type-B Motor Control Center

The Type-B Motor Control Center is the newest addition to Mitsubishi Electric’s distinguished line-up of motor control products. Developed by a company long recognized as a pioneer in the field of motor-switching devices, the product is the result of state-of-the-art technology comprehensively engineered from the user’s perspective. The Type-B Electronic Multi-Function Motor Controller (EMC-B) is characterized by a heightened capacity to withstand various site-related conditions. Tough and stylish, it comes fully equipped with useful functions enhanced by an attractively designed, high-visibility display for an expanded range of applications.

- **Easy Maintenance**
  - Capacitors and LCDs easily replaced
  - Grips easily maintained thanks to the use of long-lasting grease

- **Secure**
  - Equipped with the latest security mechanisms

- **Tough**
  - Durable motor controller, highly resistant to a wide range of external factors

- **Stylish**
  - Motor controller features:
  - Visually appealing design
  - MCCB operating handles and LED lamps for easy viewing of operating status
  - Attractive high-visibility LCDs

- **Energy-saving**
  - Features LCD “Normally OFF” mode
  - Measures electrical energy
  - Features 0-1mA DC current output
  - Uses a low-capacity regulating transformer

- **Space Saving**
  - Employs unit height of 150mm as standard

- **Easy Operation**
  - Simple to use
  - Quick learning process

- **Features of the Type-B Motor Control Center**
  - Type-B Motor Control Center
  - Tough
  - Stylish
  - Easy Operation
  - Space-saving
  - Expanded Maintenance Support

- **Plant Startup Support**
  - CDL MASTER Maintenance Support/Operation Status Monitoring System (optional)
  - EMCSET Plant Startup/Maintenance Support (Computer Version) (optional)

- **Easy Maintenance**
  - Energy-savings
  - Secure

- **Type-B Motor Control Center**
  - Product Specifications

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- **Easy Maintenance**
  - Energy-savings
  - Secure
Added resistance to the effects of temperature, corrosive gas, radio noise and static electricity

EMC-B Tough Motor Controller (Tough-Con)

- Vibration/Impact-resistant
  Remains problem-free even after the Control Center contactor has switched ON/OFF a million times.

- Corrosive Gas
  Can be used in an environment subjected up to 50ppb of H2S gas (ISA S71.04 G3).
  - Protected by a special high-performance coating for keeping out corrosive gas.
  - Housed in a semi-hermetic casing.
  - Fitted with gold-plated switches and connectors.

- Dust
  Keeps out dust thanks to its hermetic construction and specially coated board elements (to IP53 when mounted on the Control Center).
  (The Control Center has a semi-hermetic construction and may be optionally protected against dust to IP43 max.)

- Surge/Noise
  Prevents malfunctions caused by propagation/radiation of surge/noise and noise from the power supply.
  Withstands an impulse noise level of 5kV.

- Radio Noise
  Highly resistant to interference from cellular phones and transceivers.
  Cellular phones: may be used even at close proximity to the controller.
  Transceivers: may be used at a distance of 40cm or more (154MHz, 5W; 460MHz, 5W; 900MHz, 5W)

- Water
  Hermetic construction guards against intrusion of water (to IP53 when mounted on the Control Center).
  (The Control Center has a semi-hermetic construction and may be optionally waterproofed to a maximum of IP43.)

- Static Charge
  Withstands the effects of static electricity at the highest level in its class (15kV).
  (Complies with international standard IEC61004-2 Class 4 requirements [static discharge immunity testing].)

11: Index of protective level against dust and liquids.
12: ISA (Instrument Society of America) S71.04 (environmental conditions for process measurement and control systems) G3 (level of severity indicating an environment subject to a strong likelihood of corrosion).
13: Here, the term “corrosive gas” refers to H2S alone (50% RH or less).
   The concurrent presence of another gas can accelerate corrosion and thus shorten the expected service life.
   If the presence of a non-H2S gas on its own is expected, contact us during the planning stage.
   If operation in an environment subjected to corrosive gas is expected (up to 50ppb), contact us for considerations pertaining to devices other than the EMC.
14: According to the results of our studies of phones from multiple Japanese manufacturers (2010).
One of them has tripped.

The clearly visible MCCB operating handles and LED lamps make it easy to detect the operating states of rows of panels at a glance. They’ve made our routine checks especially easy.

When OFF

When ON

The MCCB operating handle is fitted to a plate with a high-contrast 2-segment design, making the current operating state easy to identify even when viewed at an angle.

LED Lamp (front and side views)

The LED used to indicate operating states is twice as bright as before. In addition, the LED portion protruding from the lamp body enables checking from both the front and sides.

The newly-added bar graphs now display information on operating current graphically. The text is bright and extremely legible and turns orange to alert us as soon as a motor trips. There’s no need for stepladders or bending down when checking the displays.

The main display is a LCD specially designed to provide wide viewing angles, making inspections of topmost/bottommost units significantly easier than with previous models. The positive display (i.e., white text against a blue background) turns orange when a motor trips. Compared to displays on previous models, the new display is significantly more advanced in terms of visibility and legibility from wider viewing angles.

Stylish (practical, attractively designed indicators)

1. The MCCB operating handles and LED lamps help make the current status of individual panels easily recognizable, all at one glance.

Visually appealing design

The images on the LCD are clearly visible across a wide range of angles—even from perspectives well above or below the device.

2. The high-visibility LCD can be viewed from any angle.

The newly-added bar graphs now display information on operating current graphically. The text is bright and extremely legible and turns orange to alert us as soon as a motor trips. There’s no need for stepladders or bending down when checking the displays.
Easy Operation

Operation Panel - The ultimate in operation ease

1. EMC-B Operation Buttons
The arrangement and design of the operation buttons have been fully reconfigured to improve ease of operation. The darker shade of the STOP button makes it easier to spot.

2. Connector with a Locking Mechanism
The connectors have a locking mechanism on both ends, enhancing connection reliability. In addition, reduced spring pressure and use of metal plating makes connection/disconnection easier than with previous models.

3. MCB Operating Handle
The recessed handle surface provides a better grip for easier operation. The location of the indentations has been determined based on ergonomic considerations.

Easy-to-Learn Button Operation

1. Mode Sequence of the EMC-B
Shifting through modes is as easy as pressing the MODE button.

2. Additional Button (DISP)
One press of the DISP (display) button turns on the LCD without needing to open the cover. (†1)

3. Simplified EMC Settings
Settings are performed in setup mode. Switch to setup mode and use the ▲ and ▼ buttons to move to the item to be set.

Space-saving

Improved Packaging Efficiency Saves Space

E Series Unit (fitted with EMC-B)
1. 150mm-high Unit Added to Line-up
The addition of a 150mm unit to the line-up further increases space efficiency permitting the use of as many as 24 units (400V, non-reversible, up to 7.5kW).

2. Higher Packaging Efficiency in 200mm/300mm-high Units
The internal components have been reduced in size and laid in a different arrangement for better use of the space inside the unit. The use of miniature-size relays has also helped increase the efficiency in accommodating control devices.

B Series Unit (not fitted with EMC-B)
B Series Units Also Made More Compact
The functions of both the leakage relay and instantaneous voltage-drop relay have been combined in a single relay in the form of the ML-type multi-function leakage relay. Nearly identical in size to the existing leakage relay, the new relay has a reduced height now permitting installation in a 200mm unit while the existing type requires a 300mm unit.
**User support**

### Expanded Maintenance Support

#### 1. 3-mode Restart Function after Instantaneous Voltage Drop

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pattern 1: Set 3 modes (Pattern 1: Set 3 mode for switchover between simultaneous and time series startups, based on the level of the motor startup inrush current).</td>
</tr>
<tr>
<td>2</td>
<td>Pattern 2: Set 2 modes (Pattern 2: Set 2 modes for sequential startup of motors in the event of an instantaneous voltage drop).</td>
</tr>
<tr>
<td>3</td>
<td>Pattern 3: Keep the instantaneous voltage drop restart mechanism disabled.</td>
</tr>
</tbody>
</table>

**Operation in possible patterns**

- Pattern 1: Set 3 modes: 0% for switchover between simultaneous and time series startups, based on the level of the motor startup inrush current.
- Pattern 2: Set 2 modes: 0% for sequential startup of motors in the event of an instantaneous voltage drop.
- Pattern 3: Keep the instantaneous voltage drop restart mechanism disabled.

#### 2. Running Time/Count-based Alarms

##### **Alarm indicator**

- Indicates alarm according to operation history.

##### **Sub-indicator**

- Alarm name:
- Indicates that the alarm is caused by an unforeseen event or abnormality.

#### 3. Target Current Setup

- A sticker is attached to the unit to indicate its stable current value.
- The EMC-B monitors the readings for you!
- The EMC-B notifies what needs to be replaced, and when.

---

**Plant Startup Support**

Plant startup time has recently become much shorter. From installation to operation, hardly any time is required in most cases. With this in mind, the EMC-B is equipped with support features including functions to test the transmission system and simulate system error or failures.

#### 1. Electronic Thermal Relay Enables Simple Post-delivery Adjustment

The EMC-B can function as an electronic thermal relay. As the adjustment range is large and the error is small, there is no need for replacement.

- **Conventional mechanical relay**
  - Small adjustment range (one type of rating)
  - Large error (tens of percent)
  - Wide range of settings

- **EMC-B**
  - Wide adjustment range (lots of types of ratings)
  - Error is small (a few percent)
  - Settings are fixed

#### 2. Ample Test Functions

**1. Abnormal CPU operation mode**

- I need to conduct tests that simulate system error and transmission tests during abnormal CPU operation.

In the abdual CPU operation test mode, actual internal signals when the system is not operating properly (internal failure signal M250) can be simulated simply by pushing a button. At the same time, when the CPU is operating abnormally transmission data is sent automatically, which means that generation of the transmission signals sent in the case of an actual system error can be simulated (with CDL transmission specifications).

**Abnormal CPU operation mode**

- The EMC-B can simulate system error!

**2. Transmission output mode**

- I want to conduct a main circuit current output test for transmission.

In transmission output test mode, it’s possible to simulate the output of main circuit current transmission data. The output level can be varied between 0% to 100% and so on. For “0% Current setting,” 100% of the setting value is output (the displays below are for CDL transmission specifications).

**Transmission output mode (0% output)**

- The EMC-B can be simulated freely.

**Using EMC-B, the level can be changed and output enabled without having to perform actual input!**

**Transmission output mode (50% output)**

- Transmission output mode (100% output)**
This software makes it easy to efficiently read/write internal sequence data and edit setting data/display operation logs of the EMC using a computer.

**Advantages Demonstrated in Four Situations**

1. **Quickly test operations at time of plant startup**
   
   - Situation: The number of motor operations and failures can be checked easily. It took less time to test operations when installing equipment for production line A.

2. **Easily complete settings using data-editing software**
   
   - Situation: Setting the EMC for expanding conveyor belt of production line B was easy. All that was required was carrying over the data for existing EMC settings.

3. **Carry-over sequence circuits too...**
   
   - Situation: It's now easier to put all the EMCs under the same sequence circuit at the time of plant startup too.

4. **Integrate EMC status displays**
   
   - Situation: When starting up production line C, all of the measurements could be checked on a single screen without having to use the control panel of the EMC main unit. The data log function is also very convenient for maintenance.

**Sample system configuration**

This system provides efficient maintenance support and monitoring of control center status by making it possible to view EMC data on a personal computer.†

Data such as present load conditions and measurement values are displayed on the screen for simple monitoring of load operation status. EMC characteristics are tested once for all points. EMC registration data, status, measurement values, operation log settings, failure log and other items can be saved as text or CSV files.

† It’s recommended that this software be purchased pre-installed as a set with a computer specified by Mitsubishi Electric. The software can be supplied separately, but the user will be required to personally check operations after installation. The operations guarantee only applies when used with a computer specified by Mitsubishi Electric.
Easy Maintenance

Replacement of Parts
When a replacement part
(requires routine maintenance.)
In practice, contamination by foreign matter/dust still
and its use significantly reduces the maintenance workload.
reapplication, the new grease remains highly lubricative,
necessitates a great deal of labor for removal and
verified by testing.
sometimes retaining its initial state for 30 years or more, as
grease is characterized by its resistance to oxidization,
contact points for energizing the power-supply grip. The oil
Mitsubishi Electric’s original fluorine grease is used at

1. Replacing the Aluminum Electrolytic Capacitor PCB

When the aluminum electrolytic capacitor reaches the end of its life...

†1: We designate replacement time of the aluminum electrolyte capacitor as 10 years.

1. Slide the unit in the direction of the arrow.
2. Disconnect the connectors, replace the part, and reassemble the unit.

2. Replacing the Display PCB (LCD, LED)

When the LCD reaches the end of its life... 

†2: The liquid crystal display (LCD) is likely to require replacement after 10 years or so of use.

1. Place the screwdriver tip in the tab, and pry apart in the direction of the arrow.
2. Detach the part while tilting it in the direction of the arrow.
3. Attach the new part and reassemble.

Use of Long-lasting Grease in the Power-supply Grip

Mitsubishi Electric’s original fluorine grease is used at
contact points for energizing the power-supply grip. The oil
content of the grease tends to resist evaporation, and the
grease is characterized by its resistance to oxidization,
sometimes retaining its initial state for 30 years or more, as
verified by testing.
Unlike conventional grease, which tends to cake and
necessitates a great deal of labor for removal and
reapplication, the new grease remains highly lubricative,
and its use significantly reduces the maintenance workload.
(In practice, contamination by foreign matter/dust still
requires routine maintenance.)

Adding/Changing Specifications

I want to change the EMC-B specifications.
†1: Here, “specifications” refers to the hardware-based items shown below.
†3: A long service life aluminum electrolytic capacitor rated at 125°C and 5,000hr is adopted

2. Procedure for Checking Specifications
The present specifications and specifications after making changes can be easily checked in test mode.

<EMC-B hardware-based specifications list>

1. Main indicator: 1 st digit
2. Main indicator: 2 nd digit
3. Main indicator: 3 rd digit
4. Main indicator: 4 th digit
5. Main indicator: 5 th digit

Main indicator: 1 st digit
- Transducer board Transducer board
- Input/Output data (0: None, 1: CDL, 2: CC-Link, 3: Modbus ®-RTU)
- Main indicator: 2 nd digit
- Sub-indicator: 1 st digit
- System error contact output function (0: None, 1: Yes)
- Low-sensitivity ground overcurrent specification (0: None, 1: Yes)
- Micro-leakage current measurement data (0: None, 1: Yes)
- Transmission data (0: None, 1: CDL, 2: CC-Link, 3: Modbus ®-RTU)
- Main indicator: 3 rd digit
- Sub-indicator: 2 nd digit
- Main indicator: 4 th digit
- Sub-indicator: 3 rd digit
- Main indicator: 5 th digit

Sub-indicator: 1 st digit
- Main indicator: 1 st digit
- Main indicator: 2 nd digit
- Main indicator: 3 rd digit
- Main indicator: 4 th digit
- Main indicator: 5 th digit

Sub-indicator: 2 nd digit
- Main indicator: 1 st digit
- Main indicator: 2 nd digit
- Main indicator: 3 rd digit
- Main indicator: 4 th digit
- Main indicator: 5 th digit

Sub-indicator: 3 rd digit
- Main indicator: 1 st digit
- Main indicator: 2 nd digit
- Main indicator: 3 rd digit
- Main indicator: 4 th digit
- Main indicator: 5 th digit

Sub-indicator: 4 th digit
- Main indicator: 1 st digit
- Main indicator: 2 nd digit
- Main indicator: 3 rd digit
- Main indicator: 4 th digit
- Main indicator: 5 th digit

Sub-indicator: 5 th digit
- Main indicator: 1 st digit
- Main indicator: 2 nd digit
- Main indicator: 3 rd digit
- Main indicator: 4 th digit
- Main indicator: 5 th digit

Note
Transmission board Transducer board
- External current output data (T/D: Transducer)
- External current output data (T/D: Transducer)
- Low-sensitivity ground overcurrent specification (0: None, 1: Yes)
- Micro-leakage current measurement data (0: None, 1: Yes)

Please contact a Mitsubishi Electric representative for details.

2. Adding Transmission Options Board
The standard specification for transmission is CDL, but by adding a CC-Link or Modbus ®-RTU transmission board, it’s possible
to change to CC-Link or Modbus ®-RTU specifications (see pages 27 and 28 for details).

3. Adding Transducer Options Board
The external current output function is an option for standard specifications, but if a
transducer board is added, the external current output function can be provided.

In the example above, the values indicate: CDL transmission 1 , 5-point input 2 , no external current output 3 , auxiliary power supply 4 , micro-leakage current measurement specification 5 , no low-sensitivity ground overcurrent specification 6 , and no system error contact output function 7 .
Energy saving

LCD Normally Off Mode

In this mode, the LCD is normally off, prioritizing energy savings. The LCD turns on (high brightness) during key operation and turns off two minutes after key operation stops.

Please note that use of the Normally On mode shortens the service life of the LCD. Therefore, we recommend operation in Normally Off mode.

LCD Normally On mode

In this mode, the LCD is always on, prioritizing visibility. The low-brightness mode can be used for energy-saving operation but the service life will be shorter compared to use in Normally Off mode. In high-brightness mode, the LCD remains on with high brightness regardless of the amount of time elapsed. In low-brightness mode, the LCD switches to high brightness when key operation begins, and returns to low brightness two minutes after key operation stops.

Power/Electrical Energy

0-1mA DC Current Output

Small-capacity Control Transformer

The EMC-B now makes it possible to deploy a soft padlock (security function\(^\text{†2}\)) designed to lock data electronically via special software. Previously, the cover had to be equipped with a physical padlock to ensure data protection.

\(^{†2}\): The security function requires a special security key (EMC-B-SKEY, available separately).

Security

Type-B Motor Control Center Product Specifications

Specifications

- Applied standard ——— IEC60439-1
- IEC61439-1, -2
- Other applicable standards ——— JEM1195
- Degree of protection ——— IEC66529
  according to
  IP20 to IP52 (indoor type)
  IP33 to IP54 (outdoor type)
- Internal separation up to ——— Form 4b
- Rated insulation voltage ——— 690VAC
- Frequency ——— 50/60Hz
- Rated current up to ——— AC 3,500A
- Rated short-circuit withstand ——— 75kA, 1.0sec.
  current up to
- Maximum load capacity ——— 2,000A (MCCB)
  300kW (440V; motor starter)
- Maximum load capacity of ——— 150kW, 380-440V
  withdrawable unit
  75kW, 200-220V
  400A (MCCB)
- Maximum load capacity of ——— 55kW, 440V/220V common
  inverter
- Seismic performance ——— 0.4G (standard intensity; JEM-TR 144)
Full Casing Line-up to Suit Individual Needs

- **Basic Casing**: Double-front construction (height: 2,300mm; panel width: 600mm; panel depth: 550mm). Provides ample accommodation space.
- **Thin Casing**: Single-front construction (height: 400mm). Designed for panel arrangements above the panel.
- **Low-profile Casing**: Designed for wall installations. Panel height is 1,900mm.

Safety-oriented Compartment Construction

- **A metal partition is positioned between units and the busbar compartment to eliminate unused space.**
- **Control wiring is separated from the main busbar wiring.**

Simple Planning

- The unit arrangement may be freely planned in increments of 100mm.
- Depending on the specific application, select basic, thin or low-profile casings.

Easy Installation

- The casing may be shipped in separate units to any location.
- The horizontal busbar can be arranged horizontally and vertically.
- Control wiring is permitted for easy wiring.

Improved Heat Transfer Characteristics

- Ventilation holes are installed in the lower faceplate and duct door, enhancing heat transfer characteristics.
- The space at the top front can be used as a wire path.

Wiring Method and Number of Units in a Stack

<table>
<thead>
<tr>
<th>Number of units</th>
<th>B-B</th>
<th>Main circuit B</th>
<th>Control circuit B</th>
<th>C-B</th>
<th>Main circuit C</th>
<th>Control circuit C</th>
<th>C-C</th>
<th>Main circuit C</th>
<th>Control circuit C</th>
</tr>
</thead>
<tbody>
<tr>
<td>150mm → 9 †1</td>
<td></td>
<td></td>
<td></td>
<td>9 †1</td>
<td></td>
<td></td>
<td>9 †1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200mm → 7 †2</td>
<td>100</td>
<td></td>
<td></td>
<td>8 †2</td>
<td></td>
<td></td>
<td>6 †1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300mm → 5 †2</td>
<td>150</td>
<td></td>
<td></td>
<td>7 †2</td>
<td></td>
<td></td>
<td>6 †1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- †1: Indicates the maximum number of units in a stack of panels 2,300mm high.
- †2: May vary depending on the number of terminal mounts and size.

Busbar

**Horizontal Busbar (copper, tin-plated)**

<table>
<thead>
<tr>
<th>Rated busbar current</th>
<th>Busbar compartment space</th>
</tr>
</thead>
<tbody>
<tr>
<td>600A</td>
<td>300mm (front)</td>
</tr>
<tr>
<td>800A</td>
<td>300mm (front)</td>
</tr>
<tr>
<td>1,000A</td>
<td>400mm (front)</td>
</tr>
<tr>
<td>1,200A</td>
<td>400mm (front)</td>
</tr>
<tr>
<td>1,600A</td>
<td>500mm (front)</td>
</tr>
<tr>
<td>2,000A</td>
<td></td>
</tr>
<tr>
<td>2,500A</td>
<td></td>
</tr>
<tr>
<td>3,000A</td>
<td>500mm (front)</td>
</tr>
<tr>
<td>3,500A</td>
<td></td>
</tr>
</tbody>
</table>

- The horizontal busbar is arranged vertically at the top-rear so that the load cable can be drawn either upward or downward.
- The space at the top-front can be used as a wire path when control wiring is laid from panel to panel for common circuit interlock or other such mechanisms.
- As a rule, the size of the neutral phase of the 3-phase, 3-line horizontal busbar is 1/2 the size of the other phases.

**Vertical Busbar (copper, tin-plated Z-shaped busbar)**

- The Z-shaped vertical busbar is a Mitsubishi Electric original and possesses a short-circuit withstand strength that is approximately three times higher than that of flat-type busbars.
- The vertical busbar is shielded by means of a steel plate on both the front and rear sides. The angular openings found at intervals of 100mm are for the unit grips; unused holes are fitted with an insulating plate. Holes used may be fitted with a shutter that opens and closes in conjunction with the insertion/removal of the grips (optional).
- The vertical busbar support is made of an insulation material with enhanced resistance to the detrimental elements of the environment.
Thin, Large-capacity Grips Support Up to 400A Rating

The newly-designed grip enables compact, large-capacity configurations. The thin grips pave the way for multi-tiered configurations and increase the maximum ratings from 300 to 400A. Together, these improvements allow the addition/removal of large-scale grip connection power feeder units without disconnecting power from the busbar.

Comparison to Previous Models (large-scale grip connection power feeder units)

<table>
<thead>
<tr>
<th>Grip rating</th>
<th>Unit type</th>
<th>Grip construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>To 300A</td>
<td>Motor starter: to 150kW (at 400V) Power feeder (MCCB): to 225AF</td>
<td>Previous: Standard grip</td>
</tr>
<tr>
<td>To 400A</td>
<td>Large-scale power feeder (MCCB): to 400AF</td>
<td>Previous: Large-capacity grip (designed exclusively for large-scale power feeder units). Requires disconnection of power from the busbar at the time of unit addition/removal</td>
</tr>
<tr>
<td>Over 400A</td>
<td>Large-scale power feeder and incoming</td>
<td>Previous: Bolt connection</td>
</tr>
</tbody>
</table>

Standard and large-capacity grips were incompatible in previous models, requiring the disconnection of power from the busbar and sometimes even panel modifications when adding/removing large-scale power feeder units (fitted with large-capacity grips).

Improved Usability and Ease of Maintenance

The one-touch lever used to attach/detach the unit has been reassessed and improved to make tasks significantly easier.

Additional Environmental Considerations

- The main circuit cable incorporates halogen-free wires.
- Plastic parts are identified by material names to facilitate recycling.

Unit latching mechanism

- Run position: Connecting the power-supply grip to the vertical busbar locks the latching mechanism. If the mechanism fails to lock, the unit is not correctly inserted.
- Test position: Turn the latching mechanism 90 degrees to the left. The arrow should point to the left. When you remove the unit under these conditions, the unit is held in place automatically. Now, lock the latching mechanism once again. The grip is released from the busbar, and the circuit in the unit is disconnected from the busbar.
- Drawing position: Turn the latching mechanism 180 degrees from the locked position. The arrow will point downward. Pull to remove the unit from the unit housing.

Automatic connection unit (optional)

The secondary side of the unit also uses grips. It’s simple to detach the unit only by removing the control circuit connector.

Door and relevant components

- The MCCB operating handle, display, and operating and setting functions of the EMC-B are located on the surface of the door.
- The system uses a card-type holder, allowing easy switching of usage nameplates.
- In addition to a door interlock, the MCCB operating handle is equipped with another interlock that prevents the MCCB from turning ON while the door is open. Yet another interlock controls unit insertion/removal.
- A lock pin or a padlock can be attached to the MCCB operating handle at either the ON or OFF position. Up to three padlocks can be attached.

†1: One lock pin is provided for an array. More lock pins can be added as optional components.
†2: Optional
<Names and Functions of Parts>

**<Functions>**

**Description**
- Low-voltage busbar (including manual feed)
- Specifications
  - Rated voltage (LV): 440/440V AC, 50/60Hz
  - High-voltage (HV): 500/500V AC, 50/60Hz
  - High-resistance grounding (H)4: 500/500V AC, 50/60Hz
- Protection
  - Overcurrent protection
  - Overload protection
- Indicators
  - LED: TRIP, STOP, TRANSMISSION ERROR, TRANSIOM ERROR, ALARM
  - LCD: TRIP, STOP, TRANSMISSION ERROR, TRANSIOM ERROR, ALARM
- Measured values
  - Overcurrent protection
  - Overload protection
- Expansion
  - Expansion connector
- Remote control
  - Remote control
- Mechanical
  - Mounting

**<Names and Functions of Parts>**

<table>
<thead>
<tr>
<th>Setting name</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes (on) / No (off)</td>
</tr>
<tr>
<td>2</td>
<td>Yes (on) / No (off)</td>
</tr>
</tbody>
</table>
<Protective Characteristics>

- Overcurrent Operating Characteristics
- Hot-start Characteristics
- Unbalance Characteristics
- Ground Fault Operating Characteristics
- Overcurrent Instantaneous Characteristics
- Undercurrent Characteristics

The graph depicts time-based overcurrent operating characteristics with settings at 600%.
These characteristics also apply at 800%.

<Sample Wiring>
Standard EMC-B for a non-reversible sequence (CDL transmission, 5-point input)

<Product Configuration>

EMC-B CC-Link transmission specifications (optional)

Standard model name
- With Modbus-RTU transmission I/F (redundant)
- With Modbus-RTU transmission I/F (single)

Product version (1st version)
- DC power-supply input specification
- Low-sensitivity earth overcurrent specification
- Single-phase, 3-line specification
- With micro-leakage current measurement function
- With auxiliary power supply function (200V input)
- With external current output

<Associated Equipment>
The following equipment must be connected when using the EMC-B.

- Transformer (ZCT)
- Special Zero-phase Current Sensor (MCT)
- Special Transformer
- Special Current Sensor (MCT)
- Special Zero-phase Current Transformer (ZCT)

†1: For DC power-supply input specifications, the input voltage is DC and there is no auxiliary power-supply function.
†2: Please confirm the delivery schedule separately.
What is a CDL Transmission System?

Control center data link systems (CDLs) were developed to establish a control/information network connecting various devices and equipment in a power distribution system. They are primarily used as part of a configuration for monitoring power distribution systems managed from control centers. Connecting devices and equipment with a flexible, branching digital network reduces wiring costs, facilitates distributed control/collective supervision/maintenance, and results in reliable systems.

### Physical Conditions

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission medium</td>
<td>Electricity</td>
</tr>
<tr>
<td>Twisted pair cable</td>
<td>24VDC (signal line: 12VDC)</td>
</tr>
<tr>
<td>Topology</td>
<td>Bus type (loop connection also possible)</td>
</tr>
<tr>
<td>Connected terminals</td>
<td>64 terminals (depending on type)</td>
</tr>
<tr>
<td>Transmission distance</td>
<td>By electricity: 2,000m (depending on cable size and number of terminals)</td>
</tr>
<tr>
<td>By light: 3,000m (depending on cable size and number of terminals)</td>
<td></td>
</tr>
</tbody>
</table>

### Electrical Conditions

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission speed</td>
<td>9.6kbps (bit/s)</td>
</tr>
<tr>
<td>Time-division multiplex digital transmission†2</td>
<td>Baseband†3 and Current bus†4</td>
</tr>
<tr>
<td>Control power supply</td>
<td>24VDC (signal line: 12VDC)</td>
</tr>
<tr>
<td>Power supply</td>
<td>24VDC (signal line: 12VDC)</td>
</tr>
<tr>
<td>Signal Type</td>
<td>Time-division multiplex digital transmission†2, Baseband†3, Current bus†4</td>
</tr>
<tr>
<td>Voltage level at High</td>
<td>12VDC</td>
</tr>
<tr>
<td>Voltage level at Low</td>
<td>0VDC</td>
</tr>
</tbody>
</table>

### Logic

- **Synchronization Base frame construction**
  - 8A: Self-address (1 byte)
  - DA: Data address (1 byte)
  - CW: Control code (1 byte)
  - D: Data byte (5 byte)
  - BC: Data byte size (1 byte)
  - FCC: Frame check code (1 byte)

### Error detection

- **Combined parity/FCC**: The duration for which the level of the signal line (S) remains low is monitored. If it remains low for more than a specific period (200 to 500ms), an error condition is assumed, resulting in cutting off the terminal signal line in question from the CDL transmission bus.

### Double-address detection

The use of the same address by different slave terminals results in a double-address error.

### Calculating Transmission Distance

A CDL transmission system uses electric current to transmit signals. Feasible transmission distances depend on transmission line impedances and the number of connected terminals. The specific transmission type affects the propagation time of the entire transmission system. This makes it important to determine transmission distances that satisfy both of the following requirements:

1. **The transmission system is divided into independent systems (nodes) separated by relays (RPO) or optical converters (OEG) with the maximum length of each node assigned the value in Table 1.**
2. **The overall transmission system consists of nodes. The maximum distance between the two terminals is the largest of the two figures given in Table 2.**

### Table 1

<table>
<thead>
<tr>
<th>Transmission line type [Single]</th>
<th>Maximum node length (l) being 64 max.</th>
<th>0.75mm² (AWG 18, φ 1.6mm)</th>
<th>1.05mm² (AWG 16, φ 1.9mm)</th>
<th>1.3mm² (AWG 14, φ 2.6mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW</td>
<td>560m (if CDL-Z and -V used in combination, 550m)</td>
<td>560m (if CDL-Z and -V used in combination, 550m)</td>
<td>560m (if CDL-Z and -V used in combination, 550m)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Conditions</th>
<th>N number of terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic system (not using relays or optical converters)</td>
<td>1,500m (CDL-Z and -V used in combination, 1,500m)</td>
</tr>
<tr>
<td>Transmission system using relays</td>
<td>0.75mm² (AWG 18, φ 1.6mm)</td>
</tr>
<tr>
<td>Transmission system using an optical converter</td>
<td>2,000m (PC-30 or -V)</td>
</tr>
</tbody>
</table>

### Example

**Example using 1.25mm² transmission line (AWG 16, φ 1.3mm, single line)**

- **System with “n” repeaters**:
  - 1,500m (n = 1, 2, 3, 4) when using CDL-Z or CDL-V
  - 1,000m (n = 1, 2, 3, 4) when using CDL-Z or CDL-V

### Terminology

- **Transmission system using an optical converter**: Silica glass GI type optical fiber 2,000m

---

† Refers to a transmission system in which digital signals are sent to a transmission channel without modulation.

**Note:**

- (1) The transmission system is divided into independent systems (nodes) separated by relays (RPO) or optical converters (OEG) with the maximum length of each node assigned the value in Table 1.
- (2) The overall transmission system consists of nodes. The maximum distance between the two terminals is the largest of the two figures given in Table 2.
Modbus®-RTU Transmission System

What is Modbus®-RTU® Transmission?

Modbus® transmission is a de facto standard bus® equipped with the Modbus® protocol.† Modbus® transmission is used widely throughout industries based on the fact that the protocol has been released for public use, and also because of its simple configuration. As a multi-vendor network, Modbus®-transmission-compliant devices are provided from manufacturers worldwide, so system configuration and expansion capabilities are excellent. Additionally, RS485 and other standards can be used as the physical layer.

† A choice of serial communications. Modbus® transmission has a serial terminal unit (STU) mode and an American Standard Test (AST) mode for high-speed communication over a large distance (modems). In general, the STU mode (known as Modbus® RTU), which allows both types of data to be sent without changes, is used exclusively for RS485 (see (2)).

† Modbus® is a registered trademark of Schneider Electric SAS.

† Cyclic redundancy check (CRC) is a method of detecting whether or not errors have been introduced during a transmitted packet.

† A communication protocol developed by Modicon Inc. (AEG Schneider Automation International S.A.S.) for programmable logic controllers (PLCs).

† The worldwide standard transmission bus for all practical purposes irrespective of whether or not there are established standards or norms.

†‡ A communications protocol developed by Modicon Inc. (AEG Schneider Automation International S.A.S.) for programmable logic controllers (PLCs).

†³ The protocol has been released for public use, and also because of its simple configuration. As a multi-vendor network, Modbus®-transmission-compliant devices are provided from manufacturers worldwide, so system configuration and expansion capabilities are excellent. Additionally, RS485 and other standards can be used as the physical layer.

†1 In Modbus® transmission, only units with height of other than 200mm are supported. (However, storage is not possible in the case of 200mm-high units and use of the S-N80 connector is prohibited.)

†2™ A transmission system component that enables overall communications through mutual conversion of data differing in terms of medium or protocol.

†3 A choice of two types to suit customer operations.

Example Modbus®-RTU Transmission System Configuration

Examples of single and redundant configurations are shown below for the case of the EMC-B with Modbus®-RTU transmission system. The EMC-B can be connected to any machinery or system that conforms to the Modbus®-RTU transmission protocol. For the EMC-B with redundant system configurations, various configurations can be realized in the range where redundancy is desired (see (a) to (c) below). It is also possible to connect directly to a distributed control system (DCS) without going through a programmable logic controller (PLC).

Redundant Modbus®-RTU Transmission Control System: A Choice of Two Types to Suit Customer Operations

For EMC-B, the following items are supported within the function code defined in the Modbus® protocol.

Advantages of EMC-B Transmission

1. Excellent responsiveness: Equal to or under 10ms, excluding transmission route

2. Faster transmission speed than the standard Modbus transmission: Set speed up to 1.125Mbps

3. Increased No. of connected terminals: Up to 64 units can be connected (standard: 32 units)

The EMC-B has an industry-leading compact size thanks to the use of the same external dimensions (length, width) for both redundant and single transmission specifications. In addition, MCC units with a height of 100mm can be stored with an increase in the depth dimension of only approximately 10mm.

However, storage is impossible in the case of 200mm-high units and use of the S-N80 connector is prohibited. (However, only units with height of other than 200mm are supported.)

†4 In Modbus® transmission, a single master can issue a query (start transmission). The slave stations see the query, perform the specified function and send a response message.

†5 In Modbus® transmission, a code known as the function code is prepared. This code defines the transmission function and allows support functions to be adopted or rejected for each device (the supporting function codes are set by the user).

†6 Parity, CRC †13

†7 There is no notification function in Modbus®-RTU transmission; the EMC-B only notifies when the status changes.

†8 There is no notification function in Modbus®-RTU transmission; the EMC-B only notifies when the status changes.

†9 RS485 are standards relating to the level of the communications-protocol physical layer, which consists of two lines: the communications line and grounding line.

†10 In Modbus® transmission, only the master station can issue a query (start transmission). The slave stations see the query, perform the specified function and send a response message.

†11 In Modbus® transmission, a code known as the function code is prepared. This code defines the transmission function and allows support functions to be adopted or rejected for each device (the supporting function codes are set by the user).

†12 Parity-bit and stop-bit settings are correlated as follows.

†13 CRC: Cyclic redundancy check (error check field) (2 bytes)

†14 A transmission system component that enables overall communications through mutual conversion of data differing in terms of medium or protocol.

†15 Special purpose as a bus to a master station or to slave stations. The receiving slave stations execute functions as defined by the query but cannot send an answer.
Benefits of Installing a Control Center

The pumps and various machinery used in factories, water supply and sewage treatment facilities, power plants, and other industrial plants utilize numerous motors. A control center provides the switching mechanisms used to control, protect, gauge, monitor, or otherwise centrally control an array of motors by housing multiple units fitted with switches to turn motors on/off and, as a protective mechanism, uses molded-case circuit breakers (MCCBs) to safely isolate circuits in fault states upon electrical system failure.

Construction and Configuration

### Construction
A control center consists of a cubicle and units.

### Cubicle
The cubicle houses units and allows the configuration of busbars used to supply power to the units. The units and the busbar compartments are separated by partitions.

### Unit (functional component)
The drawer-type units are fitted with a short-circuit protective device, contactor, parts for auxiliary circuits (control, gauge), etc. A single unit is installed for each motor (or feeder).
A full line-up of units representing a wide range of motor capacities and startup types is available for specific applications.

Deploying a Mitsubishi Electric Control Center Results in the Following Benefits.

1. **Damage Control**
   In the event of accidents, damage is limited to the busbar compartment, unit compartment, or other compartment, minimizing incident repercussions.

2. **Inspection, Settings Alteration, and Testing during Operations**
   There is no need to disconnect power from the busbar for inspection, settings alteration, or testing. Only the affected feeder must be stopped and its unit drawn out to perform any of the foregoing tasks, with plant operations allowed to continue throughout the work.

3. **Simple Addition/Removal of Feeders**
   • The control center is designed on a unit-per-feeder basis, with units stacked in a column. Each additional feeder is easily installed in an available panel space, simplifying planning. The same is true of feeder removal. Units are easily removed together with associated wiring.
   • A feeder can be added/removed without disconnecting power from the busbar.

4. **High-density Packaging**
   Up to 24 units may be installed as long as the motor load is rated 400V (non-reversible, 7.5kW) or less.

5. **Wide Selection**
   Select a unit from a wide selection to suit individual motor capacity specifications—i.e., reversible, non-reversible, star-delta startup, inverter.

For power control panel:
- The panel is not internally partitioned. Accidents in a feeder often affect other feeders—for example, by exposing them to arc gas.
- Inspection, settings alterations, or testing for a single feeder requires the power to be disconnected from other feeders.
- Each feeder addition must be preceded by an examination of the equipment arrangement and wiring routes to ascertain the space available.
- Wiring from individual feeders is often bundled, so removal of a feeder tends to leave behind unnecessary wiring.
- Adding/removing a feeder requires that power be disconnected from the busbar.
EMC stands for Electronic multi-function Motor Controller1). As the name suggests, EMCs provide various electronic functions used to control motor arrays. In 1985, Mitsubishi Electric began marketing electronic motor controllers in the EMC Series of products. The series has grown steadily, leading to the EMC-Z, and then to the EMC-A, all the while adding pioneering functions to meet the needs of changing times.

†1: Controller exclusively designed for Mitsubishi Electric control centers.

Benefits of Installing an EMC

Using EMCs will provide the following benefits to your facilities.

1. **Extensive Motor Protective Mechanisms**

   EMCs meet a wide range of needs for motor protection. There is no need to provide separate relays to protect motors against overcurrent (OC), unbalance (UB), leakage current (ground fault, GF), instantaneous overcurrent (OCI), or undercurrent (UC) or power shortage. The wide selection and range of settings eliminates the need to consider equipment replacement when planning or changing configurations. The controllers can also be used in combination with harmonic circuits (inverter loads).

2. **Various Indicators/Readings**

   The state of the motor is indicated by LED lamps (e.g., operational, at rest, fault, error (including system error)). The EMC provides current meter, leakage current meter, and voltage meter functions, eliminating the need for separate meters and reducing cost and space requirements. The readings are indicated on a LCD.

   A current output function can also be incorporated (optional; 0-1mA DC, 4-20mA DC).

3. **Programmable Sequence**

   Using a MELSEC programmable controller and equivalent ladder software, it’s possible to freely program the internal ladder program. Installing the ladder program internally reduces internal wiring in the unit, allowing cost to be reduced. Ladder programs can be changed using the software (max. steps: 350). There are five input points (forward x 1, reverse x 1 and general-use x 3), and 10 output points (trip/alarm: 1a1b x 1, stop: 1b x 1, forward: 1a x 1, reverse: 1x x 1, general-use x 6 [1a x 3, 1b x 2, 1c x 1]), which can be applied to various circuits. As optional items, seven input points (eight output points), and 10 input points (five output points) are also available. In addition, an instantaneous voltage drop restart function is included, enabling continuous operation.

4. **Compact Design**

   Designed to be compact, it fits in a unit only 150mm in height. This increases the number of units that can be housed while reducing the number of panels.

5. **Multiplexing Compliant**

   A range of communication options are provided for CDL/CC-Link Modbus®-RTU transmission. In the case of CDL transmission, when the CDL MASTER maintenance support system is connected, a dedicated maintenance monitoring system can be set-up, decreasing the workload of daily maintenance tasks. Structuring transmission to include the distributed control system enables constant monitoring of operation and control.

†2: Please confirm the delivery schedule, including that for standard products, separately.

6. **Preventing Accidents**

   The EMC constantly monitors the system for load/leakage currents and retains histories of various operations to help predict and prevent accidents by indicating the hours of motor operation/number of contactor activations (open/close), and the nature and number of motor tripping events based on causative factors. Other preventive functions include self-diagnostics, auxiliary power supply (optional), and various fail-safe mechanisms.

7. **Simple Panel Planning and Alteration**

   Compact dimensions make unit size less of a consideration, simplifying panel planning. Its compatibility for a wide range of applications make it possible to address changes with great flexibility, from planning to delivery.

8. **Simplified Post-delivery Modification/Customization**

   Before EMCs were used in control centers, when currents reached unexpected levels due to motor capacity, there were many cases in which modifications such as the replacement of thermal relays or the addition of a reactor were carried out. However, since the introduction of EMCs, the adjustment range is large and most problems can be resolved by changing internal settings. In contrast to the adjustment scales of thermal relays, which are imprecise and produce large error, accurate settings are possible using EMCs. EMCs are also convenient for adjustment because of the many functions incorporated, such as functions to automatically inspect the protective properties, test overcurrent/leakage current and test system error and transmission data output (see page 10 for more information regarding test output functions). The reduced time required for making adjustments also increases efficient use of time.
Related Products

TYPE LIM-B Inverter Panelboard
Up to 12 inverters can be stored in each cabinet.
Installed side-by-side with the control center, this realizes more efficient, centralized monitoring.

Features
- The Type-B motor control center has the same casing depth and busbar structure, enabling side-by-side busbar connection.
- The unit structure is suitable for additions, changes and maintenance.
- The structure realizes efficient heat transfer using the central ventilation pipe space.
- Data linking is possible using the EMC-B.
- Up to 30kW, 2-panel storage is possible. For single-panel storage, equipment of up to 280kW can be added.
- When Mitsubishi Electric FREQROL-A700 Series inverters are equipped with the CDL transmission interface option (H-A7CDL), use as a CDL transmission terminal is possible, and a CDL transmission system can be established.

TYPE CNF-B Distribution Panelboard
Accommodating as many as 36 MCCBs in a Compact Configuration
Realizing More Effective Central Monitoring from the User’s Point of View through Contiguous Arrangement with the Motor Control Center

Features
- Constructed with the same casing depth and configured using the same busbar scheme as the Type-B Motor Control Center, this model permits contiguous installation and direct connection of busbars of both panels.
- With its B wiring (standard), connection to external devices is easy through the front of the panel.
- Accommodates units within a height of 1,800mm, housing up to 18 units of 100 AF/3P MCCB units (18 units x 2 = 36 in total).†
- In the case of 50AF/2P MCCB, however, up to 24 units may be installed (24 x 2 = 48 in total).†
- Features double-door construction (inside door, outside door). The inside door (i.e., unit front) is fitted with a protective cover that leaves only the MCCB operating handles exposed.
- The transparent safety cover fitted to the MCCB power-supply side ensures safe execution of maintenance/inspection work even when the inside door is left open.
- The unit comes in two types: grip and fixed.

Unit size (with Mitsubishi Electric FR-A700 Series inverter mounted)

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Invertor capacity</th>
<th>Unit size</th>
<th>37kW~55kW</th>
<th>220kW~280kW</th>
<th>75kW~160kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 unit</td>
<td>1/2 unit</td>
<td>One-half of a cabinet</td>
<td>One-quarter of a cabinet</td>
<td>One-half of a cabinet (One side or both sides of panel used)</td>
<td></td>
</tr>
</tbody>
</table>

† Load stocking must be planned such that the total load will remain within the vertical busbar capacity (vertical busbar: 750A standard, 950A optional).

Panel Configuration Sample

Example unit configuration

Unit size is expressed assuming the cabinet width for storage is 1,000mm.

- 1/16 unit: One-sixth of a cabinet
- 1/10 unit: One-tenth of a cabinet
- 1/12 unit: One-twelfth of a cabinet
- 1/15 unit: One-fifteenth of a cabinet
- 1/20 unit: One-twentieth of a cabinet
- 1/30 unit: One-thirtieth of a cabinet
### External Dimensions

**Unit accommodation space.**

<table>
<thead>
<tr>
<th></th>
<th>Side</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor casing</td>
<td>600</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Outdoor casing</td>
<td>800</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Thin casing</td>
<td>600</td>
<td>1200</td>
<td>50†²</td>
</tr>
</tbody>
</table>

†1: To prevent condensation.

### Installation

**Front Bottom**

(Notes)
1. One foundation base unit holds a maximum of three panels; installation of four or more panels requires a combination of units.
2. A maximum of three panels can be combined on one common foundation base as a transportation unit.
3. The necessary number of foundation bolts (figure on right) can be supplied as an option.

**Standard/Wide cabinet**

Cross-sectional view (A-A)

- Foundation hole in bottom frame (14 x 22mm dia.)
- Foundation bolt (M12, not included)
- Cotter rod (not included)
- Buried base (not included)

**Thin Casing**

Cross-sectional view (A-A)

- Foundation hole in bottom frame (14 x 22mm dia.)
- Foundation bolt (M12, not included)
- Cotter rod (not included)
- Buried base (not included)

**Cross-sectional view (B-B)**

- 4 x 22mm dia. hole (top to bottom)

**Cross-sectional view (B-B)**

- 6 x 22mm dia. hole (top to bottom)

† Dimensions in parentheses are for the wide cabinet.
### Specifications Sheet (for planning by customer)

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard specification</th>
<th>Optional specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied standard</td>
<td>JEC</td>
<td>JEM, JIS</td>
</tr>
<tr>
<td>General conditions</td>
<td>Standard</td>
<td>Standard</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-5°C ~ +40°C</td>
<td>Relative humidity 45% ~ 85%</td>
</tr>
<tr>
<td>Relative humidity</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Elevator</td>
<td>2,000mm or less</td>
<td></td>
</tr>
<tr>
<td>Painting</td>
<td>Internal frame and unit case are SY71 or plating</td>
<td>(note on left also applies here)</td>
</tr>
<tr>
<td>Panel</td>
<td>Standard (melamine baking coating 30µm)</td>
<td>Open front (Back/Door/Pan)</td>
</tr>
<tr>
<td>Material</td>
<td>Copper (tin plating)</td>
<td>Copper (silver plating)</td>
</tr>
<tr>
<td>Horizontal</td>
<td>Standard (bare) busbar capacity special capacity A</td>
<td>Insulated (with insulation tube)</td>
</tr>
<tr>
<td>Vertical</td>
<td>Standard (bare) busbar capacity 700A or 300A</td>
<td>Insulated (molded case)</td>
</tr>
<tr>
<td>Earth</td>
<td>Standard (earth terminal: 3 x 2 x 130mm)</td>
<td>Horizontal earth busbar</td>
</tr>
<tr>
<td>Short-circuit withstand</td>
<td>30KA (1s) or 30KA (1s)</td>
<td>Bus duct from top, capacity special</td>
</tr>
<tr>
<td>Neutral</td>
<td>None</td>
<td>Direct to horizontal/vertical busbar</td>
</tr>
<tr>
<td>Incoming power arrangement</td>
<td>Terminal lug not supplied</td>
<td>Compression terminal not supplied</td>
</tr>
<tr>
<td>Terminal lug</td>
<td>Terminal lug not supplied</td>
<td>Compression terminal not supplied</td>
</tr>
<tr>
<td>Terminal lug</td>
<td>Provided (crimp type)</td>
<td>Supplied (crimp type)</td>
</tr>
<tr>
<td>Wire</td>
<td>BIB</td>
<td>BIB</td>
</tr>
<tr>
<td>Material</td>
<td>Standard (main circuit: non-halogen wire, <strong>3.5mm</strong> or morn, black)</td>
<td>Special</td>
</tr>
<tr>
<td>Testing cable (round)</td>
<td>Standard (control circuit: vinyl wire HVP, <strong>1.5</strong> or black, yellow)</td>
<td>Special</td>
</tr>
<tr>
<td>Unit cable connection method</td>
<td>Main terminal</td>
<td>Main terminal</td>
</tr>
<tr>
<td>Main terminal</td>
<td>Provided (crimp type)</td>
<td>Provided (crimp type)</td>
</tr>
<tr>
<td>Main terminal</td>
<td>Provided (crimp type)</td>
<td>Provided (crimp type)</td>
</tr>
<tr>
<td>Short-circuit protective device</td>
<td>MCCB</td>
<td>MCCB</td>
</tr>
<tr>
<td>MCCB</td>
<td>Isolator and fuse</td>
<td>MCCB</td>
</tr>
<tr>
<td>MCCB</td>
<td>50KA or 75KA</td>
<td>50KA or 75KA</td>
</tr>
<tr>
<td>Main-circuit protective device</td>
<td>MCCB</td>
<td>MCCB</td>
</tr>
<tr>
<td>Thermal overload</td>
<td>Standard (2 cartridge, without reset button)</td>
<td>EMC</td>
</tr>
<tr>
<td>Thermal overload</td>
<td>Standard (2 cartridge, with reset button)</td>
<td>EMC</td>
</tr>
<tr>
<td>Multifunction motor controller (EMC)</td>
<td>Required or not required</td>
<td>Required or not required</td>
</tr>
<tr>
<td>Transmission device</td>
<td>Not required</td>
<td>DC, CC-Link, Modbus/RTU (only when EMC is selected)</td>
</tr>
<tr>
<td>Leakage current relay</td>
<td>Not required</td>
<td>Leakage current relay 1. KEL (leak)</td>
</tr>
<tr>
<td>Nameplate</td>
<td>Bottle</td>
<td>With alarm contact</td>
</tr>
<tr>
<td>Power system</td>
<td>Power supply transformer <strong>0.8</strong> kVA</td>
<td>Power supply transformer <strong>0.8</strong> kVA</td>
</tr>
<tr>
<td>Main circuit</td>
<td>Power supply transformer <strong>0.8</strong> kVA</td>
<td>Power supply transformer <strong>0.8</strong> kVA</td>
</tr>
<tr>
<td>Control circuit</td>
<td>Power supply transformer <strong>0.8</strong> kVA</td>
<td>Power supply transformer <strong>0.8</strong> kVA</td>
</tr>
</tbody>
</table>

### Points to Note When Placing an Order

Thank you for your continued patronage of Mitsubishi Electric products. Before ordering the Mitsubishi Electric product described in this catalog (hereinafter, the Product), please carefully read the following conditions (assuming there are no requirements for special conditions relating to matters such as estimates, contracts, specifications, or catalogs other than this one). When placing an order, you (the customer) agree to the stipulations stated hereinbelow.

1. Warranty Period
   - The free service warranty period for the Product is one (1) year from the date of delivery, provided that no separate agreement has been made between Mitsubishi Electric and the customer.

2. Scope of Warranty
   - If the Product is found to have a fault or defect attributable to Mitsubishi Electric during the warranty period, Mitsubishi Electric shall provide the necessary repairs to the customer at no cost or exchange. In the event that the customer is not satisfied with the above, the customer may make a claim to the Mitsubishi Electric representatives for repairs either domestically or internationally. In addition, Mitsubishi Electric shall not be liable for any incidental accidents or damage in connection with the repair, repair materials or operation trials. Furthermore, defects or faults attributable to one of the causes listed in a. below are not covered by the warranty that is, defects or faults attributable to:
     - a. Handling that has not been in accordance with the directions in this catalog, the operations manual, specifications or related documents.
     - b. A cause not resulting from use of the Product.
     - c. A Product that has been altered by a Mitsubishi Electric representative after the Product has been purchased by the customer.
     - d. A phenomenon that is impossible to stop using the scientific/technological practices when the Product was purchased or the purchase contract was signed.
     - e. The Product is not incorporated into the machine if the customer is machinery or the fault or defect could have been avoided had the customer’s machinery been equipped with functions, structure or other mechanism generally accepted as necessary by industry standards.

3. Exclusion of Warranty Obligations for Opportunity/Secondary Loss
   - In addition, the Products are not covered by any warranty if the Product is used beyond the recommended environment. Please refer to the catalog for the recommended environment.

4. Range of Product Application
   - Where the Product is used in combination with other products, it is the responsibility of the customer to confirm adherence to applicable standards, laws and regulations. Furthermore, confirmation of whether or not the Product is compatible with the system, devices and machinery of the customer is the responsibility of the customer. Mitsubishi Electric shall not be liable for any results of compatibility-incompatibility of the Product with customer applications.

5. Term for Repairs (Charged) After Production is Discontinued
   - Mitsubishi Electric shall accept the Product for repairs, which will be charged to the customer, up to seven (7) years after production has been discontinued. (Note that there may be times when the Product cannot be repaired due to circumstances related to manufacturing equipment or parts. Furthermore, renewal of any products shall be conducted within 15 years after the date of manufacture.)

6. Changes to Specifications
   - Please be aware that the specifications described in the catalog, manual or technical documents are subject to change without prior notice.

7. Scope of Services
   - The price of the Product does not include service costs such as the dispatch of technical personnel. Customers are requested to contact Mitsubishi Electric if such services are required.

### Improving Reliability and Recommended Renewal Period

1. Improving Reliability of Safeguards
   - The parts equipped in protective relays have a limited service life; the rate of deterioration varies according to the application, number of years in service, usage environment and individual performance of parts. Mitsubishi Electric generally designs its products to have a recommended renewal period of 15 years. However, based on the above, there may be times when components, etc. require replacement prior to the end of the 15-year period. To avoid situations where relays do not operate properly to operate as a result of unexpected circumstances/conditions, depending on the importance of the equipment, the customer is advised to take countermeasures; for example, use a redundant system for safeguards, and monitor relay status using products equipped with alarm output contacts that enable constant self-monitoring.

2. Recommended Renewal Period
   - In general, Mitsubishi Electric recommends a scheduled renewal absolutely 15 years after manufacture. This is based on the recommended renewal period described in “JEM TR-136: Guidelines for Maintenance/Inspections of Protective Relays” issued by the Japan Electric Makers’ Association (in Japanese). This revision of the previous edition has been published with consideration of the manufacturer’s guaranteed values for functions and performance, and has been generally considered beneficial, including economically, to replace the Product with a new product considering the deterioration of machinery structural materials in a standard usage environment when the machinery is to be discontinued. Furthermore, if the Product is expected to be used beyond the recommended renewal period. Furthermore, Mitsubishi Electric recommends that peripheral devices such as transducers be included in the renewal process. As described in 1. above, Mitsubishi Electric generally designs its products to have a recommended renewal period of 15 years.

### Maintenance/Inspections

1. For the Product to provide satisfactory performance, appropriate regular inspections and maintenance are essential. Please perform an initial inspection before turning the power on for the first time and then at least once every three to four years thereafter.

2. Please check that there are no terminal connections which are securely tightened, as loose connections of conductive parts may cause abnormal heat generation.

3. The LCD parts, including the LEDs used in the LCD, have a limited service life and will gradually decrease in brightness (this varies depending on the usage environment). Please replace the LCD if the lamps or LCD screen become dark or the characters become unclear (for details, please contact a Mitsubishi Electric representative).
Please read the instruction manual before using the device.