BCN-P5999-0502-B(1508)MEE

# Mitsubishi Safety Programmable Controller MELSEC iQ-R Series

# Machinery Directive (2006/42/EC) Compliance

Thank you for purchasing the Mitsubishi safety programmable controller MELSEC iQ-R series.
The MELSEC iQ-R series programmable controller is suitable for establishing safety functions for general industrial machinery and complies with the Machinery Directive (2006/42/EC).

Before using this product, please read this manual, the relevant manuals, and the safety standards carefully and pay full attention to safety to handle the product correctly.

## 1. Safety Programmable Controller Product List

| Product name | Model | Description |
|---|---|---|
| Safety CPU | RnSFCPU | A CPU module that performs logic operations for safety control, and can be used in applications compliant with SIL3 of IEC61508 and performance level "e" of ISO13849-1.The module must be mounted on the main base unit and used with a safety function module as a pair. |
| Safety function module | R6SFM | A module that can be used in applications compliant with SIL3 of IEC61508 and performance level "e" of ISO13849-1 on the condition that it is used with a Safety CPU. Make sure that the module is used with a Safety CPU as a pair. |

## 2. Relevant Manuals

The following lists the safety programmable controller relevant manuals.
The following are translated from the original Japanese version. For the Japanese version, please consult your local Mitsubishi representative.

| Manual name | Manual number |
|---|---|
| MELSEC iQ-R Module Configuration Manual | SH-081262ENG |
| MELSEC iQ-R CPU Module User's Manual (Startup) | SH-081263ENG |
| MELSEC iQ-R CPU Module User's Manual (Application) | SH-081264ENG |
| MELSEC iQ-R Programming Manual (Program Design) | SH-081265ENG |
| MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks) | SH-081266ENG |
| GX Works3 Operating Manual | SH-081215ENG |
| MELSEC iQ-R Safety Application Guide | SH-081538ENG |

## 3. Safety Standards

Use the product according to the following safety standards.

| Region | Safety standards |
|---|---|
| International | IEC61508, IEC62061, ISO13849, IEC61131-2, IEC61010-2-201<br>IEC61000-6-2, IEC61000-6-4, IEC61326-3-1 |
| Europe | EN62061, EN ISO13849, EN61131-2, EN61010-2-201<br>EN61000-6-2, EN61000-6-4 |

## 4. Module Replacement

Replace the module according to the following replacement cycle.

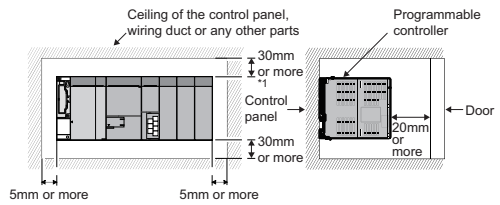
| Module | | Replacement cycle |
|---|---|---|
| Safety CPU | RnSFCPU | 10 years |
| Safety function module | R6SFM | 10 years |

## 5. Installation

When installing a programmable controller to a control panel or similar, fully consider its operability, maintainability, and environmental resistance. For details, refer to the MELSEC iQ-R Module Configuration Manual.

### Installation position

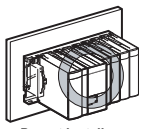
Keep the clearances shown below between the top/bottom faces of the modules and the control panel or other parts so that good ventilation is ensured and the modules can be easily replaced.



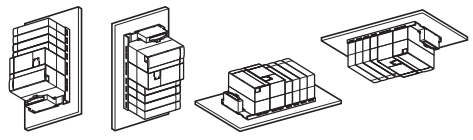

*1 A clearance required when the wiring duct is 50mm or less in height. A 40mm or more clearance is required when the wiring duct is longer.

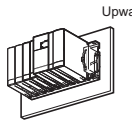
### Installation orientations

■ **Install a programmable controller in the following orientation to ensure good ventilation for heat release.**



■ **Do not install a programmable controller in the following orientations.**



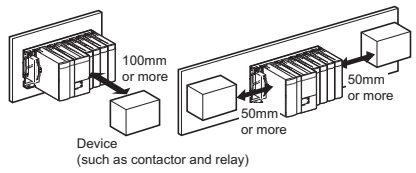
Upside-down installation

### Installation precautions

■ **Install a base unit on a flat surface.**
**If the surface is not flat, the printed circuit board is distorted, resulting in malfunction of the modules mounted.**

■ **If there is a vibration source, such as an electromagnetic contactor or no fuse breaker, separate the control panel or keep enough clearance from the vibration source to install the programmable controller.**
**In addition, keep the clearances shown below between the programmable controller and devices (such as contactors and relays) to avoid being affected by radiated noise or heat.**

- In front of the programmable controller: 100mm or more
- On the right or left of the programmable controller: 50mm or more




■ **When installing a programmable controller to a control panel, do not mount any module in the rightmost slot of the base unit.**
**Before uninstalling, remove the module mounted in the rightmost slot of the base unit.**

## 6. Module Status after Power-on and LED Indication

A Safety CPU and safety function module performs initial processing (such as self-diagnostics) after the system is powered on or the Safety CPU is reset. The LEDs of each module indicate the module operating status after initial processing.

### Safety CPU

| No. | Name | Application |
|---|---|---|
| 1) | READY LED | Indicates the operating status of the CPU module and the error level.<br>READY LED - ERROR LED status<br>On - off: Normal operation<br>On - on: Minor error<br>On - flashing: Moderate error<br>Flashing (every 2s) - off: Initial processing<br>Off- on/flashing: Major error |
| 2) | ERROR LED | |
| 3) | PROGRAM RUN LED | Indicates the operating status of the program.<br>On: Being executed (RUN state)<br>Flashing: Being suspended (PAUSE state)<br>Off: Stopped (STOP state) or stop error |
| 4) | USER LED | Indicates the status of the annunciator (F).<br>Flashing: Annunciator (F) on<br>Off: Normal operation |
| 5) | BATTERY LED | Indicates the battery status.<br>Flashing: Battery low<br>Off: Normal operation |
| 6) | CARD READY LED | Indicates the availability of the SD memory card.<br>On: Available<br>Flashing: Ready<br>Off: Not available or not inserted |
| 7) | CARD ACCESS LED | Indicates the access status of the SD memory card.<br>On: Being accessed<br>Off: Not accessed |
| 8) | FUNCTION LED | Indicates the status of the function being executed. |

### Safety function module

| No. | Name | Application |
|---|---|---|
| 1) | READY LED | Indicates the operating status of the module and the safety control related error level.<br>READY LED - ERROR LED status<br>On - off: Normal operation<br>On - on: Minor error<br>On - flashing: Moderate error<br>Off - on/flashing: Major error |
| 2) | ERROR LED | |
| 3) | PROGRAM RUN LED | Indicates the operating status of the safety program.<br>On: Being executed<br>Off: Not executed or stopped |
| 4) | SAFETY COM RUN LED | Indicates the status of the safety communications.<br>On: Being executed<br>Off: Not executed or stopped |
| 5) | SAFETY COM ERR LED | Indicates the status of the safety communications.<br>On: An error has occurred during communications<br>Off: No error |
| 6) | TEST LED | On: TEST MODE<br>Flashing: SAFETY MODE (waiting for reboot)<br>Off: SAFETY MODE |

## 7. Precautions for Use

Users must prove that their entire safety system complies with the safety standards and the Machinery Directive. The third-party certification organization will validate the safety of product for the entire safety system, including a safety programmable controller and safety components.
To establish a safety system, calculate the target failure measure (PFD/PFH) for each safety application (safety function) based on the PFD/PFH values of the safety programmable controller and connected safety components. The target failure measure (PFD/PFH) is the reliability target value for each Safety Integrity Level (SIL) defined in IEC61508 and can be calculated by the following formula.
PFD/PFH = A + B + C + D ....Calculation formula of PFD/PFH

| Variable | Definition |
|---|---|
| A*1 | Total PFD/PFH of the Safety CPU and safety function module |
| B | PFD/PFH of the safety I/O module*3<br>(1) When safety input device(s) and safety output device(s) are connected to the same safety I/O module*3: B = B1<br>(2) When safety input device(s) and safety output device(s) are connected to different safety I/O modules*3: B = B1 + B2 |
| B1 | PFD/PFH of the safety I/O module*3 to which safety input device(s) is connected |
| B2 | PFD/PFH of the safety I/O module*3 to which safety output device(s) is connected |
| C*2 | PFD/PFH of safety input device(s) |
| D*2 | PFD/PFH of safety output device(s) |

*1 The PFD/PFH values are listed in the following table.
*2 For the values, refer to the manual for the safety component used.
*3 This refers to a module such as a CC-Link IE Field Network remote I/O module (with safety functions).

| Module | PFD | PFH/h |
|---|---|---|
| Total PFD/PFH*4 of the Safety CPU and safety function module | $1.02 \times 10^{-5}$ | $5.50 \times 10^{-9}$ |

*4 The proof test interval is ten years (module replacement cycle).

## 8. Safety Response Time

The safety response time is the maximum time taken from when the safety input of the remote device station (safety station) turns off until the safety output of the remote device station (safety station) turns off (the time including an error detection).
This maximum time is calculated by the following formula.
Remote device station (safety station) on the input side → Master station (safety station) → Remote device station (safety station) on the output side
(SCmst × 3) + (SRref × 4.5) + (RM×2) + SRin + SRout + (n × 4)

SCmst: Safety cycle time*1 of the master station (safety station)
SRref: Safety remote station refresh response processing time*2
RM: Safety refresh monitoring time*3
SRin: Safety remote station input response time*2
SRout: Safety remote station output response time*2
n: One of the lower value of 1) or 2) described as follows.
1) RM-TMmst-(TMrmt÷2)+a
2) RM-(TMmst÷2)-TMrmt+c
a: TMmst-b (enables only when a station set to Active is the RJ71GF11-T2, otherwise plug 0)
b: A smallest multiple of Safety cycle time value which is greater than the calculation result of TMmst divided by 2.*4
c: TMrmt-d (enables only when a station set to Passive is the RJ71GF11-T2 or NZ2GFSS2-32D, otherwise plug 0)
d: A smallest multiple of Safety cycle time value which is greater than the calculation result of TMrmt divided by 2. (for the NZ2GFSS2-32D, apply Safety remote station refresh response processing time value).*4
TMmst: Transmission interval monitoring time*3 of the master station (safety station)
TMrmt: Transmission interval monitoring time*2 of the remote device station (safety station)
*1 For the safety cycle time, refer to the following.
MELSEC iQ-R CPU Module User's Manual (Application)
*2 For details, refer to the following.
Manual for the remote device station (safety station) used
*3 For details, refer to the following.
MELSEC iQ-R CC-Link IE Field Network User's Manual (Application)
*4 A sample calculation of 4b and d:
When Transmission interval monitoring time is 24ms and Safety cycle time is 10ms, the result is 20; the smallest multiple of 10 which is greater than the result 12 of 24 divided by 2.

For details on the Safety CPU and safety function module, refer to the following after reading this manual.
"PART 4 WHEN USING THE SAFETY CPU" in the MELSEC iQ-R CPU Module User's Manual (Application)



## 9. EC Declaration of Conformity

MITSUBISHI ELECTRIC
*Changes for the Better*

### EU DECLARATION OF CONFORMITY

We,

Manufacturer : MITSUBISHI ELECTRIC CORPORATION

Address (Place of Declare) : TOKYO 100-8310, JAPAN

Brand Name : MITSUBISHI ELECTRIC

declare under our sole responsibility that the product

Description : Programmable Controller
Type of Model : MELSEC iQ-R series
Notice : Refer to next page about each type name

to which this declaration relates is in conformity with the following standard and directive.

| Directive | | Harmonized Standard | Notified Body |
|---|---|---|---|
| EMC Directive | 2004/108/EC | EN61131-2:2007 | — |
| Machinery Directive | 2006/42/EC | EN ISO 13849-1:2008 + AC:2009 | 1 |

| This declaration is based on the conformity assessment of following Notified Body | | |
|---|---|---|
| No. | Name and Address | Identification Number |
| 1 | TÜV RHEINLAND INDUSTRIE SERVICE GMBH,<br>Alboinstr. 56, 12103 Berlin, Germany | 0035 |

| Authorized representative in Europe<br>( The person authorized to compile the Technical file or relevant Technical documentation) |
|---|
| Hartmut Pütz<br>FA Product Marketing, Director, MITSUBISHI ELECTRIC EUROPE B.V., German Branch<br>Gothaer Str. 8, 40880 Ratingen, Germany |

Issue Date (Date of Declaration):31 Jul. 2015

Signed for and on behalf of

(Signature) Mitsushiro Fujishima

[Mitsushiro Fujishima]
Senior Manager, Safety Control Systems Development Section
FA System Dept.2
MITSUBISHI ELECTRIC CORPORATION

### Appendix List of type name to declare

| | | |
|---|---|---|
| R08SFCPU | R120SFCPU-SET(C) | R32SFCPU |
| R08SFCPU-SET | R120SFCPU(C) | R32SFCPU-SET |
| R08SFCPU-SET(C) | R16SFCPU | R32SFCPU-SET(C) |
| R08SFCPU(C) | R16SFCPU-SET | R32SFCPU(C) |
| R120SFCPU | R16SFCPU-SET(C) | R6SFM |
| R120SFCPU-SET | R16SFCPU(C) | R6SFM(C) |