

FACTORY AUTOMATION

**MELSEC iQ-R**  
series

# iQ Platform-compatible PAC Process CPU/Redundant System/ SIL2 Redundant System

Broadcast



## Highly scalable process control

The MELSEC iQ-R Series enables a process control system through its range of CPU modules (up to 1200K steps) integrating advanced PID and general control into one module providing excellent system scalability (from small to large) for a best-fit solution. When paired with a redundant function module, it realizes a redundant control system ideal for applications that require highly reliable control. Various network modules with redundant functionality embedded are also available, further improving reliability.

## Extensive visualization and data acquisition

Through its interconnectivity with supervisory control and data acquisition (SCADA) software GENESIS64™, GT SoftGOT2000, and GOT2000, extensive plant-wide monitoring and control can be realized.

### Highlights

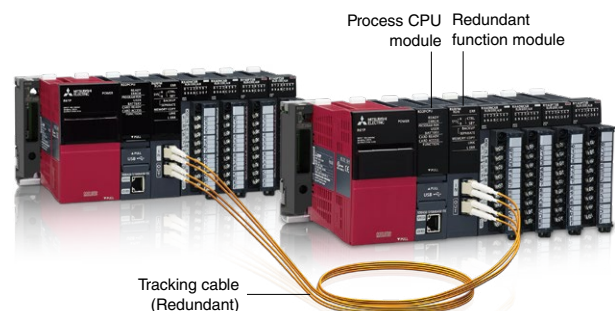
- High availability process control system
- Excellent scalability with four models available (between 80K-1200K steps memory)
- Extensive visualization and data acquisition with GENESIS64™, GT SoftGOT2000, and GOT2000
- Redundancy across multiple levels reduces single points of failure
- Improved system flexibility supporting both local I/O and remote I/O configurations
- GX Works3 integrated engineering software simplifies engineering

## High availability across multiple levels

The MELSEC iQ-R Series redundant system enables high availability at multiple levels in the control system hierarchy, from visualization (SCADA) and control to networks, thereby improving system reliability. In addition, the MELSEC iQ-R Series SIL2 process CPU realizes a SIL 2-supporting redundant system.

## Integrated software simplifies engineering

GX Works3 integrated engineering software enables programming in multiple languages such as function block diagram (FBD) for process control. Intuitive features for simplifying process control system engineering include process tag label (variable) sharing, simple program structures, and easy project upload/download to the process CPU.





# Process

## High-availability process control in a scalable automation solution

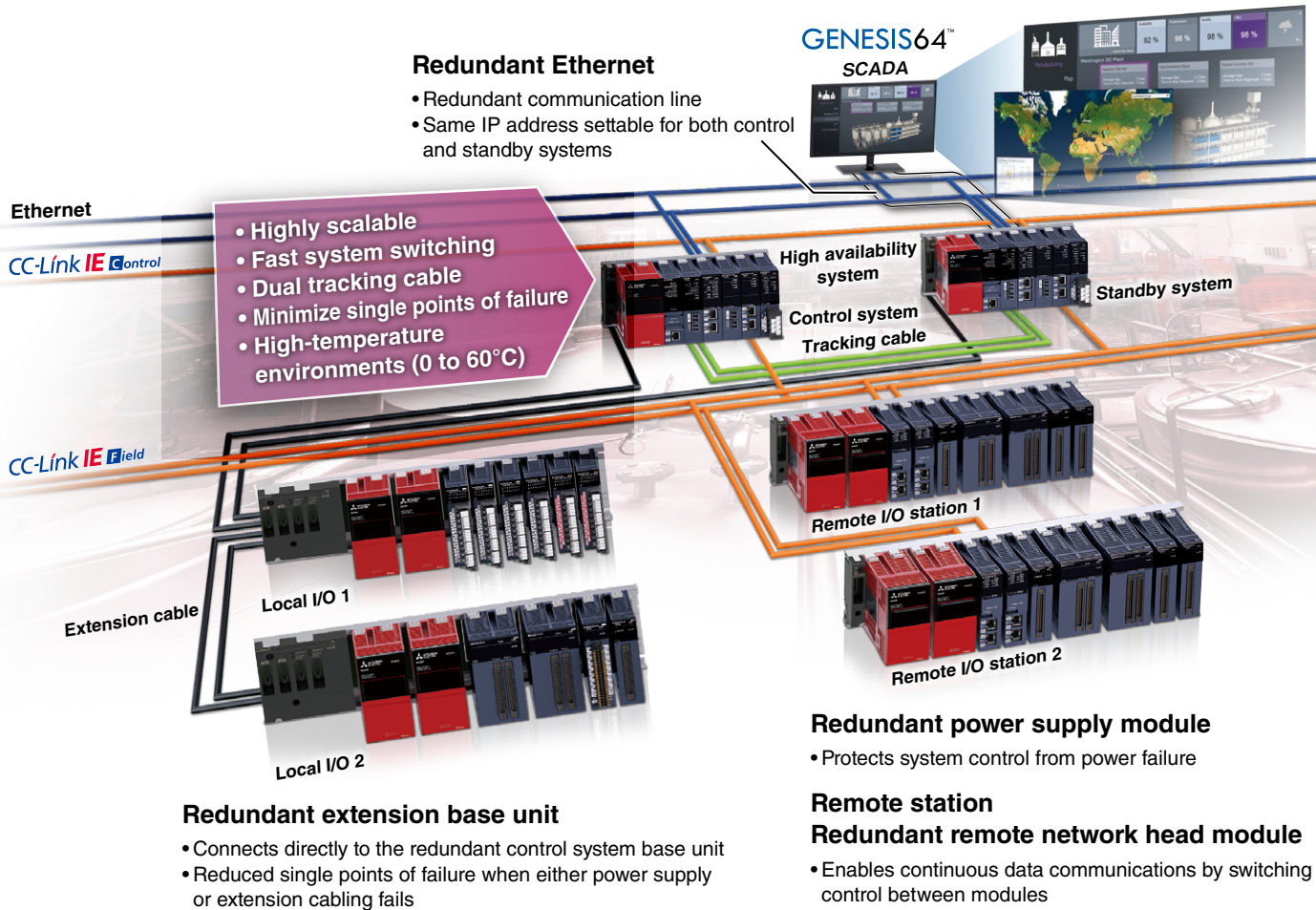
MELSEC iQ-R Series process CPU modules are designed to cover wide-ranging process control applications, from small- to large-scale. All models provide high-speed performance coupled with the ability to handle large PID loops utilizing embedded PID control algorithms; integrating both general and process control into one module. When paired with a redundant function module, a redundant control system ideal for applications that require highly reliable control can be easily realized at a low cost.



### System monitoring control and data utilization

#### Extensive visualization

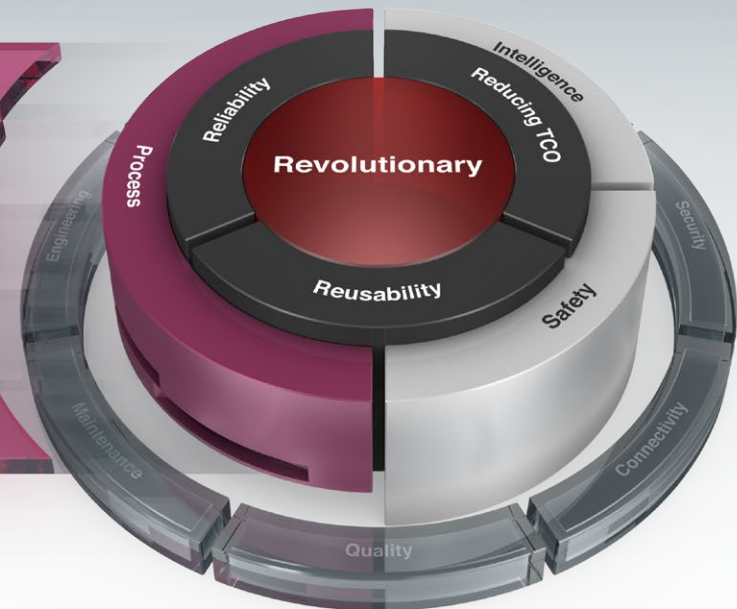
SCADA Software GENESIS64™, GT SoftGOT2000, and GOT2000 provide extensive visualization with their enhanced interconnectivity with the MELSEC iQ-R Series. Advanced features such as energy management, scheduling, alarm and event management, trending, reporting, historian, and Geo-SCADA monitoring realize intuitive factory-wide control.



### Multi-level redundancy ensuring continuous control

#### High availability

Highly reliable control systems can be easily established by minimizing single points of failure at the visualization (SCADA), control, network, and extension cable levels, thereby avoiding system downtime and ensuring continuous control and operation of critical systems.



Mitsubishi Electric PAC MELSEC iQ-R  
"Process" Movie

## GX Works3

One Software, Many Possibilities



GOT (HMI)



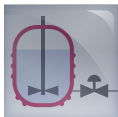
Process control system

Extension cable



Extension base unit  
• Supports Q Series modules (RQ extension base)

- Process CPU module
- Register up to 1000 tags (execute up to 300 PID loops)
- Fast process scan-type program execution cycle (50 ms)



### Embedded PID algorithms

#### PID control

The process CPU includes dedicated algorithms such as two-degree-of-freedom PID, sample PI, and auto-tuning, enabling advanced process control.



### One package process control software

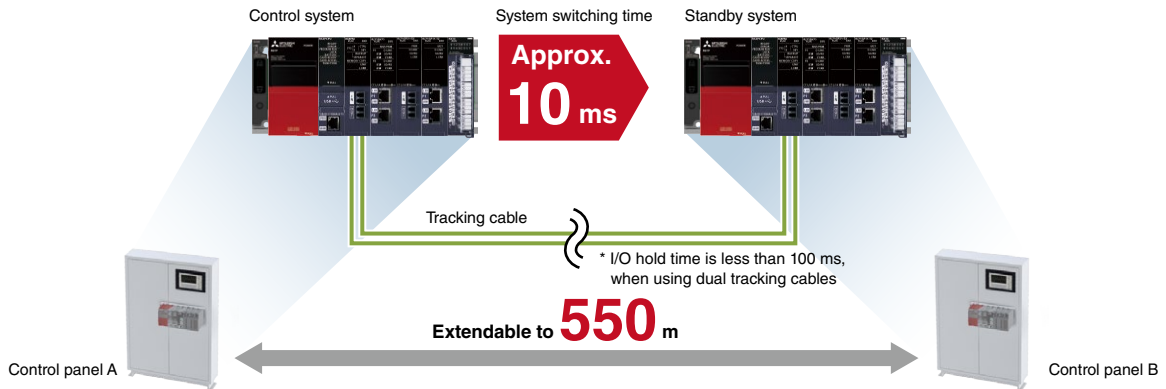
#### Integrated engineering

GX Works3, the standard integrated engineering software for the MELSEC iQ-R Series, makes programming redundant process control systems relatively easy. The program editor uses function block diagram (FBD) language for process control and simplifies system configuration with its intuitive features such as process tag label (variables) sharing, simple program structure, and easy project upload/download to the process CPU.

## Redundant system remote location and high-speed switching

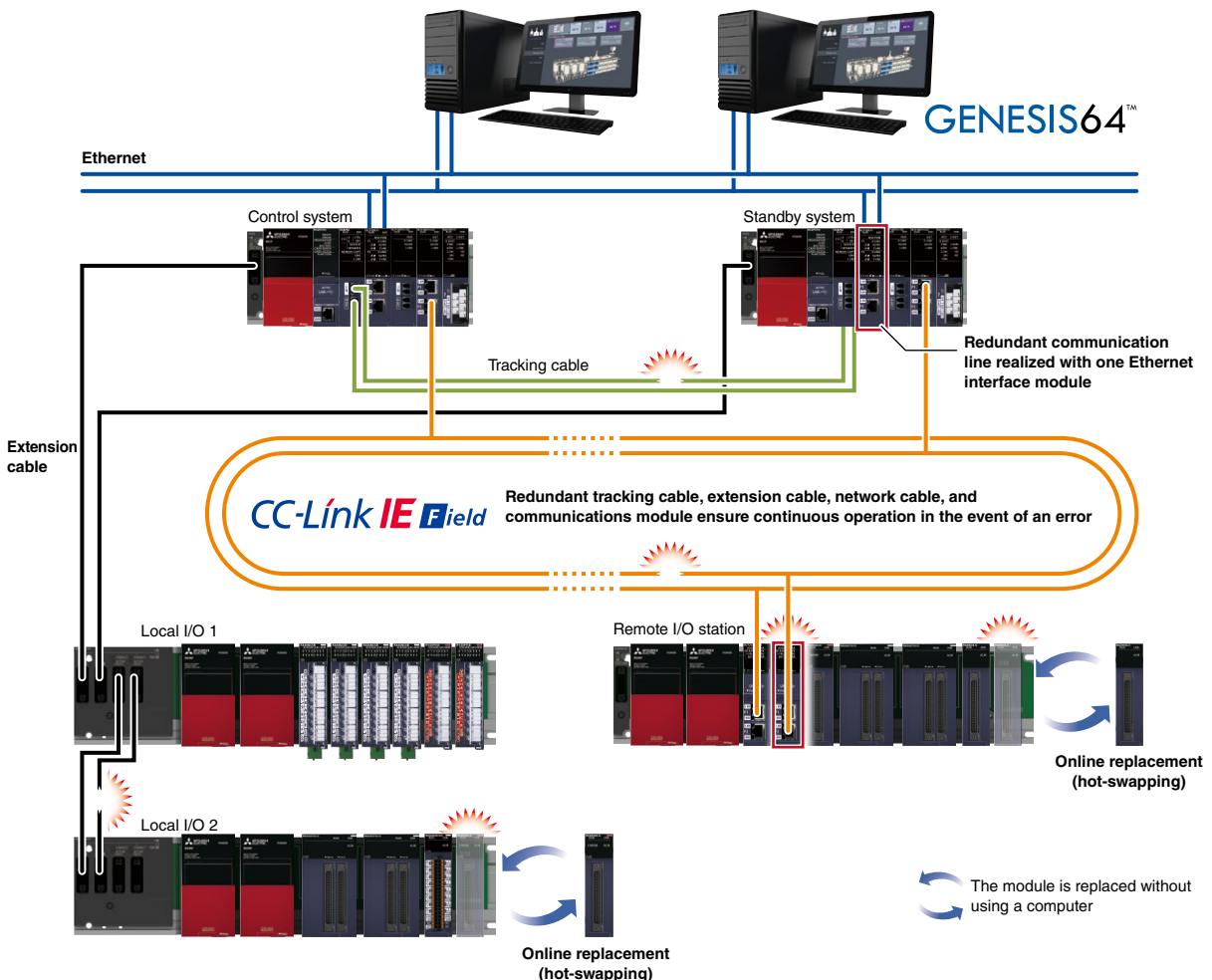
Optical-fiber tracking cables enable the standby system to be installed in a remote location up to 550 m from the control (primary) system. The tracking cables are immune to noise interference and support fast data transfer rates.

System switching speed from the control system to the standby system has also been improved to speeds of approximately 10 ms, further improving system reliability.



## Improve reliability with reduced single points of failure

A multi-level redundant system is achieved by installing dual control systems consisting of the control (primary) and standby CPUs. Combined with a dual extension cable topology for both the redundant extension base units and network cabling of the CC-Link IE Field Networks, and a dual remote head module configuration, in which two remote head modules are equipped for remote stations, single points of failure are minimized. Online replacement of cables and modules (hot-swapping) is possible while continuously operating the system when an error occurs, enabling prompt troubleshooting.


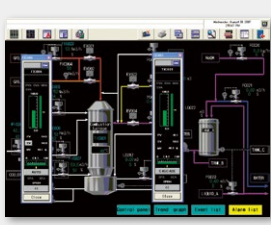



## Efficient engineering through extensive compatibility between software and devices

An efficient and highly scalable engineering environment is achieved through the interconnectivity of the engineering software GX Works3, monitoring software such as SCADA, and various devices.

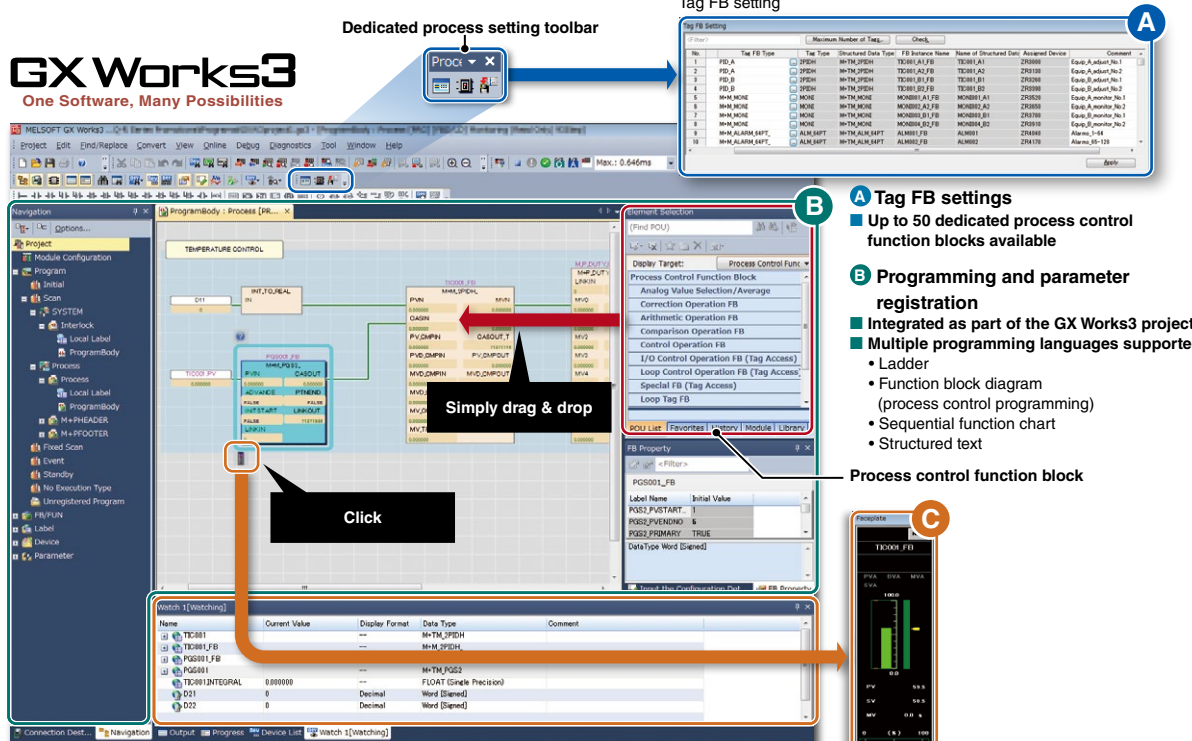
### • Highly scalable process control visualization

Process tag labels (variables) can be shared between the engineering software GX Works3, SCADA software GENESIS64™, GT SoftGOT2000, and GOT2000, realizing an efficient engineering environment that makes screen creation easier. In addition, a scalable SCADA control system can be realized combining these products.

Shop floor monitoring	Central monitoring (simplified monitoring)	Central monitoring (advanced monitoring)
		
<b>GOT2000</b>	<b>GT SoftGOT2000</b>	<b>GENESIS64™</b>
Small	Medium	Large-scale
<ul style="list-style-type: none"> <li>• Suitable for rugged environments</li> <li>• Operability suitable for the production site</li> </ul>	<ul style="list-style-type: none"> <li>• Easily configure a monitoring system by the extensive compatibility between the monitoring tool and GT SoftGOT</li> </ul>	<ul style="list-style-type: none"> <li>• Extensive monitoring functions unique to SCADA</li> <li>• Web-based monitoring of server/client configuration</li> </ul>

### • Integrated engineering software realizing easy programming and maintenance

The engineering software GX Works3 includes functions for process control (process functions). GX Works3 supports various programming languages such as FB (function block) for easy development of process control systems.



**GX Works3**  
One Software, Many Possibilities

**Dedicated process setting toolbar**

**Tag FB setting**

No.	Tag Name	Tag Type	Structural Data Type	FB Instance Name	Name of Structured Data	Assigned Device	Comment
1	FB_A	SPDHT	IN-TM_SPDHT	TC001_A1_FB	TC001_A1	ZRS000	Equip_A_monitor_No.1
2	FB_B	SPDHT	IN-TM_SPDHT	TC001_B1_FB	TC001_B1	ZRS000	Equip_B_monitor_No.1
3	FB_C	SPDHT	IN-TM_SPDHT	TC001_C1_FB	TC001_C1	ZRS000	Equip_C_monitor_No.1
4	FB_D	SPDHT	IN-TM_SPDHT	TC001_D1_FB	TC001_D1	ZRS000	Equip_D_monitor_No.1
5	MON_MON	MON	IN-TM_MON	MON001_A1_FB	MON001_A1	ZRS000	Equip_A_monitor_No.1
6	MON_MON	MON	IN-TM_MON	MON002_A1_FB	MON002_A1	ZRS000	Equip_A_monitor_No.2
7	MON_MON	MON	IN-TM_MON	MON002_B1_FB	MON002_B1	ZRS000	Equip_B_monitor_No.1
8	MON_MON	MON	IN-TM_MON	MON002_C1_FB	MON002_C1	ZRS000	Equip_B_monitor_No.2
9	MON_ALARM_BAPT.	ALM	IN-TM_ALARM_BAPT.	ALM001_FB	ALM001	ZRS000	Alarm_No.104
10	MON_ALARM_BAPT.	ALM	IN-TM_ALARM_BAPT.	ALM002_FB	ALM002	ZRS170	Alarm_No.120

**A Tag FB settings**

- Up to 50 dedicated process control function blocks available

**B Programming and parameter registration**

- Integrated as part of the GX Works3 project
- Multiple programming languages supported
  - Ladder
  - Function block diagram (process control programming)
  - Sequential function chart
  - Structured text

**C Tag FB monitoring and online tuning**

- Debugging improved utilizing tag FB monitoring and online tuning

**Faceplate**

## Process CPU module Redundant function module

**R08PCPU**  
**R16PCPU**

**R32PCPU**  
**R120PCPU**

**R6RFM**

- Highly scalable system with four CPU modules available (based on program capacity)
- Realize redundant control system when paired with redundant function module (R6RFM)
- Supports standalone process control when only the process CPU module is installed
- Dual optical-fiber tracking cable
- Large data tracking capacity up to 1M words



### Specifications

**LD** : Ladder diagram

**ST** : Structured text

**FBD** : Function block diagram

**SFC** : Sequential function chart

Item	R08PCPU	R16PCPU	R32PCPU	R120PCPU
Operation control method	Stored program cyclic operation			
I/O control mode	Refresh mode (Direct access I/O is available by specifying direct access I/O (DX, DY))			
Programming language	<b>LD</b> <b>ST</b> <b>FBD</b> <b>SFC</b>			
Extended programming language	Function block (FB), label programming (system/local/global)			
Program execution type	Initial, scan, fixed scan, event execution, standby			
Number of I/O points (X/Y)	4096	4096	4096	4096
<b>Memory capacity</b>				
Program capacity (steps)	80K	160K	320K	1200K
Program memory	320 KB	640 KB	1280 KB	4800 KB
Device/label memory (ECC type)*1	1188 KB	1720 KB	2316 KB	3380 KB
Data memory	5 MB	10 MB	20 MB	40 MB

\*1. An extended SRAM cassette expands the device/label memory area.

Item	R6RFM
Communication cable	Multi-mode optical-fiber cable
Laser class	Class 1 laser product (JIS C 6802:2014, IEC 60825-1:2014)
Maximum cable length (m)	550 (when the core outer diameter is 50 μm)
Tracking cable data capacity (words)	1M

## Redundant power supply base (including extended temperature models)

**R310RB** (Main base)

**R610RB**

(Redundant power supply extension base)

**R68WRB** (Redundant extension base)

**R66WRB-HT**

(Redundant extension base “extended temp.”)

**R38RB-HT** (Main base “extended temp.”)

**R68RB-HT**

(Redundant power supply extension base “extended temp.”)



- Enables the installation of redundant power supply modules and extension cables
- Standard and extended temperature models available
- Utilize standard MELSEC iQ-R Series modules\*1\*2

### Specifications

Item	Main base unit		Extension base unit		Redundant extension base unit	
	R310RB	R38RB-HT	R610RB	R68RB-HT	R68WRB	R66WRB-HT
Number of I/O modules installed	10	8	10	8	8	6
Redundant power supply support	●	●	●	●	●	●
Extended temperature range (0...60°C)*3	-	●	-	●	-	●
External dimensions (H x W x D, mm)	101 x 439 x 32.5	101 x 439 x 32.5	101 x 439 x 32.5	101 x 439 x 32.5	101 x 439 x 32.5	101 x 439 x 32.5

\*1. For installable modules, please refer to the relevant manual.

\*2. Only these base units support the use of redundant power supply modules.

\*3. Enables standard MELSEC iQ-R Series modules to support extended operating ambient temperatures of 0 to 60°C when installed.

## Redundant power supply module

**R63RP**

**R64RP**

- Same size as standard power supply module
- Able to replace while online (hot-swap)
- Enables installation of up to two modules simultaneously on the same base unit



### Specifications

Item	R63RP	R64RP
Input power supply voltage	24 V DC (19.2...31.2 V DC)	100...240 V AC (85...264 V AC)
Input frequency	-	50/60 Hz ±5%
Max. input apparent power (VA)	-	160
Max. input power (W)	50	-
Rated output current (5 V DC, A)	6.5	9
Redundant power supply function	●	●

## Network modules supporting redundancy

**RJ71EN71** (Ethernet multiple network)  
**RJ71GP21(S)-SX** (CC-Link IE Control)  
**RJ71GF11-T2** (CC-Link IE Field)

**RJ72GF15-T2** (CC-Link IE Field remote head)  
**RJ71LP21-25** (MELSECNET/H)

- Dual Ethernet ports realizing redundant Ethernet communications
- Redundant CC-Link IE Control Network (control station), CC-Link IE Field Network (master station)
- Redundant CC-Link IE Field Network remote head module supports dual network lines
- Redundant MELSECNET/H network module



SIL 2-supporting

### Specifications

Item	RJ71EN71 <sup>*1</sup>	RJ71GP21(S)-SX	RJ71GF11-T2 <sup>*2</sup>	RJ72GF15-T2 <sup>*3</sup>	RJ71LP21-25 <sup>*4</sup>
Transmission speed	1 Gbps	1 Gbps	1 Gbps	1 Gbps	25 Mbps/10 Mbps
Network topology	Line topology, star topology, and ring topology	Redundant loop	Line topology, star topology, and ring topology	Line topology, star topology, and ring topology	Redundant loop
Communication cable	Ethernet cable (Category 5e or higher, shielded/STP) straight cable	Optical-fiber cable (1000BASE-SX standard)	Ethernet cable (Category 5e or higher, double shielded/ STP) straight cable	Ethernet cable (Category 5e or higher, double shielded/ STP) straight cable	Optical-fiber cable
Max. station-to-station distance (m)	100	550	100	100	1000
Overall cable distance (m)	Line: 12000 (121 stations) Star: Depends on system configuration Ring: 12100 (121 stations)	66000 (120 stations)	Line: 12000 (121 stations) Star: Depends on system configuration Ring: 12100 (121 stations)	Line: 12000 (121 stations) Star: Depends on system configuration Ring: 12100 (121 stations)	30000
Max. number of connectable stations	121 (master station: 1, device station: 120)	120 (control station: 1, normal station: 119)	121 (master station: 1, device station: 120)	121 (master station: 1, device station: 120)	64 (control station: 1, normal station: 63)
Redundant function	● (Ethernet)	● (CC-Link IE Control Network)	● (CC-Link IE Field Network)	● (CC-Link IE Field Network)	● (MELSECNET/H)

\*1. Redundant function can be used only when connected with Ethernet.

\*2. SIL 2-supporting redundant system is supported in the module firmware version of "23" or later.

\*3. SIL 2-supporting redundant system is supported in the module firmware version of "04" or later.

\*4. For details, refer to "MELSEC iQ-R MELSECNET/H Network Module User's Manual (Startup) (SH-082202ENG)".

## Channel isolated analog input module

### R60AD6-DG

- Supplies power to the 2-wire transmitter
- Wiring to the power supply is unnecessary, reducing wiring cost
- Power supply to the 2-wire transmitter can be temporarily stopped on a per-channel basis. This allows maintenance to be performed during system operation, even in the event of a failure

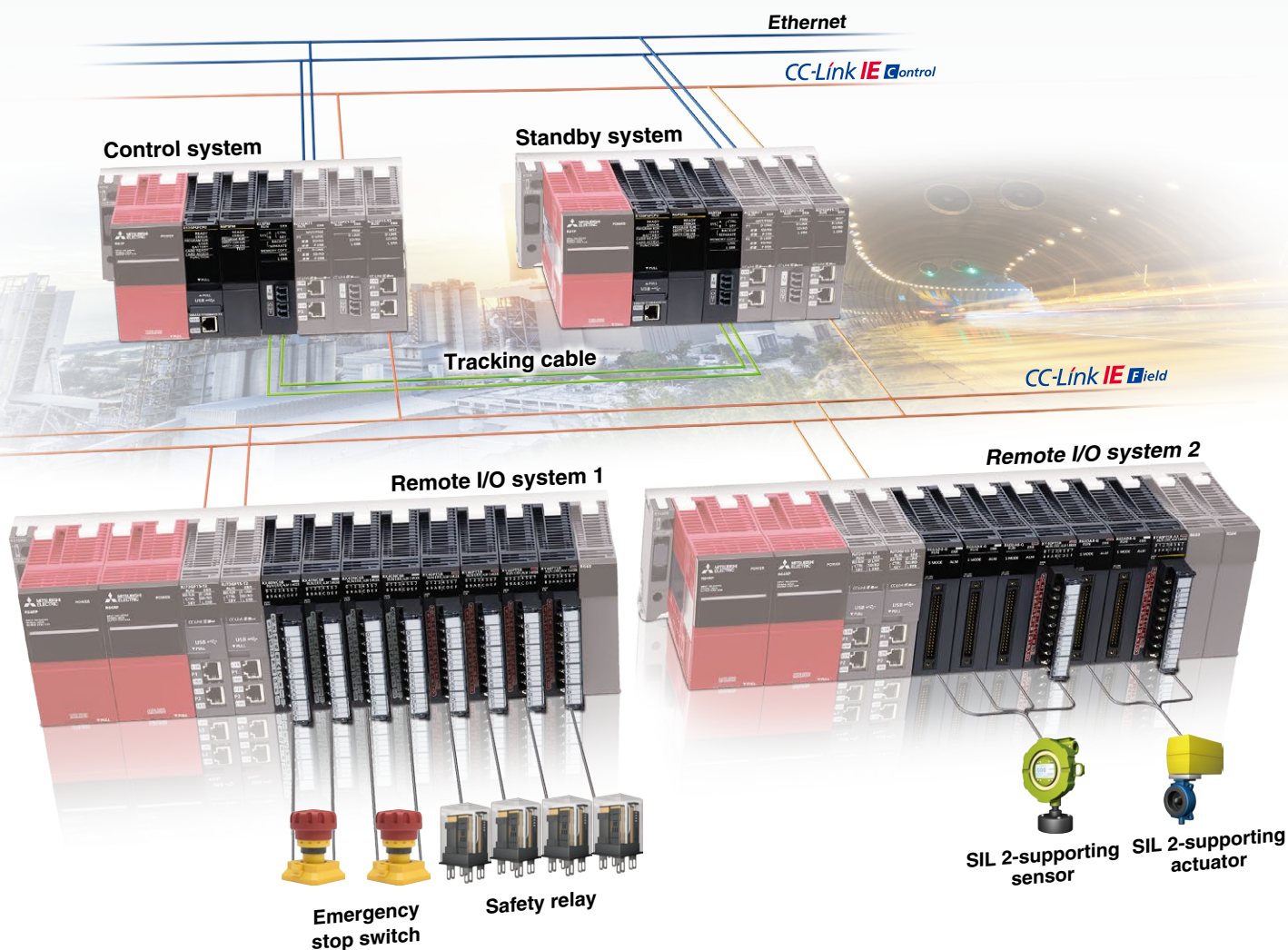


### Specifications

Item	R60AD6-DG
Number of analog input points (ch)	6
Reference accuracy	
Ambient temperature 25 ± 5°C (%)	Within ±0.1
Temperature coefficient (ppm/°C)	±35
Common	
Conversion speed (ms/CH)	10
Channel isolation	Transformer
Input from 2-wire transmitter	
Analog input current (mA DC)	4...20
Digital output value	0...32000
Current input	
Analog input current (mA DC)	0...20
Digital output value	0...32000

## Redundant system supporting IEC 61508 SIL 2

The MELSEC iQ-R Series SIL2-supporting redundant system supports SIL 2, which is required for highly reliable public infrastructure applications that require high reliability, to meet global needs.



### SIL 2-supporting modules and non-supporting modules can be mixed

It is possible to install SIL 2-supporting modules (SIL2 process CPU module, CC-Link IE Field Network module) and non-SIL 2-supporting general modules (CC-Link IE Control Network, CC-Link, Ethernet) on the same main base unit.

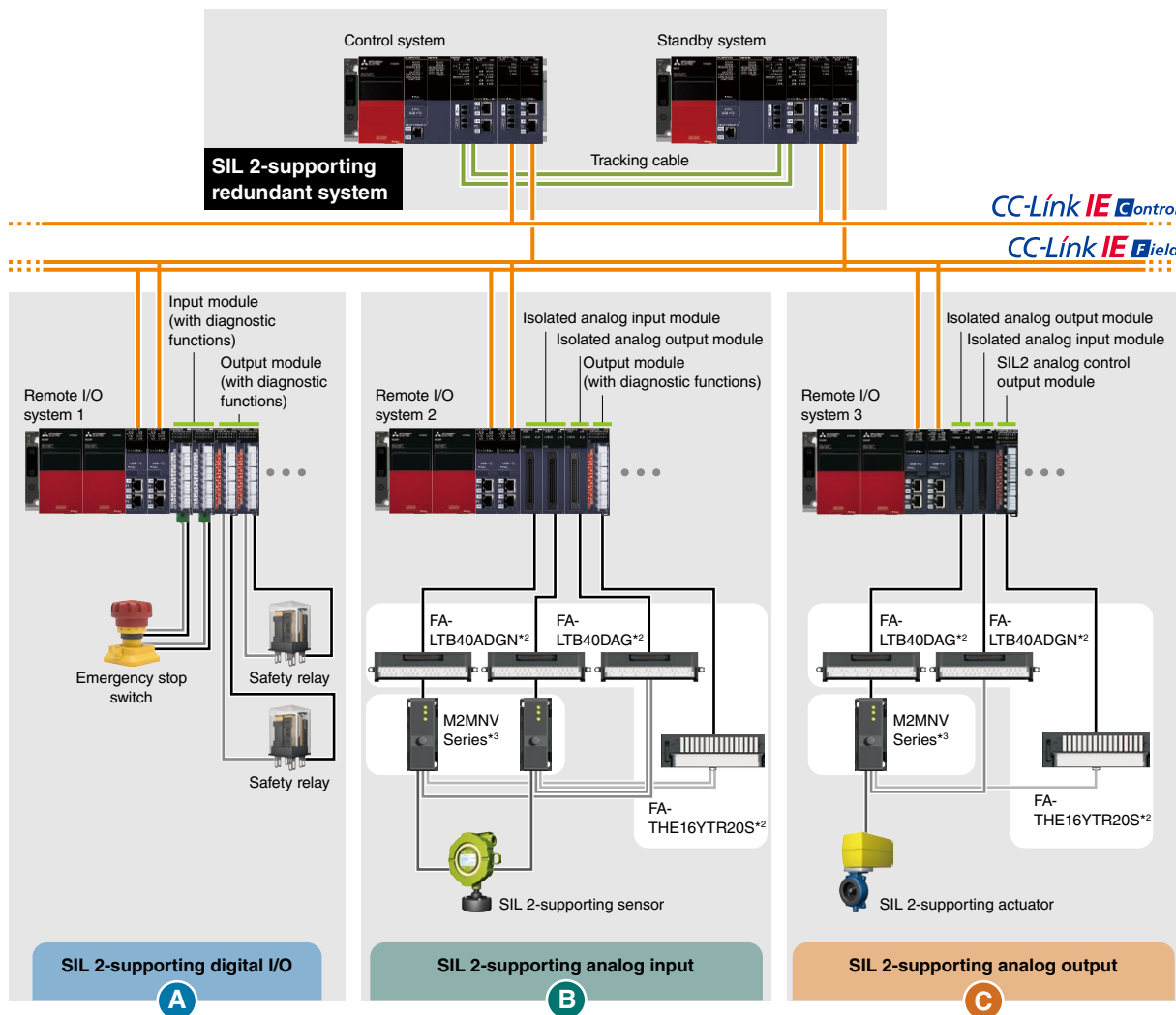
### Integration of non-safety and safety control

Safety control programs are created using ladder logic. Both general and safety control programs can be included in a GX Works3 project. A safety control program is created using safety devices and general/safety shared labels, and its program execution type is specified as a fixed scan program.

## Mixed configuration of SIL 2-supporting and non-supporting modules

The MELSEC iQ-R Series SIL2 redundant system meets global needs by complying with SIL 2<sup>\*1</sup>, which is required in the field of public infrastructure where high reliability is required.

<sup>\*1</sup> For details, please refer to the technical bulletin "Certification of Compliance with Safety Standards for MELSEC iQ-R Series SIL2 Redundant System Products (FA-A-0469)".



### A SIL 2-supporting digital I/O

SIL 2-supporting safety inputs and outputs are configured by having a set of two input modules (RX40NC6B) and two output modules (RY40PT5B) with diagnostic functions.

### B SIL 2-supporting analog input

SIL 2-supporting analog inputs are configured by having four modules in total. This consists of two analog input modules (R60AD8-G) with channel isolation, one analog output module (R60DA8-G) with channel isolation, and one digital output module (RY40PT5B) with diagnostic functions. The resulting digital value is verified with the calculated digital value.

### C SIL 2-supporting analog output

SIL 2-supporting analog outputs are configured to have three modules in total. This consists of one analog output module (R60DA8-G) with channel isolation, one analog input module (R60AD8-G) with channel isolation, and one SIL2 analog control output module (RY40PT5B-AS). The resulting analog output value is verified with the set value.

<sup>\*2</sup> These products are manufactured by Mitsubishi Electric Engineering Co., Ltd.

<sup>\*3</sup> These products are manufactured by a third-party, for further information please contact your local Mitsubishi Electric sales office or representative.

## SIL2 process CPU module

- R08PSFCPU-SET**
- R16PSFCPU-SET**
- R32PSFCPU-SET**
- R120PSFCPU-SET**



- Product package includes a SIL2 process CPU module and SIL2 function module, which is necessary for realizing a SIL 2-supporting system
- Redundant control system supporting SIL 2 when paired with redundant function module (R6RFM)
- Execute general (process) control and safety control programs on the same CPU

### Specifications

LD : Ladder diagram    ST : Structured text    FBD : Function block diagram

Item	R08PSFCPU-SET*1	R16PSFCPU-SET*1	R32PSFCPU-SET*1	R120PSFCPU-SET*1
Operation control method	Stored program cyclic operation			
I/O control mode	Refresh mode (Direct access I/O is available by specifying direct access I/O (DX, DY))			
Programming language	LD    ST*2    FBD*2			
Extended programming language	Function block (FB), label programming (system/local/global)			
Program execution type	Initial*2, scan*2, fixed scan, event execution*2, standby*2			
Number of I/O points (X/Y)	4096	4096	4096	4096
Constant scan (ms) (function for keeping regular scan time)	0.2...2000 (setting available in 0.1-ms increments)			
<b>Memory capacity</b>				
Program capacity (steps)	80K*3	160K*3	320K*3	1200K*3
Program memory	320 KB	640 KB	1280 KB	4800 KB
Device/label memory (ECC type)*4	1178 KB	1710 KB	2306 KB	3370 KB
Data memory	5 MB	10 MB	20 MB	40 MB
<b>Memory interface</b>				
SD memory card	●	●	●	●
Extended SRAM cassette	●	●	●	●
<b>Safety standard</b>				
IEC 61508 SIL 2	●	●	●	●
<b>Function*5</b>				
Multiple interrupt	●	●	●	●
Standard PID control	●	●	●	●
Process control	●	●	●	●
Data logging	-	-	-	-
Security function	●	●	●	●
Inter-module synchronization*6	-	-	-	-
SLMP communication	●	●	●	●
Online module change	●	●	●	●

\*1. Product package includes a SIL2 process CPU (R□PSFCPU) and SIL2 function module (R6PSFM).

\*2. Cannot be used for safety control programs.

\*3. Program capacity of 40K steps is allocated for safety program.

\*4. An extended SRAM cassette expands the device/label memory area.

\*5. Memory dump and real-time monitor are not supported.

\*6. Inter-module synchronization is not supported when used in redundant mode.



## I/O module (with diagnostic functions)

### RX40NC6B RY40PT5B

- Includes input disconnection, output disconnection, and short-circuit detection
- Supports SIL 2 inputs and outputs by duplexing of each module in the system configuration\*1
- Event information such as errors that occurred on the module can be collected by the CC-Link IE Field Network remote head module.

\*1. System configuration is possible, but new third-party certification cannot be obtained.



### Specifications

Item	RX40NC6B*2	RY40PT5B*2
	Input (with diagnostic functions)	Source output (with diagnostic functions)
Number of I/O points	16	16
Rated input voltage (V DC)	24	-
Rated input current (mA)	6.0	-
Rated load voltage (V DC)	-	24
Max. load current	-	0.5 A/point, 5 A/common
Response time (ms)	1...70	≤ 1.5
Common terminal arrangement (points/common)	16 (negative common)	16
Interrupt function	●	-
Protection function (overload, overheat)	-	●
Diagnostic functions*3		
Disconnection detection	●	●
Short-circuit detection	-	●
External interface		
18-point screw terminal block	●	●

\*2. When used in the SIL 2-supporting redundant system (SIL 2 is supported in the module firmware version of "02" or later).

\*3. For more information about diagnostic functions, please refer to the relevant product manual.

## Isolated analog I/O module

### R60AD8-G R60DA8-G

- Can be used as SIL 2 analog input by combining a total of four modules: two isolated analog input modules, one isolated analog output module, and one output module with diagnostic functions\*<sup>1</sup>
- Combining isolated analog input and output modules with the SIL2 analog control output module realizes a SIL 2-supporting analog output\*<sup>1</sup>

\*1. System configuration is possible, but new third-party certification cannot be obtained.



### Specifications

Item	R60AD8-G* <sup>2</sup>	R60DA8-G* <sup>2</sup>
	Analog input	Analog output
Number of analog I/O points (ch)	8	8
Conversion speed (ms/CH)	10	1
Channel isolation	Transformer isolation	Transformer isolation
Absolute max. input	±15 V, 30 mA	-
Output short-circuit protection	-	●
Voltage input/output		
Analog voltage (V DC)	-10...10	-12...12
Digital value	-32000...32000	-32000...32000
Current input/output		
Analog current (mA DC)	0...20	0...20
Digital value	0...32000	0...32000
External interface		
40-pin connector	●	●

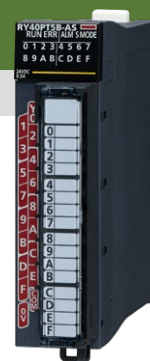
\*2. When used in the SIL 2-supporting redundant system (SIL 2 is supported in the module firmware version of "02" or later).



## SIL2 analog control output module

### **RY40PT5B-AS**

- Galvanic channel isolation eliminates the need for an additional signal converter to prevent current and noise interference.



### **Specifications**

Item	RY40PT5B-AS
Number of output points	16
Rated load voltage (V DC)	24
Max. load current	0.5 A/point, 5 A/common
Response time (ms)	≤ 1.5
Control cycle time (ms)	2
Common terminal arrangement (points/common)	16
External interface	
18-point screw terminal block	●

## MELSEC iQ-R Series process control used in industry

MELSEC iQ-R Series process CPU/redundant systems are ideal for various industrial process control applications requiring highly reliable process control solutions that can be easily integrated. Most components are based on the standard range of MELSEC iQ-R Series modules, enabling total cost of ownership to be reduced through utilization of its extensive functions and features.

### PID control for stringent control of ingredients mix

- Extensive PID instructions that are embedded in the CPU can be used for maintaining stringent process parameters such as for beverage ingredient processing



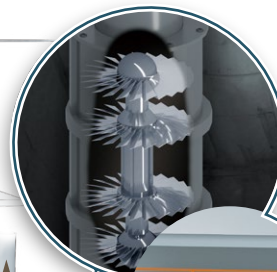
### Facility-wide monitoring and control

- Factory-wide visualization and data acquisition in real-time with status data updated seamlessly



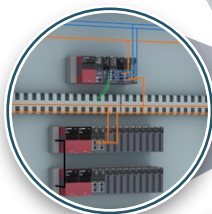
### SIL 2 redundant control of ventilation system

- System configuration supporting IEC 61508 SIL 2



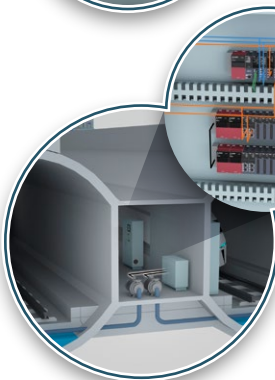
### Extended tracking cable length improves reliability

- Improve reliability even further by installing the control (primary) and standby systems in separate control cabinets utilizing long-length tracking cable



### Redundant control of drainage pumping control systems

- Protection against system failures of critical processes can be realized ensuring continuous control in the event of control equipment failure



### Reduce wiring with remote stations closer to processes

- Locate remote stations closer to actual control processes to save on wiring, thereby reducing cost

## Sales office

MITSUBISHI ELECTRIC Factory Automation Global Website  
 ▶ Locations Worldwide  
[www.MitsubishiElectric.com/fa/about-us/overseas/](http://www.MitsubishiElectric.com/fa/about-us/overseas/)



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### ⚠ For safe use

- To use the products listed in this publication properly, always read the relevant manuals before use.

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