# Safety Controllers
iQ-R/WS Series

iQ-R Integrated Safety Controller

The iQ-R Integrated Safety solution delivers functionally safe machines in one platform, over one network, and using one software. It is a standard iQ-R controller with additional safety features that comply with IEC 61508 SIL3 and ISO 13849-1 PLe international safety standards. It also uses the standard iQ-R Series base units, power supplies, communication, and special function modules.

System Configuration
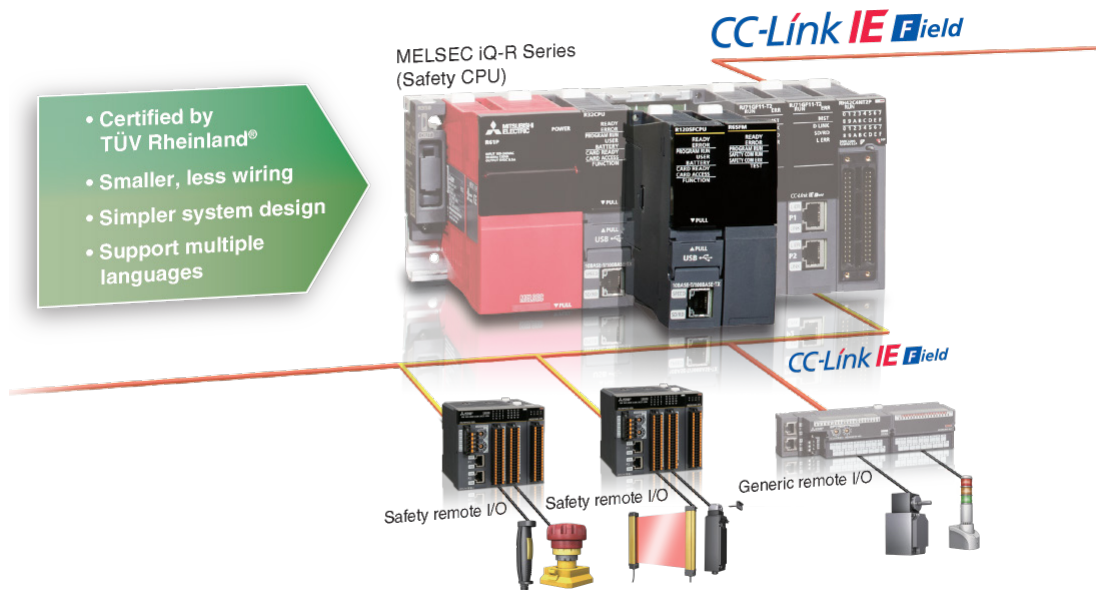
iQ-R Safety CPU

Since the iQ-R Safety CPU must be used in combination with the Safety Function Module, we've bundled the two together as a set. To order, please add the suffix "-SET" at the end of the iQ-R Safety CPU's part number. For example: R08SFCPU-SET.

Model Number		R08SFCPU-SET	R16SFCPU-SET	R32SFCPU-SET	R120SFCPU-SET
Stocked Item		S	S	S	S
Certification		UL • cUL • CE			
Operation Control Method		Stored program cyclic operation			
I/O Control Mode		Refresh mode (The direct access input/output is available by specifying the direct access input/output (DX, DY))			
Instruction Processing Time	LD SA\X0	0.98ns			
	MOV SA\D0 SA\D1	1.96ns			
Memory Capacity	Program Capacity	80K steps (320K bytes) (For safety programs: 40K steps (160K bytes))	160K steps (640K bytes) (For safety programs: 40K steps (160K bytes))	320K steps (1280K bytes) (For safety programs: 40K steps (160K bytes))	1200K steps (4800K bytes) (For safety programs: 40K steps (160K bytes))
	Program Memory	320K bytes (For safety programs: 160K bytes)	640K bytes (For safety programs: 160K bytes)	1280K bytes (For safety programs: 160K bytes)	4800K bytes (For safety programs: 160K bytes)
	Device/Label Memory (*1)	1178K bytes	1710K bytes	2306K bytes	3370K bytes
	Data Memory	5M bytes	10M bytes	20M bytes	40M bytes
	CPU Buffer Memory	1024K bytes (512K words) (including the built-in function information area capacity 4M bytes (2K words))			
	CPU Buffer Memory	2048K bytes (*2)			
Number of Storable Files	Program Memory (P: Number of Program Files, FB: Number of FB Files)	380 (including safety programs) (P: 252, FB: 128 (One FB file can store 64 function blocks.))			
	Program Memory (P: Number of Safety Program Files, FB: Number of Safety FB Files)	48 (P: 32, FB: 16 (One FB file can store 64 function blocks.))			
	Device/Label Memory (File Storage Area)	323 (with or without an extended SRAM cassette) (*3)			
	Data Memory	512 (*4)			
	SD Memory Card	NZ1MEM-2GBSD: 256 (*4); NZ1MEM-4GBSD and later: 32767 (*4)			
Number of Storable Folders	Data Memory	512 (*4)			
	SD Memory Card	NZ1MEM-2GBSD: 256 (*4); NZ1MEM-4GBSD and later: 32767 (*4)			
USB Port		USB2.0 High Speed (miniB) x 1			
Ethernet Port		Refer to MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup)			
Clock Function		Year, month, date, hour, minute, second, and day of the week (automatic leap year adjustment) -1.00 to +1.00s/d at 0 to 55°C			
Allowable Momentary Power Failure Time		The time differs depending on the power supply module used. (MELSEC iQ-R Module Configuration Manual)			
Internal Current Consumption (5VDC)		0.76A			
External Dimensions (H x W x D) mm		106 x 27.8 x 110 (Base unit mounting side: 98mm)			
Weight (kg)		0.20			

Notes:
1. The capacity of device area, label area, latch label area, and file storage area can be changed in the parameter. The capacity of the device/label memory can be increased by inserting an extended SRAM cassette. (MELSEC iQ-R CPU Module User's Manual (Application))
2. This is the total capacity of the device area and module label area.
3. System files consume part of the 323 count.
4. The number indicates the number of files and folders (including system files and system folders) that can be created in the root directory on the condition that the number of characters in the file or folder name is 13 or less. In a subdirectory, up to 32767 folders can be created. Note that the number of storable files and folders will decrease if many folders with a long name, more than 13 characters (including an extension), are created.

Safety Function Module

The safety function module must be mounted next to the iQ-R Safety CPU module. It is included with the purchase of an iQ-R Safety CPU set, and cannot be purchased independent from the set.

Model Number		R6SFM
Certification		UL • cUL • CE
Operation Control Method		Stored program cyclic operation
Memory Capacity Safety Program	Program Capacity	40K steps (160 kbytes)
	Program Memory	160 kbytes
	Device/Label Memory	80 kbytes
Number of Occupied I/O Points		16 points (*1)
Buffer Memory		4096K bytes
Allowable Momentary Power Failure Time		The time differs depending on the power supply module used. (MELSEC iQ-R Module Configuration Manual)
Internal Current Consumption (5VDC)		0.67A
Dimensions (H x W x D) mm		106 x 27.8 x 110 (Base unit mounting side: 98mm)
Weight (kg)		0.16

Note 1: All I/O signals (input (X): 16 points, output (Y): 16 points) are use prohibited.

CC-Link IE Field Remote Safety I/O Modules – Remote Safety Input (Main Module)

Model Number		NZ2GFSS2-32D
Stocked Item		S
Certification		UL • cUL • CE
CC-Link IE Station Type		Remote device station
Number of Input Points		Single wiring: 32 points, double wiring: 16 points
Rated Input Voltage		24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
Rated Input Current		6.0mA TYP. (at 24VDC)
Isolation Method		Photocoupler isolation
Max. Number of Simultaneous Input Points		100% (front mounting), when any installation method other than the front mounting is performed
ON Voltage/ON Current		15VDC or higher/2mA or higher
OFF Voltage/OFF Current		5VDC or lower/0.5mA or lower
Input Resistance		Approx. 2.0kΩ
Input Circuit Response Time	OFF – ON	0.4ms or less (24VDC)
	ON – OFF	0.4ms or less (24VDC)
Safety Remote Station Refresh Response Processing Time		2.0ms
Input Response Time of Safety Remote Station		Input circuit response time + Input response time (1ms, 5ms, 10ms, 20ms, 50ms)
External Power Supply For Input Part	Voltage	24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
	Current	40mA
	Protection Functions	External power supply overvoltage protection function, external power supply overcurrent protection function
	Fuse	8A (user-unchangeable)
Power Supply Current For Input Device (COM+)		0.4A/1 terminal
Input Type		Negative common
Withstand Voltage		500VAC for 1 minute between all DC external terminals and the ground
Insulation Resistance		10MΩ or higher between all DC external terminals and ground (500VDC insulation resistance tester)
Noise Immunity		Noise voltage 500Vp-p, noise width 1μs, noise frequency 25 to 60Hz (DC type noise simulator condition)
Protection Degree		IP2X
Wiring Method for Common		Input 32 points/common (spring clamp terminal block)
External Interface	External Interface	RJ45 connector
	Module Power Supply Part	Terminal block for module power supply and FG (2-piece spring clamp terminal block)
	Input Part, External Power Supply Part	40 points, 2-piece spring clamp terminal block (push-in)
Applicable DIN Rail		TH35-7.5Fe, TH35-7.5Al (compliant with IEC 60715)
Applicable Wire Size	Terminal Block For Module Power Supply and FG	Core: 0.5 to 2.0² (24 to 14 AWG), terminal hole size: 2.8mm x 2.0mm
	I/O Terminal Block	Core: 0.5 to 1.5² (24 to 16 AWG), terminal hole size: 2.4mm x 1.5mm
Applicable Solderless Terminal	Terminal Block For Module Power Supply and FG (*1)	AI0.5-10WH (Phoenix Contact Co., Ltd.) applicable wire size: 0.5² AI0.75-10GY (Phoenix Contact Co., Ltd.) applicable wire size: 0.75² AI1-10RD (Phoenix Contact Co., Ltd.) applicable wire size: 1.0² AI1.5-10BK (Phoenix Contact Co., Ltd.) applicable wire size: 1.5² AI2.5-10BU (Phoenix Contact Co., Ltd.) applicable wire size: 2.0²
	I/O Terminal Block	AI0.5-10WH (Phoenix Contact Co., Ltd.) applicable wire size: 0.5² AI0.75-10GY (Phoenix Contact Co., Ltd.) applicable wire size: 0.75² A1.0-10 (Phoenix Contact Co., Ltd.) applicable wire size: 1.0² A1.5-10 (Phoenix Contact Co., Ltd.) applicable wire size: 1.5²
Cyclic Transmission	RX/RY Points	80 points
	RWr/RWw Points	16 points
	SA\X/SA\Y Points	32 points
Communication Cable		An Ethernet cable that meets the 1000BASE-T standard: Category 5e or higher (double shielded, STP), straight cable
Availability of Connecting Extension Module		Connectable
Module Power Supply (*2)	Voltage	24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
	Current (*3)	230mA
	Protection Functions	Module power supply overvoltage protection function, module power supply overcurrent protection function
	Fuse	1.6A (user-unchangeable)
	Allowable Momentary Power Failure Time (*4)	Within 10ms
Weight (kg)		0.45

Notes:
1. Only one wire can be connected to a terminal of the terminal block for the module power supply and FG.
2. To connect to the main module, use the power supply that meets the following conditions:
   - SELV (Safety Extra Low Voltage): Product with reinforced insulation from the hazardous potential part (48V or more)
   - LVD applicable product
   - Output voltage specifications: 24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
3. When an extension module is connected, the current consumption of the extension module is added.
4. At a momentary power failure over 10ms, the module operates as any of the following.
   - The operation remains.
   - The input and output are turned off by the protection circuit, and the communication is disabled. To recover the module, turn off and on the module.
   - The module is restarted and initialized. The operation is the same as when the module is turned off and on.
   In the case other than when the operation remains, the safety station interlock status is applied. Cancel the safety station interlock of the CPU module. For the safety station interlock, refer to the following:
   MELSEC iQ-R CPU Module User's Manual (Application)

Remote Safety Output (Extension Module)

This remote safety output module is an extension module. It cannot be used standalone and must be mounted next to the remote safety input module.

Model Number		NZ2EXSS2-8TE
Stocked Item		S
Certification		UL • cUL • CE
Number of Output Points		Single wiring: 8 points, double wiring: 4 points
Rated Load Voltage		24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
Maximum Load Current		0.5A/point 4A/common (front mounting), when any installation method other than the front mounting is performed
Isolation Method		Photocoupler isolation
Max. Inrush Current		1.0A, 10ms or less
Leakage Current at OFF		0.5mA or less
Maximum Voltage Drop at ON		1.0VDC or less
Output Circuit Response Time	OFF – ON	0.4ms or less (24VDC)
	ON – OFF	0.4ms or less (24VDC)
Safety Remote Station Refresh Response Processing Time		2.0ms
Output Response Time of Safety Remote Station		Output circuit response time
Surge Suppressor		Zener diode
External Power Supply For Output Part	Voltage	24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
	Current	120mA
	Protection Functions	External power supply overvoltage protection function, external power supply overcurrent protection function
	Fuse	8A (user-unchangeable)
Output Type		Source + Source type
Withstand Voltage		500VAC for 1 minute between all DC external terminals and the ground
Insulation Resistance		10MΩ or higher between all DC external terminals and ground (500VDC insulation resistance tester)
Noise Immunity		Noise voltage 500Vp-p, noise width 1µs, noise frequency 25 to 60Hz (DC type noise simulator condition)
Protection Degree		IP2X
Wiring Method for Common		Output 8 points/common (spring clamp terminal block)
Common Current		Max. 4A
Protection Functions		Output overload protection function
External Interface	Output Part, External Power Supply Part	40 points, 2-piece spring clamp terminal block (push-in)
Applicable DIN Rail		TH35-7.5Fe, TH35-7.5Al (compliant with IEC 60715)
Applicable Wire Size	I/O Terminal Block	Core: 0.5 to 1.5² (24 to 16 AWG), terminal hole size: 2.4mm x 1.5mm
Applicable Solderless Terminal	I/O Terminal Block	AI0.5-10WH (Phoenix Contact Co., Ltd.) applicable wire size: 0.5² AI0.75-10GY (Phoenix Contact Co., Ltd.) applicable wire size: 0.75² A1.0-10 (Phoenix Contact Co., Ltd.) applicable wire size: 1.0² A1.5-10 (Phoenix Contact Co., Ltd.) applicable wire size: 1.5²
Cyclic Transmission	RX/RY Points	0 point (Use the points secured by the main module)
	SA\X/SA\Y Points	0 points (Use the points secured by the main module)
Module Power Supply (*1)	Voltage	24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
	Current	20mA
Weight (kg)		0.16

Note 1: To connect to the extension module, use the power supply that meets the following conditions:
- SELV (Safety Extra Low Voltage): Product with reinforced insulation from the hazardous potential part (48V or more)
- LVD applicable product
- Output voltage specifications: 24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)

CC-Link IE Field Network Remote I/O Module

Item		NZ2GFSS2-16DTE	NZ2GFSS2-8D	NZ2GFSS2-8TE
Stocked Item		S	S	S
Certification		UL • CE		
CC-Link IE Station Type		Remote device station		
Number of Input Points		Single wiring: 8 points, double wiring: 4 points		-
Number of Output Points		Single wiring: 8 points, Double wiring: 4 points	-	Single wiring: 8 points, Double wiring: 4 points
Rated Input Voltage		24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)		
Rated Load Voltage		-		24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
Rated Input Current		7.0mA TYP. (at 24VDC)		-
Isolation Method		Photocoupler isolation		
Max. Inrush Current		-		1.0A, 10ms or less
Maximum Load Current		-		0.5A/point
Leakage Current at OFF		-		0.1mA or lower
Max. No. of Simultaneous Input Points		100%		-
Maximum Voltage Drop at ON		-		0.5VDC (TYP.) 0.5A, 0.8VDC (MAX.) 0.5A
ON Voltage/ON Current		12VDC or higher/3mA or higher		-
OFF Voltage/OFF Current		5VDC or lower/1.3mA or lower		-
Input Resistance		Approx. 2.6k Ω		
Circuit Response Time	OFF – ON	0.4ms or less (24VDC)		
	ON – OFF	0.4ms or less (24VDC)		
Safety Remote Station Refresh Response Processing Time		2.0ms		
Input Response Time of Safety Remote Station		Input circuit response time + Input response time (1.0ms, 1.5ms, 5ms, 10ms, 20ms, 50ms, 70ms)		-
Output Response Time of Safety Remote Station		-		Output circuit response time
Surge Suppressor		Zener diode		Zener diode
External Power Supply for I/O Part (*2)	Voltage	24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)		
	Current	150mA	100mA	70mA
	Protection Function	External power supply overvoltage protection function, external power supply overcurrent protection function		
Power Supply Current for Input Device (COM+)		0.4A/1 terminal		
Input Type		Negative common		
Output Type		Source + Source type	-	Source + Source type
Withstand Voltage		500VAC for 1 minute between all DC external terminals and the ground		
Isolation Resistance		10MΩ or higher between all DC external terminals and ground (500VDC isolation resistance tester)		
Noise Immunity		Noise voltage 500Vp-p, noise width 1 μs, noise frequency 25 to 60Hz (DC type noise simulator condition)		
Protection Degree		IP2X		
Writing Method for Common		Input 8 points/common (spring clamp terminal block)		
Rated Load Voltage		24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)		
Leakage Current at OFF		0.1mA or lower	-	-
Protection Function		Output overload protection function	-	Output overload protection function
External Interface	Communication Part	RJ45 connector		
	Module Power Supply Part	Terminal block for module power supply and FG (2-piece spring clamp terminal block)		
	I/O Part, External Power Supply Part	40 points, 2-piece spring clamp terminal block (push-in)		
Applicable DIN Rail		TH35-7.5Fe, TH35-7.5AI (compliant with IEC 60715)		
Applicable Wire Size	Terminal Block for Module Power Supply and FG	Core: 0.3 to 1.5mm² (22 to 16 AWG)		
	I/O Terminal Block	Core: 0.5 to 1.5mm² (24 to 16 AWG)		
Applicable Solderless Terminal	Terminal Block for Module Power Supply and FG (*1)	AI0.34-8 (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 0.3mm²; AI0.5-8WH, AI0.5-10WH (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 0.5mm²; AI0.75-8GY, AI0.75-10GY (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 0.75mm²; AI1-8RD, AI1-10RD (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 1.0mm²; AI1.5-8BK, AI1.5-10BK (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 1.5mm²		
	I/O Terminal Block	AI0.5-10WH (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 0.5mm²; AI0.75-10GY (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 0.75mm²; A1.0-10 (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 1.0mm²; AI1.5-10 (PHOENIX CONTACT GmbH & Co. KG) applicable wire size: 1.5mm²		
Cyclic Transmission	RX/RY Points	80 points		
	RWr/RWw Points	20 points		
	SA\X/SA\Y Points	12 points		8 points
Communication Cable		An Ethernet cable that meets the 1000BASE-T standard: Category 5e or higher (double shielded, STP), straight cable		
Availability of Connecting Extension Module		Connectable		
Module Power Supply (*2, *4)	Voltage	24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)		
	Current (*3)	160mA	150mA	160mA
	Protection Function	Module power supply overvoltage protection function, module power supply overcurrent protection function		
	Fuse	1.6A (user-unchangeable)		
Safety Element		Type B, HFT = 1, SC 3		
Weight (kg)		0.25		

Notes:
1. Only one wire can be connected to a terminal of the terminal block for module power supply and FG. Multiple wires cannot be connected to a terminal. Connecting two or more wires may cause a poor contact.
2. To connect to the main module, use the power supply that meets the following conditions: SELV (Safety Extra Low Voltage): Product with reinforced insulation from the hazardous potential part (60V or higher);
   • LVD applicable product; • Output voltage specifications: 24VDC (ripple ratio: 5% or less) (allowable voltage range: 20.4 to 28.8VDC)
3. When an extension module is connected, the current consumption of the extension module is added.
4. To connect to the module, use a power supply whose output hold time is 10ms or longer.