Changes for the Better

MITSUBISHI ELECTRIC

Mitsubishi Safety Programmable Controller
MELSEC Safety

MELSEC Safety

MITSUBISHI SAFETY FA SOLUTION

The safety programmable controller that stands between workers and hazards

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001 (standards for quality assurance management systems).

TÜV Rheinland Group
Functional Safety
FS
Type Approved

MELSOFT

CC-Link Safety
SAFETY FA NETWORK SERIES

CC-Link

ISO 14001
JACO
EC97J1113

UKAS ENVIRONMENTAL MANAGEMENT
051

ISO 9001
BUREAU VERITAS
Certification

UKAS QUALITY MANAGEMENT
008

"Safety" is crucial on the shop floor.

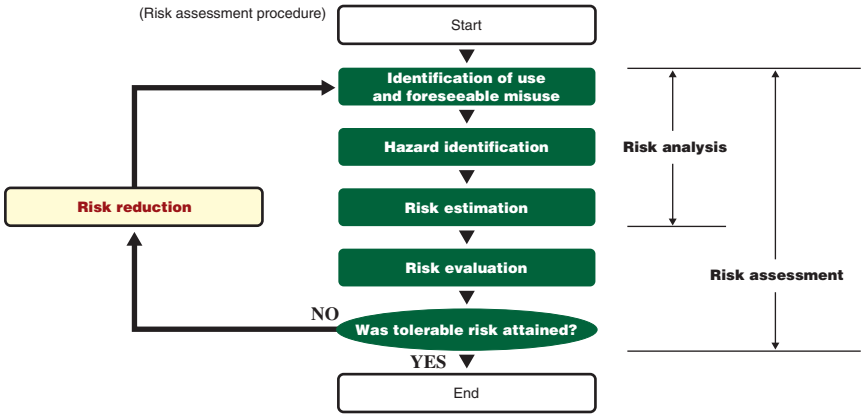
The concept of safety is shifting from "zero accidents" to "zero risk."

As many industries have expanded globally, it has become necessary to conform to international standards such as ISO12100 (JIS B 9700) "Safety of machinery - basic concepts, general principles for design" in order to ensure workplace safety. At the same time, the safety concept has shifted from human intervention based "zero accidents" to risk assessment based "zero risk".
As a solution for this, Mitsubishi Electric has introduced the MELSEC-QS Safety programmable controller, based on the world leading technology of the established Q Series Automation Platform.
This solution conforms to international safety standards and maintains compatibility with other MELSEC programmable controllers while providing a comprehensive safety control solution.

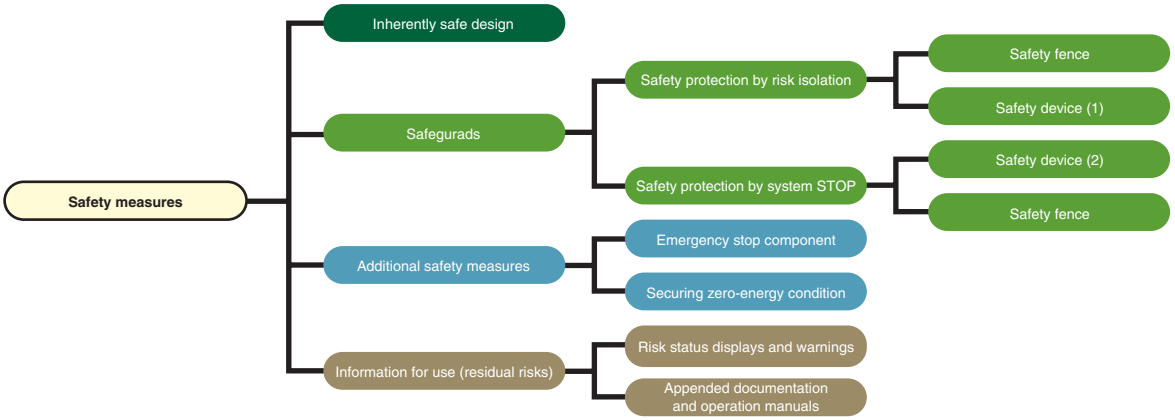
Ensuring safety in manufacturing facilities around the world, while meeting growing demands for compliance with international standards.

ISO12100 (JIS B 9700) Risk assessment

"Risk assessment" refers to identifying potential hazards present in machinery and evaluating the degree of hazard (risk).

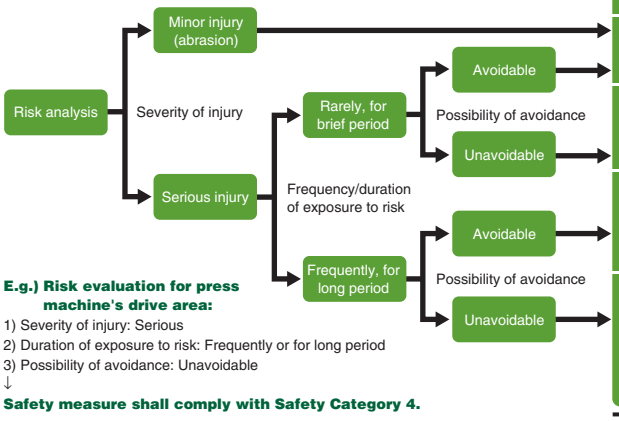


ISO12100 (JIS B 9700) Risk reduction and safety measures



EN954-1/ISO13849-1 (JIS B 9705-1) Safety categories

"Safety categories" are indicators used to determine specific safety measures based on risk assessment results.



E.g.) Risk evaluation for press machine's drive area:
1) Severity of injury: Serious
2) Duration of exposure to risk: Frequently or for long period
3) Possibility of avoidance: Unavoidable
↓
Safety measure shall comply with Safety Category 4.

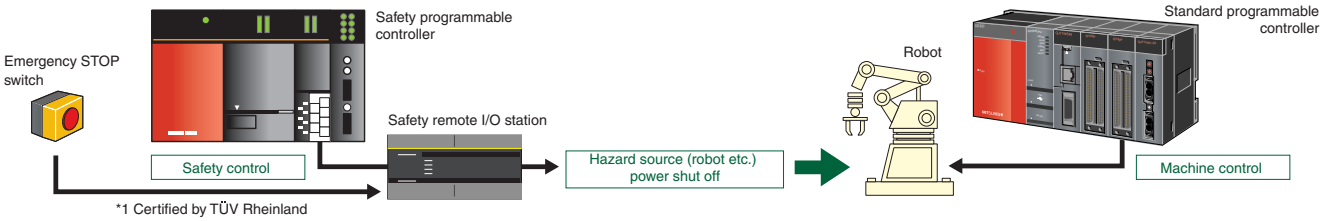
■Safety category requirements

Category	Requirement summary	System behaviour
B	・Shall realize the intended functions of safety-related parts of the machine control system.	・The occurrence of a fault can lead to the loss of the safety function.
1	・Shall meet the requirements of Category B. ・Shall use well-examined reliable components and observe safety principles.	・The same as Category B, but the safety-related part has more reliable safety function.
2	・Shall meet the requirements of Category B. ・Shall observe safety principles. ・Shall check the safety function at appropriate intervals.	・Although the loss of the safety function can be detected by checking, the safety function is lost between checks.
3	・Shall meet the requirements of Category B. ・Shall observe safety principles. ・Design requirements: A single fault shall not lead to the loss of the safety function. ・Detect as many single faults as possible.	・The safety function is not lost by a single fault. ・Some but not all faults can be detected. Accumulation of undetected faults may lead to the loss of the safety function.
4	・Shall meet the requirements of Category B. ・Shall observe safety principles. ・Design requirements: Detect a single fault at or before executing safety function. In cases where this is not possible, the safety function shall not be disabled by accumulated faults.	・The safety function is always in effect whenever a fault occurs. ・Faults will be detected in time to prevent the loss of the safety function.

Fully compliant to international safety standards from design to operation and maintenance.

The MELSEC-QS Safety programmable controller

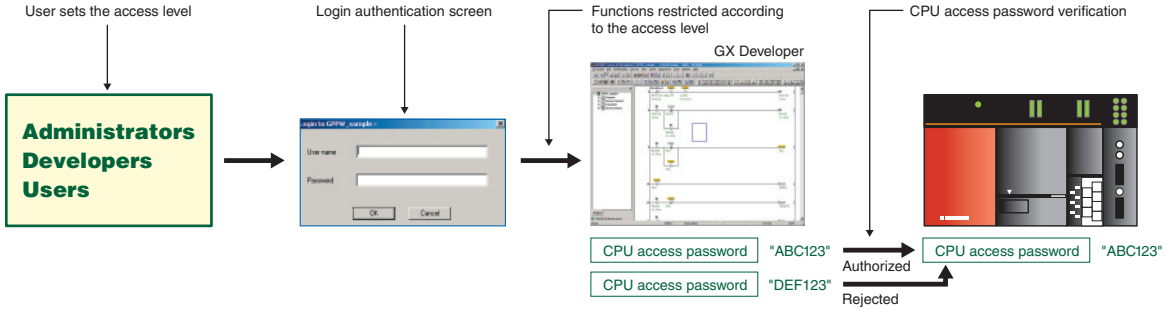
The "MELSEC-QS Safety programmable controller" is designed for safety control, compliant to the international safety standards ISO13849-1 (JIS B 9705-1)/EN954-1 Category 4 and IEC61508 (JIS C 0508) SIL 3.*1 The QS can be connected to an emergency stop switch, a light curtain, etc., to shut off (safety output OFF) the power of hazard sources (robots etc.) according to user programs. Operation of machines (robots, conveyors, etc.) is controlled by standard programmable controllers. The major difference is that the QS is equipped with a safety function which can forcibly turn off the safety output by error diagnostics.



GX Developer safety compliant engineering environment

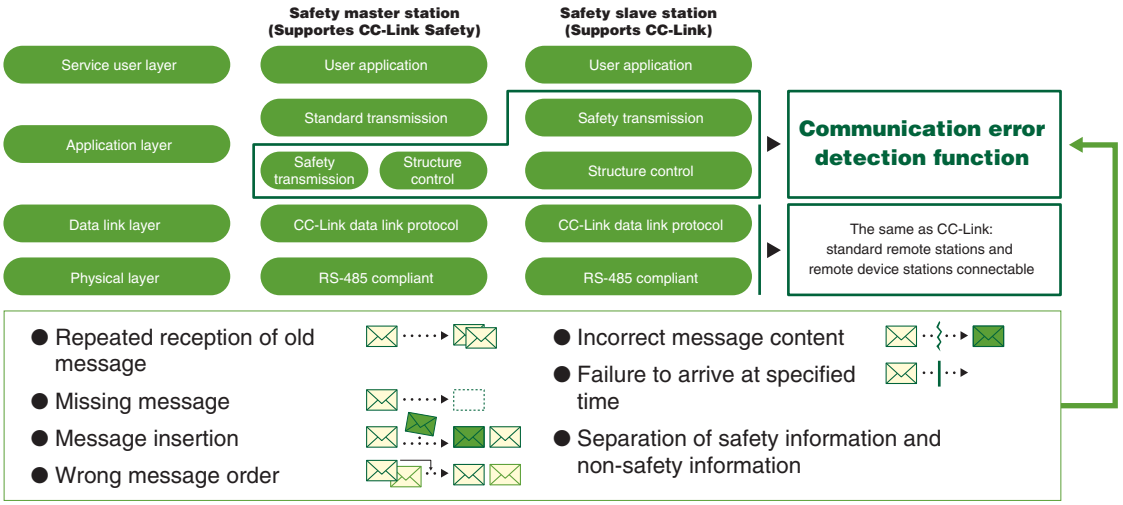
Programming the MELSEC-QS uses the same GX Developer programming tools already familiar to users of Mitsubishi systems; there are no new techniques to learn or software to buy.
However, a safety system should prevent malfunctions due to user-specified parameter settings or accidental program changes. GX Developer prevents this with the following additional functions:

- Prevents unauthorized access to safety control programs.
  Login authentication prevents unauthorized users from accessing project files.
- Prevents unauthorized access to the Safety CPU.
  CPU access password prevents project files from being incorrectly written to the Safety CPU.



CC-Link Safety open field network

The CC-Link Safety network detects the communication errors defined by safety standards, and serves as a safety system to turn outputs OFF when those errors are detected. CC-Link Safety is compatible with the established CC-Link open device level network, and features an additional error detection function protocol required for safety control, thereby permitting it to be used as a safety field network. Communication is stopped when an error is detected, and the Safety CPU and Safety Remote I/O modules turn the outputs OFF.



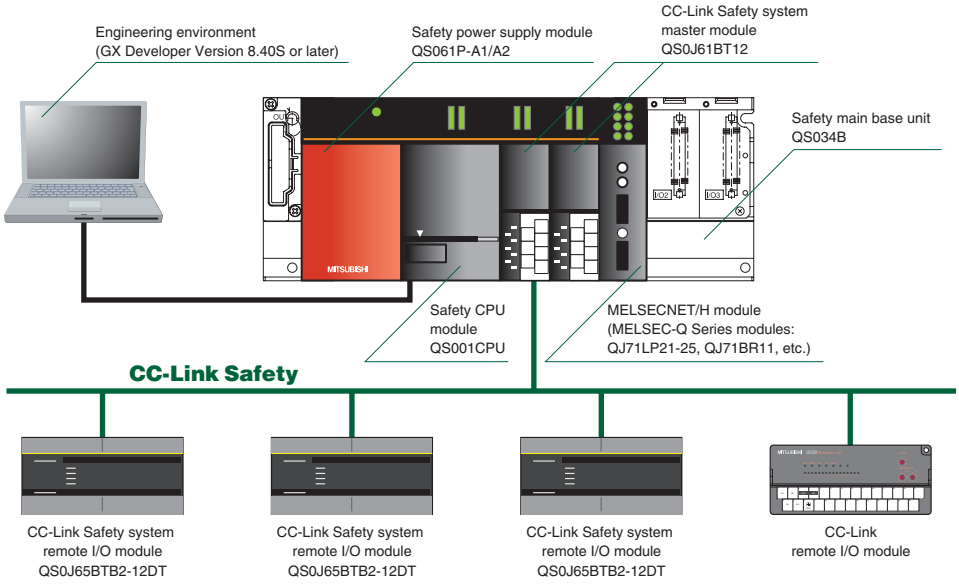
A key element of safety

MELSEC Safety

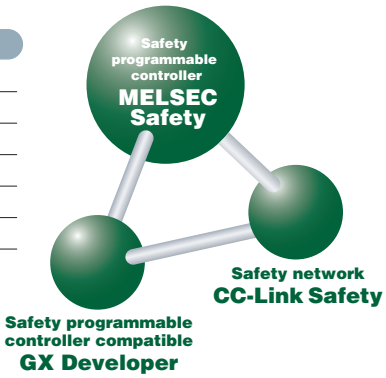
MITSUBISHI SAFETY FA SOLUTION

MELSEC-QS Safety programmable controller is the ideal solution for safety in manufacturing facilities.

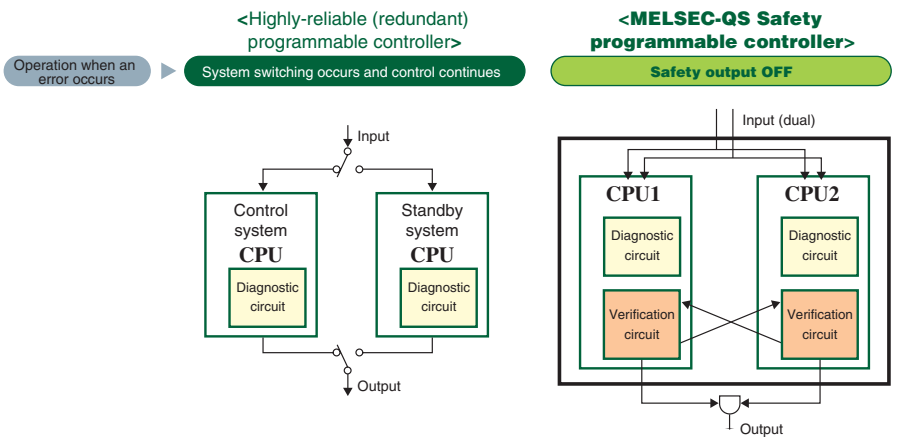
MELSEC-QS Safety programmable controller system configuration



Model	Outline
QS001CPU	Program capacity: 14 K steps, operation/error history: 3,000 records
QS034B-E	4 slots, for QS Series and MELSECNET/H modules
QS061P-A1	Input: 100 to 125 V AC, 50/60 Hz; output: 5 V 6 A
QS061P-A2	Input: 200 to 240 V AC, 50/60 Hz; output: 5 V 6 A
QS0J61BT12	Max. number of connectable modules: 64 (max. 42 for safety station)
QS0J65BTB2-12DT	Safety input: 8 points (dual input), safety output: 4 points (dual output)



Differences between the highly-reliable (redundant) programmable controller and the QS Safety programmable controller



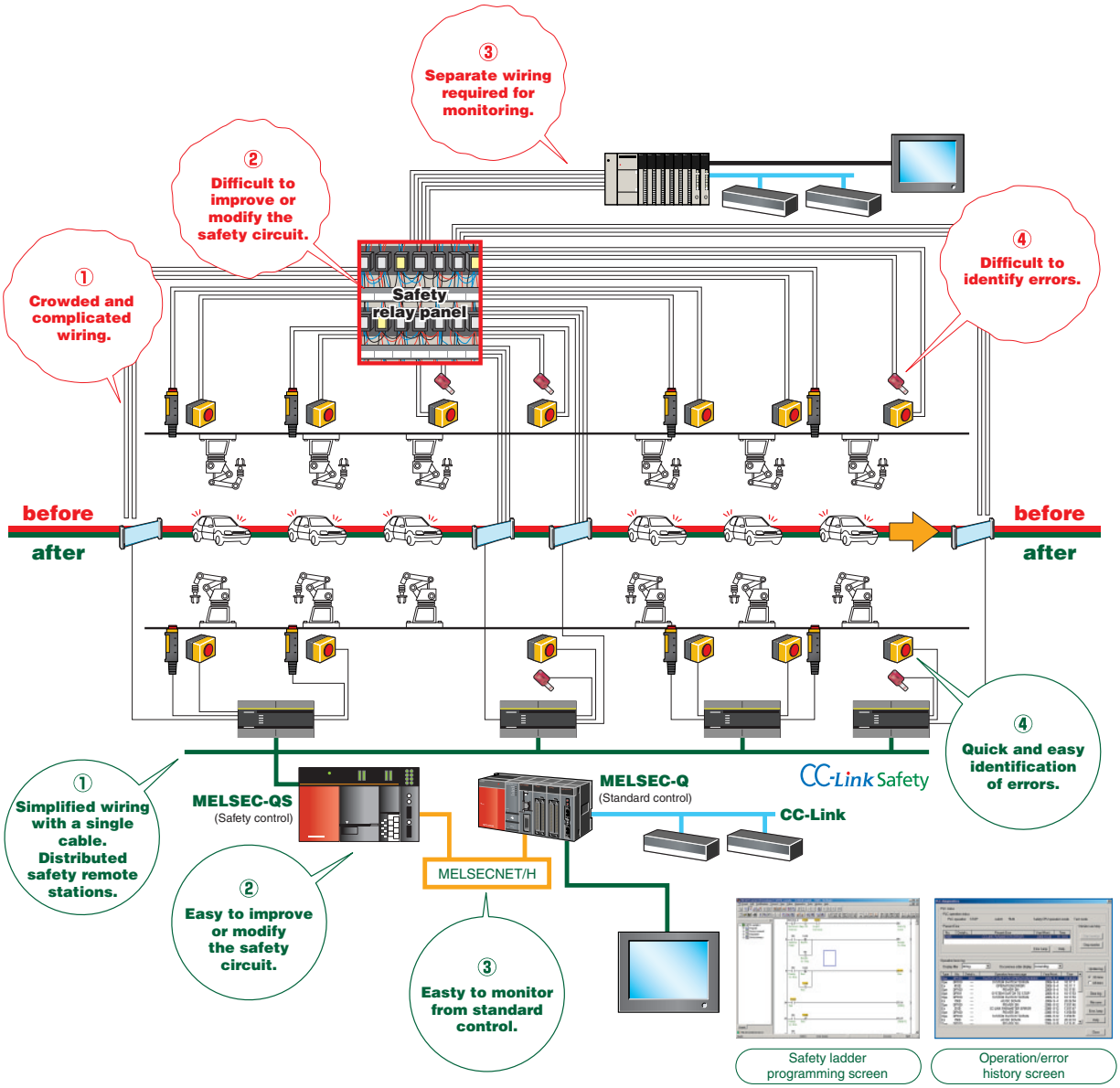
Building on Q Series technology to provide higher safety levels with enhanced system functions.

Solution 1

Reduced cost, increased diagnostics and flexibility through replacement of hardwired safety relay panels

MELSEC-QS Safety programmable controller solves the complicated wiring and time-consuming troubleshooting issues associated with previous safety relay systems.

Conventional system with safety relay

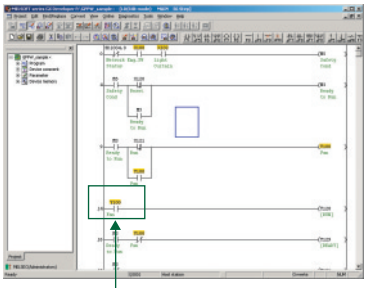


System with MELSEC-QS Safety programmable controller

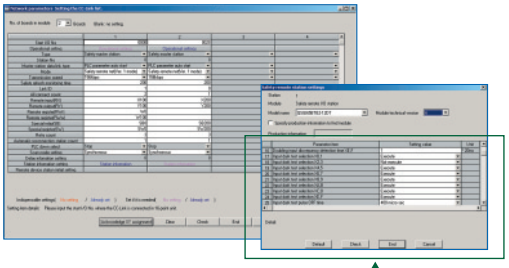
Solution 2

Simple engineering of systems which integrate machine and safety control

- Use GX Developer to start up both standard and safety control systems (programming, monitoring, diagnostics, and debugging).
- GX Developer can also configure all CC-Link and CC-Link Safety related parameters.



Safety device
(1) Safety devices displayed in yellow.



Examples of settable safety remote station parameters:
(1) Dual input verification time
(2) Dark test pulse enable
(3) Dark test pulse duty cycle

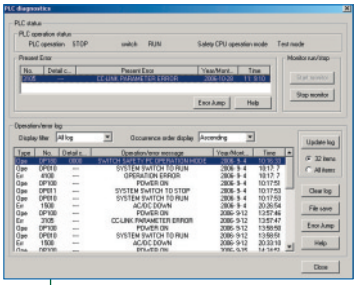
* Parameter setting examples are shown on page 12.

Solution 3

Easy error/failure troubleshooting

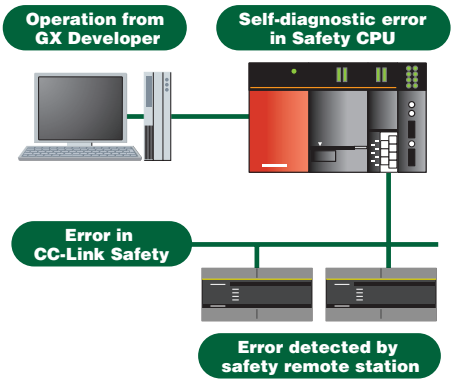
A total of up to 3,000 system operation events (user access, program changes, errors, etc.) can be stored.

- Provides full traceability for later analysis. Identity of users accessing the system, program download ID codes, timestamp information etc. are all logged.



History details can be checked from GX Developer.

- Remote STOP operation at 14:12 on 2006-12-19
- CC-Link Safety timeout at 15:20 on 2006-12-19
- Dual input verification in safety remote station at 0:10 on 2006-12-20

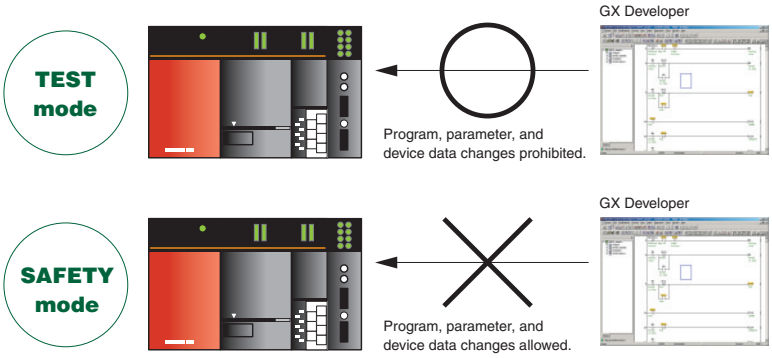


Safety, design and maintenance all integrated into one comprehensive system.

Solution 4

Same efficient debugging capabilities as MELSEC-Q Series

Debug functions (device test, write during RUN, etc.) are available in test mode.

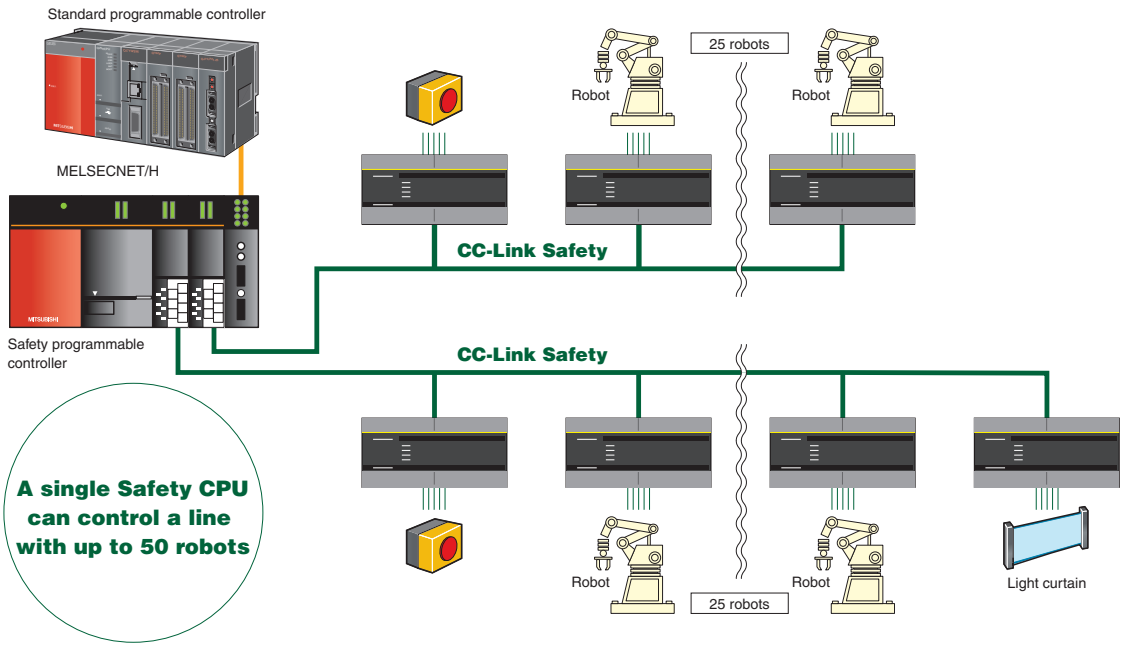


● SAFETY mode: Used during actual safety system operation. ● TEST mode: Used at system startup and during maintenance.

Solution 5

Scalable to a wide variety of system sizes

- One system can handle the safety demands of an entire line or large machine, avoiding the issues of multiple separate controllers. (A single Safety CPU can control up to 84 safety remote stations.)
- Flexible programming allows full system stops, partial system stops, and muting condition assignments, etc.
- Easy to expand I/O by changing parameters and programs, without requiring additional CPUs.

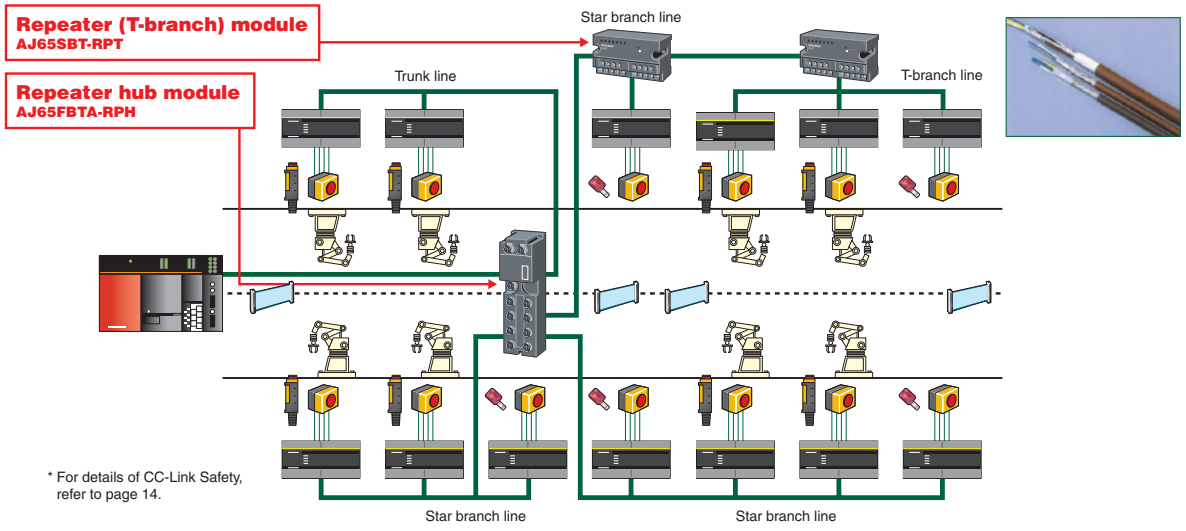


Solution 6

CC-Link Safety allows flexible network wiring

The same cables and wiring method as CC-Link are employed for CC-Link Safety (safety network). Moreover, existing T-branch, repeater hub modules, etc. can be used, allowing flexible wiring like CC-Link.

- Cables can be extended while maintaining high-speed transmission of max. 10 Mbps.
- At 10 Mbps, each branch line can be extended to maximum of 100 m.

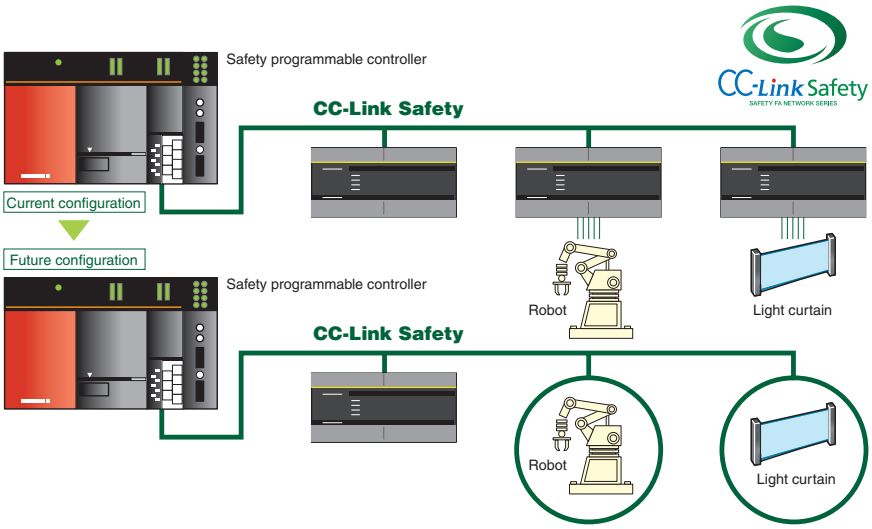


* For details of CC-Link Safety, refer to page 14.

Solution 7

Possibility of further reduction in wiring

The CC-Link Safety protocol specifications have been released by CLPA (CC-Link Partner Association).
Therefore, CC-Link Safety compatible products will be released by partner manufacturers, further minimizing wiring.

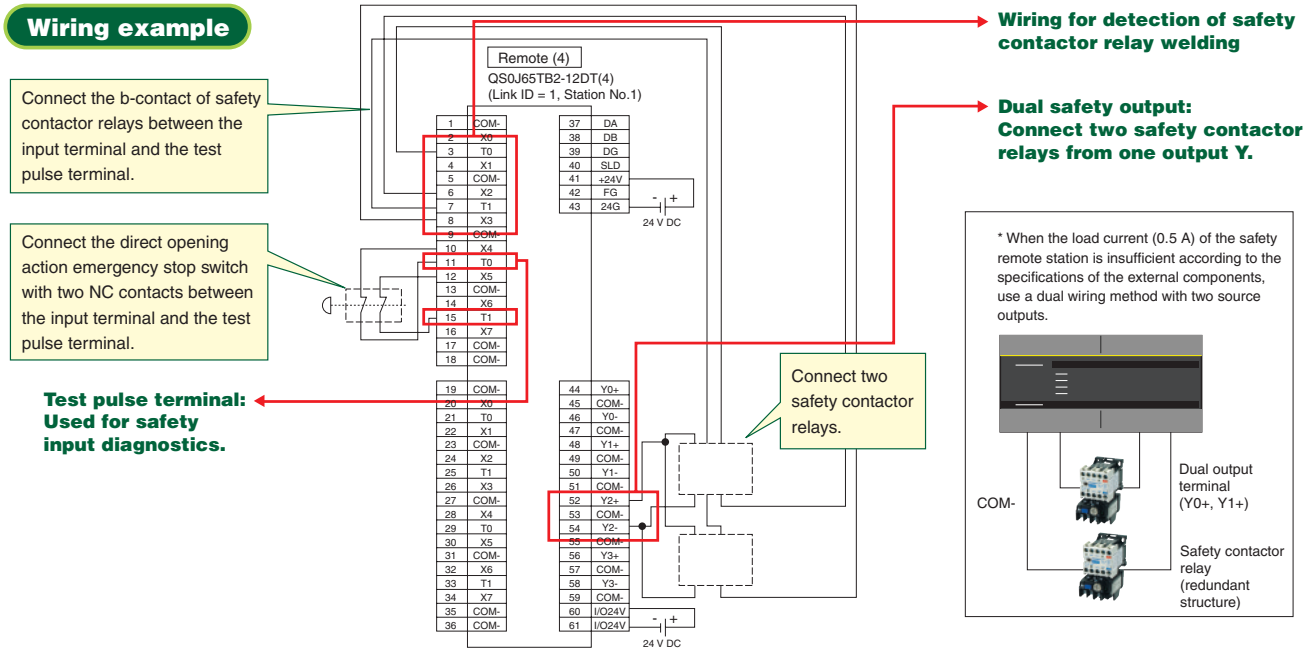


GX Developer handles parameter settings, programming, and error diagnostics, and facilitates MELSEC Safety design and maintenance.

Wiring and parameter setting example

The Safety programmable controller parameter settings, programming, and error diagnostics can be performed just like other MELSEC series products.
The following wiring example shows a system in which an emergency stop switch and two safety contactor relays are connected.

Wiring example



Parameter setting example

The following is an example of parameter settings when an emergency stop switch and safety contactor relay are connected.

Item	Setting
Time of noise removal filter × 2.3*	0: 1 ms . 1: 5 ms. 2: 10 ms. 3: 20 ms. 4: 50 ms
Time of noise removal filter × 4.5*	0: 1 ms . 1: 5 ms. 2: 10 ms. 3: 20 ms. 4: 50 ms
Doubling input discrepancy detection time × 2.3*	100 ms (Setting range: 20 to 500 ms)
Doubling input discrepancy detection time × 4.5*	100 ms (Setting range: 20 to 500 ms)
Input dark test selection × 2.3	0: Execute . 1: Not execute
Input dark test selection × 4.5	0: Execute . 1: Not execute
Input dark test pulse OFF time	0: 400 µs . 1: 1 ms. 2: 2 ms
Method of wiring of output Y2	0: No use. 1: Doubling wiring (source + sink). 2: Doubling wiring (source + source)
Output dark test selection Y2	0: Execute . 1: Not execute
Output dark test pulse OFF time Y2	0: 400 µs . 1: 1 ms. 2: 2 ms

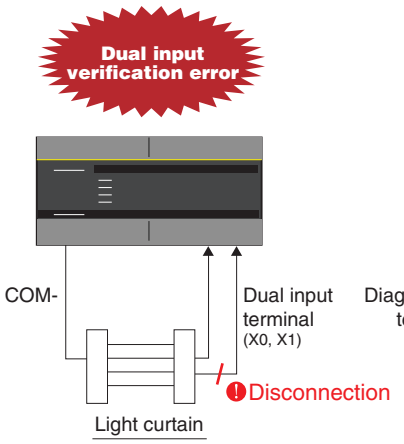
*: Adjust "Time of noise removal filter", "Input dark test pulse OFF time", and "Output dark test pulse OFF time" according to the installation environment and wiring length.
Set "Doubling input discrepancy detection time" to "100 ms" for the mechanical switch and "20 ms" for the sensor input as a guideline.

Input/output dark test function

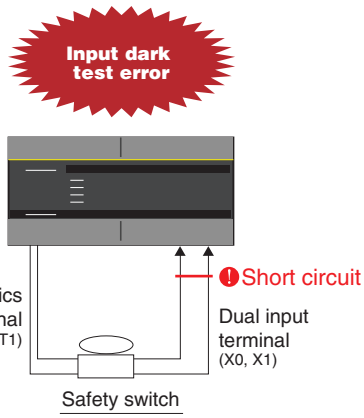
When the input/output is on, the module outputs a momentary OFF pulse which is used for failure diagnostics of contacts and external components.
For details regarding this failure diagnostics, refer to the "Safety input diagnostics" and "Safety output diagnostics" shown at right.
* For programming examples, refer to the "Safety Application Guide" (SH (NA)-080613ENG-A).

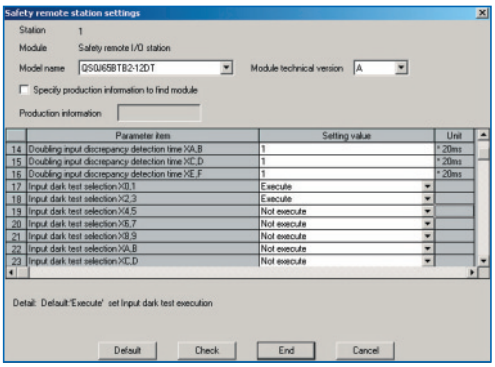
Safety input diagnostics

Diagnoses a failure including that of external components by verifying input signals of dual input wiring. Detects disconnection etc.



Diagnoses a failure of contacts and external components by the input dark test function. Detects short circuit etc.

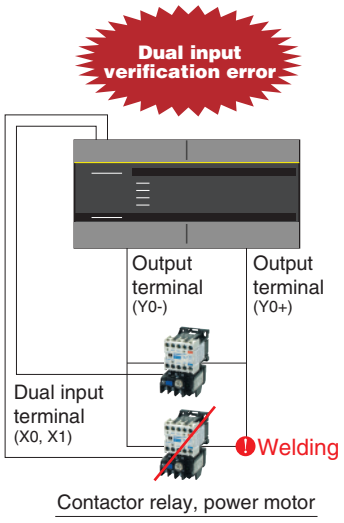




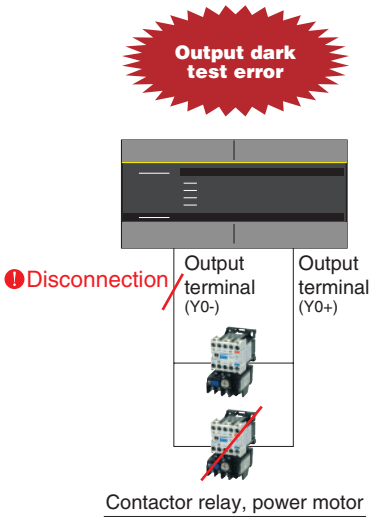
Safety remote station setting screen (input parameters)

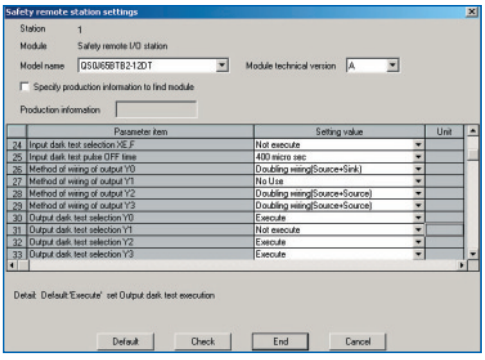
Safety output diagnostics

Inputs the b-contact of contactor relay and detects welding etc. of the contactor relay by the input dark test function.



Diagnoses a failure of contacts and external components by the output dark test function. Detects disconnection etc.





Safety remote station setting screen (output parameters)

* Need to connect safety inputs to the b-contact of contactor relays with forcibly guided contacts.

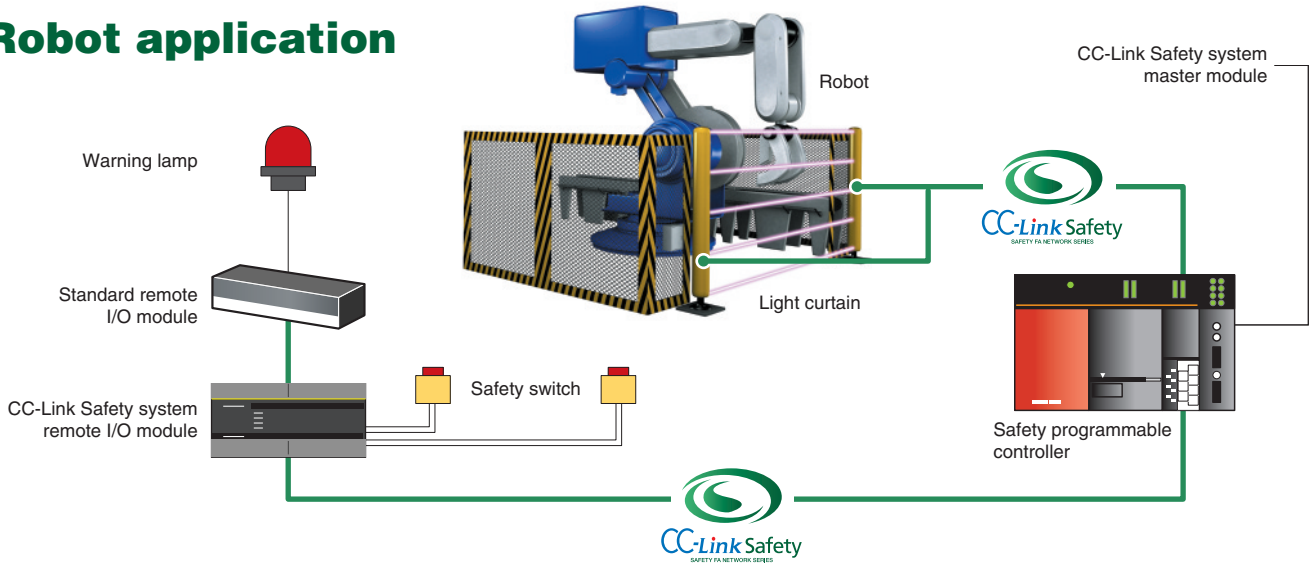
Safety field network "CC-Link Safety" The high-speed communication capability ensures safety and minimizes wiring.

Compatible with the CC-Link Safety, the safety field network

With enhanced communication error detection function, the "CC-Link Safety" has been developed based on the open field network "CC-Link", which originates from Japan. It was expanded to ensure machine safety and complies with the international standards IEC61508 SIL3, EN954-1/ISO13849-1 Category 4.
The CC-Link Safety protocol specifications have been released by the CLPA promotional organization (CC-Link Partner Association), and a variety of CC-Link Safety compatible products such as light curtains and robots are expected to be released from partner manufacturers in the near future.

Inherited functions	Transmission speed of 10 Mbps equivalent to CC-Link is realized, allowing use of the same CC-Link cables. Standard CC-Link stations can be connected.
Identifying the communication target station (safety remote I/O station)	The model name and production information of safety remote I/O stations can be set in the network parameters. Hence, an error can be detected if an incorrect safety remote I/O station is connected.
Enhanced RAS function	Detects communication errors such as communication delays and lost of messages and then stops the system completely.
Falexible safety system configuration	Safety remote I/O stations can be spread out, minimizing wiring for I/O. Extending I/O stations is also easy.

Robot application



For CC-Link Safety specifications and information on compatible products, refer to the following CC-Link Partner Association website:

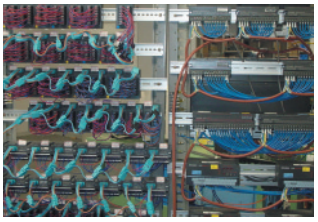
URL : http://www.cc-link.org/

The CC-Link Partner Association (CLPA): Actively working to promote the worldwide adoption of CC-Link Safety, and to facilitate new safety system advances.

From promotion to specification development, the CLPA actively supports CC-Link

The CC-Link Partner Association (CLPA) was established to promote the worldwide adoption of the CC-Link open field network. By conducting promotional activities, such as organizing trade shows and seminars, implementing conformance tests, and providing catalogs, brochures, and website information, the CLPA has been successfully increasing the number of CC-Link partner manufacturers and CC-Link compatible products. The CLPA takes a major role in the globalization of CC-Link.

■Conformance test to support the rapid increase in CC-Link compatible products.



■Exhibitions and seminars are held to recruit new CLPA members.

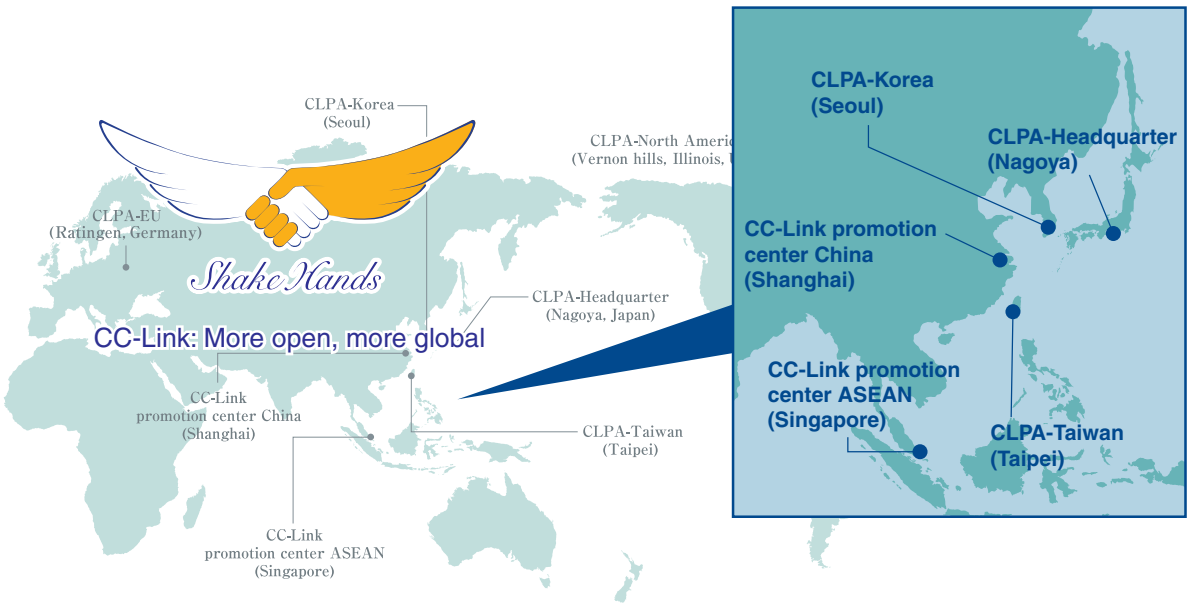
CC-Line Partner Association

The latest CC-Link information is posted on the website.

6F Meiji Yasuda Seimei Ozone Bldg. 3-15-58 Ozone, Kita-ku, Nagoya 462-0825, Japan
TEL : +81-52-919-1588 FAX : +81-52-916-8655 URL : http://www.cc-link.org/ E-mail : cc-link@post0.mind.ne.jp

CC-Link continues to increase its global influence

CC-Link is supported globally by the CLPA. With offices throughout the world, support for partner companies can be found locally. Each regional CLPA office undertakes various support and promotional activities to further the influence of the network in that part of the world. For companies looking to increase their presence in Asia, CLPA is well placed to assist these efforts through offices in all major Asian economies.

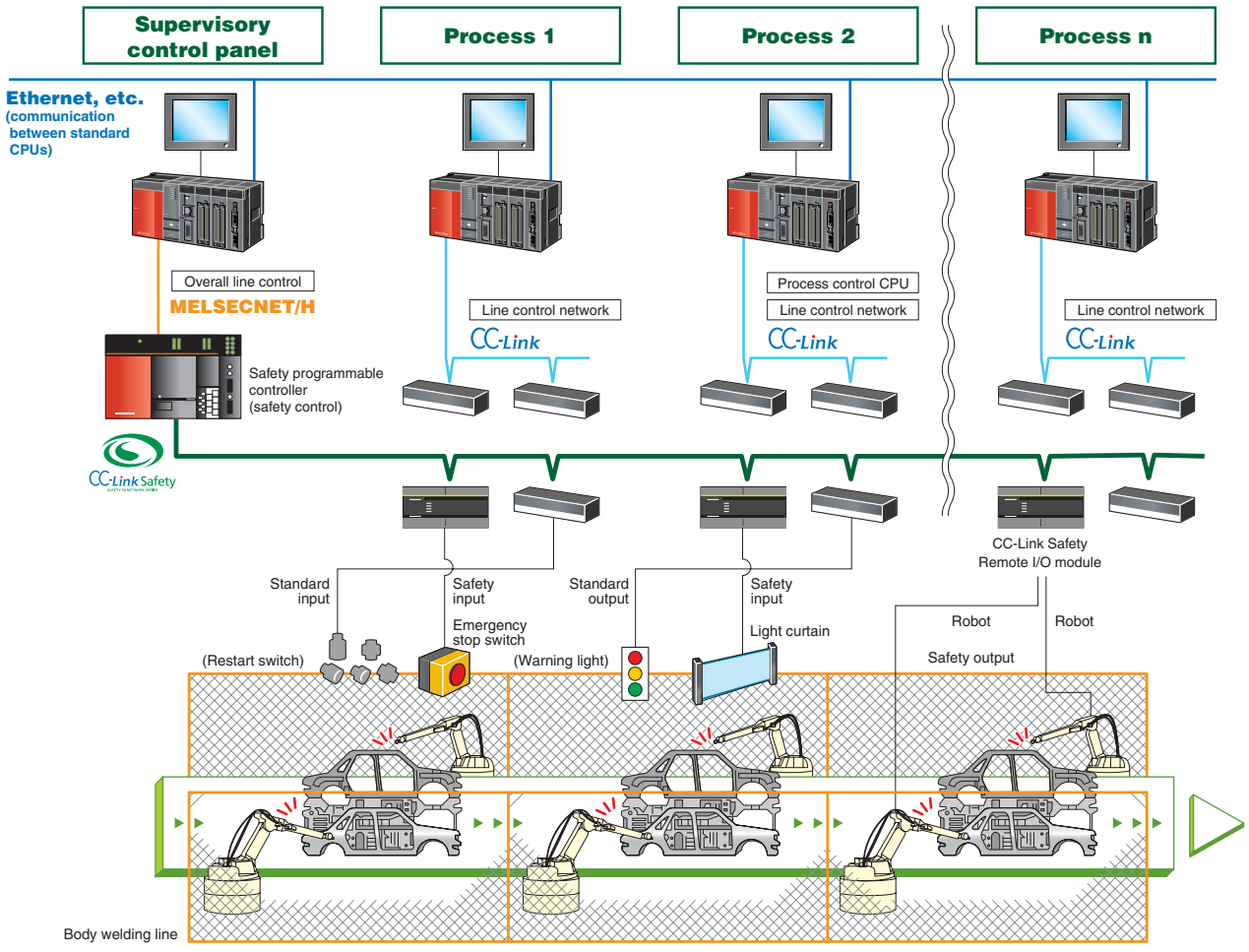


Meeting the safety needs of a variety of end-user industries around the world.

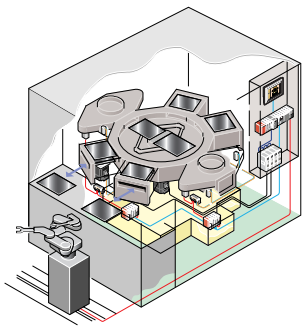
Application examples

Automotive welding line

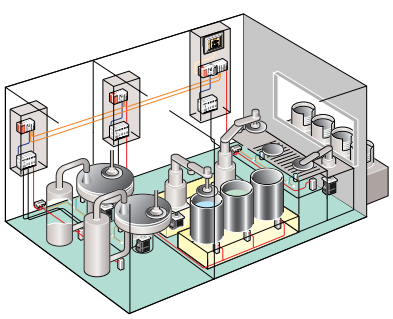
Ensures safety on a welding line with multiple welding robots.



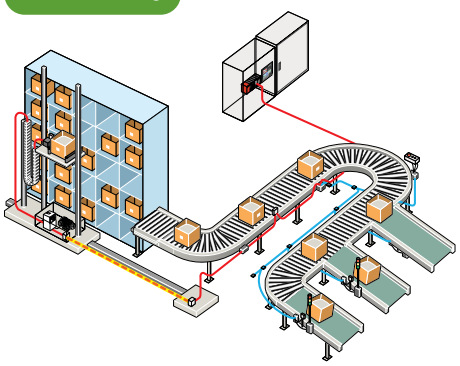
Liquid crystal manufacturing equipment



Semiconductor manufacturing equipment

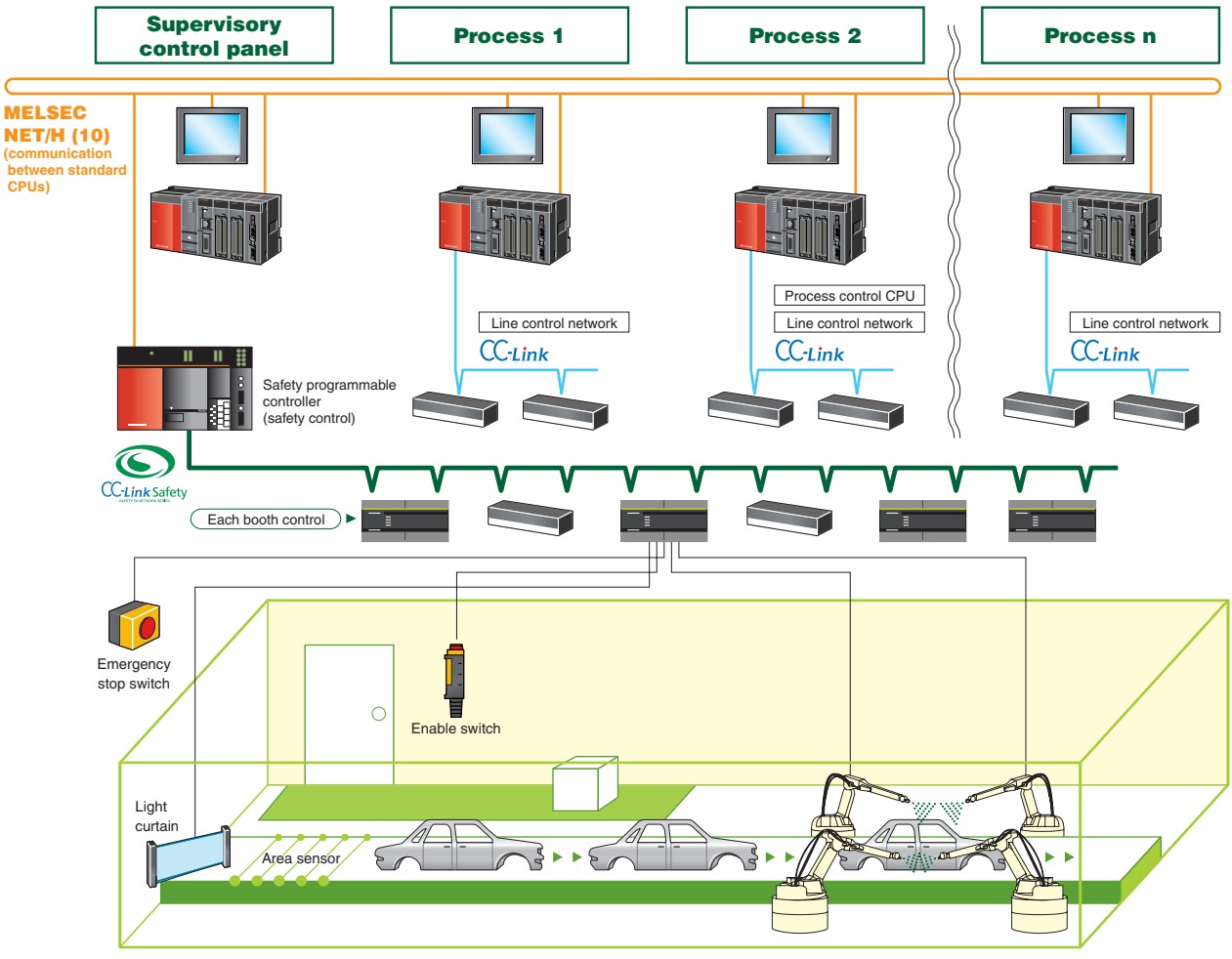


Material handling

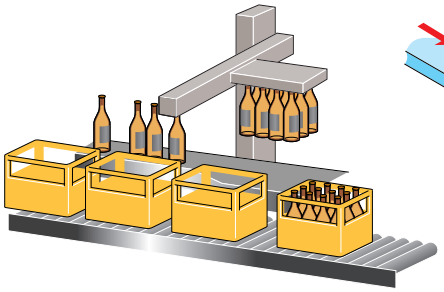


Automotive painting line

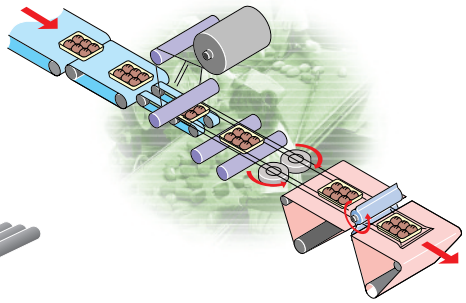
Ensures safety on a painting line including a paint booth, working area, etc.



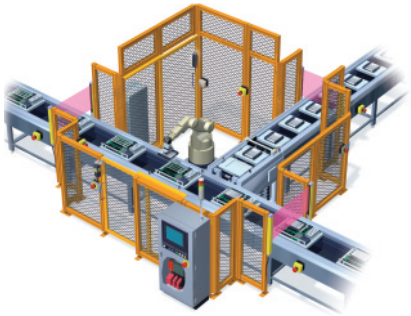
Beverage factory



Packaging equipment



Electronic assembly line



■General Specifications

Item	Specifications					
Operating ambient temperature	0 to 55°C					
Storage ambient temperature	-40 to 75°C					
Operating ambient humidity	5 to 95% RH, non-condensing					
Storage ambient humidity	5 to 95% RH, non-condensing					
Vibration resistance	Conforms to JIS B 3502, IEC61131-2		Frequency range	Constant acceleration	Half amplitude	Sweep count
		Under intermittent vibration	5 to 9 Hz	–	3.5 mm	10 times each in X, Y, Z directions
			9 to 150 Hz	9.8 m/s^2	–	
		Under continuous vibration	5 to 9 Hz	–	1.75 mm	
			9 to 150 Hz	4.9 m/s^2	–	
Shock resistance	Conforms to JIS B 3502, IEC61131-2 (147 m/s^2, 11 ms shock pulse duration, shine half-wave pulse applied 3 times each in X, Y, Z directions.)					
Operating ambience	No corrosive gases					
Operating altitude*3	2,000 m (6562 ft.) or less					
Installation location	Inside control panel					
Overvoltage category*1	II or less					
Pollution degree*2	2 or less					
Equipment category	Class I*4					

*1: This indicates the section of power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within the premises. Category II applies to equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for up to the rated voltage of 300 V is 2500 V.
*2: This index indicates the degree to which conductive material is generated in the environment where the device is used. Pollution degree 2 is when only non-conductive pollution occurs. However, temporary conductivity caused by condensation is to be expected.
*3: Do not store or use the programmable controller under the pressure higher than the atmospheric pressure of altitude 0 m. Doing so can cause a malfunction. When using the programmable controller under pressure, please consult your local sales representative.
*4: The equipment category of the CC-Link Safety system remote I/O module is Class III.

■Safety CPU Module Specifications

Item			QS001CPU
Control method			Cyclic program execution
I/O control mode			Refresh
Program language		Sequence control language	Relay symbol language, function block
Processing speed (sequence instruction)		LD X0	0.10 µs
		MOV D0 D1	0.35 µs
Constant scan (function that keeps scan time constant)			1 to 2,000 ms (setting unit: 1 ms)
Program capacity*1			14 k steps (56 KB)
Memory capacity		Program memory (Drive 0)	128 KB
		Standard ROM (Drive 4)	128 KB
Max. number of stored files		Program memory	3*2
		Standard ROM	3*2
Number of writes to standard ROM			Max. 100,000 times
Number of I/O device points			6144 points (X/Y0 to 17FF)
Number of I/O points			1024 points (X/Y0 to 3FF)
Number of device points	Internal relay [M]		Default: 6144 points (M0 to 6143) (changeable)
	Link relay [B]		Default: 2048 points (B0 to 7FF) (changeable)
	Timer [T]		Default: 512 points (T0 to 511) (changeable) (for low-/high-speed timer)
			Low-/high-speed timer is specified by instructions. The low-/high-speed timer measurement unit is set by parameters. (Low-speed timer: 1 to 1000 ms, in increments of 1 ms; default: 100 ms) (High-speed timer: 0.1 to 100 ms, in increments of 0.1 ms; default: 10 ms)
	Retentive timer [ST]		Default: 0 points (for low-/high-speed retentive timer) (changeable) Low-/high-speed retentive timer is specified by instructions. The low-/high-speed retentive timer measurement unit is set by parameters. (Low-speed retentive timer: 1 to 1000 ms, in increments of 1 ms; default: 100 ms) (High-speed retentive timer: 0.1 to 100 ms, in increments of 0.1 ms; default: 10 ms)
	Counter [C]		Normal counter default: 512 points (C0 to 511) (changeable)
	Data register [D]		Default: 6144 points (D0 to 6143) (changeable)
	Link register [W]		Default: 2048 points (W0 to 7FF) (changeable)
	Annunciator [F]		Default: 1024 points (F0 to 1023) (changeable)
	Edge relay [V]		Default: 1024 points (V0 to 1023) (changeable)
	Link special relay [SB]		1536 points (SB0 to 5FF)
	Link special register [SW]		1536 points (SW0 to 5FF)
	Special relay [SM]		5120 points (SM0 to 5119)
	Special register [SD]		5120 points (SD0 to 5119)
RUN/PAUSE contact			RUN contact: 1 point can be set in the range of X0 to 17FF, PAUSE contact: None
Clock function			Year, month, date, hour, minute, second, day (automatic leap-year detection) Accuracy: -3.18 to +5.25 s (TYP. +2.14 s)/d at 0°C Accuracy: -3.18 to +2.59 s (TYP. +2.07 s)/d at 25°C Accuracy: -12.97 to +3.63 s (TYP. +3.16 s)/d at 55°C
5 V DC internal current consumption			0.43 A
External dimensions		H	98 mm (3.86 inch)
		W	55.2 mm (2.17 inch)
		D	113.8 mm (4.48 inch)
Weight			0.29 kg
Degree of protection			IP2X

*1: The maximum number of executable sequence steps is calculated using the following formula:
(Program capacity) - (File header size [default: 34 steps])
For details of program capacity and file, refer to the following manual.
QSCPU User's Manual (Function Explanations, Program Fundamentals).
*2: The memory stores 1 file for each of parameter, sequence program, and device comment.

■Safety Power Supply Module Specifications

Item			QS061P-A1	QS061P-A2
Mounting position on base			QS Series power supply module mounting slot	
Applicable base unit			QS034B	
Input power supply			100 to 120 V AC +10% −15% (85 to 132 V AC)	200 to 240 V AC +10% −15% (170 to 264 V AC)
Input frequency			50/60 Hz ± 5%	
Input voltage distortion factor			5% or less	
Max. input apparent power			125 VA	
Inrush current			20 A 8 ms or less	
Rated output current	5 V DC		6 A	
Overcurrent protection			6.6 A or more	
Overvoltage protection			5.5 to 6.5 V	
Efficiency			70% or more	
Allowable momentary power failure period			20 ms or less	
Dielectric withstand voltage			Across inputs/LG and outputs/FG 1780 Vrms AC/3 cycles (Altitude: 2,000 m [6562 ft.])	Across inputs/LG and outputs/FG 2830 Vrms AC/3 cycles (Altitude: 2,000 m [6562 ft.])
Insulation resistance			Across Inputs/LG and outputs/FG, across inputs and LG, across outputs and FG: 10 MΩ or more by 500 V DC insulation resistance tester	
Noise immunity			• By noise simulator of 1500 Vp-p noise voltage, 1 µs pulse width, and 25 to 60 Hz noise frequency • Noise voltage IEC61000-4-4, 2 kV	
Operation indication			LED indicators (Normal: ON [green]; error: OFF)	
Fuse			Built-in (unchangeable by user)	
Contact output section		Application	ERR. contact	
		Rated switching voltage/current	24 V DC, 0.5 A	
		Min. switching load	5 V DC, 1 mA	
		Response time	OFF to ON: 10 ms or less, ON to OFF: 12 ms or less	
		Life	Mechanical: 20,000,000 times more; electrical: 100,000 times or more at rated switching voltage/current.	
		Surge suppressor	No	
		Fuse	No	
Terminal screw size			M3.5 screw	
Applicable wire size			0.75 to 2 mm^2	
Applicable crimping terminal			RAV1.25-3.5, RAV2-3.5 (thickness of 0.8 mm or less)	
Applicable tightening torque			0.66 to 0.89 N·m	
External dimensions		H	98 mm (3.86 inch)	
		W	55.2 mm (2.17 inch)	
		D	115 mm (4.53 inch)	
Weight			0.40 kg	

■Safety Main Base Unit Specifications

Item		QS034B-E
Number of mountable I/O modules		4
Possibility of extension		Not extendable
Applicable modules		QS Series modules
5 V DC internal current consumption		0.095 A
Mounting hole size		M4 screw hole or ϕ4.5 hole (for M4 screw)
External dimensions	H	98 mm (3.86 inch)
	W	245 mm (9.65 inch)
	D	44.1 mm (1.74 inch)
Weight		0.28 kg
Accessories		Mounting screws M4 × 14 (4 screws) (DIN rail mounting adaptor to be sold separately)
DIN rail mounting adaptor type		Q6DIN2

■CC-Link Safety System Master Module Specifications

Item		QS0J61BT12				
Transmission speed		Selectable from 156 kbps/625 kbps/2.5 Mbps/5 Mbps/10 Mbps				
Max. overall cable distance (max. transmission distance)		Ver. 1.10 compatible, CC-Link dedicated cable (Terminating resistor of 110 Ω is used)				
		Transmission speed	Station-to-station cable length		Max. overall cable distance	
		156 kbps	20 cm or more		1200 m	
		625 kbps			900 m	
		2.5 Mbps			400 m	
		5 Mbps			160 m	
		10 Mbps			100 m	
Max. number of connectable modules		64 modules (42 for safety remote stations)				
Max. number of link points per system		Remote I/O (RX, RY): 2048 points				
		Remote register (RWr): 256 points (remote device station to master station)				
		Remote register (RWw): 256 points (master station to remote device station)				
Number of link points per remote station	Station type	Safety remote station	Standard remote station			
	Number of occupied stations	1 station	1 station	2 stations	3 stations	4 stations
	RX	32 points	32 points	64 points	96 points	128 points
	RY	32 points	32 points	64 points	96 points	128 points
	RWr	0 points	4 points	8 points	12 points	16 points
	RWw	0 points	4 points	8 points	12 points	16 points
Communication method		Broadcast polling method				
Synchronization method		Flag synchronous method				
Coding method		NRZI method				
Transmission path		Bus (RS-485)				
Transmission format		HDLC compliant				
Error control system		CRC32*2 ($X^{32}+X^{26}+X^{23}+X^{22}+X^{16}+X^{12}+X^{11}+X^{10}+X^{8}+X^{7}+X^{5}+X^{4}+X^{2}+X+1$)				
		CRC16 ($X^{16}+X^{12}+X^{5}+1$)				
Connection cable		Ver. 1.10 compatible, CC-Link dedicated cable*1				
Number of occupied I/O points		32 points (I/O assignment: 32 intelligent points)				
5 V DC internal current consumption		0.46 A				
Weight		0.12 kg				

*1: CC-Link dedicated cable (Ver. 1.00) or CC-Link dedicated high-performance cable can also be used. Using a cable together with another type of cable is not allowed. Attach terminating resistors that match the cable type. Two terminating resistors (110 Ω) are included with the CC-Link Safety system master module.

*2: Error detection using CRC32 is not performed for communication with standard remote I/O stations or remote device stations.

■CC-Link Safety System Remote I/O Module Specifications

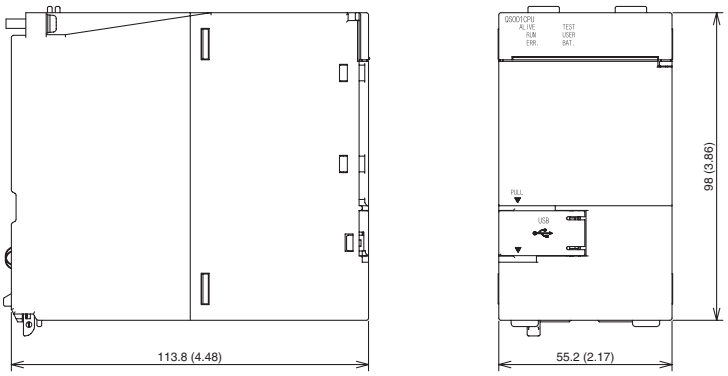
Item		QS0J65BTB2-12DT			
		Input specifications	Output specifications		
Number of input points		8 points (input terminals: 16 points*2)	Number of output points		4 points (source + sink type) 2 points (source + source type)
Isolation method		Photocoupler	Isolation method		Photocoupler
Rated input voltage		24 V DC	Rated load voltage		24 V DC
Rated input current		Approx. 4.6 mA	Operating load voltage range		19.2 to 28.8 V DC (ripple ratio: 5% or less)
Operating voltage range		19.2 to 28.8 V DC (ripple ratio: 5% or less)	Max. load current		0.5 A/point
Max. number of simultaneous input points		100%	Max. inrush current		1.0 A 10 ms or less
On voltage/ON current		15 V DC or more/2 mA or more	Leakage current at OFF		0.5 mA or less
OFF voltage/OFF current		5 V DC or less/0.5 mA or less	Max. voltage drop at ON		1.0 V DC or less
Input resistance		Approx. 5.6 kΩ	Protection function		Output overload protection function
Input type		Negative common	Output type		Source + sink type Source + source type
Response time	OFF to ON	0.4 ms or less (at 24 V DC)	Response time	OFF to ON	0.4 ms or less (at 24 V DC)
	ON to OFF	0.4 ms or less (at 24 V DC)		ON to OFF	0.4 ms or less (at 24 V DC)
Safety remote station input response time		32 ms or less + filter-out time (1 ms, 5 ms, 10 ms, 20 ms, 50 ms)	Safety remote station output response time		32 ms or less
			Surge suppressor		Zener diode
External power supply*1	Voltage	19.2 to 28.8 V DC (ripple ratio: 5% or less)			
	Current	60 mA (at 24 V DC, all points ON, not including external load current)			
	Protection function	External power supply overvoltage/overcurrent protection function			
	Fuse	8 A (not replaceable)			
Wiring method for common		16 input points/common, 4 output points/common (terminal block 2-wire type)			
Common current		Max. 4 A (total of inputs and outputs)			
Number of occupied stations		1 station			
Number of writes to nonvolatile memory inside module		10^{12} times			
Safety refresh response processing time		38 ms			
Module power*1	Voltage	19.2 to 28.8 V DC (ripple ratio: 5% or less)			
	Current	140 mA or less (at 24 V DC, all points ON)			
	Protection function	Module power supply overvoltage/overcurrent protection function			
	Fuse	0.8 A (not replaceable)			
	Momentary power failure period	10 ms or less			
Degree of protection		IP2X			
Weight		0.67 kg			
External connections	Communication, module power supply	7-point detachable terminal block [transmission circuits, module power supply, FG] M3 × 5.2; tightening torque: 0.425 to 0.575 N·m; 2 crimping terminals or less			
	External power supply, I/O	18-point detachable terminal block × 3 [external power supply, I/O signals] M3 × 5.2; tightening torque: 0.425 to 0.575 N·m; 2 crimping terminals or less			
Module mounting screw		M4 screw with polished, round flat washer (tightening torque: 0.824 to 1.11 N·m); mountable with a DIN rail, and in 6 orientations.			
Applicable DIN rail		TH35-7.5Fe, TH35-7.5Al (JIS C 2812 compliant)			
Applicable wire size		0.3 to 2.0 mm^2			
Applicable crimping terminal		• RAV1.25-3 (JIS C 2805 compliant) [applicable wire size: 0.3 to 1.25 mm^2] • V2-MS3 (JST Mfg. Co., Ltd.), RAP2-3SL (Nippon Tanshi Co., Ltd.), TGV2-3N (Nichifu) [applicable wire size: 1.25 to 2.0 mm^2]			

*1: The power supply connected to the QS0J65BTB2-12DT must satisfy the following conditions:
(1) SELV (Safety Extra Low Voltage): Reinforced isolation from hazardous areas (48 V or more) required.
(2) Compliance with LVD (Low Voltage Directives).
(3) Output voltage specification must be 19.2 to 28.8 V DC (ripple rate: 5% or less).

*2: Two input terminals are assigned for each input since dual wiring is supported.

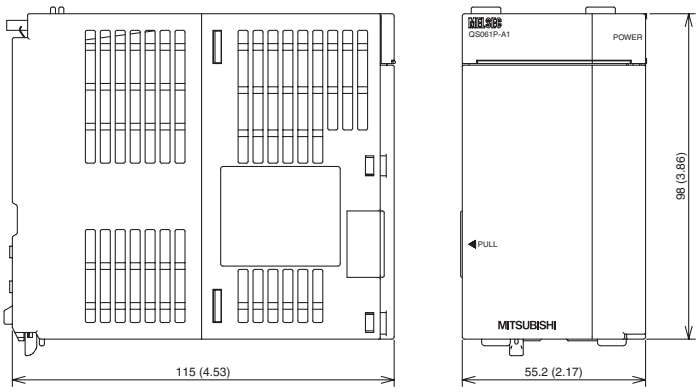
External Dimensions of Safety CPU Module

Unit: mm (inch)



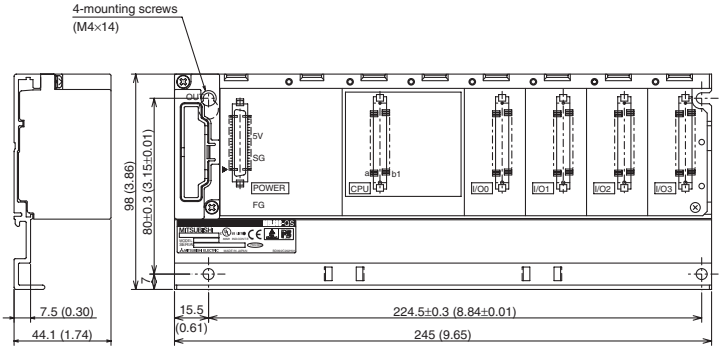
External Dimensions of Safety Power Supply Module

Unit: mm (inch)



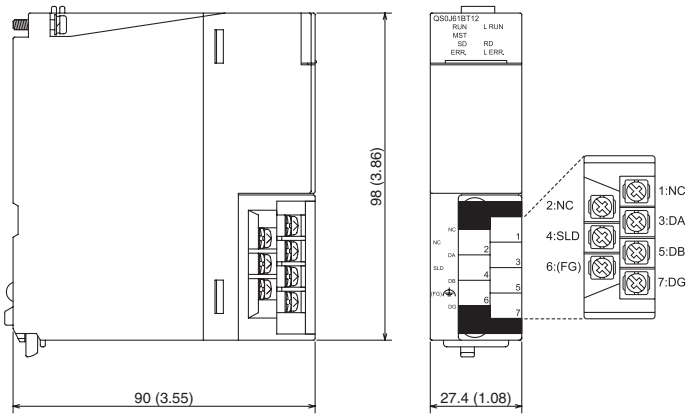
External Dimensions of Safety Main Base Unit

Unit: mm (inch)



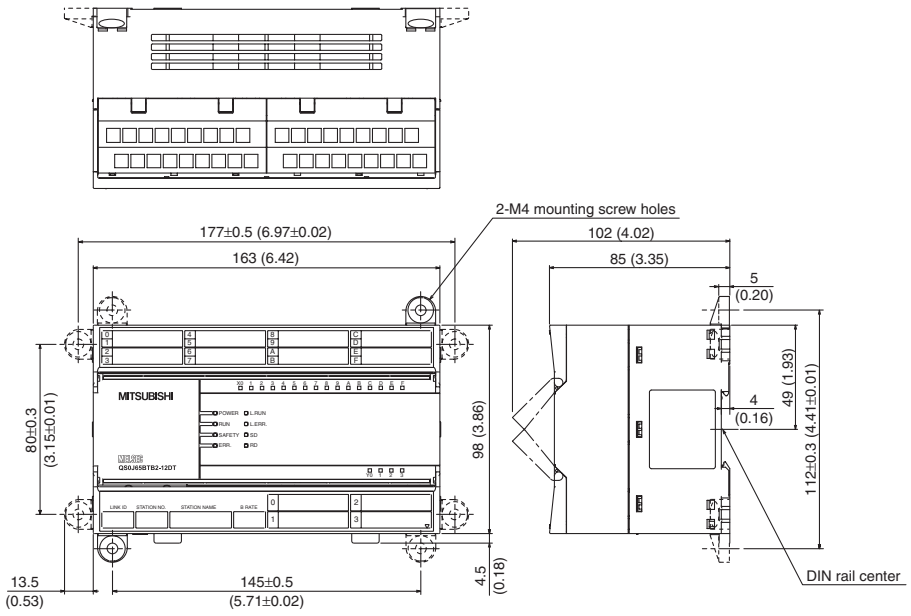
External Dimensions of CC-Link Safety System Master Module

Unit: mm (inch)



External Dimensions of CC-Link Safety System Remote I/O Module

Unit: mm (inch)



Product name	Model	Outline
Safety CPU module	QS001CPU	Program capacity: 14 k steps, number of I/O device points: 6144 points, operation/error history: 3,000 records
Safety main base unit	QS034B-E	4 slots, for QS Series and MELSECNET/H modules
Safety power supply module	QS061P-A1	Input: 100 to 120 V AC, 50/60 Hz; output: 5 V 6 A; with overvoltage/overcurrent protection and shutdown circuit diagnostics
	QS061P-A2	Input: 200 to 240 V AC, 50/60 Hz; output: 5 V 6 A; with overvoltage/overcurrent protection and shutdown circuit diagnostics
CC-Link Safety system master module	QS0J61BT12	Max. number of connectable modules: 64 (42 for safety stations), safety station information management
CC-Link Safety system remote I/O module	QS0J65BTB2-12DT	Safety input: 8 points (dual input); safety output: 4 points (dual output)
GX Developer	SW8D5C-GPPW-E	Version 8.40S or later

Warranty

1. Limited Warranty and Product Support

a. Mitsubishi Electric Corporation ("MELCO") warrants that for a period of eighteen (18) months after date of delivery from the point of manufacture or one year from date of Customer's purchase, whichever is less, Mitsubishi MELSEC Safety programmable controllers (the "Products") will be free from defects in material and workmanship.
b. At MELCO's option, for those Products MELCO determines are not as warranted, MELCO shall either repair or replace them or issue a credit or return the purchase price paid for them.
c. For this warranty to apply:
(1) Customer shall give MELCO (i) notice of a warranty claim to MELCO and the authorized dealer or distributor from whom the Products were purchased, (ii) the notice shall describe in reasonable details the warranty problem, (iii) the notice shall be provided promptly and in no event later than thirty (30) days after the Customer knows or has reason to believe that Products are not as warranted, and (iv) in any event, the notice must given within the warranty period;
(2) Customer shall cooperate with MELCO and MELCO's representatives in MELCO's investigation of the warranty claim, including preserving evidence of the claim and its causes, meaningfully responding to MELCO's questions and investigation of the problem, grant MELCO access to witnesses, personnel, documents, physical evidence and records concerning the warranty problem, and allow MELCO to examine and test the Products in question offsite or at the premises where they are installed or used; and
(3) If MELCO requests, Customer shall remove Products it claims are defective and ship them to MELCO or MELCO's authorized representative for examination and, if found defective, for repair or replacement. The costs of removal, shipment to and from MELCO's designated examination point, and reinstallation of repaired or replaced Products shall be at Customer's expense.
(4) If Customer requests and MELCO agrees to effect repairs onsite at any domestic or overseas location, the Customer will pay for the costs of sending repair personnel and shipping parts. MELCO is not responsible for any re-commissioning, maintenance, or testing on-site that involves repairs or replacing of the Products.
d. Repairs of Products located outside of Japan are accepted by MELCO's local authorized service facility centers ("FA Centers"). Terms and conditions on which each FA Center offers repair services for Products that are out of warranty or not covered by MELCO's limited warranty may vary.
e. Subject to availability of spare parts, MELCO will offer Product repair services for (7) years after each Product model or line is discontinued, at MELCO's or its FA Centers' rates and charges and standard terms in effect at the time of repair. MELCO usually produces and retains sufficient spare parts for repairs of its Products for a period of seven (7) years after production is discontinued.
f. MELCO generally announces discontinuation of Products through MELCO's Technical Bulletins. Products discontinued and repair parts for them may not be available after their production is discontinued.

2. Limits of Warranties

a. MELCO does not warrant or guarantee the design, specify, manufacture, construction or installation of the materials, construction criteria, functionality, use, properties or other characteristics of the equipment, systems, or production lines into which the Products may be incorporated, including any safety, fail-safe and shut down systems using the Products.
b. MELCO is not responsible for determining the suitability of the Products for their intended purpose and use, including determining if the Products provide appropriate safety margins and redundancies for the applications, equipment or systems into which they are incorporated.
c. Customer acknowledges that qualified and experienced personnel are required to determine the suitability, application, design, construction and proper installation and integration of the Products. MELCO does not supply such personnel.
d. MELCO is not responsible for designing and conducting tests to determine that the Product functions appropriately and meets application standards and requirements as installed or incorporated into the end-user's equipment, production lines or systems.
e. MELCO does not warrant any Product:
(1) repaired or altered by persons other than MELCO or its authorized engineers or FA Centers;
(2) subjected to negligence, carelessness, accident, misuse, or damage;
(3) improperly stored, handled, installed or maintained;
(4) integrated or used in connection with improperly designed, incompatible or defective hardware or software;
(5) that fails because consumable parts such as batteries, backlights, or fuses were not tested, serviced or replaced;
(6) operated or used with equipment, production lines or systems that do not meet applicable and commensurate legal, safety and industry-accepted standards;
(7) operated or used in abnormal applications;
(8) installed, operated or used in contravention of instructions, precautions or warnings contained in MELCO's user, instruction and/or safety manuals, technical bulletins and guidelines for the Products;
(9) used with obsolete technologies or technologies not fully tested and widely accepted and in use at the time of the Product's manufacture;
(10) subjected to excessive heat or moisture, abnormal voltages, shock, excessive vibration, physical damage or other improper environment; or
(11) damaged or malfunctioning due to Acts of God, fires, acts of vandals, criminals or terrorists, communication or power failures, or any other cause or failure that results from circumstances beyond MELCO's control.
f. All Product information and specifications contained on MELCO's website and in catalogs, manuals, or technical information materials provided by MELCO are subject to change without prior notice.
g. The Product information and statements contained on MELCO's website and in catalogs, manuals, technical bulletins or other materials provided by MELCO are provided as a guide for Customer's use. They do not constitute warranties and are not incorporated in the contract of sale for the Products.
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i. THE WARRANTIES AND REMEDIES SET FORTH IN THESE TERMS ARE THE EXCLUSIVE AND ONLY WARRANTIES AND REMEDIES THAT APPLY TO THE PRODUCTS.
j. MELCO DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

3. Limits on Damages

a. MELCO'S MAXIMUM CUMULATIVE LIABILITY BASED ON ANY CLAIMS FOR BREACH OF WARRANTY OR CONTRACT, NEGLIGENCE, STRICT TORT LIABILITY OR OTHER THEORIES OF RECOVERY REGARDING THE SALE, REPAIR, REPLACEMENT, DELIVERY, PERFORMANCE, CONDITION, SUITABILITY, COMPLIANCE, OR OTHER ASPECTS OF THE PRODUCTS OR THEIR SALE, INSTALLATION OR USE SHALL BE LIMITED TO THE PRICE PAID FOR PRODUCTS NOT AS WARRANTED.
b. Although MELCO has obtained the certification for Product's compliance to the international safety standards IEC61508 and EN954-1/ISO13849-1 from TUV Rheinland, this fact does not guarantee that Product will be free from any malfunction or failure. The user of this Product shall comply with any and all applicable safety standard, regulation or law and take appropriate safety measures for the system in which the Product is installed or used and shall take the second or third safety measures other than the Product. MELCO is not liable for damages that could have been prevented by compliance with any applicable safety standard, regulation or law.
C MELCO prohibits the use of Products with or in any application involving power plants, trains, railway systems, airplanes, airline operations, other transportation systems, amusement equipments, hospitals, medical care, dialysis and life support facilities or equipment, incineration and fuel devices, handling of nuclear or hazardous materials or chemicals, mining and drilling, and other applications where the level of risk to human life, health or property are elevated.
d. MELCO SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL, INDIRECT OR PUNITIVE DAMAGES, FOR LOSS OF PROFITS, SALES, OR REVENUE, FOR INCREASED LABOR OR OVERHEAD COSTS, FOR DOWNTIME OR LOSS OF PRODUCTION, FOR COST OVERRUNS, OR FOR ENVIRONMENTAL OR POLLUTION DAMAGES OR CLEAN-UP COSTS, WHETHER THE LOSS IS BASED ON CLAIMS FOR BREACH OF CONTRACT OR WARRANTY, VIOLATION OF STATUTE, NEGLIGENCE OR OTHER TORT, STRICT LIABILITY OR OTHERWISE.
e. In the event that any damages which are asserted against MELCO arising out of or relating to the Products or defects in them, consist of personal injury, wrongful death and/or physical property damages as well as damages of a pecuniary nature, the disclaimers and limitations contained in these terms shall apply to all three types of damages to the fullest extent permitted by law. If, however, the personal injury, wrongful death and/or physical property damages cannot be disclaimed or limited by law or public policy to the extent provided by these terms, then in any such event the disclaimer of and limitations on pecuniary or economic consequential and incidental damages shall nevertheless be enforceable to the fullest extent allowed by law.
f. In no event shall any cause of action arising out of breach of warranty or otherwise concerning the Products be brought by Customer more than one year after the cause of action accrues.
g. Each of the limitations on remedies and damages set forth in these terms is separate and independently enforceable, notwithstanding the unenforceability or failure of essential purpose of any warranty, undertaking, damage limitation, other provision of these terms or other terms comprising the contract of sale between Customer and MELCO.

4. Delivery/Force Majeure

a. Any delivery date for the Products acknowledged by MELCO is an estimated and not a promised date. MELCO will make all reasonable efforts to meet the delivery schedule set forth in Customer's order or the purchase contract but shall not be liable for failure to do so.
b. Products stored at the request of Customer or because Customer refuses or delays shipment shall be at the risk and expense of Customer.
c. MELCO shall not be liable for any damage to or loss of the Products or any delay in or failure to deliver, service, repair or replace the Products arising from shortage of raw materials, failure of suppliers to make timely delivery, labor difficulties of any kind, earthquake, fire, windstorm, flood, theft, criminal or terrorist acts, war, embargoes, governmental acts or rulings, loss or damage or delays in carriage, acts of God, vandals or any other circumstances reasonably beyond MELCO's control.

Local sales office warranty conditions also apply. Please contact your local Mitsubishi Electric sales office or sales representatives.

Online information for reference and learning... The MELFANSweb offers speedy answers to questions about Mitsubishi FA devices.

MELFANSweb – your source for FA information

The "MELFANSweb" offers a wealth of information concerning Mitsubishi FA devices. Registering over 100,000 hits a day, the site is clearly popular with our customers. The MELFANSweb content includes information about products, an FA terminology glossary, and information about seminars and FA devices, and it represents a powerful resource for users of Mitsubishi FA.

MELFANSweb web site URL:

http://www.MitsubishiElectric.co.jp/melfansweb/english

List of Related Catalogs

01. MELSEC Q Series Catalog L (NA) 08033E-C

02. MELSEC Q Series Data Book L (NA) 08029E-B

03. CC-Link, CC-Link/LT Catalog L (NA) 08038E-B

04. CC-Link and CC-Link/LT Compatible Product Databook L (NA) 08039E-B

05. MELSOFT Catalog L (NA) 08008-C

06. GOT-1000 Series Catalog L (NA) 08054E

Mitsubishi Safety Programmable Controller
MELSEC Safety

Precautions for Choosing the Products

This catalog explains the typical features and functions of the QS Series programmable controller and does not provide restrictions and other information on usage and module combinations. When using the products, always read the user's manuals of the products. Also, confirm the "Warranty" on page 22 before using the products.

⚠ For safe use

- To use the products given in this catalog properly, always read the manuals before starting to use them.
- Confirm the "Warranty" on page 22 before using the products.

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