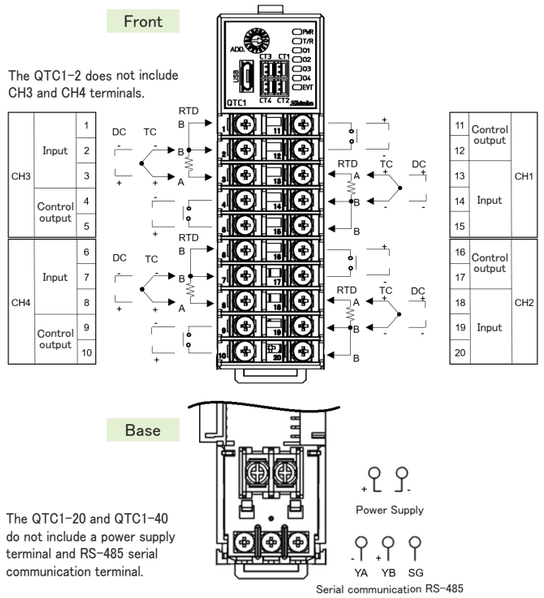
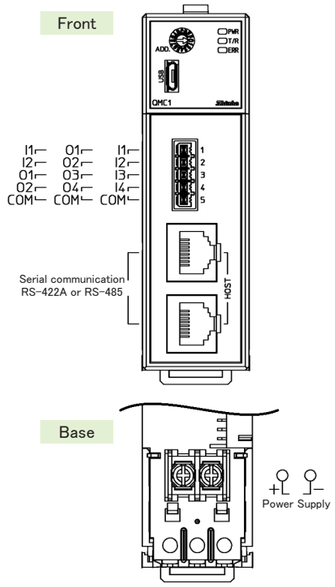
Terminal Arrangement

Control Module QTC1-2/QTC1-4

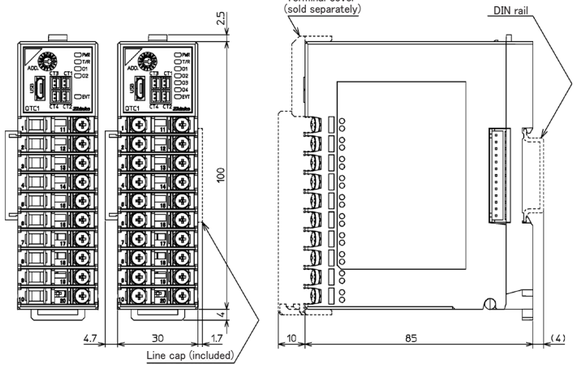


Communication Expansion Module QMC1

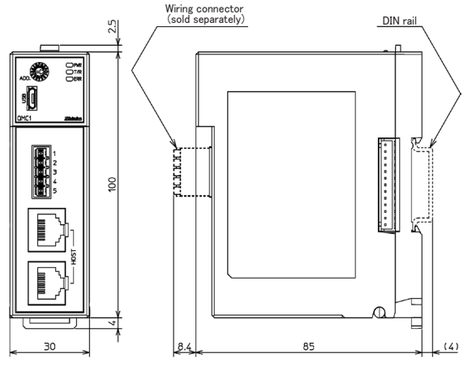


Dimensions (Scale: mm)

Control Module QTC1-2/QTC1-4



Communication Expansion Module QMC1



SAFETY PRECAUTIONS

- To ensure safe and correct use, thoroughly read and understand the manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after consulting with our agency or main office regarding the purpose of use. (Never use this instrument for medical purposes in which human lives are involved.)
- External protection devices such as protection equipment against excessive temperature rise, etc. must be installed, as a malfunction of this product could result in serious damage to the system or injury to personnel. Also, proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in the manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

Caution with respect to Export Trade Control Ordinance

To avoid this instrument from being used as a component in or being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment), please investigate the end users and the final use of this instrument. In the case of resale, ensure that this instrument is not illegally exported.

- This catalog is current as of June 2022, and its contents are subject to change without notice.
- The photos in this catalog do not show actual usage.
- If you have any inquiries, please consult your us or our agency.

SHINKO TECHNOS CO., LTD.
OVERSEAS DIVISION
Head Office : 2-5-1, Senbahigashi, Minoo, Osaka, 562-0035, Japan
Tel : +81-72-727-6100
Fax : +81-72-727-7006
URL : https://shinko-technos.co.jp/e/
E-mail : overseas@shinko-technos.co.jp

202206 E07

Max. 1024-point measurement, control, and monitoring

MODULAR CONTROLLERS

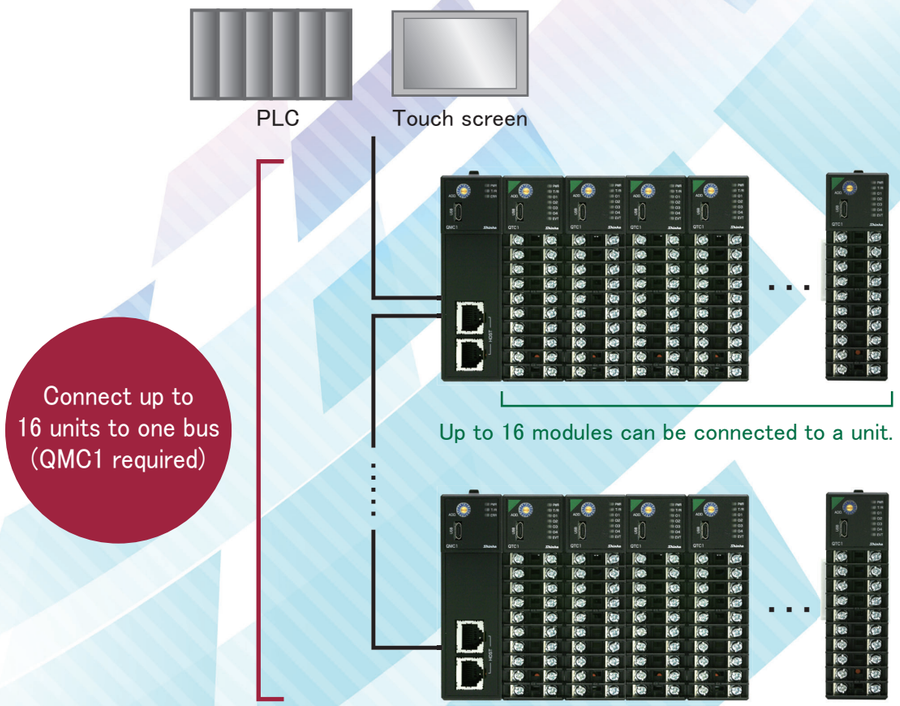
QX1 series

Internally mounted control system for multi-point measurement, control, and monitoring functionality

Shinko

Multi-point controller for infinite possibilities

Max. 1024-point measurement and control



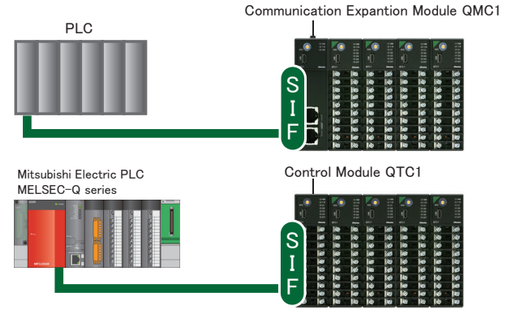
1 Program-less connections to PLCs for reduced work (SIF function)

The Smart InterFace (SIF) function (program-less PLC communication function) enables direct connectivity to PLCs from various manufacturers.
(Connect up to 1 unit to one bus)

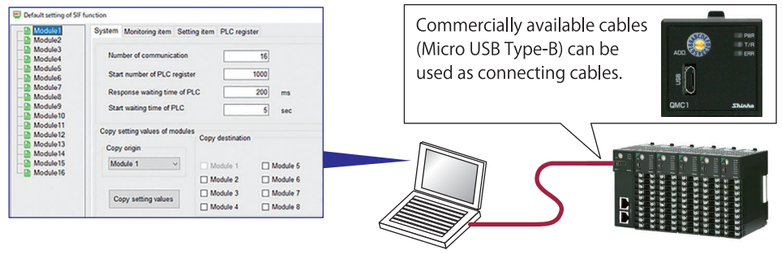
Supported PLC

Manufacturer	Resister	Communication command	
Mitsubishi Electric	D resister	QR/QW	(*)
Mitsubishi Electric	R resister	QR/QW	
Mitsubishi Electric	D resister	WR/WW	
Mitsubishi Electric	R resister	WR/WW	
OMRON	DM resister	FINS command	
KEYENCE	DM resister	RDS/WRS	

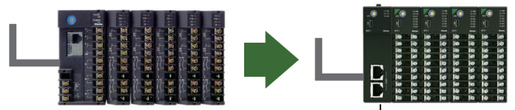
(*) The SIF function of the control module QTC1 is exclusively for Mitsubishi Electric Corporation PLC D register QR/QW.



Settings can be easily changed using the console software, making it possible to manage multiple modules at once.
OS: Windows 10 (Japanese/English)



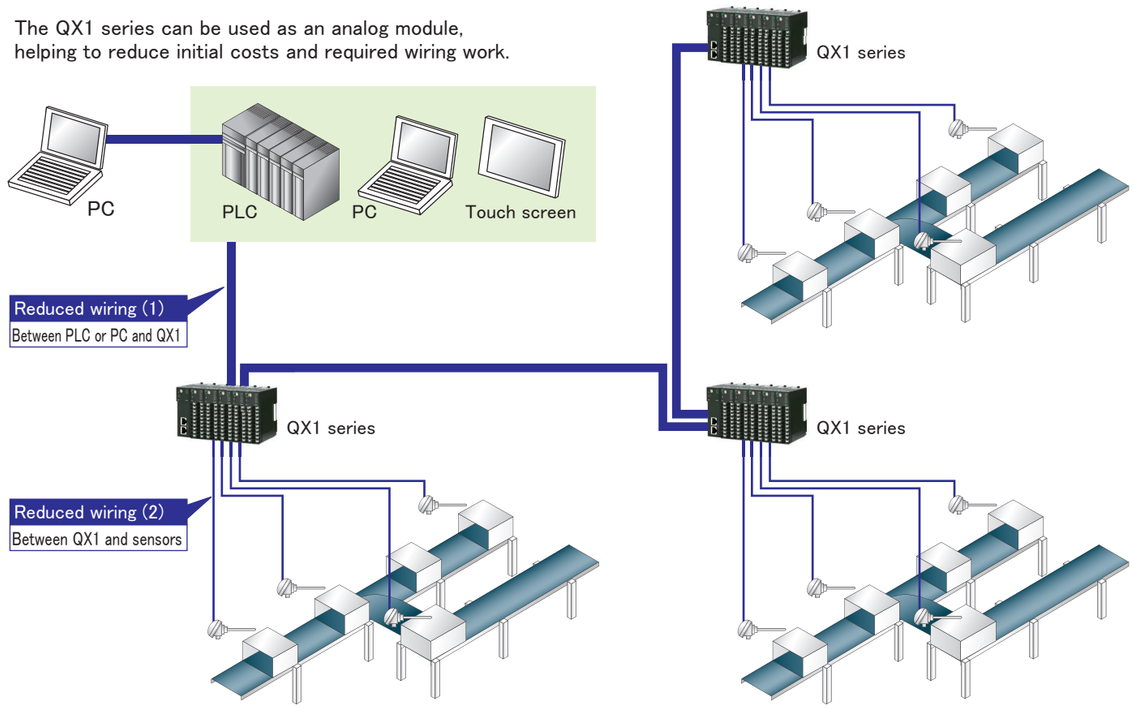
Please use Communication Expansion Module QMC1 when replacing Shinko C series devices.



Some communication commands are different.
When replacing the C series with the QX1 series, please contact us.

2 Usable as an analog module for reducing initial costs and wiring

The QX1 series can be used as an analog module, helping to reduce initial costs and required wiring work.



Administrative support

3 Failure prediction maintenance

Failure prediction maintenance

Check usage statuses using the following measurement functions.

1. Cumulative heater energization time (QTC1)
2. Cumulative module energization time (QMC1, QTC1)
3. Cumulative relay contact open/close count (QTC1)

In the event of an error, the error number and energization time are saved. The 10 most recent errors are saved. (Error history: Can be checked with console software) (QTC1)

Items	CH1	CH2	CH3	CH4
Content of error history 1	384	384	384	384
Energizing integrated time of error history 1	790	790	790	767
Content of error history 2	384	384	384	384
Energizing integrated time of error history 2	790	790	790	767
Content of error history 3	384	384	384	384
Energizing integrated time of error history 3	789	789	789	767
Content of error history 4	384	384	384	256
Energizing integrated time of error history 4	766	789	766	767
Content of error history 5	256	256	256	384
Energizing integrated time of error history 5	766	789	766	767
Content of error history 6	640	384	384	256
Energizing integrated time of error history 6	764	787	763	767
Content of error history 7	384	384	256	384
Energizing integrated time of error history 7	764	786	763	767
Content of error history 8	384	256	384	384
Energizing integrated time of error history 8	763	786	763	766
Content of error history 9	256	384	384	384
Energizing integrated time of error history 9	763	785	758	766
Content of error history 10	384	256	256	384
Energizing integrated time of error history 10	762	785	758	766

The input difference detection function makes it possible to monitor for input differences between channels.

Risk avoidance in case of emergency

The output selection function can be used to switch between outputs. For example, in the event of a CH1 output failure, CH2 output is enabled.

A signal can be output if heater burnout is detected. (QTC1)
[Heater burnout alarm options: Single-phase, 3-phase (3-phase: QTC1-2 only)]

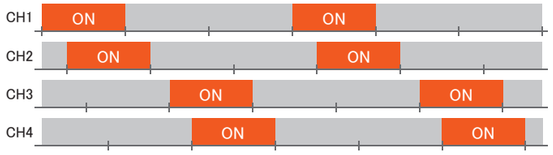
Alarm output signals can be used to start or stop control. [Event input/output (optional)]

4 Peak power suppression function for lower power equipment costs

Peak power suppression function

The total current can be set for the module, and power suppression control can be performed when the sum of the current values set for each channel is less than or equal to the total current. This can help minimize investments in power equipment.

■Example of peak power suppression function output timing

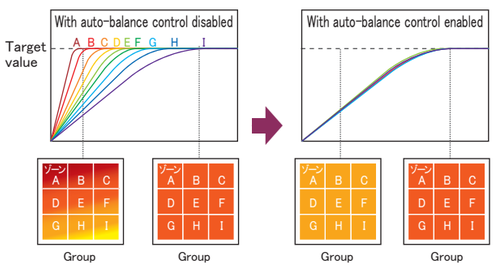


5 Improved product quality

Multi-zone connection (Auto-balance control)

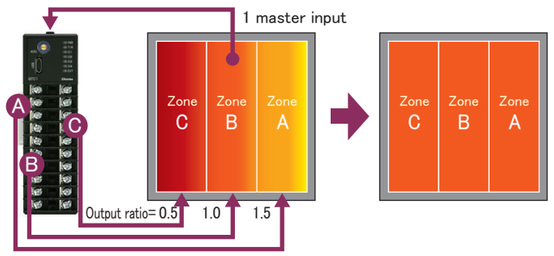
Take advantage of uniform control of multiple control locations (zones) of a control target (group) through linking. This helps prevent partial burning and mechanical distortion while also reducing adverse effects on product quality.

Auto-balance control works with multiple connected modules.



Individual output amount settings (output gain, bias control)

If required output amounts are known in advance, such as when controlling heaters in multiple locations (zones) for a single input point, uniform control of multiple zones is possible. Combining output selection functions reduces the number of input terminals needed, initial costs can also be reduced.



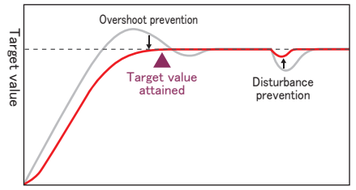
Rich functions

6 Five included control methods for reduced manual labor

Control characteristics vary depending on the control target.
The QX1 series includes five control methods to meet a variety of control characteristics.

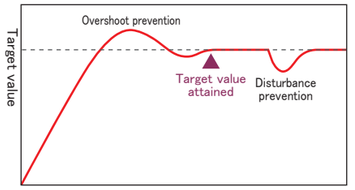
2DOF PID control

In addition to target value tracking and disturbance responsiveness, this well-balanced system reduces overshooting.
(When using default control action.)



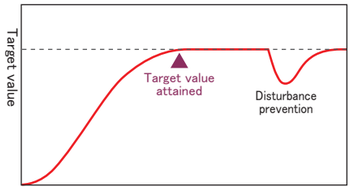
Fast-PID control

This control method emphasizes target value tracking.
This control method works best when replacing the controller with a Shinko product. (Doing so provides better performance.)



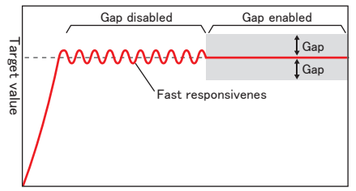
Slow-PID control

This control method prioritizes preventing overshooting rather than attaining a target value.



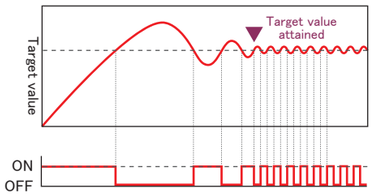
Gap-PID control

This control method is effective with fast responses such as for flow rates and valves. (Deviation characteristics are provided within the gap.)



ON-OFF control

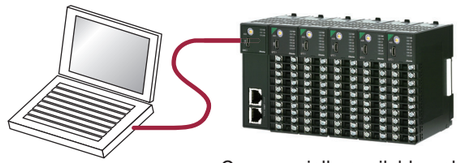
This control method is selected for operating devices that turn heaters and other equipment on or off.



7 Maintenance improvements

The numerous LEDs allow users to visually check statuses and errors on-site.

Settings can be easily changed using the console software, making it possible to manage multiple modules at once.
OS: Windows 10 (Japanese/English)



Commercially available cables (Micro USB Type-B) can be used as connecting cables.

8 Heating/cooling control

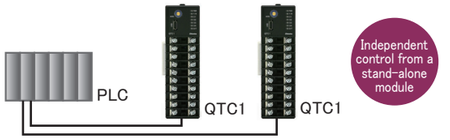
Heating and cooling are controlled with CH1 used as the heating-side input and CH2 as the cooling-side input.
(Up to 2 loops are possible with the QTC1-4.)

9 Cascade control

The adjusted CH1 variable, obtained from the SV and PV of CH1, is substituted for the SV of CH2, enabling CH2 control calculation and outputting.
(Up to 2 loops are possible with the QTC1-4.)

10 High functionality even when used independently

When used independently, the QTC1 can be used for control or to communicate with a host, and adding monitoring targets is easy.



Model

Control Module (2ch)
QTC1-2

Control Module (4ch)
QTC1-4

Model name

QTC1-2	□	□	-□	□			□	□			-□	□	
QTC1-4	□	□	-□	□	□	□	□	□	□	□	-□	□	
Power supply / communication options	0												No options
	P												Power supply / host communication function
Wiring method		T											Terminal block type
CH1 control output			□										See output code table
CH2 control output				□									
CH3 control output (*1)					□								
CH4 control output (*1)						□							
CH1 input							□						See input code table
CH2 input								□					
CH3 input (*1)									□				
CH4 input (*1)										□			
Heater burnout alarm options(*2)											0		No options
											2		4 points CT, 20 A (*3) (*4)
											A		4 points CT, 100 A (*3) (*4)
Event input/output options												0	No options
												1	Event input (4 points)(*5) (*6)
												2	Event output (4 points) (*5) (*6)

(*1) For the QTC1-2, CH3 and CH4 are not available.
(*2) Cannot be added to Direct current output type, DC voltage output type, or Triac output type.
(*3) CT and connector harness are sold separately.
(*4) Single-phase or 3-phase is available for the QTC1-2.
(*5) Connector harness is sold separately.
(*6) For the QTC1-2, Event input/output (2 points)

Input Codes

Code	Input Type	Range
M	Thermocouple K	-200 to 1370°C
	Thermocouple K	-200.0 to 400.0°C
	Thermocouple J	-200 to 1000°C
	Thermocouple R	0 to 1760°C
	Thermocouple S	0 to 1760°C
	Thermocouple B	0 to 1820°C
	Thermocouple E	-200 to 800°C
	Thermocouple T	-200.0 to 400.0°C
	Thermocouple N	-200 to 1300°C
	Thermocouple PL-Ⅱ	0 to 1390°C
	Thermocouple C	0 to 2315°C
	Thermocouple K	-328 to 2498°F
	Thermocouple K	-328.0 to 752.0°F
	Thermocouple J	-328 to 1832°F
	Thermocouple R	32 to 3200°F
	Thermocouple S	32 to 3200°F
	Thermocouple B	32 to 3308°F
	Thermocouple E	-328 to 1472°F
	Thermocouple T	-328.0 to 752.0°F
	Thermocouple N	-328 to 2372°F
	Thermocouple PL-Ⅱ	32 to 2534°F
	Thermocouple C	32 to 4199°F
	RTD Pt100	-200.0 to 850.0°C

M	RTD Pt100	-328.0 to 1562.0°F
	DC voltage input 0 to 1 V DC	-2000 to 10000
	Direct current input 4 to 20 mA DC (Externally mounted shunt resistor)	-2000 to 10000
	Direct current input 0 to 20 mA DC (Externally mounted shunt resistor)	-2000 to 10000
A	Direct current input 4 to 20 mA DC (Built-in shunt resistor)	-2000 to 10000
	Direct current input 0 to 20 mA DC (Built-in shunt resistor)	-2000 to 10000
V	DC voltage input 0 to 5 V DC	-2000 to 10000
	DC voltage input 1 to 5 V DC	-2000 to 10000
	DC voltage input 0 to 10 V DC	-2000 to 10000

Output Codes

Code	Output Type
R	Relay contact output
S	Non-contact voltage output (for driving SSR)
A	Direct current output, 4 to 20 mA DC
0	Direct current output, 0 to 20 mA DC
V	DC voltage output, 0 to 1 V DC
1	DC voltage output, 0 to 5 V DC
2	DC voltage output, 1 to 5 V DC
3	DC voltage output, 0 to 10 V DC
C	Open collector output
T	Triac output

Specification

Rated Scale

Input (TC)	Scale Range		Resolution	Input (RTD)	Scale Range		Resolution
K	-200 to 1370°C	-328 to 2498°F	1°C(F)	Pt100	-200.0 to 850.0°C	-328.0 to 1562.0°F	0.1 °C(F)
	-200.0 to 400.0°C	-328.0 to 752.0°F	0.1 °C(F)				
J	-200 to 1000°C	-328 to 1832°F	1°C(F)				
R	0 to 1760°C	32 to 3200°F	1°C(F)				
S	0 to 1760°C	32 to 3200°F	1°C(F)	Input (DC)	Scale Range		Resolution
B	0 to 1820°C	32 to 3308°F	1°C(F)	4 to 20 mA	-2000 to 10000 (*)		1
E	-200 to 800°C	-328 to 1472°F	1°C(F)	0 to 20 mA			
T	-200.0 to 400.0°C	-328.0 to 752.0°F	0.1°C(F)	0 to 1 V			
N	-200 to 1300°C	-328 to 2372°F	1°C(F)	0 to 5 V			
PL-Ⅱ	0 to 1390°C	32 to 2534°F	1°C(F)	1 to 5 V			
C	0 to 2315°C	32 to 4199°F	1°C(F)	0 to 10 V			

(*) Scalable

Input	Thermocouple (TC)	K, J, R, S, B, E, T, N, C, PL-Ⅱ External resistance: 100 Ω or less (However, B input: 40 Ω or less)
	RTD	Pt100, 3-wire type Allowable input lead wire resistance: 10 Ω or less per wire
	Direct current (mA DC)	0 to 20 mA DC, 4 to 20 mA DC Input impedance: 50 Ω (Shunt resistance) Allowable input current: 50 mA or less
	DC voltage (V DC)	0 to 1 V DC Input impedance: 1 MΩ or more Allowable input voltage: 5 V DC or less Allowable signal source resistance: 2 kΩ or less 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC Input impedance: 100 kΩ or more Allowable input voltage: 15 V DC or less Allowable signal source resistance: 100 Ω or less
Base accuracy		At ambient temperature of 23°C and mounting angle of ±5 degrees Thermocouple: Within ±0.2% of each input span However, below 0°C (32°F): Within ±0.4% of each input span R, S inputs, 0 to 200°C (32 to 392°F): Within ±6°C (12°F) B input, 0 to 300°C (32 to 572°F): Accuracy is not guaranteed. RTD: Within ±0.1% of each input span Direct current: Within ±0.2% of each input span DC voltage: Within ±0.2% of each input span
Cold junction temperature compensation accuracy		Within ±1°C at -10 to 55°C
Effect of ambient temperature		Thermocouple input (no decimal point): Within ±100 ppm/°C of each input span Below 0°C (32°F): Within ±200 ppm/°C of each input span Thermocouple input (decimal point): Within ±200 ppm/°C of each input span Below 0°C (32°F): Within ±400 ppm/°C of each input span Other: Within ±100 ppm/°C of each input span
Effects of electromagnetic interference		Within ±1% of each input span
Input sampling period		20 ms (with only DC voltage input and Direct current input enabled) 50 ms (with only DC voltage input and Direct current input enabled) 125 ms Note: Fixed to 125 ms regardless of settings for thermocouple input and RTD input
Control action		2DOF PID control A control method that offers both tracking characteristics with SV changes, and disturbance suppression. This method offers the same disturbance responsiveness as Fast-PID control as well as control actions with reduced overshooting. Fast-PID control This general PID control method is used for constant value control (SV control at a single value). ・P control: When integral time and derivative time are set to 0. ・PI control: When derivative time is set to 0. ・PD control: When integral time is set to 0. ・Deviation PID control: When the proportional gain 2DOF coefficient (α) is se to 1.00 and the derivative 2DOF coefficient (γ, Cd) is set to 1.00. Slow-PID control This control method is effective for processes where generating overshoot is not desired, and processes where the PV does not easily decrease after having exceeded the SV. Gap-PID control If the PV is noisy or if there is hysteresis in the operation unit, a slight fluctuation may be maintained near the deviation of 0. In such cases, a dead band is usually used, but since control is not performed within dead bands, the PV changes in the event of a disturbance. In this way, this control method ensures deviation characteristics in dead bands and allows for disturbance responses.

Item	Setting Range
Proportional band (P)	1 to Input span °C (°F) or 0.1 to Input span °C (°F) Direct current input, DC voltage input: 0.10 to 100.00%
Integral time (I)	0 to 3600 sec or 0.0 to 2000.0 sec 1 to 3600 sec or 0.1 to 2000.0 sec (When Slow-PID control is selected) The setting range varies depending on the selected integral/derivative decimal point position.
Derivative time (D)	0 to 3600 sec or 0.0 to 2000.0 sec The setting range varies depending on the selected integral/derivative decimal point position.
Proportional gain 2DOF coefficient (α)	0.00 to 1.00
Integral 2DOF coefficient (β)	0.00 to 10.00
Derivativ 2DOF coefficient (γ, Cd)	0.00 to 1.00
Proportional cycle	0.1 to 100.0 sec
Output high limit, output low limit	0.0 to 100.0% Direct current output: -5.0 to 105.0%
Gap width (*)	0.0 to 10.0% Proportional band × Gap width
Gap coefficient (*)	0.0 to 1.0

(*) With Gap-PID control only

ON-OFF control
Control method that operates with only two values: ON and OFF

Item	Setting Range
ON/OFF hysteresis	0.1 to 1000.0°C (0.1 to 1800.0°F) Direct current input, DC voltage input: 1 to 10000

Control range	Control output is turned OFF when the following control ranges are exceeded. Thermocouple input (no decimal point) Input range low limit value -50°C (90°F) to Input range high limit +50°C (90°F) Thermocouple input (decimal point), RTD input Input range low limit value - (Input span × 1%)°C(°F) to Input range high limit + 50.0°C(90.0°F) Direct current input, DC voltage input Scaling low limit value - Scaling width × 1% to Scaling high limit value + Scaling width × 10%
Control output	Relay contact output: 1a Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ = 0.4) Electrical life: 100,000 cycles Minimum applicable load: 10 mA 5 V DC Non-contact voltage output: 12 V DC ± 15% (for driving SSR)Max. 40 mA (short circuit protected) * The power supply is not electrically insulated from the output. Direct current output: 4 to 20 mA DC, 0 to 20 mA DC (Resolution: 12000) Load resistance: Maximum 550 Ω * The power supply is not electrically insulated from the output. DC voltage output: 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 1 to 10 V DC (Resolution: 12000) Allowable load resistance: 1 kΩ or more * The power supply is not electrically insulated from the output. Open collector output (NPN): Allowable load current: 100 mA or less Load voltage: 30 V DC or less Triac output: (AC output zero-cross method) Allowable load current: 0.5 A or less Load voltage: 75 to 250 V AC
Standard Functions	Alarm Function, Loop Break Alarm, Set Value Ramp Function, Power-On Return Action Selection, Non-Volatile IC Memory Data Save Selection, Automatic/Manual Control Switching, Sensor Correction Coefficient, Sensor Correction, Control Function Selection, Extension Function Selection, Output Gain/Bias Function, Input Calculation Function, Input Difference Detection Function
Optional Functions	Heater Burnout Alarm, Event Input, Event Output
Power Supply / Host Communication Function (QTC1-2/QTC1-4)	Communication line: EIA RS-485 compliant Communication method: Half-duplex communication Communication speed: Selecting 9600, 19200, 38400, or 57600 bps is possible using the DIP switches. (Factory default: 57600 bps) Synchronization method: Start-stop synchronization Data bit/parity: Data bits: 8 Parity: Selecting even, odd, or no parity is possible using the communication specification selection DIP switch. (Factory default: 8 bits / Even) Stop bit: Selecting 1 or 2 is possible using the communication specification selection DIP switch. (Factory default: 1) Response delay time setting: 0 to 1000 ms (Factory default: 0 ms) The response from the module after receiving a command from the host can be delayed. Data structure

Communication protocol	MODBUS RTU
Start bit	1
Data bit	8
Parity	Enabled (even, odd), Disabled
Stop bit	1 or 2

Smart InterFace (SIF) Function (Program-less communication function)	This function enables a serial communication connection with Mitsubishi Electric MELSEC-Q series PLCs and writes/reads various data to/from the PLC register using the PLC communication protocol. The communication protocol uses QW and QR commands, and PLCs capable of using A-compatible 1C frame AnA/AnU common commands (QR/QW) (D resister) are supported.
Attached Functions	Power failure countermeasures, Self-diagnosis, Automatic cold junction temperature, Compensation, PV filter time constant setting, Moving average count setting, CH enable/disable selection, Overscale, Underscale, Sensor error, Cold junction error, ADC error, Warm-up display, Cumulative contact open/close count measurement function, Cumulative energization time measurement function, Cumulative heater energization time, measurement function, Error history, Console communication
Power supply voltage	24 V DC Allowable fluctuation range: 20 to 28 V DC

Accessories Sold Separately

Product Name	Model
50 Ω shunt resistor	RES-S01-050
Front terminal cover	TC-QTC
CT for 20 A	CTL-6-S-H (*1)
CT for 100 A	CTL-12-S36-10L1U (*1)
Heater burnout alarm connector harness	WQ (*1)
Event input/output connector harness	EVQ (*2)

(*1) For heater burnout alarm (heater burnout alarm option symbols: 2, A)
(*2) For event input or event output (event input/output option symbols: 1, 2)

Communication Expansion Module
QMC1

Model name

QMC1	-□	□	-□	
Communication type	C4			RS-422A
	C5			RS-485 (*1)
Event input/output options		0		No options
		1		Event input 4 points (*2)
		2		Event output 4 points (*2)
		3		Event input 2 points, Event output 2 points (*2)
Communication protocol			0	Console selection (MODBUS RTU / SIF) (*1)
			1	C series compatible

(*1): When connecting to an OMRON PLC or Keyence PLC using the SIF function (Smart InterFace, program-less communication function), it cannot be connected using the RS-485 communication type (QMC1-C5□). Use communication type RS-422A(QMC1-C4□).
(*2): The plug side connector of the event input/output connector is sold separately

Specifications

Communication lines	EIA RS-422A compliant EIA RS-485 compliant
Communication method	Half-duplex communication
Synchronization method	Start-stop synchronization
Communication speed	Selecting 9600, 19200, 38400, or 57600 bps is possible using the DIP switches. (Factory default: 9600 bps)
Data bit/ parity	Data bit: 7 bits, 8 bits (Factory default: 8 bits) Parity bit: With parity, No parity (Factory default: With parity) Parity: Even, Odd (Factory default: Even) Select by communication specification selection DIP switch
Stop bit	Selecting 1 or 2 is possible using the communication specification selection DIP switch. (Factory default: 1 bit)
Response delay time setting	0 to 1000 ms (Factory default: 0 ms) The response from the module after receiving a command from the host can be delayed.
Communication protocol (Set with console software)	

Communication protocol	Register	Communication command
MODBUS	—	—
Made by Mitsubishi Electric	D register	QR/QW
Made by Mitsubishi Electric	R register	QR/QW
Made by Mitsubishi Electric	D register	WR/WW
Made by Mitsubishi Electric	R register	WR/WW
Made by OMRON	DM register	FINS command
Made by Keyence	DM register	RDS/WRS

C series compatible protocols are selected by model name.

Number of connections	Control module: Max 16 modules
Event Input (optional)	No. of inputs: 4 or 2 Input method: Voltage contact input sink method Circuit current when closed: Approx. 6 mA Reading judgment time: Approx. 100 ms
Event Output (optional)	No. of outputs: 4 or 2 Circuit: NPN open collector Maximum load voltage: 30 V DC Maximum load capacity: 50 mA
Attached Functions	Power failure countermeasures, Self-diagnosis, Warm-up display, Cumulative energization time measurement function
Power supply voltage	24 V DC Allowable fluctuation range: 20 to 28 V DC

Accessories Sold Separately

Product Name	Model
Communication cable (USB Type A - Modular)	CMC-001-4
Communication cable [Modular - Y terminal (RS-485, 3-wire)]	CQM-001
Communication cable [Modular - Y terminal (RS-422A, 5-wire)]	CQM-002
Communication cable (Modular - Modular)	CQQ-001
Wiring connector	0225-0805 (*)

(*): For event input/output (event input/output option symbols: 1, 2, 3)