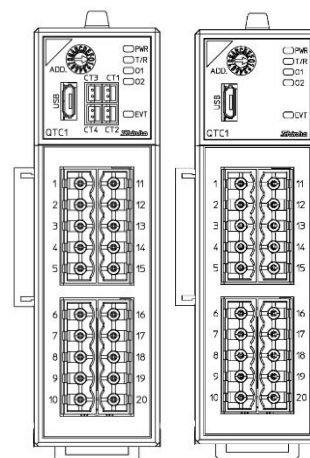
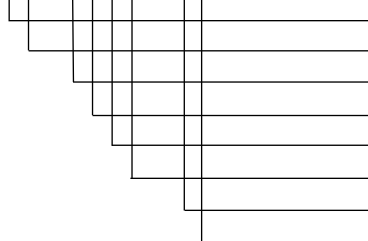


Model: **QTC1-R**



(e.g.) QTC1-RPC -RSRR - 21



Event Input (2 points)

■ Accessories Sold Separately

Product Name	Model
100 Ω terminator	RES-S07-100
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)

■ Rating

Rated Scale

Input	Input Range	Resolution
Pt100	0.000 to 32.000°C	0.001°C

(*) Scaling possible. However, it works as SV low limit to SV high limit.

Input

Input	RTD input	Pt100 4-wire type (JIS C1604-2013) Allowable input lead wire resistance: 100 Ω or less per wire
Event input	Input points	2 points
	Input type	Voltage contact input sink type
	Circuit current when closed	Approx. 6 mA
	Acquisition judgment time	40 ms to 40 ms + within the range of input sampling
CT input	20 A Specification (-2)	Rated voltage: 0.9 V, Rated current: 30 mA
	100 A Specification (-A)	Rated voltage: 0.9 V, Rated current: 120 mA

■ Performance

Base accuracy	When the ambient temperature is 23°C and the mounting angle is ± 5 degrees RTD input: Within $\pm 0.05^\circ\text{C}$
Effect of ambient temperature	Within ± 100 ppm/ $^\circ\text{C}$ of input span
Effect of electromagnetic interference	Within $\pm 1\%$ of each input span
Input sampling period	125 ms

■ Control Performance

Control action	Control method selectable from 2DOF PID control, Fast-PID control, Slow-PID control, ON-OFF control, or Gap-PID control. For optimal control, select the best control method according to the intended use and process. (Factory default: 2DOF PID control)																						
2DOF PID control Fast-PID control Slow-PID control Gap-PID control	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 set 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. <table border="1"> <thead> <tr> <th>Item</th><th>Setting Range</th></tr> </thead> <tbody> <tr> <td>Proportional band (P)</td><td>0.001 to Input span °C</td></tr> <tr> <td>Integral time (I)</td><td>0 to 3600 sec or 0.0 to 2000.0 sec The setting range varies depending on the selected integral/derivative decimal point position.</td></tr> <tr> <td>Derivative time (D)</td><td>0 to 3600 sec or 0.0 to 2000.0 sec The setting range varies depending on the selected integral/derivative decimal point position.</td></tr> <tr> <td>Proportional gain 2DOF coefficient (α)</td><td>0.00 to 1.00</td></tr> <tr> <td>Integral 2DOF coefficient (β)</td><td>0.00 to 10.00</td></tr> <tr> <td>Derivative 2DOF coefficient (γ, Cd)</td><td>0.00 to 1.00</td></tr> <tr> <td>Proportional cycle</td><td>0.1 to 100.0 sec</td></tr> <tr> <td>Output high limit, output low limit</td><td>0.0 to 100.0% Direct current output, DC voltage input: -5.0 to 105.0%</td></tr> <tr> <td>Gap width (*)</td><td>0.0 to 10.0% Proportional band × Gap width</td></tr> <tr> <td>Gap coefficient (*)</td><td>0.0 to 1.0</td></tr> </tbody> </table> (*) With Gap-PID control only	Item	Setting Range	Proportional band (P)	0.001 to Input span °C	Integral time (I)	0 to 3600 sec or 0.0 to 2000.0 sec 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	Derivative 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, DC voltage input: -5.0 to 105.0%	Gap width (*)	0.0 to 10.0% Proportional band × Gap width	Gap coefficient (*)	0.0 to 1.0
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ON-OFF control	Control method that operates with only two values: ON and OFF <table border="1"> <thead> <tr> <th>Item</th><th>Setting Range</th></tr> </thead> <tbody> <tr> <td>ON/OFF hysteresis</td><td>0.1 to 1000.0°C</td></tr> </tbody> </table>	Item	Setting Range	ON/OFF hysteresis	0.1 to 1000.0°C																		
Item	Setting Range																						
ON/OFF hysteresis	0.1 to 1000.0°C																						
Control range	Control output is turned OFF when the following control ranges are exceeded. Input range low limit value -5.000°C to Input range high limit +0.500°C																						

Control output	Relay contact output	1a	
		Control capacity	3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load $\cos\phi = 0.4$)
		Electrical life	100,000 cycles
		Minimum applicable load	10 mA 5 V DC
	Non-contact voltage (for SSR drive) output	12 V DC $\pm 15\%$	
		Max. 40 mA (short circuit protected)	
		* Non-isolated between power supply and output	
	Direct current output	4 to 20 mA DC, 0 to 20 mA DC (Resolution: 12000)	
		Load resistance	Max. 550 Ω
		* Non-isolated between power supply and output	
	DC voltage output	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC (Resolution: 12000)	
		Allowable load resistance	1 k Ω or more
		* Non-isolated between power supply and output	
	Open collector output (NPN)		

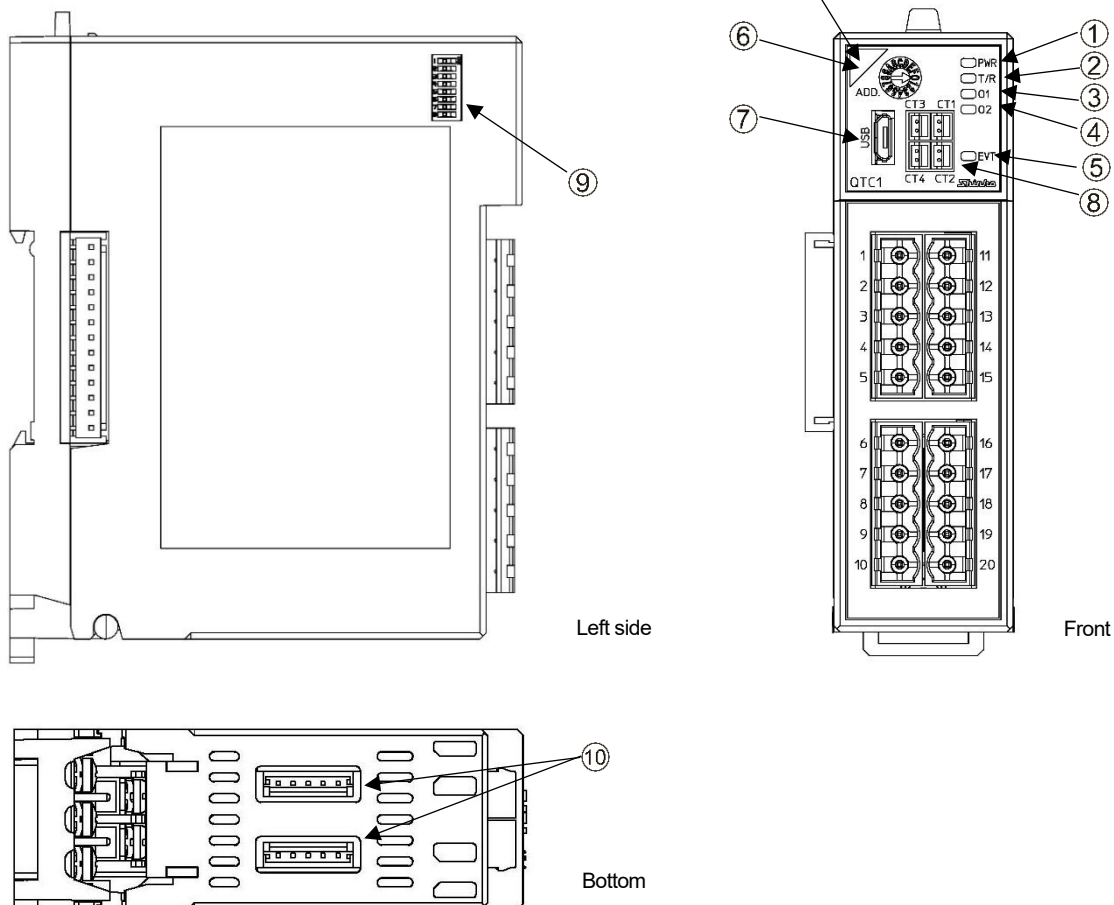
Allowable load current	100 mA or less
Load voltage	30 V DC or less
Residual voltage	1.2 V DC or less
Leakage current when OFF	0.1 mA or less

■ General Structure

Weight		Approx. 150 g
External dimensions		30 × 100 × 85 mm (W × H × D excluding protrusion)
Mounting type		DIN rail mounting type
Case		Flame-resistant resin, Color: Black
Panel		Polycarbonate sheet
Applicable standard	EN	EN61010-1 (Pollution degree 2)
	EC Directive (EMC Directive)	EMI: EN61326
		Radiated interference field strength: EN55011 Group1 ClassA
		Terminal noise voltage: EN55011 Group1 ClassA
		EMS: EN61326

■ Indication Structure / Settings Structure

* Triangle mark (green) when the power supply / host communication function is not available.



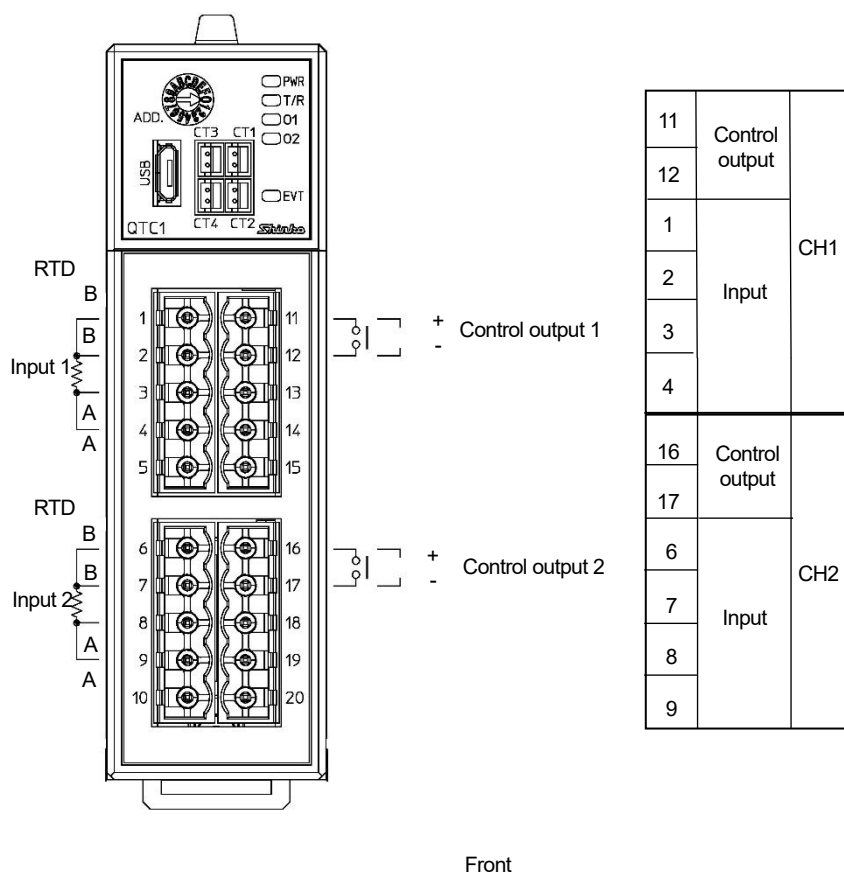
Action Indicator

No.	Symbol (color)	Name and Function	No.	Symbol (color)	Name and Function
①	PWR (Green)	Power indicator Lights off (always): No power supply to the instrument Lights up (always): Power supply to the instrument Flashing for 500 ms (3 seconds): Warming up the instrument Flashing for 500 ms (always): Internal failure of the instrument [When non-volatile IC memory error or ADC (internal circuit) error]	③	O1 (Green)	Control output OUT1 indicator
			④	O2 (Green)	Control output OUT2 indicator
			⑤	EVT (Red)	Event indicator Lights off (always): No alarm or abnormality Lights up (always): Alarm, loop abnormality alarm or heater burnout alarm (option) is activated Flashing for 500 ms: Sensor error (overscale, underscale) Flashing for 250 ms: (always) Power is supplied from the computer by USB bus power
②	T/R (Yellow)	Communication indicator Flashing (fast): Communication is normal Flashing (slow): Communication error (reception error) Lights off (always): Communication error (no response) or USB communication			

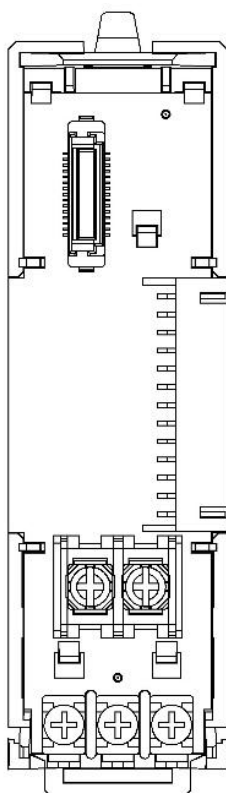
Switches, Connectors

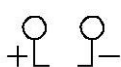
No.	Symbol	Name and Function
⑥	ADD.	Module address selection rotary switch Use the rotary switch to select the module address from 0 to F (1 to 16).
⑦	USB	Micro USB Type-B console communication connector
⑧	CT1, CT3	CH1 CT input connector For single-phase, use CT1 or CT3. For 3-phase, use CT1 and CT3.
	CT2, CT4	CH2 CT input connector For single-phase, use CT2 or CT4. For 3-phase, use CT2 and CT4.
⑨		Communication specification selection dip switch Use the DIP switches for selecting the communication speed, data bit, parity, stop bit, and communication protocol.
⑩		Event input/output connector Operation is selected by event input assignment selection or event output assignment selection.

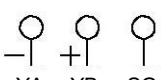
Terminal Arrangement



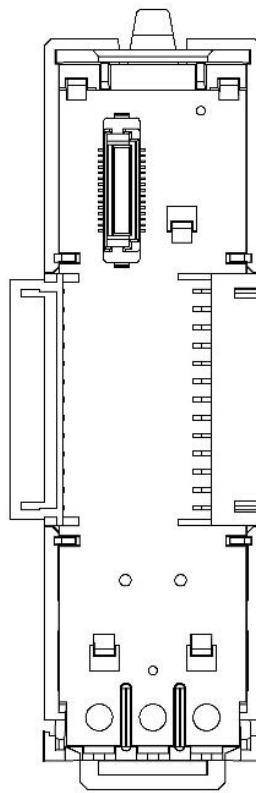
QTC1-RP




 Power supply 24 V DC

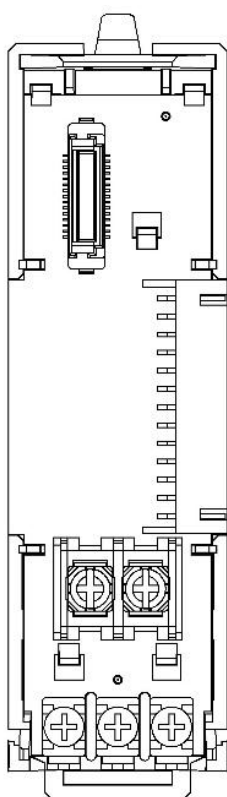

 Serial communication RS-485

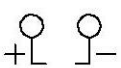
QTC1-R0

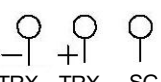


(*) The QTC1-R0 do not include a Power supply terminal and RS-485 serial communication terminal.

QTC1-RC




 Power supply 24 V DC


 CU-net communication

Base

■ Standard Functions

Alarm output

Alarm types	Select High limit alarm, Low limit alarm, High/Low limits alarm, High/Low limit s range alarm, Process High alarm, Process Low alarm, High limit with standby alarm, Low limit with standby alarm, High/Low limits alarm with standby alarm, High/Low limits alarm individually, High/Low limit s range alarm individually, High/Low limits alarm with standby individually or No action. (Factory default: No action)
Action	ON/OFF action
Alarm hysteresis	0.001 to 10.000°C
Output	Event output allocated by status flag or event output allocation selection
Alarm setting 0 Enabled/Disabled selection	When Enabled is selected in Alarm setting 0 Enabled/Disabled selection, High limit alarm, Low limit alarm, High/Low limits alarm, High/Low limits range, Process High alarm, Process Low alarm, High limit with standby, Low limit with standby, High/Low limits alarm with standby, High/Low limits alarm individually, High/Low limit s range alarm individually, High/Low limits alarm with standby individually, the alarm action will work even if the alarm action setting value is set to 0.

Loop break alarm

Setting range	Loop break alarm time 0 to 200 minutes Loop break alarm band 0.000 to 15.000°C
Output	Event output allocated by status flag or event output allocation selection

Setting value ramp function

When the SV is changed, control is performed from the SV before the change to the SV after the change at the set change rate. When the power is turned on, control is performed at the set rate of change from PV to SV at that time.	
Setting range	SV increase rate Temperature input 0.000 to 10.000 °C/min. SV decrease rate Temperature input 0.000 to 10.000 °C/min. Both the rise rate and fall rate have a factory default of 0.000°C/min; however, setting this function to 0.000°C/min disables it.

Restore action selection when power is turn on

When the power is turned on, select whether to resume in the continuous state (state before turning off the power) or in the stopped state.

Non-volatile IC memory save selection

Select whether to allow or prohibit saving data to the non-volatile IC memory. If you select save prohibition, can temporarily change all the set values, but if turn the power off and then on, it will return to the value before selecting save prohibition.
--

Auto/Manual selection

Switching between automatic and manual control is possible through host communication.
--

Sensor correction factor setting

Set the slope of the sensor input value.	
Setting range	0.000 to 10.000

Sensor correction setting

If the control location temperature and the sensor location temperature are different, shifting and correction of the PV is possible. (Valid within the rated input range regardless of the sensor correction value.)	
Setting range	-10.000 to 10.000 °C

Control function selection

Select from standard, heating/cooling control, cascade control or output selection function.	
Cascade control	The master-side operation output amount obtained from the master-side SV and PV (CH1) is substituted for the slave-side SV (CH2), slave-side calculation is performed, and the slave-side control output is output. (With CH1 control output OFF (Current output: 0 mA))
Heating/cooling control	When heating/cooling control is selected as the control function for CH1, heating/cooling control is performed with CH1 as the heating side output and CH2 as the cooling side output. Heating/cooling control cannot be selected for CH2.
Output selection function	When using the controller, if there is an unused input and an error occurs in the input channel currently being used, the input can be changed to an unused channel, and the output location for the input can be selected.

Extension function selection

Selecting between no extension, Peak power suppression function and the auto-balance control function is possible.	
Peak power suppression function	Peak power suppression function
Auto-balance control function (For devices with power supply / host communication function)	Auto-balance control function (For devices with power supply / host communication function)

Output gain-bias function

When multiple outputs are used for inputs, such as input-based heater controls at multiple outputs, if the output amount distribution is known in advance, this function enables uniform control by setting the ratio and bias for the reference output.
--

Control action selection when input error

The user can select whether to continue the control operation when the input becomes an input error, overscale, or underscale, or whether to output the fixed operation amount set in the input error operation amount setting.

Input calculation function

Input calculation function selection can be used to select between standard input, difference input, and addition input. The calculation function selected for CH1 applies to CH1 and CH2. However, the selection becomes invalid if a non-standard control function is selected.
--

Input difference detection function

The input difference between the current input difference detection selection channel and the selected channel is detected, and if the value set in the input difference detection setting is exceeded, 1 is set as the input difference flag. However, if the current input difference detection selection channel is selected, this function is disabled.

■ Optional Functions

Heater Burnout Alarm (Heater burnout alarm option symbols: -2, -A)

This function cannot be added to Direct current output, DC voltage output. The status can be determined by reading the status flag during serial communication.	
Rating	Single-phase/3-phase: 20 A, Single-phase/3-phase: 100 A (specified when ordering)
Setting range	20 A: 0.0 to 20.0 A (Off when set to 0.0) 100 A: 0.0 to 100.0 A (Off when set to 0.0)
Setting accuracy	±5% of rated value
Action point	Set value
Action	ON/OFF action
Output	Event output selected by status flag or event output assignment selection

Event Input (Event input/output option symbol: 1)

When an event input is input, the operations selected by the event input assignment selection are performed.	
Event input assignment selection	No action, Control start/stop (CH independent), Control start/stop (CH interlock)
No. of inputs	2
Input method	Voltage contact input sink method
Circuit current when closed	Approx. 6 mA
Reading judgment time	Approx. 100 ms

Event Output (Event input/output option symbol: 2)

The operations selected by the event output assignment selection are performed.	
Event output assignment selection	No action, EVT output (CH independent), EVT output (CH interlock)
No. of outputs	2
Circuit	NPN open collector
Maximum load voltage	30 V DC
Maximum load capacity	50 mA

Power Supply / Host Communication Function (Power supply/communication option symbol: P)

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	<table border="1"> <tr> <td>Communication protocol</td><td>MODBUS RTU</td></tr> <tr> <td>Start bit</td><td>1</td></tr> <tr> <td>Data bit</td><td>8</td></tr> <tr> <td>Parity</td><td>Enabled (even, odd), Disabled</td></tr> <tr> <td>Stop bit</td><td>1 or 2</td></tr> </table>	Communication protocol	MODBUS RTU	Start bit	1	Data bit	8	Parity	Enabled (even, odd), Disabled	Stop bit	1 or 2
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 resistor) are supported.

CUnet communication function (Power supply/communication option symbol: C)

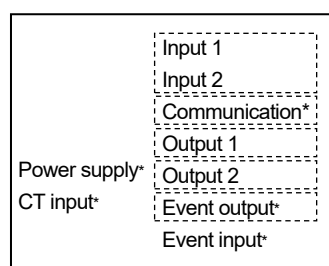
Connection type	ulti-drop								
Communication method	2-wire half-duplex								
Synchronization method	Bit-synchronous								
Error detection	CRC-16								
Number of occupied slave addresses	1								
Maximum number of connected nodes	64 nodes								
Communication speed, Communication distance	<table border="1"> <tr> <th>Communication speed</th><th>Maximum network length</th></tr> <tr> <td>12Mbps</td><td>100m</td></tr> <tr> <td>6Mbps</td><td>200m</td></tr> <tr> <td>3Mbps</td><td>300m</td></tr> </table>	Communication speed	Maximum network length	12Mbps	100m	6Mbps	200m	3Mbps	300m
Communication speed	Maximum network length								
12Mbps	100m								
6Mbps	200m								
3Mbps	300m								
Isolation method	Pulse transformer isolation								
Impedance	100 Ω								
Termination resistance	Last connection, set by CUnet slave This instrument is not equipped.								

■ Insulation / Dielectric Resistance

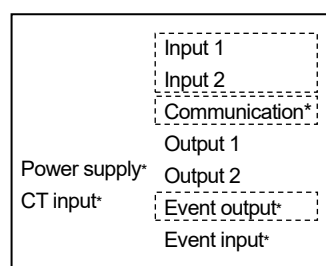
Circuit Insulation Configuration

· Relay output, Open collector output

· Non-contact voltage output, Direct current output, DC voltage output



* When options are ordered.



* When options are ordered.

Insulation resistance	500 V DC, 10 MΩ or more
Dielectric resistance	Between input terminal and ground: 1.5 kV AC for 1 minute Between power terminal and ground: 1.5 kV AC for 1 minute Between power terminal and input terminal: 750 V AC for 1 minute

■ Environmental Conditions

Ambient temperature	-10 to 50°C (Non-condensing, no icing)
Ambient humidity	35 to 85% RH (Non-condensing)
Altitude	2,000 m or less
Installation environment	Pollution Degree 2 (according to EN61010-1)
Memory protection	Non-volatile IC memory (write cycles: 1 trillion times)
Environmental specifications	RoHS Directive Compliant

■ Attached Functions

Power failure countermeasures	Setting data is backed up to non-volatile IC memory.	
Self-diagnosis	The watchdog timer monitors runaway and halt of the program, and when an abnormality is detected, it resets the MCU and initializes the instrument.	
PV filter time constant setting	A digital first-order low-pass filter is used to reduce PV fluctuations caused by noise.	
Moving average count setting	Values that alter input values due to noise are averaged to stabilize the indicated values.	
CH enable/disable selection	Enabled or disabled can be selected for each channel. When disabled, all operations for the selected channel are disabled, and PV becomes 0.00.	
Overscale	A status flag is set when overscale is detected. However, control continues during overscale.	
Underscale	A status flag is set when underscale is detected. However, control continues during underscale.	
Sensor error	A status flag is set when a sensor error is detected, and control output is turned OFF.	
ADC error	If there is an error such as a failure in an internal circuit, the control output of the channel where the error occurred is turned OFF. When this occurs, the PV is 32767.	
Warm-up display	After the power is turned on, the power indicator flashes every 500 ms for about 3 seconds.	
Cumulative contact open/close count measurement function	Cumulative measurement of the control output ON/OFF count is possible.	
Cumulative energization time measurement function	Checking the cumulative energization time is possible.	
Cumulative heater energization time measurement function	Checking the cumulative heater energization time is possible for relay output and non-contact voltage output.	
Error history	In the event of an error, the bit ON/OFF status and energization time are saved. The 10 most recent errors are saved. Error history is available for each channel, and device common errors are saved in the all-channel error history.	
	Error details	Alarm 1, Alarm 2, Alarm 3, Alarm 4, Heater burnout alarm, Loop break alarm, Sensor error, Input error (overscale), Input error (underscale), Non-volatile IC memory error, ADC error
Console communication	Connect a communication cable (commercially available) to the console communication connector to perform operation from an external computer using the console software (SWC-QTC101M).	
	Operations that can be performed	(1) Reading and configuration of SV, PID, and various other setting values (2) Reading of PV and operating statuses (3) Modification of functions
	Communication protocol	MODBUS RTU
	Communication cable	USB to Micro USB Type-B (Commercially available)
	Software	Console software (SWC-QTC101M)
Firmware update function	Connect the communication cable (commercial item) to the console communication connector, and use the console software (SWC-QTC101M) to update the functions from an external computer. When the firmware is updated, the set values are initialized.	

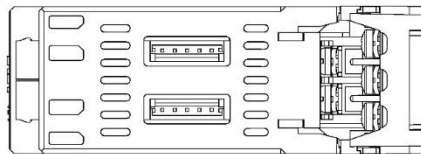
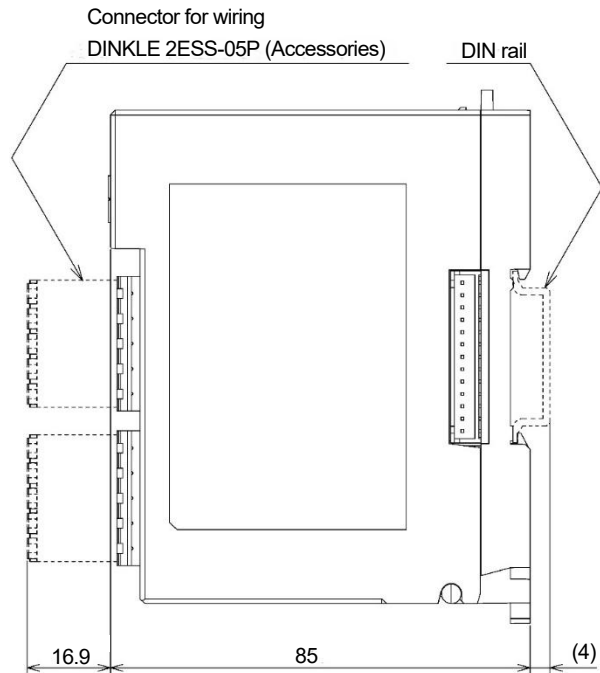
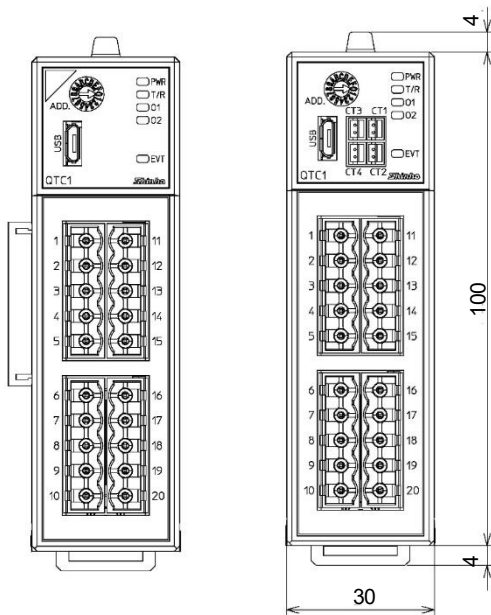
■ Other

Power supply voltage	24 V DC	Allowable fluctuation range: 20 to 28 V DC
Power consumption	5 W or less	
Rush current	Max. 10 A	
Accessories included	Power supply terminal cover (1) (for devices with power supply / host communication function or CUnet communication function), Mounting and wiring instruction manual (1) Connector for wiring (2ESS-05P): 4	
Accessories sold separately	Termination resistance (100 Ω) (RES-S07-100), CT for heater burnout alarm 20 A (CTL-6-S-H), CT for heater burnout alarm 100 A (CTL-12-S36-10L1U), Heater burnout connector harness (WQ), Event input/output connector harness (EVQ)	
Instruction manual	Please download the full Instruction Manual from the Shinko website. https://shinko-technos.co.jp/e/	

■ Dimensions (Scale: mm)

Main Unit

QTC1-R0C-RR-0 , QTC1-R0C-RR-2 ,
QTC1-R0C-RR-A



Accessories sold separately

Termination resistance: 100 Ω, RES-S07-100		Heater burnout alarm CT (current transformer)	
		CTL-6-S-H (for 20 A)	
		CTL-12-S36-10L1U (for 100 A)	
Heater burnout alarm connector harness WQ		Event input/output connector harness EVQ	