High-performance Multi-point Control System

SR Mini HG SYSTEM

Hardware Quick Manual

RKC® RKC INSTRUMENT INC.

IMS01V01-E3

- Modbus is a registered trademark of Schneider Electric.
- The name of each programmable controller (PLC) means the products of each manufacturer.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

 : This mark indicates that all precautions should be taken for safe usage.

 : This mark indicates important information on installation, handling and operating procedures.

 : This mark indicates supplemental information on installation, handling and operating procedures.

 : This mark indicates where additional information may be located.

⚠ WARNING

- To prevent injury to persons, damage to instrument and equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take adequate measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
  The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- Do not connect modular connectors to telephone line.
- When high alarm with hold action/re-hold action is used for Alarm function, alarm does not turnon while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
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1. OUTLINE

This manual describes the specifications, mounting and wiring of the SR Mini HG SYSTEM control unit (H-PCP-A/B module, Function modules).
For the detail handling procedures and various function, please read if necessary the following separate manuals.

- SR Mini HG SYSTEM Hardware Instruction Manual (IMSRM15-E□)
- SR Mini HG SYSTEM Communication Instruction Manual (IMSRM09-E□)
- SR Mini/SR Mini HG SYSTEM Supplementary Information
  Initialize Settings (Extended Communications) (IMSRM07-E□)

The above manuals can be downloaded from the official RKC website:
http://www.rkcinst.com/english/manual_load.htm

It shows below the module describing in this manual.

Module name	Type
Power supply/CPU module *	H-PCP-A H-PCP-B
Temperature control module	H-TIO-A H-TIO-B H-TIO-C H-TIO-D H-TIO-E H-TIO-F H-TIO-G H-TIO-H H-TIO-J H-TIO-P H-TIO-R
Position proportioning control module	H-TIO-K
Temperature input module	H-TI-A H-TI-B H-TI-C
Cascade control module	H-CIO-A
Current transformer input module	H-CT-A
Digital input module	H-DI-A H-DI-B
Digital output module	H-DO-A H-DO-B H-DO-C H-DO-D
Analog input module	H-AI-A H-AI-B
Analog output module	H-AO-A H-AO-B

* When it used the H-PCP-G/H/J (Power supply/CPU module), refer to each instruction manual. Refer to this manual only about description of the functional module.

1.1 Checking the Products

When unpacking your new instrument, please confirm that the following products are included. If any of the products are missing, damaged, or if your manual is incomplete, please contact RKC sales office or agent for replacement.

☐ H-PCP-A/B module (Power supply/CPU module) .... 1 module

H-PCP-A/B module is included in control unit.
One H-PCP-A/B module (power supply/CPU module) is required for each control unit.

☐ Function modules .... Required number of modules

Function module is included in control unit.

☐ DIN rail holding clips .... Two clips per unit

☐ Hardware Quick Manual (IMS01V01-E3) .... 1 copy (This manual)

☐ Communication Quick Manual (IMS01V02-E□) .... 1 copy

1.2 Confirmation of the Model Code

The model code for the instrument you received is listed below. Please confirm that you have received the correct instrument by checking the model code label, located on the left side of the module, with this list. If the product you received is not the one ordered, please contact RKC sales office or agent for replacement.

If the product conforming to CE/UL/cUL (or CSA) is selected, "/CE" is entered in the serial number column.

■ H-PCP module (Power supply/CPU module) model code

H-PCP- □ - □ □ N - □ ∗ □ □
(1) (2) (3) (4) (5) (6) (7)

(1) Type
A: DO 4 points type
B: DO 2 points with DI function

(2) Power supply voltage
1: 100 to 120 V AC
2: 200 to 240 V AC
3: 24 V DC

(3) Communication interface
1: RS-232C
4: RS-422A

(4) External connector
N: No function

(5) DO signal
M: Relay contact output
D: Open collector output

(6) Alarm 1 function *
N: No alarm function
□: Refer to **Alarm code table**

(7) Alarm 2 function *
N: No alarm function
□: Refer to **Alarm code table**

* It is alarm function of H-TIO-□ module, H-CIO-A module.

Alarm code table

A: Deviation high alarm
B: Deviation low alarm
C: Deviation high and low alarm
D: Band alarm
E: Deviation high alarm with hold action
F: Deviation low alarm with hold action
G: Deviation high and low alarm with hold action
H: Process high alarm
J: Process low alarm
K: Process high alarm with hold action
L: Process low alarm with hold action

Special alarm function

Q: Deviation high alarm with re-hold action
R: Deviation low alarm with re-hold action
T: Deviation high and low alarm with re-hold action

The selected alarm function will be common for all the modules with alarm functions in the control unit.

For the H-PCP-A/B module with the ladder communication, special specification code "Z-190" must be specified at the end of the model code.
The H-TIO-K, H-CIO-A, H-DI-B and H-DO-C module cannot be used to the H-PCP-A/B module with the specification of ladder communication.

For the H-PCP-A module with the Modbus communication, special specification code “Z-1021” must be specified at the end of the model code.
The H-TIO-K, H-TI-A/B/C, H-CIO-A, H-DI-A/B, H-DO-A/B/C/D, H-AI-A/B and H-AO-A/B module cannot be used to the H-PCP-A module with the specification of Modbus communication.

For the H-PCP-A module with the MEMOBUS communication, special specification code “Z-1001” must be specified at the end of the model code.
The H-TIO-K, H-CIO-A, H-DI-A/B, H-DO-A/B/C/D, H-AI-A/B and H-AO-A/B module cannot be used to the H-PCP-A module with the specification of MEMOBUS communication.

For the contents of the DO, four functions can be selected out of the eight functions; alarm 1, alarm 2, heater break alarm, burnout alarm, temperature rise completion, loop break alarm, AI alarm 1 and AI alarm 2. For details on the DO Allocation, refer to the following **Initial Code**.

Initial Code

- □ □ □ □ - □ □ - □ □
(1) (2) (3) (4) (5) (6) (7) (8)

(1) Digital output 1 (DO1)

N: Unused
□: Refer to **DO allocation code table**

(2) Digital output 2 (DO2)

N: Unused
□: Refer to **DO allocation code table**

(3) Digital output 3 (DO3)

N: Unused
□: Refer to **DO allocation code table**

(4) Digital output 4 (DO4)

N: Unused
□: Refer to **DO allocation code table**

(5) TI alarm 1

N: No alarm function
□: Refer to **TI, AI alarm code table**

(6) TI alarm 2

N: No alarm function
□: Refer to **TI, AI alarm code table**

(7) AI alarm 1

N: No alarm function
□: Refer to **TI, AI alarm code table**

(8) AI alarm 2

N: No alarm function
□: Refer to **TI, AI alarm code table**

DO allocation code table

1: Temperature alarm 1
2: Temperature alarm 2
3: Heater break alarm
4: Burnout alarm
5: Temperature rise completion
6: AI alarm 1
7: AI alarm 2
8: Loop break alarm
(TI alarm output is common with temperature alarm output)

TI, AI alarm code table

H: Process high alarm
J: Process low alarm
K: Process high alarm (with alarm hold)
L: Process high alarm (with alarm hold)

For DO1 to DO4, specify different code numbers other than “N.”
DO function can be allocated by the operation panel or host communication.

For type B, only DO1 or DO2 can be selected. For DO3 or DO4, set “N.”

■ H-TIO module (Temperature control module) model code

● 1 channel control type

H-TIO- □ - □ □ □ - □ □ ∗ □ □

(1) (2) (3) (4) (5) (6) (7) (8)

(1) Type

A: 1 channel type (Temperature input)
C: 1 channel heat/cool type (Temperature input)
E: 1 channel type (High accuracy temperature input)
G: 1 channel heat/cool type (High accuracy temperature input)
H: 1 channel type (Voltage/current input)
R: 1 channel fuzzy control type (High accuracy temperature input)

(2) Control action

A: ON/OFF control (Reverse action) [1]
C: ON/OFF control (Direct action) [1]
F: PID control with autotuning function (Reverse action)
D: PID control with autotuning function (Direct action)
B: Heat/cool PID control with autotuning function (Air cooling) [2]
W: Heat/cool PID control with autotuning function (Water cooling) [2]

(3) Input type

□: Refer to **Input Range Table (P. 8)**

(4) Range

□: Refer to **Input Range Table (P. 8)**

(5) Control output (Heat-side)

M: Relay contact output
V: Voltage pulse output
D: Open collector output
T: Triac output
□: Current output (Refer to **Output code table**)
□: Voltage output (Refer to **Output code table**)

(6) Control output (Cool-side) [3]

None: No function
M: Relay contact output
V: Voltage pulse output
D: Open collector output
T: Triac output
□: Current output (Refer to **Output code table**)
□: Voltage output (Refer to **Output code table**)

(7) Alarm output [4]

N: No function
1: Alarm 1 output [5]
2: Alarm 2 output [5]
3: Heater break alarm (HBA) output [6]
4: Loop break alarm (LBA) output [7]

(8) Current transformer input [8]

N: No function
P: CT input: CTL-6-P-N
S: CT input: CTL-12-S56-10L-N

Output code table

3: 0 to 1 V DC	4: 0 to 5 V DC	5: 0 to 10 V DC	6: 1 to 5 V DC
7: 0 to 20 mA DC	8: 4 to 20 mA DC	9: Others	

[1] Only possible to select for type A, E and H.
[2] Only possible to select for type C and G.
[3] Both heat-side and cool-side outputs can be selected by using the heat/cool control type (C, G). For other types, "No function" is selected for cool-side control output, and only heat-side control output can be selected.
[4] Output type is relay contact output.
[5] Only possible to select for type A, E, H and R. Alarm 1/2 types are those selected by the H-PCP module.
[6] Only possible to select for type A.
[7] Only possible to select for type A, E and R.
[8] Current transformer input can be designated when the input belongs to type A and C, as well as the type of control output (heat-side) is relay contact output, voltage pulse output, open collector output, or triac output.

- **2 channels control type**

H-TIO- □ - □ □ □ - □ □ ∗ □ □

(1) (2) (3) (4) (5) (6) (7) (8)

(1) Type [1]

B: 2 channels type (Temperature input)
D: 2 channels heat/cool type (Temperature input)
F: 2 channels type (High accuracy temperature input)
J: 2 channels type (Voltage/current input)
P: 2 channels fuzzy control type (Temperature input)

(2) Control action

A: ON/OFF control (Reverse action) [2]
C: ON/OFF control (Direct action) [2]
F: PID control with autotuning function (Reverse action)
D: PID control with autotuning function (Direct action)
B: Heat/cool PID control with autotuning function (Air cooling) [3]
W: Heat/cool PID control with autotuning function (Water cooling) [3]

(3) Input type

□: Refer to **Input Range Table (P. 8)**

(4) Range

□: Refer to **Input Range Table (P. 8)**

(5) Control output (Heat-side)

M: Relay contact output
V: Voltage pulse output
D: Open collector output
T: Triac output
□: Current output (Refer to **Output code table**)
□: Voltage output (Refer to **Output code table**)

(6) Control output (Cool-side) [4]

None: No function
M: Relay contact output
V: Voltage pulse output
D: Open collector output
T: Triac output
□: Current output (Refer to **Output code table**)
□: Voltage output (Refer to **Output code table**)

(7) Alarm output

N: No function

(8) Current transformer input [5]

N: No function
P: CT input: CTL-6-P-N
S: CT input: CTL-12-S56-10L-N

Output code table

3: 0 to 1 V DC	4: 0 to 5 V DC	5: 0 to 10 V DC	6: 1 to 5 V DC
7: 0 to 20 mA DC	8: 4 to 20 mA DC	9: Others	

[1] In two channels type, the inputs, ranges and outputs should be identical.
Both inputs of H-TIO-F module are only RTD inputs.
[2] Only possible to select for type B and F.
[3] Only possible to select for type D.
[4] Both heat-side and cool-side outputs can be selected by using the heat/cool control type (D).
For other types, "No function" is selected for cool-side control output, and only heat-side control output can be selected.
[5] Current transformer input can be designated when the input belongs to type D, as well as the type of control output (heat-side) is relay contact output, voltage pulse output, open collector output, or triac output.

■ H-TIO-K module (Position proportioning control module) model code

H-TIO- K - Z □ □ - M M
(1) (2) (3) (4) (5) (6)

(1) Type

K: 1 channel position proportioning control type
(for control motor drive)

(2) Control action

Z: Position proportioning PID control

(3) Input type

□: Refer to **Input Range Table (P. 8)**

(4) Range

□: Refer to **Input Range Table (P. 8)**

(5) Control output (Open-side)

M: Relay contact output

(6) Control output (Close-side)

M: Relay contact output

■ H-TI module (Temperature input module) model code

H-TI- □ - □ □
(1) (2) (3)

(1) Type

A: 4 channels RTD input
B: 2 channels thermocouple, RTD input (High accuracy type)
C: 4 channels thermocouple input

(2) Input type

□: Refer to **Input Range Table (P. 8)**

(3) Range

□: Refer to **Input Range Table (P. 8)**

■ H-CIO module (Cascade control module) model code

● Heat control type

H-CIO- □ - □ □ □ - □ ∗ □
(1) (2) (3) (4) (5) (6)

(1) Type
A: 1 channel cascade control type

(2) Control action
F: PID control with autotuning function (Reverse action)
D: PID control with autotuning function (Direct action)

(3) Input type
□: Refer to **Input Range Table (P. 8)**

(4) Range
□: Refer to **Input Range Table (P. 8)**

(5) Slave control output
M: Relay contact output
V: Voltage pulse output
D: Open collector output
T: Triac output
□: Current output (Refer to **Output code table**)
□: Voltage output (Refer to **Output code table**)

(6) Master manipulated output (Distribution output) ∗
None: No function
M: Relay contact output
V: Voltage pulse output
D: Open collector output
T: Triac output
□: Current output (Refer to **Output code table**)
□: Voltage output (Refer to **Output code table**)

● Heat/cool control type

H-CIO- □ - □ □ □ - □ ∗ □
(1) (2) (3) (4) (5) (6)

(1) Type
A: 1 channel cascade control type

(2) Control action
B: Heat/cool PID control with autotuning function (Air cooling)
W: Heat/cool PID control with autotuning function (Water cooling)

(3) Input type
□: Refer to **Input Range Table (P. 8)** ∗

(4) Range
□: Refer to **Input Range Table (P. 8)** ∗

(5) Control output (Heat-side)
M: Relay contact output
V: Voltage pulse output
D: Open collector output
T: Triac output
□: Current output (Refer to **Output code table**)
□: Voltage output (Refer to **Output code table**)

(6) Control output (Cool-side)
M: Relay contact output
V: Voltage pulse output
D: Open collector output
T: Triac output
□: Current output (Refer to **Output code table**)
□: Voltage output (Refer to **Output code table**)

∗ For the heat/cool control types (B and W), no voltage or current input can be specified.

Output code table

3: 0 to 1 V DC	4: 0 to 5 V DC	5: 0 to 10 V DC	6: 1 to 5 V DC
7: 0 to 20 mA DC	8: 4 to 20 mA DC	9: Others	

For the master and slave, the input and the range become same.

■ Input Range Table

Thermocouple input (H-TIO-A/B/C/D/E/G/K/P/R, H-TI-B/C, H-CIO-A)

Input type		Code	
		Input	Range
K	0 to 400 °C	K	02
	0 to 800 °C	K	04
	0 to 1300 °C	K	11
	0.0 to 400.0 °C	K	09
	0.0 to 800.0 °C	K	10
	0.0 to 1300.0 °C [1]	K	23
	0 to 800 °F	K	A1
	0.0 to 800.0 °F	K	A4
	0 to 2400 °F	K	A5
	0.0 to 2400.0 °F [1]	K	B4
	–200.0 to +300.0 °C [1]	K	32
	–100.0 to +400.0 °C [2]	K	36
J	0 to 400 °C	J	02
	0 to 800 °C	J	04
	0 to 1200 °C	J	06
	0.0 to 400.0 °C	J	08
	0.0 to 800.0 °C	J	09
	0.0 to 1200.0 °C [1]	J	16
	0 to 1600 °F	J	A2
	0.0 to 700.0 °F	J	A4
	0 to 2100 °F	J	A5
	0.0 to 1600.0 °F [1]	J	B2
	–200.0 to +300.0 °C [1]	J	26
R	0 to 1700 °C	R	03
	0.0 to 1700.0 °C [1]	R	05
	0 to 3000 °F	R	A3
S	0 to 1700 °C	S	03
	0.0 to 1700.0 °C [1]	S	04
	0 to 3000 °F	S	A3
B [3]	0 to 1800 °C	B	03
	0.0 to 1800.0 °C [1]	B	04
	0 to 3000 °F	B	A5
E	0 to 1000 °C	E	02
	0.0 to 700.0 °C	E	03
	0 to 400 °C	E	04
	0.0 to 400.0 °C [1]	E	07
	0.0 to 1000.0 °C [1]	E	08
	0 to 1800 °F	E	A3
	0.0 to 1800.0 °F [1]	E	A6

Input type		Code	
		Input	Range
T	0.0 to 400.0 °C	T	06
	0 to 400 °C	T	08
	0 to 200 °C	T	09
	–200 to +200 °C	T	10
	0.0 to 200.0 °C [1]	T	12
	–200.0 to +200.0 °C [1]	T	13
	0.0 to 700.0 °F	T	A7
	0 to 700 °F	T	A9
	–300 to +400 °F	T	B1
	–300.0 to +400.0 °F [1]	T	B3
N	0 to 1300 °C	N	02
	0.0 to 1300.0 °C [1]	N	05
	0 to 2300 °F	N	A1
	0.0 to 2300.0 °F [1]	N	A4
PL II	0 to 1200 °C	A	03
	0.0 to 1200.0 °C [1]	A	04
	0 to 2300 °F	A	A3
	0.0 to 2300.0 °F [1]	A	A5
W5Re/ W26Re	0 to 2300 °C	W	03
	0.0 to 2300.0 °F [1]	W	04
	0 to 3000 °F	W	A3
U	0.0 to 600.0 °C	U	04
	0 to 400 °C	U	05
	–200 to +200 °C	U	06
	0.0 to 400.0 °C [1]	U	03
	–200.0 to +200.0 °C [1]	U	09
	0 to 700 °F	U	A5
	–300 to +400 °F	U	A6
	0.0 to 700.0 °F [1]	U	A8
	–300.0 to +400.0 °F [1]	U	A9
L	0 to 400 °C	L	01
	0.0 to 400.0 °C	L	03
	0.0 to 900.0 °C	L	04
	0 to 900 °C	L	05
	0 to 800 °F	L	A1
	0 to 1600 °F	L	A2
	0.0 to 800.0 °F [1]	L	A5
	0.0 to 1600.0 °F [1]	L	A6

[1] The range can be specified only by H-TIO-E/G/F/R, H-TI-B or H-CIO-A module (high accuracy type).
[2] The range can be specified only by H-TIO-A/B/C/D [Z-1013 specification] or H-TI-C module [Z-1013 specification].
[3] Accuracy is not guaranteed between 0 to 399 °C (0 to 799 °F) for type B thermocouple input.

RTD input (H-TIO-A/B/C/D/E/F/G/K/P/R, H-TI-A/B, H-CIO-A)

Input type		Code	
		Input	Range
JPt100	0.0 to 400.0 °C	P	16
	0 to 400 °C	P	17
	-200 to +200 °C	P	18
	–200.0 to +200.0 °C	P	21
	–50.00 to +150.00 °C *	P	22
	–300 to +900 °F	P	B4
	0 to 800 °F	P	B3
	0.0 to 800.0 °F	P	B7
	–300.0 to +900.0 °F	P	B8
Pt100	0.0 to 400.0 °C	D	16
	0 to 400 °C	D	17
	–200 to +200 °C	D	18
	–200.0 to +200.0 °C	D	21
	–50.00 to +150.00 °C *	D	22
	–300 to +1200 °F	D	B5
	0 to 800 °F	D	B4
	0.0 to 800.0 °F	D	B7
	–300.0 to +1200.0 °F	D	B8

* The range with the resolution of 1/100 can be specified only by H-TIO-E module.

Voltage input and Current input (H-TIO-H/J, H-CIO-A)

Input type		Code		Range	Input group
		Input	Range		
Voltage input *	0 to 10 mV DC	1	01	0.0 to 100.0 %	Voltage (low) input group
	–10 to +10 mV DC	G	01	0.0 to 100.0 %	
	0 to 100 mV DC	2	01	0.0 to 100.0 %	
	–100 to +100 mV DC	U	01	0.0 to 100.0 %	
	0 to 1 V DC	3	01	0.0 to 100.0 %	
	–1 to +1 V DC	W	01	0.0 to 100.0 %	
	0 to 5 V DC	4	01	0.0 to 100.0 %	
	1 to 5 V DC	6	01	0.0 to 100.0 %	
	–5 to +5 V DC	D	01	0.0 to 100.0 %	
	0 to 10 V DC	5	01	0.0 to 100.0 %	Voltage (high) input group
	–10 to +10 V DC	V	01	0.0 to 100.0 %	
Current input *	0 to 20 mA DC	7	01	0.0 to 100.0 %	Current input group
	4 to 20 mA DC	8	01	0.0 to 100.0 %	

* Display scale of the voltage and current input can be changed.

■ H-CT module (Current transformer input module) model code

H-CT- □ - □
(1) (2)

(1) Type

A: CT input 6 points type (Each 2 points together are common)

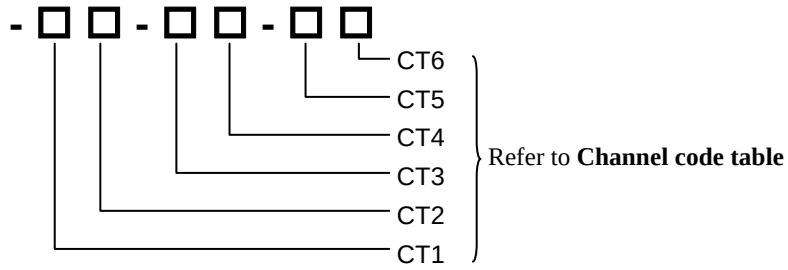
(2) CT type

P: CTL-6-P-N is used for 0 to 30 A
S: CTL-12-S56-10L-N is used for 0 to 100 A

CT (current transformer) is sold separately.

Initial Code

Specify the temperature control channels of H-TIO-□ module corresponding to each CT channel of H-CT-A module.



Channel code table

H-TIO-□ Channel No.	Unused	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Code No.	N	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	J

Each temperature control channel of H-TIO-□ module corresponding to each H-CT-A module can be allocated by the operation panel or host communication.

The overlapping of temperature control channels is possible. The unused channel is to be specified as “N.”

■ H-DI module (Digital input module) model code

H-DI- □
(1)

(1) Type

A: 24 V DC 8 points input type (4 points/common)
B: 24 V DC 8 points event input type (4 points/common)

■ H-DO module (Digital output module) model code

H-DO- □ - □
(1) (2)

(1) Type

A: 8 points alarm output type
B: 4 points alarm output type (Only relay contact output can be select)
C: 8 points event output type (Only open collector output can be select)
D: 16 points alarm output type (Only open collector output can be select)

(2) Output signal

M: Relay contact output (Type A: 4 points/common, Type B: Independent common)
D: Open collector output (8 points/common)

Initial Code

● H-DO-A, H-DO-D

- □ □

- Block 2 (H-DO-A: Lower 4 points terminal) (H-DO-D: Lower 8 points terminal) Refer to **DO allocation code table**
- Block 1 (H-DO-A: Upper 4 points terminal) (H-DO-D: Upper 8 points terminal) Refer to **DO allocation code table**

DO allocation code table

N: Unused
1: Temperature alarm 1
2: Temperature alarm 2
3: Heater break alarm
4: Burnout alarm
5: AI alarm 1
6: AI alarm 2
7: Loop break alarm

● H-DO-B

- □ N

- Block 1 (All points of terminal) Refer to **DO allocation code table**

Above initial code is for H-DO-A/B/D type module. As for the allocation of H-DO-C type module is done by the operation panel or host computer communication.

DO function can be allocated by the operation panel or host communication.

■ H-AI module (Analog input module) model code

H-AI- □ - □ □ □ □
(1) (2) (3) (4) (5)

(1) Type

A: 4 points analog input type (Not insulated between input channels)
B: 2 points analog input type (Insulated between input channels)

(2) AI 1 input type

□: Refer to **Analog input code table**

(3) AI 2 input type

□: Refer to **Analog input code table**

(4) AI 3 input type *

□: Refer to **Analog input code table**

(5) AI 4 input type *

□: Refer to **Analog input code table**

* The B type module is to be designated as “N” (no signal).

Analog input code table

1: 0 to 10 mV DC
2: 0 to 100 mV DC
3: 0 to 1 V DC
4: 0 to 5 V DC
5: 0 to 10 V DC
6: 1 to 5 V DC
7: 0 to 20 mA DC
8: 4 to 20 mA DC
D: –5 to +5 V DC
V: –10 to +10 V DC
W: –1 to +1 V DC
9: Others

■ H-AO module (Analog output module) model code

H-AO- □ - □ □ □ □
(1) (2) (3) (4) (5)

(1) Type

A: 4 points analog output type (Not insulated between output channels)
B: 2 points analog output type (Insulated between output channels)

(2) AO 1 output type

□: Refer to **Analog output code table**

(3) AO 2 output type

□: Refer to **Analog output code table**

(4) AO 3 output type *

□: Refer to **Analog output code table**

(5) AO 4 output type *

□: Refer to **Analog output code table**

* The B type module is to be designated as “N” (no signal).

Analog output code table

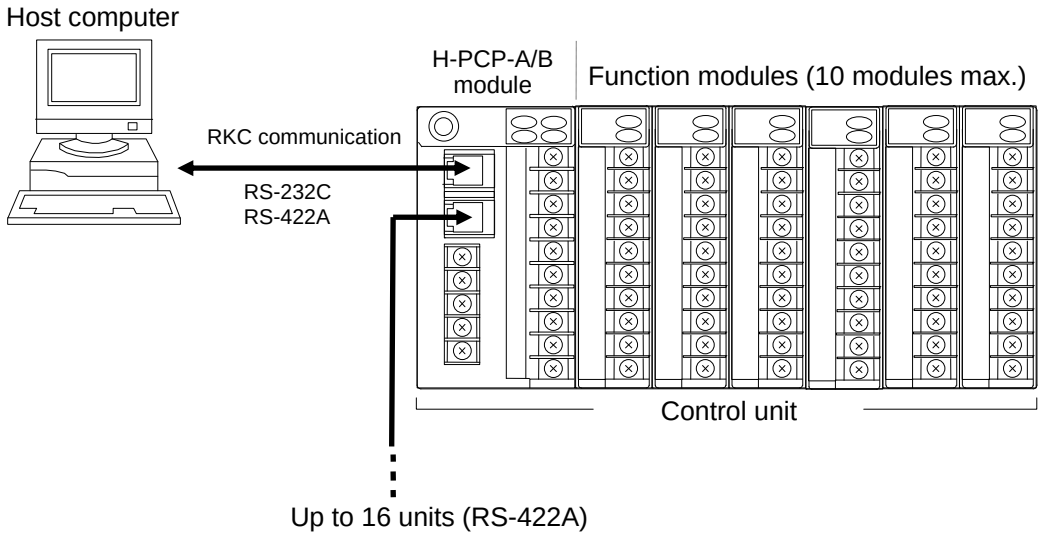
3: 0 to 1 V DC
4: 0 to 5 V DC
5: 0 to 10 V DC
6: 1 to 5 V DC
7: 0 to 20 mA DC
8: 4 to 20 mA DC
9: Others

2. SYSTEM CONFIGURATION

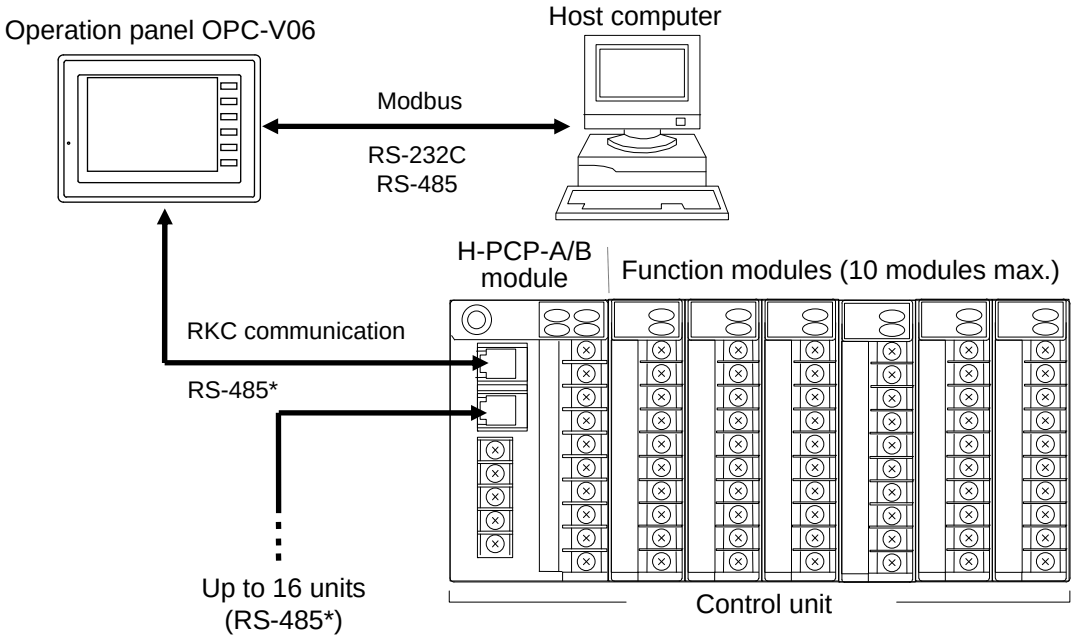
2.1 Basic Configuration

The basic system consists of control units containing the H-PCP-A/B module connected with the function modules of the desired type, and the dedicated operation panel for display and setting or the host computer.

- **Example 1: Connection with host computer**

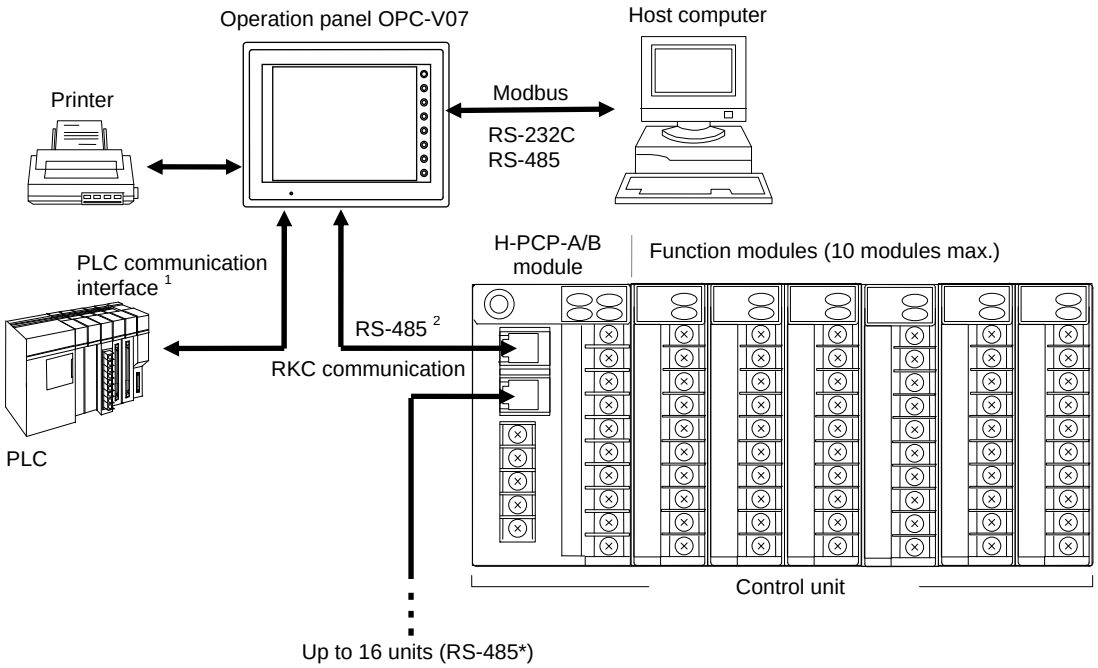


- **Example 2: Connection with RKC operation panel OPC-V06**



* The communication interface for control unit (H-PCP-A/B) is RS-422A.
The communication interface is converted RS-422A to RS-485 by connecting modular connector for terminal.

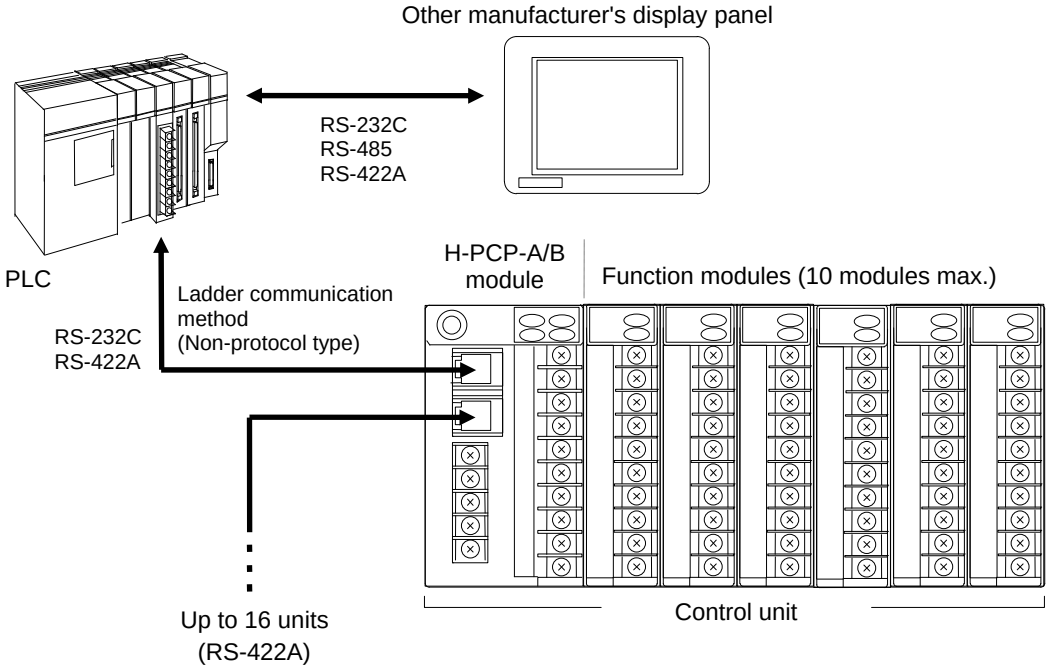
- **Example 3: Connection with RKC operation panel OPC-V07**



[1] When connecting a programmable controller (PLC), it is necessary to make the programmable controller settings, monitor screens, etc. with the panel editor V-SFT.
☞ For the panel editor V-SFT, please contact RKC sales office or the agent.

[2] The communication interface for control unit (H-PCP-A/B) is RS-422A.
The communication interface is converted RS-422A to RS-485 by connecting modular connector for terminal.

- **Example 4: Connection with PLC via ladder communication and with other manufacturer's display panel**



2.2 Precautions for System Configuration

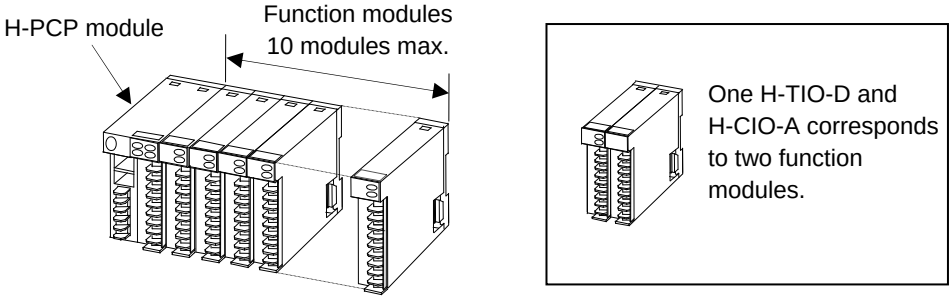
CAUTIONS

If you add or delete a functional module, or change the arrangement of the modules, or replace a module with a different model, be sure to perform "Module initialization (identifier CL)" before setting the data.
"Module initialization" stores the new module configuration in the H-PCP module.
If data is set before "Module initialization" is performed, the H-PCP module will set the previously stored initial data of the old modules in the new modules, which may cause malfunction.

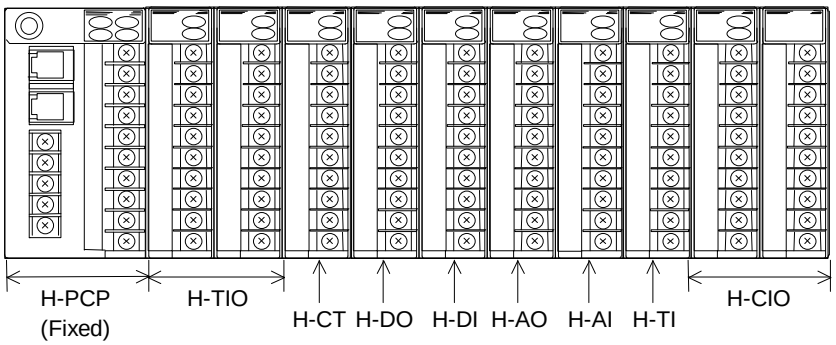
☞ For details on how to initialize the module, refer to **SR Mini/SR Mini HG SYSTEM Supplementary Information Initialize Settings [Extended Communications] (IMSRM07-E□)**.
The above manuals can be downloaded from the official RKC website:
http://www.rkcinst.com/english/manual_load.htm

When configuring or extending the system, observe the following precautions.

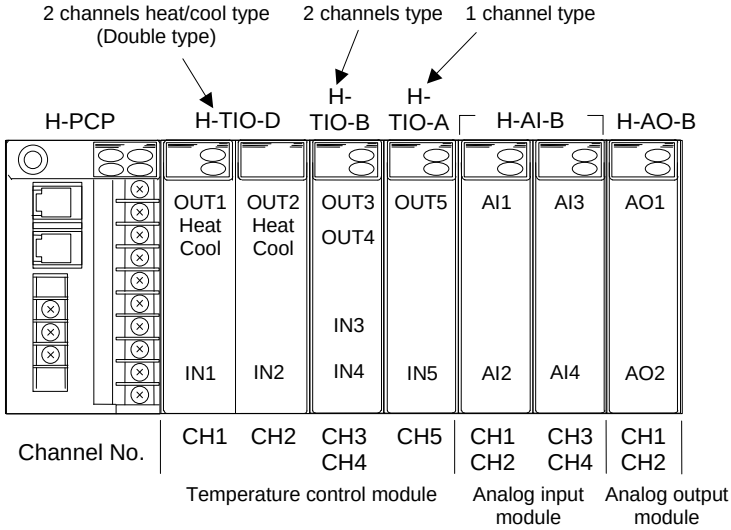
- The maximum number of function modules that can be connected to one control unit is 10, excluding the H-PCP module. However, if any specific module is mounted together with these function modules in the control unit, the maximum number of function modules mounted becomes less than 10.



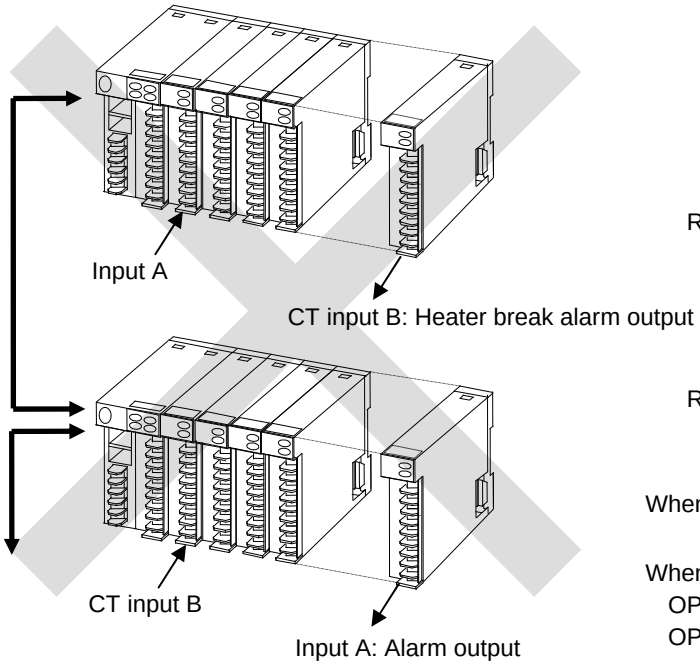
- As the mounting position of the H-PCP module is fixed to be on the left hand end of the function modules. There is no priority order of function module connection to the H-PCP module. For example, if the operation panel is used, the measured and set values can be easily checked from screen configuration with each module connected as follows. The assigned channel position can also be easily checked.



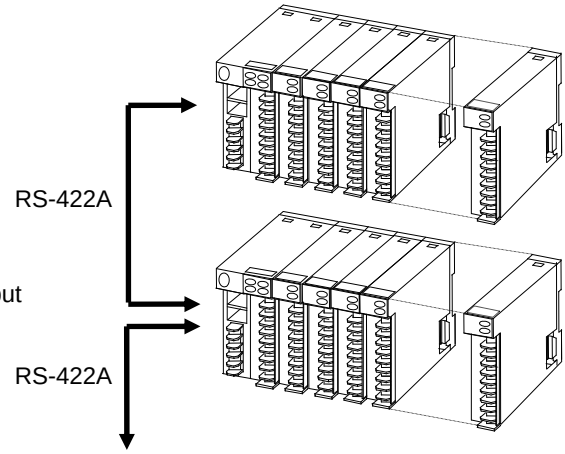
- Module channel numbers are automatically assigned from the left in order for each type of module.



- Assign CT inputs and H-DO module alarm outputs within the same control unit.
  (Because all control inputs and outputs must be closed within the same control unit.)



- If two or more control units are multi-drop connected, the communication specification of all H-PCP modules must be RS-422A.



When the host computer connected:
Up to 16 control unit

When the operation panel is connected:
OPM, OPM-H, OPC, OPC-H: Up to 8 control unit
OPC-V06, OPC-V07: Up to 16 control unit

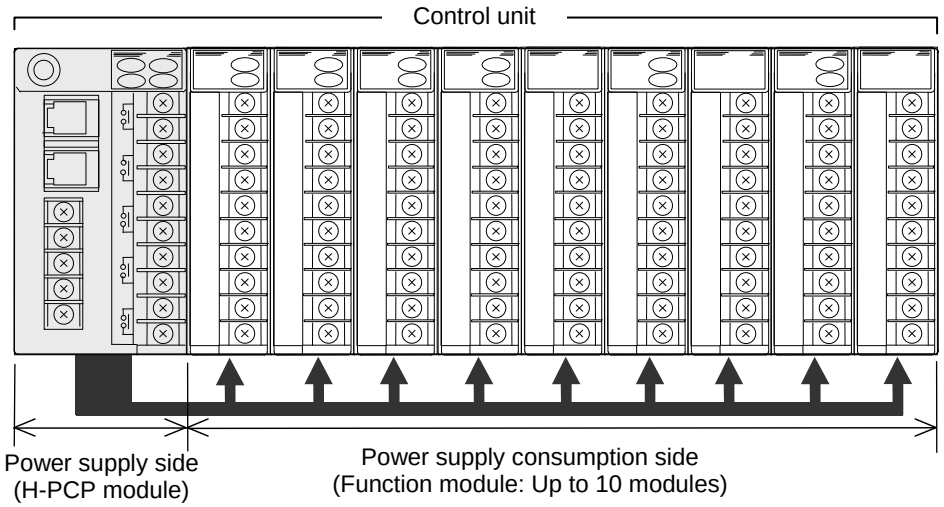
- Total power consumption of control units shall not exceed the maximum power consumption of H-PCP module on the power supply side.

  ☞ Refer to A. Appendix ■ Maximum power consumption of H-PCP module (P. 87)

- The H-PCP module contains a switching power supply and the maximum current that the H-PCP module can supply to the connected function modules is 1700 mA for 5 V power supply and 1000 mA for 12 V [CE/UL/cUL (or CSA) approved instrument] power supply.

  ☞ Refer to A. Appendix ■ Maximum current available for function modules (P. 87)

When adding function module(s), consider the power consumption of the total system referring to the following table so that either of the total current in the 5 V and 12 V power supplies will not exceed the maximum current that the H-PCP module can supply. However, when the system consists of AI-B modules only, up to seven (7) AI-B modules (total current 1820 mA for 5 V power supply) can be connected.



Consuming current of each function module

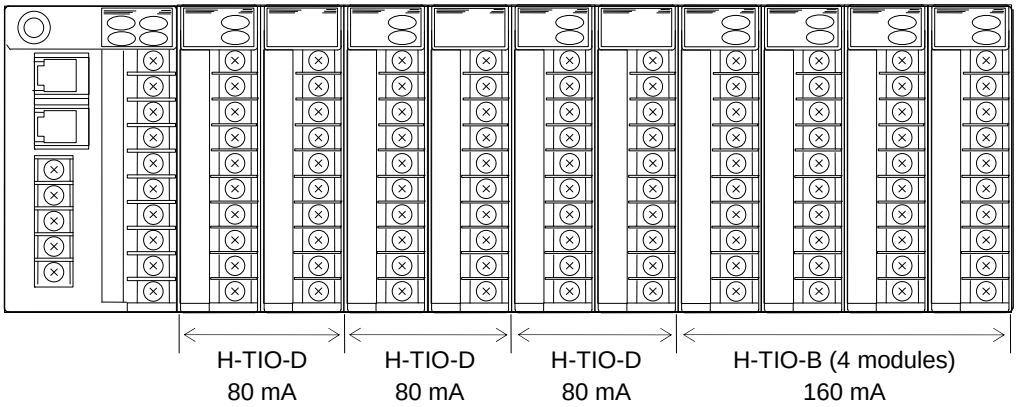
Function module	Power supply voltage of 5 V	Power supply voltage of 12 V
H-DO-A/B module (Relay contact output)	45 mA	140 mA
H-DO-A/C/D module (Open collector output)	45 mA	0 mA
H-DO-D module	70 mA	0 mA
H-AO-A module	40 mA	80 mA
H-AO-B module	40 mA	130 mA
H-TIO-D module	150 mA	80 mA
H-TIO-A/B/C/E/F/G/H/J/K/P/R module	150 mA	40 mA
H-CIO-A module	290 mA	40 mA
H-DI-A/B module	30 mA	0 mA
H-CT-A module	110 mA	0 mA
H-TI-A module	150 mA	0 mA
H-TI-B module	260 mA	0 mA
H-TI-C module	270 mA	0 mA
H-AI-A module	140 mA	0 mA
H-AI-B module	260 mA	0 mA
H-LNK-A module (Connectable to the H-PCP-G)	290 mA	0 mA
H-LNK-B module (Connectable to the H-PCP-A/J)	270 mA	120 mA
H-SIO-A module (Connectable to the H-PCP-J)	45 mA	90 mA (In using the power supply for sensor: 160 mA max.)

Continued on the next page.

Continued from the previous page.

[Example] When power supply voltage of 12 V

- **When using H-TIO-B modules together with H-TIO-D modules**

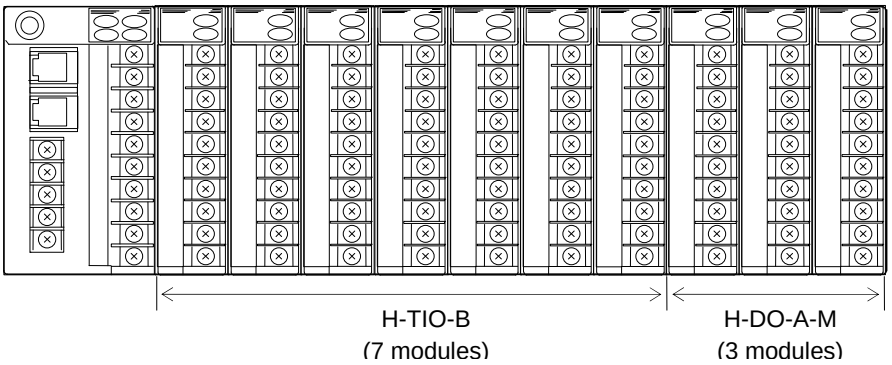


As the H-TIO-D module consumes an output current of 80 mA/slot and the H-TIO-B module, an output current of 40 mA, the following current is obtained.

For H-TIO-D (3 modules): $80 \times 3 =$ **240 mA**,
For H-TIO-B (4 modules): $40 \times 4 =$ **160 mA**

The above current does not exceed the maximum power supply capacity (1000 mA). However, as one H-TIO-D module is assumed to correspond to two function modules, **up to 7 function modules** can be mounted.

- **When using H-DO-A-M modules together with H-TIO-B modules**



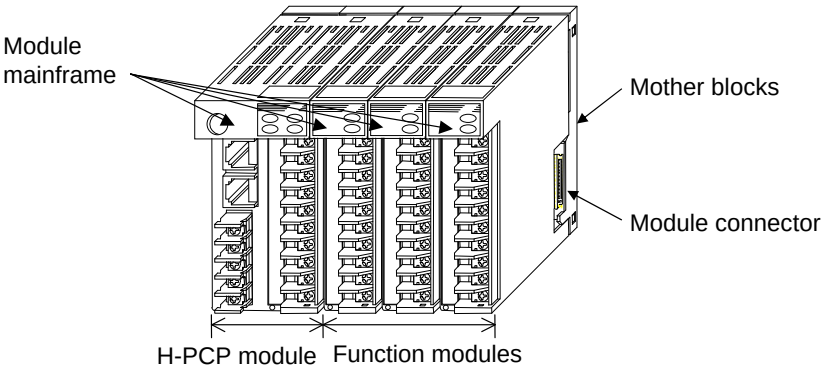
As an example in which the H-DO modules need to be added for outputting the alarm independently for each channel, when (H-DO-A-M modules: 3 modules) are added to (H-TIO-B modules: 7 modules) :
Each consuming output current becomes as follows.
For H-TIO modules (7 modules): $40 \text{ mA} \times 7 =$ **280 mA**,
For H-DO modules (3 modules): $140 \text{ mA} \times 3 =$ **420 mA**

280 mA + 420 mA = 700 mA ≤ 1000 mA: Maximum power supply capacity

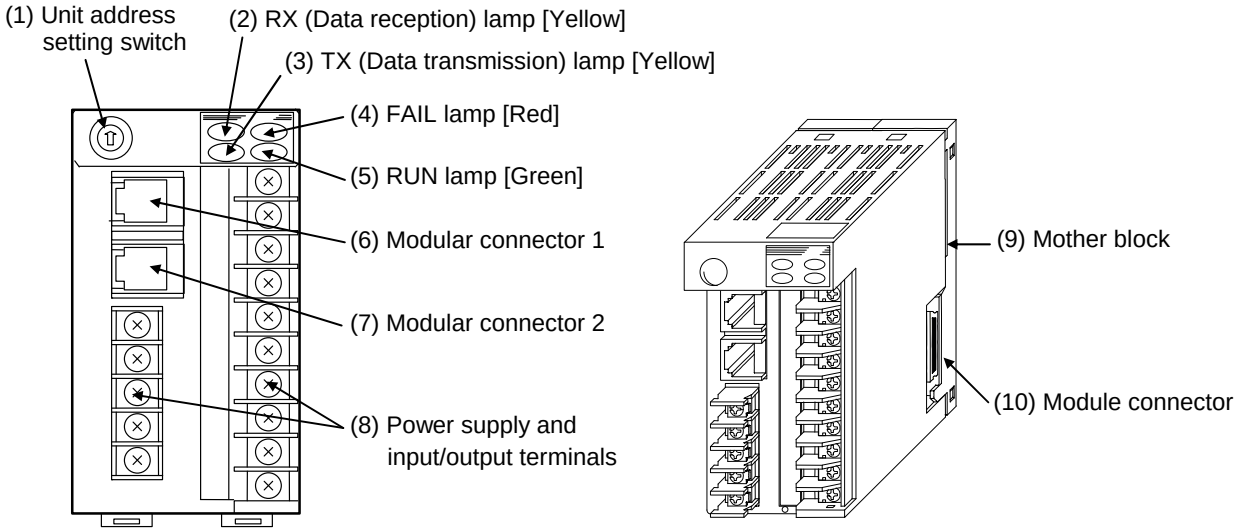
As the total current described above does not exceed the maximum power supply capacity (1000 mA), **up to 10 function modules** can be mounted.

3. PARTS DESCRIPTION

The control unit consists of various kinds of modules and a mother block and each modules are connected with each other by the connectors of mother block. Control unit using the H-PCP module as the basic module and connecting the necessary types of modules as necessary. It is possible to build up a multi function.



■ H-PCP module

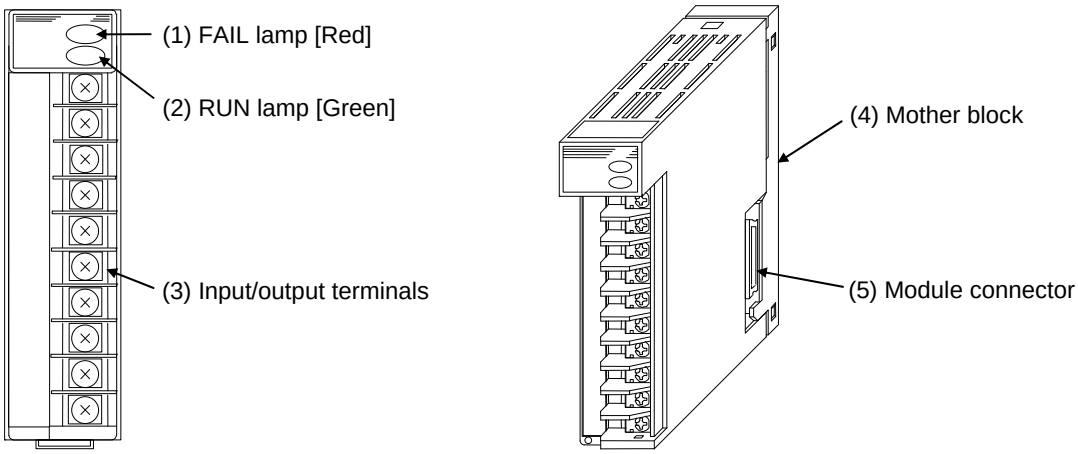


No.	Name	Description
(1)	Unit address setting switch	Set control unit slave address number Setting range: 0 to 15 (0 to F, hexadecimal)
(2)	RX (data reception) lamp [Yellow]	ON when data is correctly received
(3)	TX (data transmission) lamp [Yellow]	ON when data is correctly sent
(4)	FAIL lamp [Red]	ON during abnormal operation OFF during normal operation
(5)	RUN lamp [Green]	Flashing during normal operation
(6)	Modular connector 1	RS-232C or RS-422A connection with the host computer or operation panel
(7)	Modular connector 2	RS-422A connection with other control unit
(8)	Power supply and input/output terminals	Ground, power supply, FAIL output, digital input and digital output terminals
(9)	Mother block	Module DIN rail mounting connector
(10)	Module connector	Connector for power supply and bus connection

■ Single type module

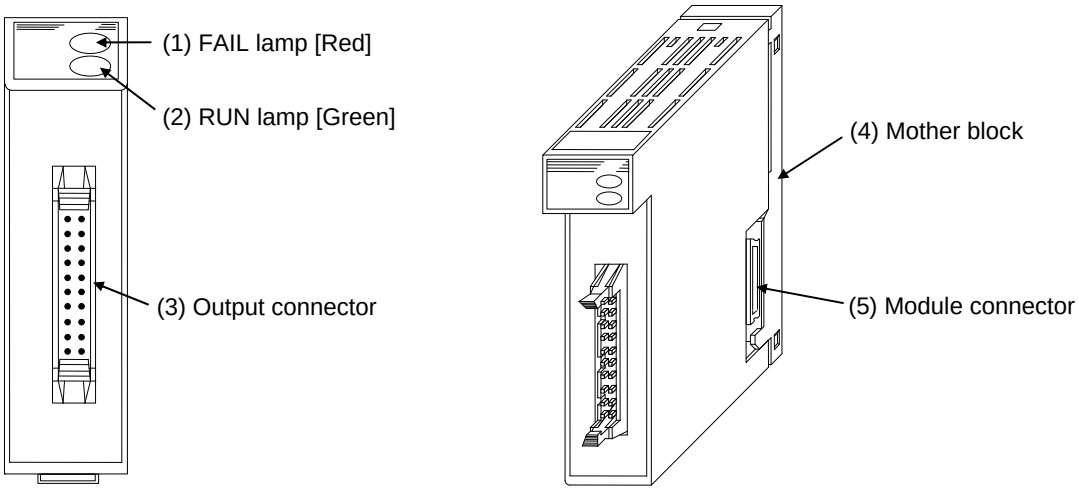
● Terminal type

Module type: H-TIO-A/B/C/E/F/G/H/J/K/P/R, H-TI-A/B/C, H-CT-A, H-DI-A/B, H-DO-A/B/C, H-AI-A/B, H-AO-A/B



● Connector type

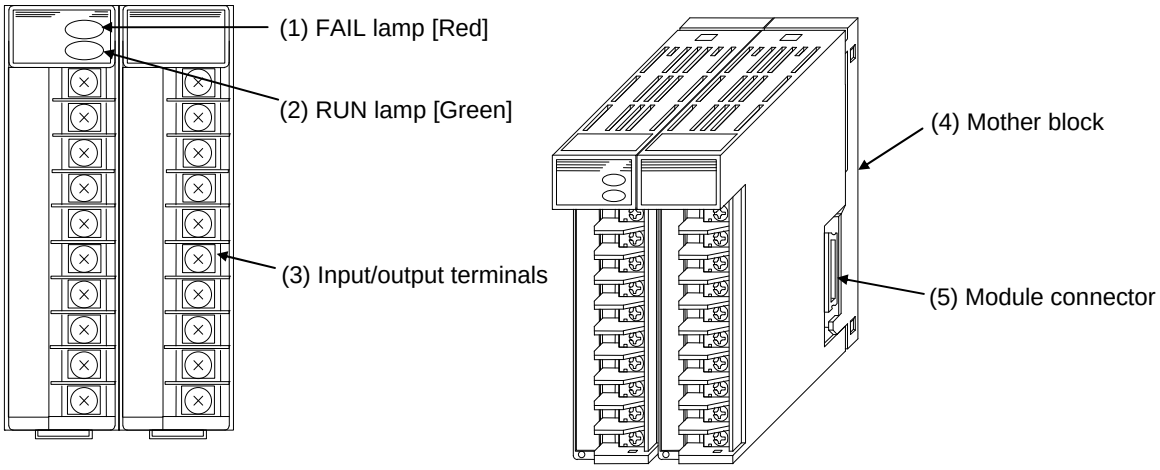
Module type: H-DO-D



No.	Name	Description
(1)	FAIL lamp [Red]	ON during abnormal operation OFF during normal operation
(2)	RUN lamp [Green]	Flashing during normal operation
(3)	Input/output terminals or output connector	Input/output terminals or digital output connector
(4)	Mother block	Module DIN rail mounting connector
(5)	Module connector	Connector for power supply and bus connection

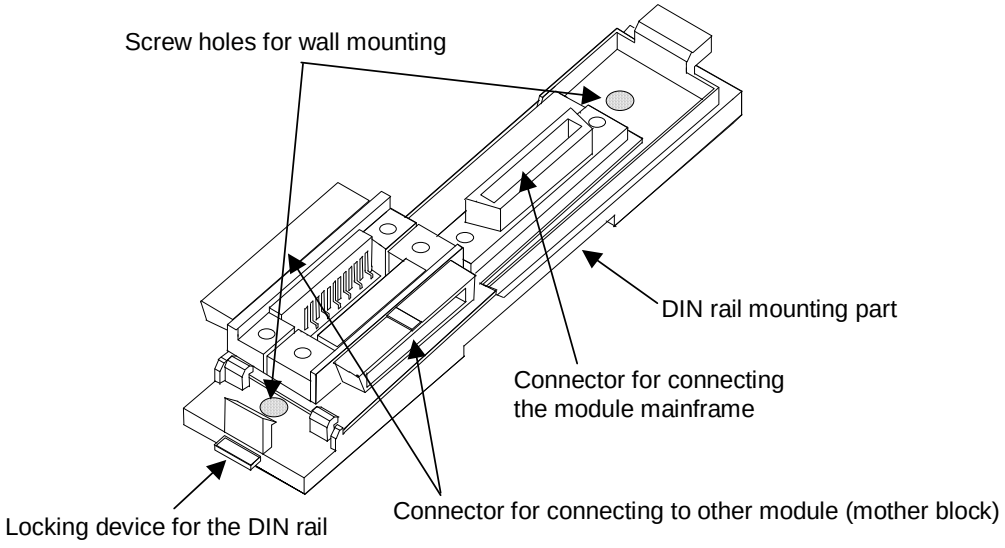
■ Double type module

Module type: H-TIO-D, H-CIO-A



No.	Name	Description
(1)	FAIL lamp [Red]	ON during abnormal operation OFF during normal operation
(2)	RUN lamp [Green]	Flashing during normal operation
(3)	Input/output terminals	Input/output terminals
(4)	Mother block	Module DIN rail mounting connector
(5)	Module connector	Connector for power supply and bus connection

■ Mother block



The Figure shows the mother block of single type module. However, the mother block is the same as for the double type module and H-PCP module.

4. MOUNTING

> **⚠ WARNING**
>
> To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

4.1 Mounting Cautions

(1) This instrument is intended to be used under the following environmental conditions. (IEC61010-1) [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

(2) Use this instrument within the following environment conditions:

- Allowable ambient temperature: 0 to 50 °C
- Allowable ambient humidity: 45 to 85 % RH
  (Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3 kPa)
- Installation environment conditions: Indoor use
  Altitude up to 2000 m.

(3) Avoid the following conditions when selecting the mounting location:

- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

(4) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

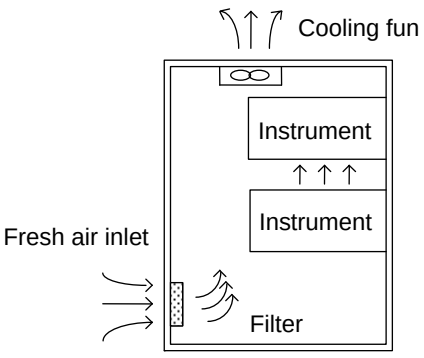
4.2 Mounting Position Within Panel

Mount this instrument in the panel most suited to the environment and to facilitate operation and maintenance.

(1) Mounting precautions

■ Temperature considerations

- Allow enough ventilation space.
- Do not mount this instrument directly above equipment which generates heat (heaters, transformers, large resistors, etc.).
- If the ambient temperature rises above 50 °C, cool the panel inside using a forced fan or cooler. However, do not expose the control unit directly to the air. If exposed, this may cause an error.



Example of cooling panel

■ Humidity considerations

Condensation may form in the instrument due to rapid changes in temperatures by turning the air conditioner on or off. Such condensation can cause instrument malfunctions due to insulation deterioration or shorting. To prevent the risk of condensation, always turn on the power or pre-heat the instrument using space heaters.

■ Panel vibration or impact considerations

- Isolate the panel from external vibration or shock using rubber vibration insulators.
- If the electromagnetic switches cause vibration when they operate within the panel, isolate the switches using rubber vibration insulators.

■ Environment considerations

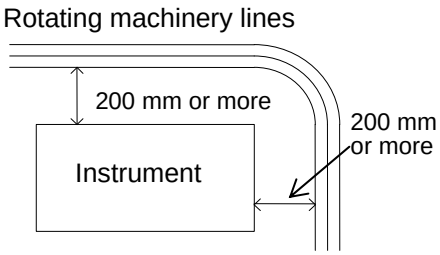
If dust, steam, soot or poisonous gas exists, purge the panel inside using clean air and create a slight positive pressure inside the panel to keep out the harmful gases.

■ Ease of operations and maintenance considerations

To ensure safety for maintenance and operation, separate the instrument from high voltage equipment or rotating machinery where possible.

■ Anti-noise considerations

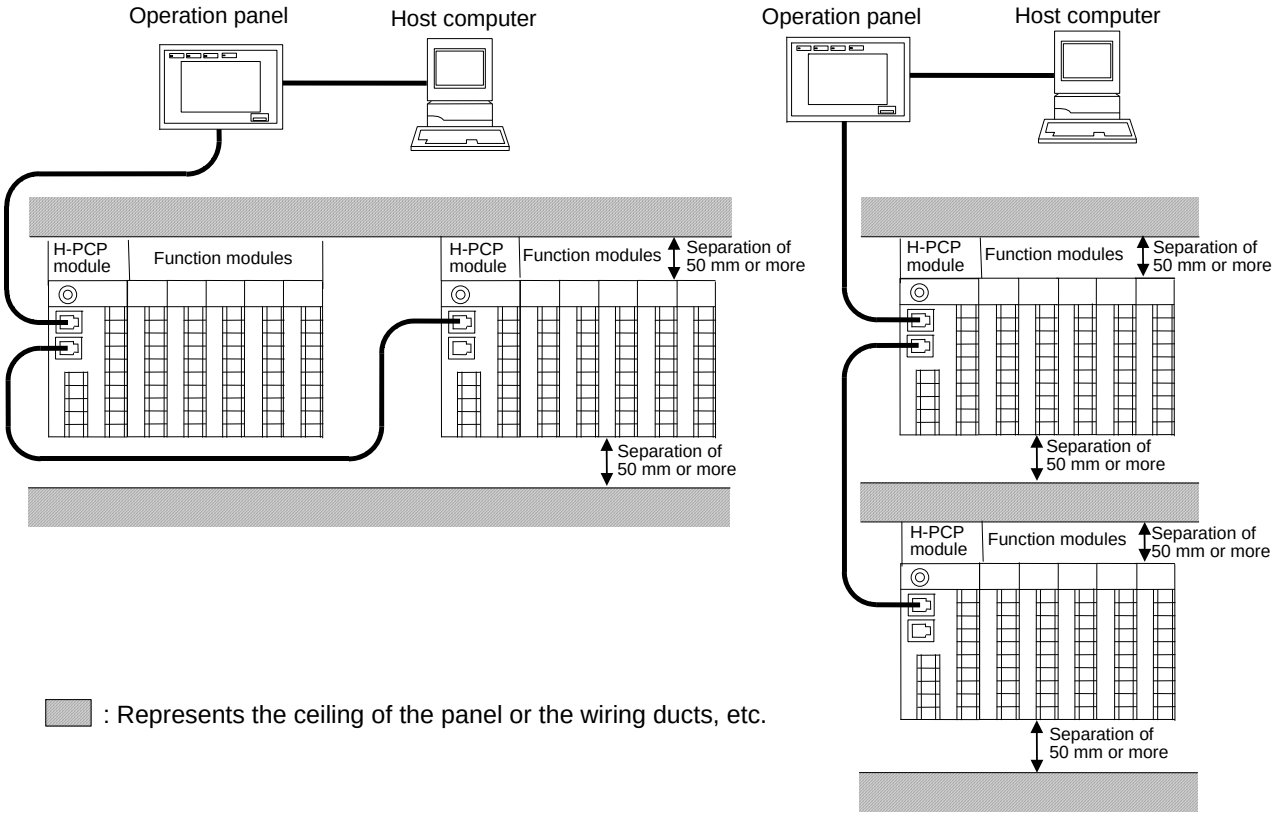
- Do not install the instrument in a panel where high-voltage equipment is installed.
- Separate the instrument from rotating machinery lines by more than 200 mm.



Distance from rotating machinery lines

(2) Example of mounting within panel

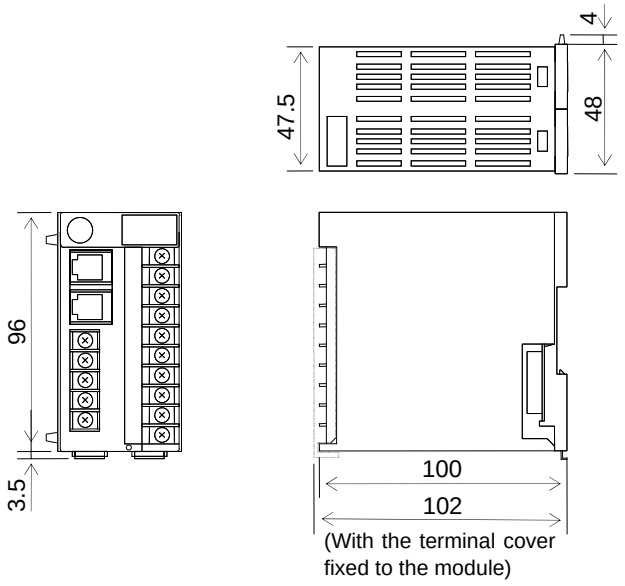
As the mounting position of the H-PCP module is fixed to be on the left hand end of the function modules, be careful not to neglect to take this position when mounting the modules. (Refer to the following figure)



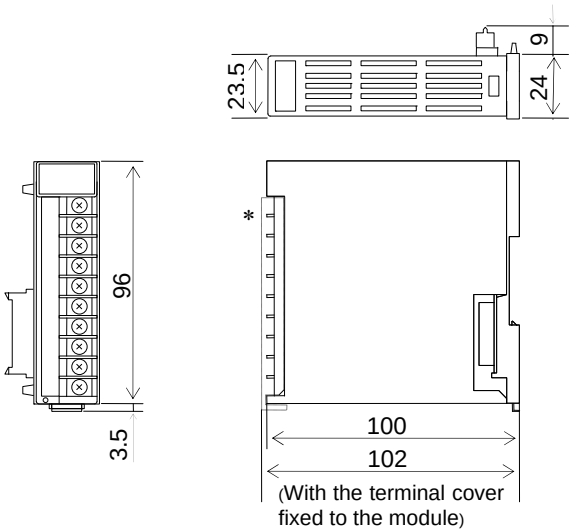
4.3 Dimensions

■ External dimensions

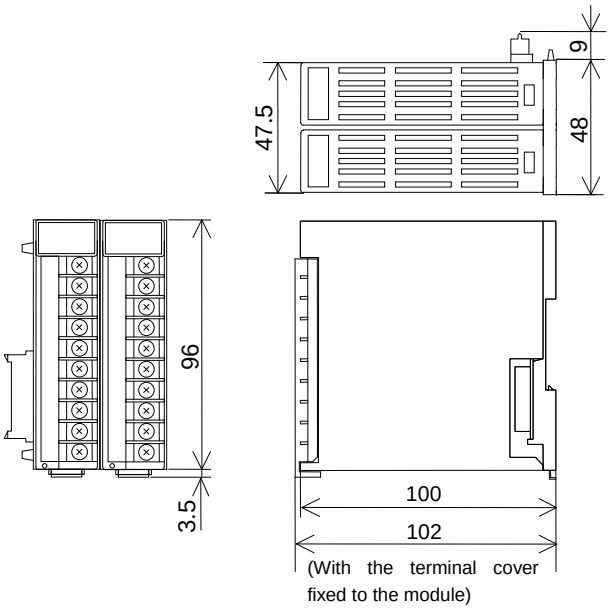
(Unit: mm)



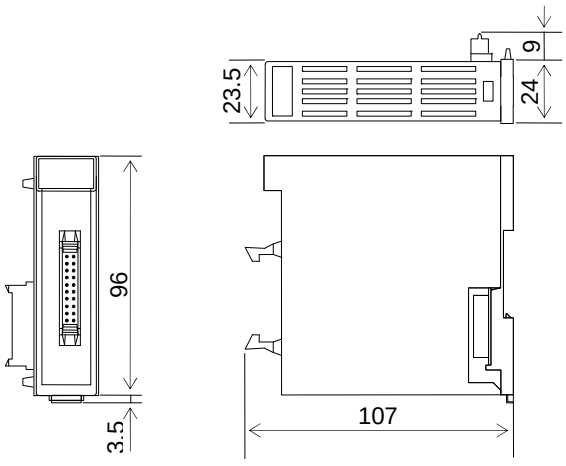
H-PCP-A/B module



Single type module



Double type module

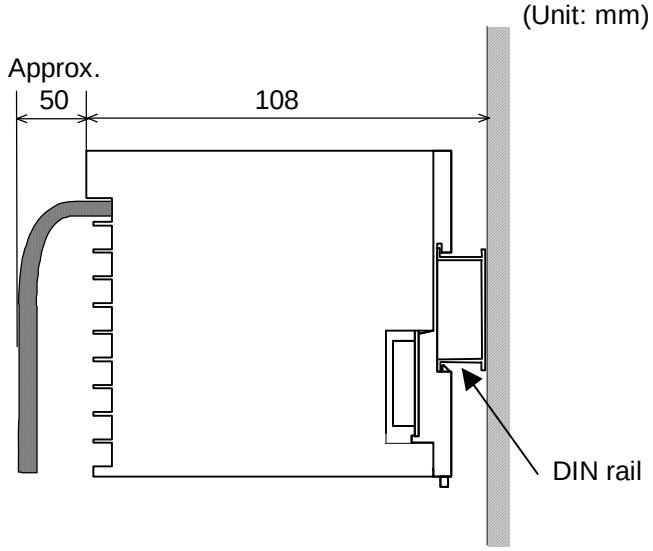


H-DO-D module

*Dotted-line section: Terminal cover

■ Module mounting depth (For DIN rail mounting)

The mounting depth of each module is 108 mm from the mounting surface inside the panel to the front of the module with the module mounted on the DIN rail. However, when modular connector cables are plugged in, additional depth is required.



4.4 Mounting the Mother Block

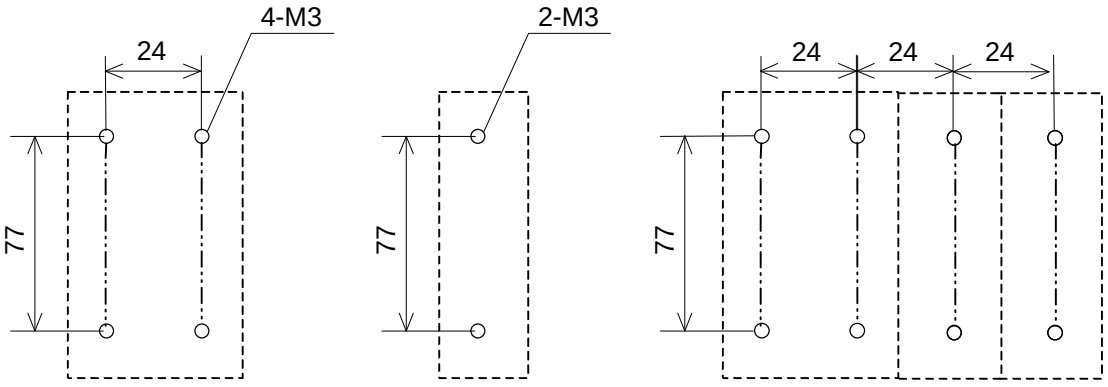
The mother block can be mounted to a panel or DIN rail.

Mount the H-PCP module on the left side of the control unit.

■ Panel mounting directions

1. Refer to both the panel mounting dimensions below and the **4.3 Dimensions (P. 24)** when selecting the location.

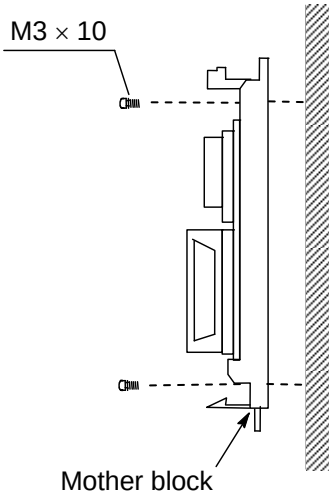
(Unit: mm)



Double type module | Single type module | Dimensions for multiple module mounting.

2. Remove the module from the mother block. For details of removing the module, refer to **4.7 Removing the Module Mainframe (P. 28)**.

3. Connect the mother blocks together before tightening the screws on the panel.
(Customer must provide the set screws)



Tightening torque
Recommended value: 0.3 N·m (3 kgf·cm)

When the mother block is mounted on the panel, 50 mm or more space is required at the top and bottom of the mother block to attach the module mainframe.

■ DIN rail mounting directions

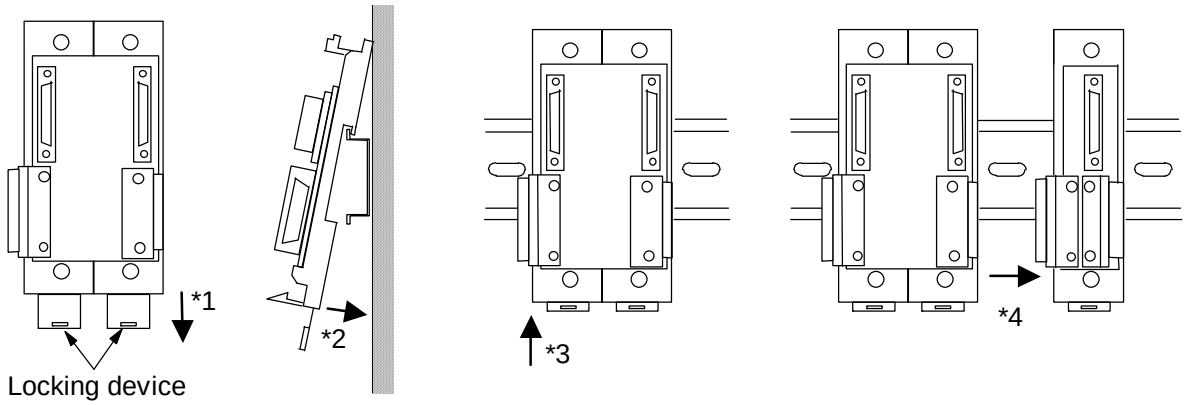
1. Remove the module mainframe from the mother block. For details of removing the module mainframe, refer to **4.7 Removing the Module Mainframe (P. 28)**.

2. Pull down the locking device at the bottom of the mother block. (*1)
For the double type, as there are two locking devices, pull down both of them.

3. Attach the top bracket of the mother block to the DIN rail and push the lower section into place on the DIN rail. (*2)

4. Slide the locking devices up to secure the mother block to the DIN rail. (*3)

5. Slide connectors together to complete mother block installation. (*4)



Double type mother block mounting

When the mother block is mounted on the panel, 50 mm or more space is required at the top and bottom of the mother block to attach the module mainframe.

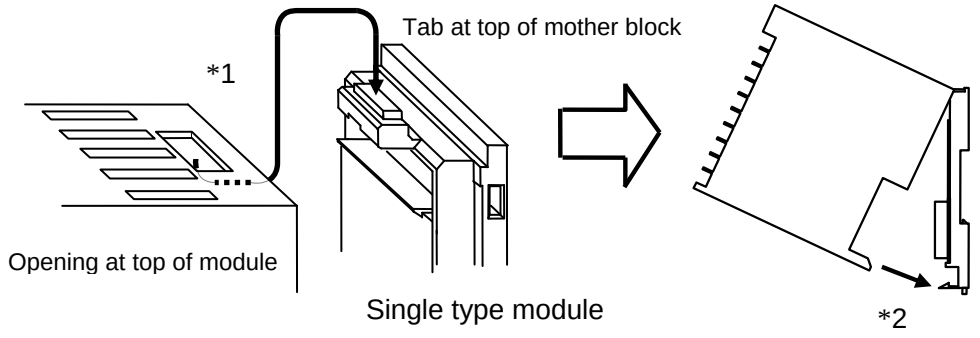
The figures above are for the double type module. The single type module can also be removed in the same way.

4.5 Mounting the Module Mainframe

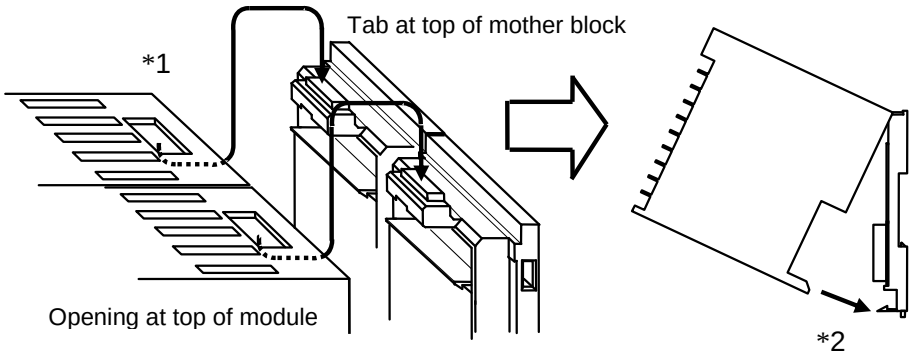
It engages the module with the mother block that is mounted on DIN rail or a panel.

1. Place the module mainframe opening on top of the mother block tab. (*1)

2. Snap the lower part of module mainframe on to the mother block. (*2)
A snapping sound will be heard when module mainframe is securely connected to mother block.



Single type module



Double type module

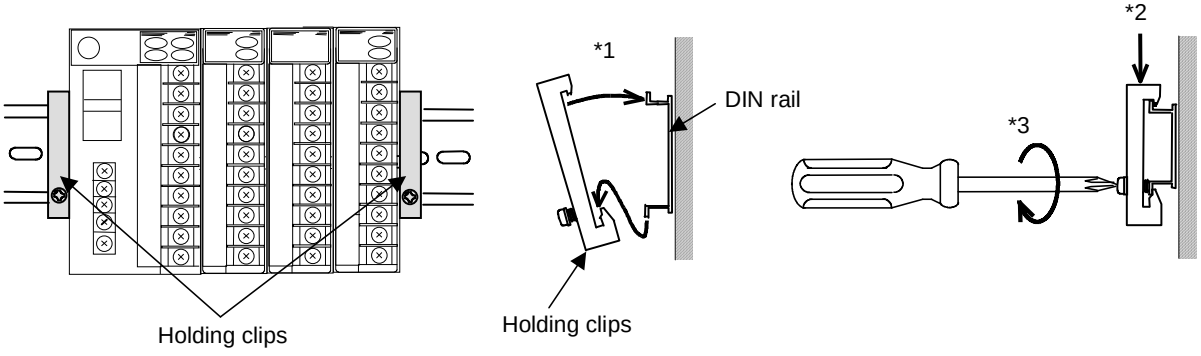
4.6 Fixing of the Control Unit (For DIN rail mounting)

Mounting the fixture (accessory) to the both end of control unit.

1. Attach the bottom of the holding clips to the DIN rail and push the top section into place on the DIN rail. (*1)

2. After the top of the holding clips is snugly attached to the top of the DIN rail. (*2)

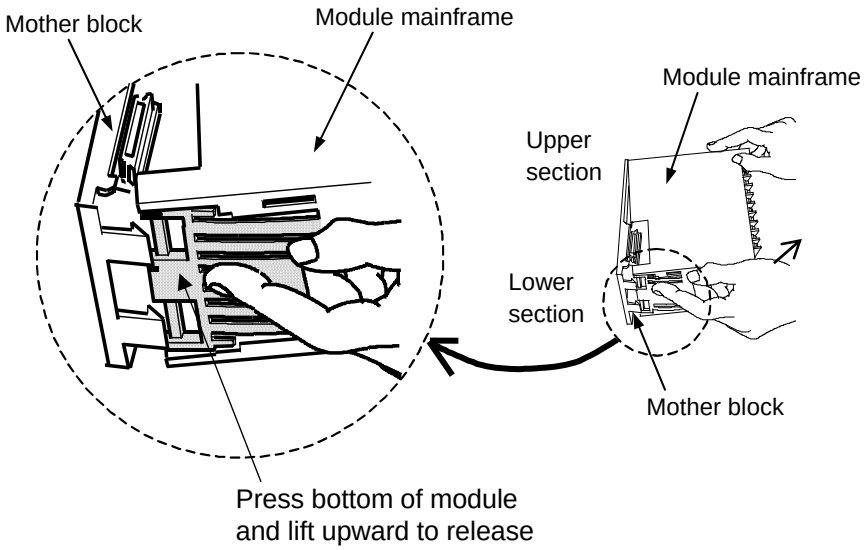
3. Tighten the screw with a screwdriver. (*3)



4.7 Removing the Module Mainframe

It detaches the module from the mother block that is mounted on DIN rail or a panel.

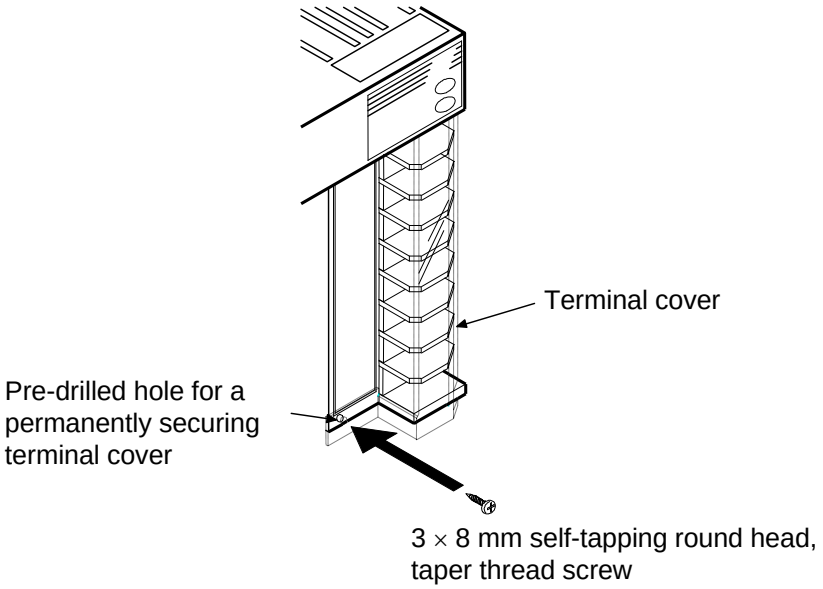
To separate the module mainframe from the mother block, press the bottom on the module, lifting upward, to release connection.



The figures above are for the double type module. The single type module can also be removed in the same way.

4.8 Terminal Covers

Terminal covers snap on to protect the module terminals. These covers can be permanently secured to the module using a 3 × 8 mm self-tapping round head, taper thread screw. (Customer must provide screws)



5. WIRING

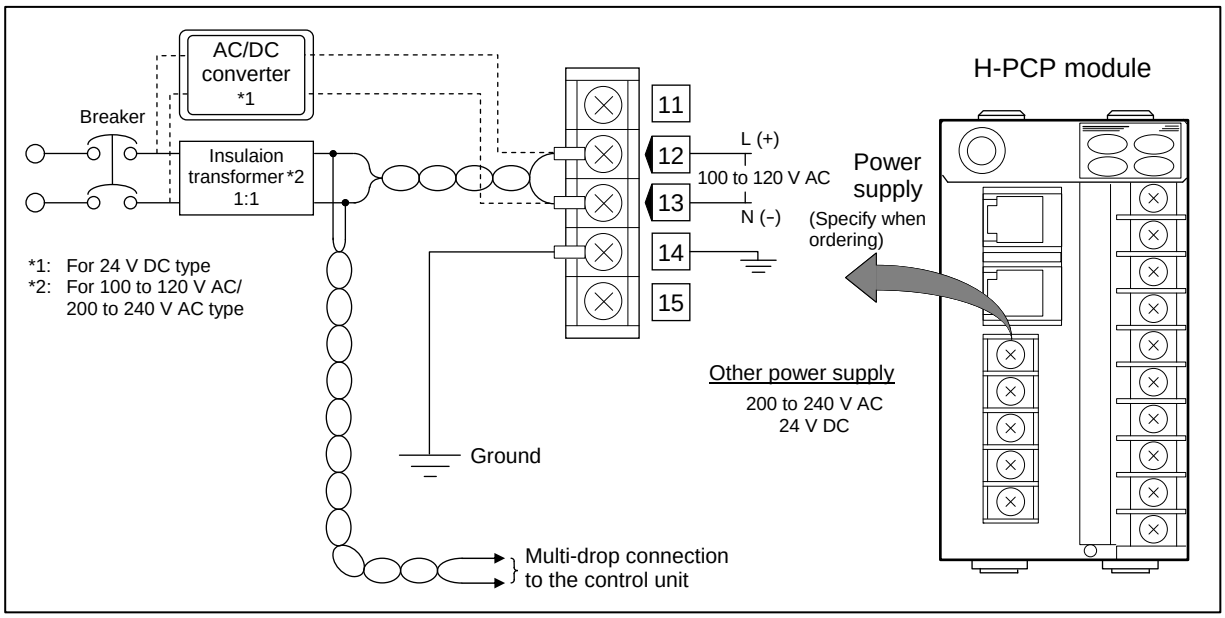
⚠ WARNING

To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

5.1 Wiring Cautions

■ Power supply wiring

- Use power supply as specified in power supply rated voltage range.
- Power supply wiring must be twisted and have a low voltage drop.
- Provide separate power supply for this instrument independent of other input/output circuits, motors, equipment and operating circuits.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
  - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
  - Always install the noise filter on a grounded panel.
  - Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
  - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
  - Take into consideration the instrument power supply voltage and filter frequency characteristics when selecting the most effective noise filter.

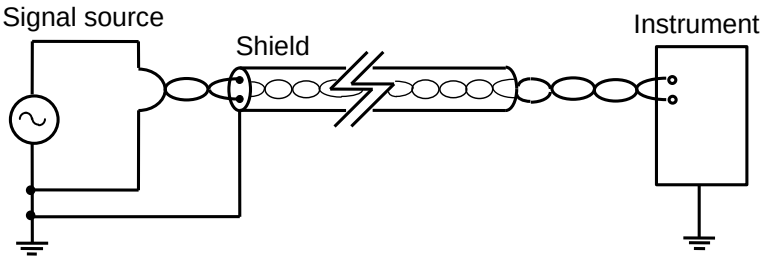


- For an instrument with 24 V power supply input, supply power from "SELV" circuit defined as IEC 60950-1.
- A suitable power supply should be considered in the end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).

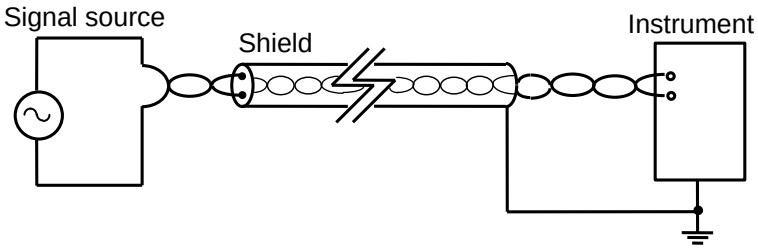
■ Input/output wiring

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- Use independent ducts for the input/output wires and power circuits inside and outside the panel.
- If input/output wires have to be placed in the same duct as the power circuits, use shielded wires. Ground the shield to reject any noise generated by the floating capacitance between the cores and shield or by a grounding potential.

Example: When signal source is grounded, ground the shield to the signal source side.

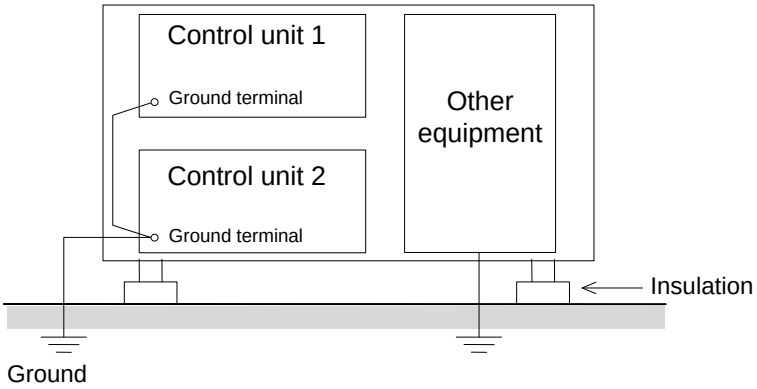


Example: When signal source is not grounded, ground the shield to the instrument side.



■ Ground wiring

- Use grounding wires with a cross section area of 2.0 mm^2 or more.

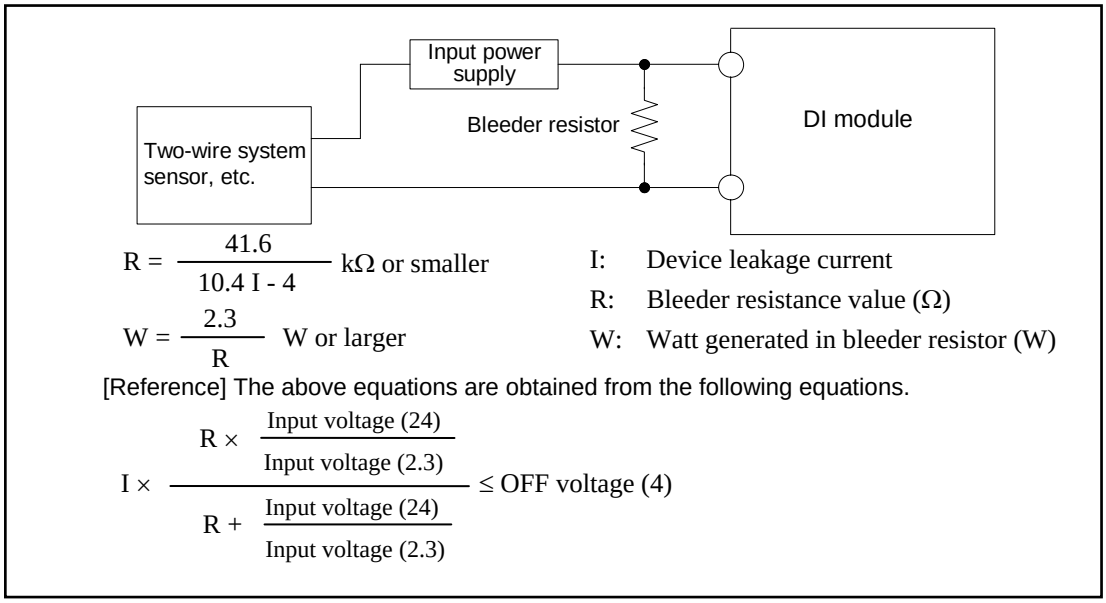


■ FAIL output wiring

Configure the external relay circuit of the FAIL output so that instrument failure does not affect the entire system. Configuration of an emergency stop circuit is also required to protect the system.

■ Leakage current at 24V DC input

When a two-wire system sensor (proximity switch or photoelectric switch) or limit switch with LED is used, the lamp may light due to leakage current or incorrect input.
No problem arises for a leakage current of less than 0.75 mA, but for 0.75 mA or more, connect a bleeder resistor as shown in figure to lower the input impedance.



$$R = \frac{41.6}{10.4\,I - 4}\ k\Omega \text{ or smaller}$$

$$W = \frac{2.3}{R}\ W \text{ or larger}$$

I: Device leakage current
R: Bleeder resistance value (Ω)
W: Watt generated in bleeder resistor (W)

[Reference] The above equations are obtained from the following equations.

$$I \times \frac{R \times \dfrac{\text{Input voltage (24)}}{\text{Input voltage (2.3)}}}{R + \dfrac{\text{Input voltage (24)}}{\text{Input voltage (2.3)}}} \leq \text{OFF voltage (4)}$$

5.2 Confirmation Before Wiring

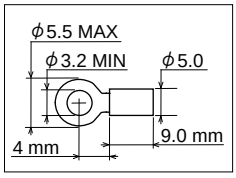
■ Re-confirmation of the specifications

Re-confirm the input/output specifications of each module.
In particular, take adequate care of the input current and voltage for the inputs, and the output current and voltage for the outputs. If a voltage is applied or if a current flows exceeding the maximum opening/closing capacity, this will cause the problems such as breakdowns, damage, fires, etc.

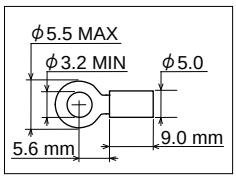
■ Confirmation of wiring

- Configure the wiring so that it will be easy to carry out the replacement of modules.
- Confirm that each module is securely attached to the mother block.
- Confirm that the terminal panels and connectors are securely attached to the modules.
- Use the solderless terminal appropriate to the screw size.
  Screw size:
  Power supply terminals (H-PCP-A/B): M3×7
  Input/output terminals: M3×6 (with 5.8×8 square washer)
  Recommended tightening torque: 0.4 N·m (4 kgf·cm)
  Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm^2
  Specified solderless terminals:
  Power supply terminals (H-PCP-A/B): Circular terminal with isolation V1.25-3 *
  Input/output terminals: Circular terminal with isolation V1.25-MS3
  Manufactured by J.S.T MFG CO., LTD.
  * If solderless terminal lugs are used, a terminal cover is not kept.
- Make sure that during field wiring parts of conductors can not come into contact with adjacent conductive parts.

V1.25–3



V1.25–MS3



5.3 H-PCP Module

The H-PCP module is made up of the CPU section and the power supply section for the SR Mini HG SYSTEM control unit. This module is indispensable to construct the control unit with other modules.
The H-PCP module carries out the supply of power to each module, the data management and the interfacing with the operation panel or a host computer. There are the following two types of H-PCP modules according to the functions.

Type	Terminal	Communication port
H-PCP-A	Power supply FAIL output Digital output (DO) 4 points [1]	COM.PORT1/COM.PORT2 Interface: RS-422A or RS-232C Protocol: RKC communication protocol Ladder communication (Non-protocol type) [Z-190 specification]
H-PCP-B	Power supply FAIL output Digital output (DO) 2 points [1] Digital input (DI) 2 points [2]	

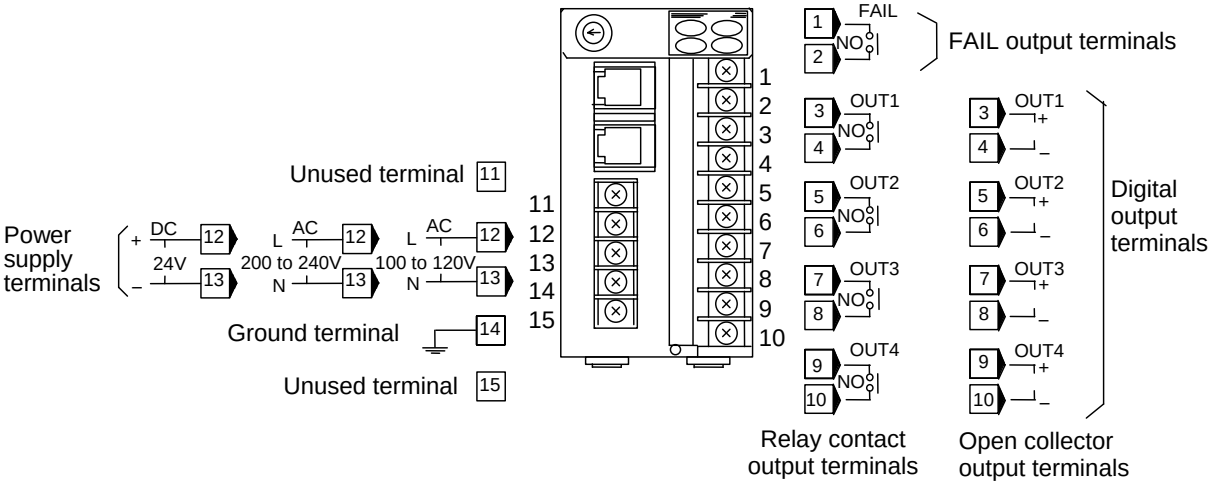
[1] The digital outputs (DO) can be selected from the alarm 1, alarm 2, heater break alarm (HBA), burnout alarm, temperature rise completion, loop break alarm (LBA), AI alarm 1 or AI alarm 2.
In addition, function of digital output (DO) selects in operation panel or host communication.

[2] The digital inputs (DI) function can be select following type 1 to 3 in operation panel or host communication. (Factory set value: Unused)

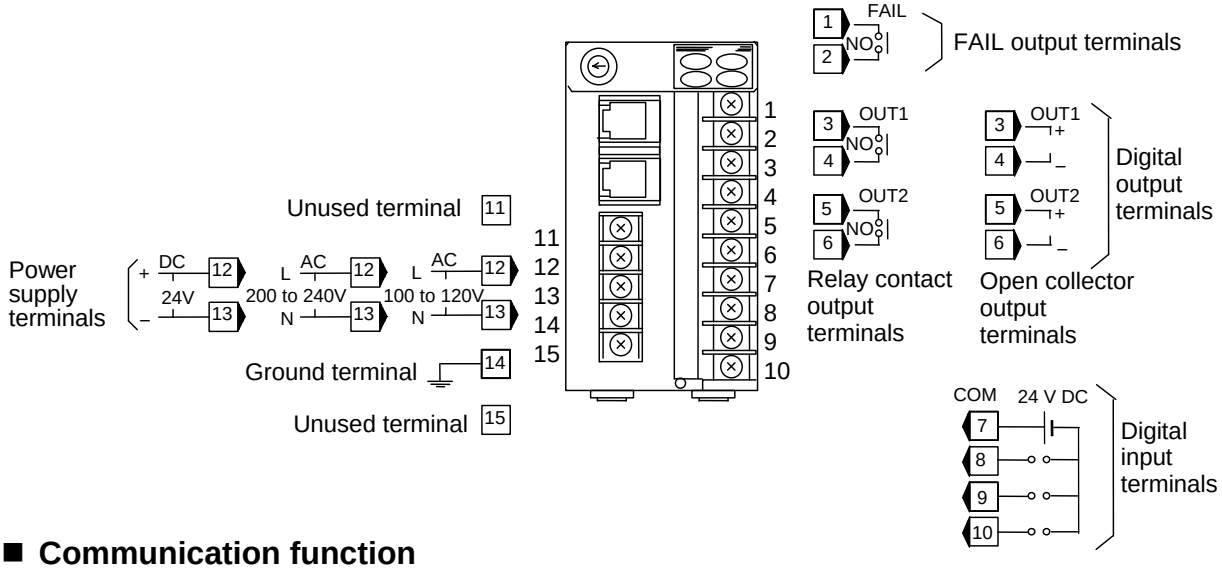
Type 1: Memory area selection (8 areas selection)
Type 2: Combination of control Run/Stop selection and memory area selection (4 areas selection)
Type 3: Combination of control Run/Stop selection, alarm interlock release and memory area selection (2 areas selection)

■ Terminal configuration

● H-PCP-A type (Module with four DO points)



● **H-PCP-B type (Module with two DO points and three DI points)**



■ Communication function

The H-PCP module has communication port COM.PORT1/COM.PORT2 and can be connected with operation panel, host computer and extension control unit.

Interface: RS-422A or RS-232C

Protocol: RKC communication protocol

Ladder communication (Non-protocol type) [Z-190 specification]

Connection instrument:

Operation panel, host computer, extension control unit, PLC [Z-190 specification]

For the H-PCP-A/B module with the ladder communication, special specification code “Z-190” must be specified at the end of the model code.

The H-TIO-K, H-CIO-A, H-DI-B and H-DO-C module cannot be used to the H-PCP-A/B module with the specification of ladder.

■ Output function

● FAIL output

The FAIL output is output when a problem occurs in the CPU operation and the FAIL lamp will light at the same time. Use this output for FAIL monitoring or for signal output to an external PLC, etc.

- Number of output: 1 point
- Output type: Relay contact output 1a contact (Open at error occurrence)
  Rating: 250 V AC 0.1 A (Resistive load)]
  CE/UL/cUL (or CSA) approved instrument: 30 V DC 0.1 A

When the FAIL condition occurs in any of the function modules in the control unit, the FAIL output will also be output. However in this situation, the FAIL lamp will not light.

If the composition of the control unit is changed (add or delete a functional module, or change the arrangement of the modules, or replace a module with a different model) without the module initialization, the FAIL output will be output. However in this situation the FAIL lamp will not light either.

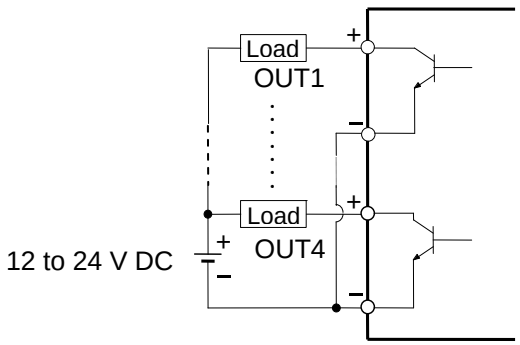
For details on how to initialize the module, refer to **SR Mini/SR Mini HG SYSTEM Supplementary Information Initialize Settings [Extended Communications] (IMSRM07-E□)**.

● Digital output (DO)

The digital outputs (DO) can be selected from the alarm 1, alarm 2, heater break alarm (HBA), burnout alarm, temperature rise completion, loop break alarm (LBA), AI alarm 1 or AI alarm 2.
In addition, function of digital output (DO) selects in operation panel or host communication.

- Number of output: 4 points (H-PCP-A type), 2 points (H-PCP-B type)
- Output type: Relay contact output 1a contact (Closed at alarm occurrence)
  Rating: 250 V AC 0.1 A (Resistive load)
  CE/UL/cUL (or CSA) approved instrument: 30 V DC 0.1 A
  Open collector output
  [Load voltage: 12 to 24 V DC, Maximum load current: 0.1 A]

Open Collector Output Wiring Example



In using the open collector output, an external power supply of 24 V DC is required. Note that if this power supply is not connected, there will be no output from the module.

If there is no heater break alarm (HBA) function in the control unit (H-TIO-A/C/D modules provided with CT input as option, or control unit without H-CT-A module), a heater break alarm (HBA) cannot be selected.

If there is no H-AI module in the control unit, an AI alarm cannot be selected.

For the control unit consisting of only the H-TIO-H/J modules, a loop break alarm (LBA) cannot be selected.

■ Input function

● Digital input (DI) [Only for H-PCP-B]

The digital inputs (DI) function can be select following type 1 to 3 in operation panel or host communication. (Factory set value: Unused)

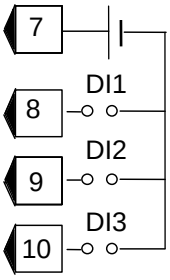
Type 1: Memory area selection (8 areas selection)
Type 2: Combination of control Run/Stop selection and memory area selection (4 areas selection)
Type 3: Combination of control Run/Stop selection, alarm interlock release and memory area selection (2 areas selection)

After the contact is closed, it takes a short time until the action of this device is actually selected. Therefore, pay attention to this delay time if the device is used together with a PLC, etc.

External power (24 V DC) supply is required for digital input.

Type 1: Memory area selection

The memory area (control area) can be selected depending on the open or close state of terminal numbers 7 to 10. Select the memory area by configuring an external contact circuit or using a contact output signal from the PLC, if necessary.

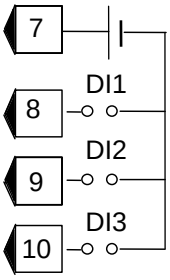


Control area / Terminal No.	1	2	3	4	5	6	7	8
7 - 8	–	×	–	×	–	×	–	×
7 - 9	–	–	×	×	–	–	×	×
7 - 10	–	–	–	–	×	×	×	×

–: Open ×: Close

Type 2: Control Run/Stop selection, memory area selection

Selection can be performed depending on the open or close state of terminal numbers 7 to 10.



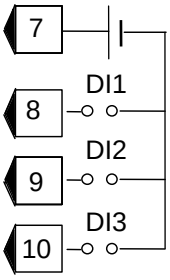
Control area / Terminal No.	1	2	3	4
7 - 8	–	×	–	×
7 - 9	–	–	×	×

–: Open ×: Close

← Contact opened: Control Stop Contact closed: Control Run

Type 3: Control Run/Stop selection, alarm interlock release specifying and memory area selection

Selection or release specifying can be performed depending on the open or close state of terminal numbers 7 to 10.



← Memory area selection (Contact opened: Memory area No.1
Contact closed: Memory area No.2)
← Alarm interlock release (Contact closed: Alarm interlock released)
← Control Run/Stop selection (Contact opened: Control Stop
Contact closed: Control Run)

5.4 H-TIO Module

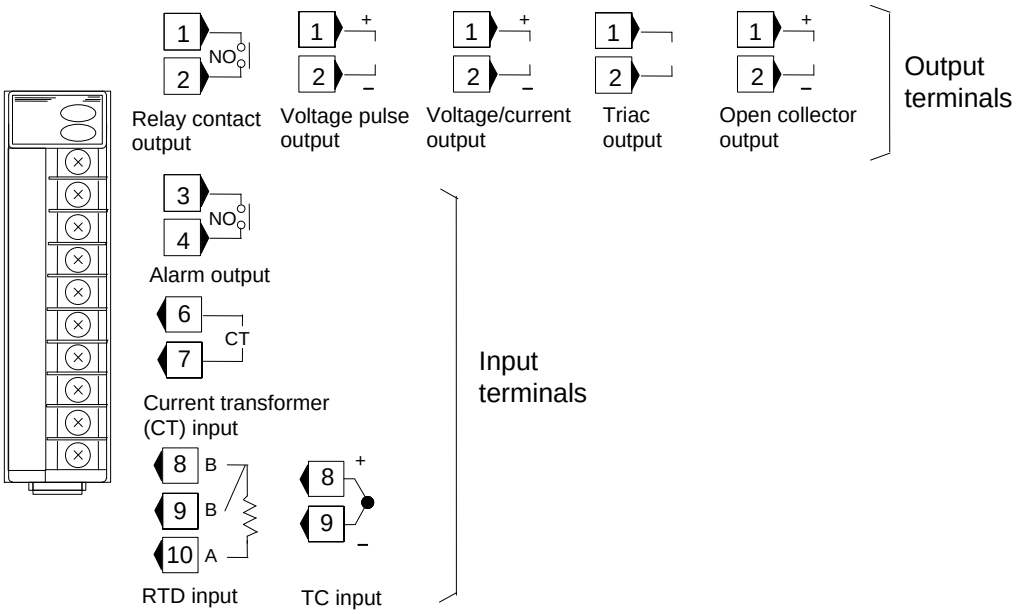
The H-TIO module is used to perform temperature or process control.
The H-TIO modules corresponding to the necessary number of control points are connected to the H-PCP module.

Type	Input terminal		Output terminal
H-TIO-A [1 channel type]	Temperature input (IN) Current transformer (CT) input *	Thermocouple/ RTD input	Control output (OUT) Alarm output *
H-TIO-B [2 channels type]	Temperature input 1 (IN1) Temperature input 2 (IN2)	Thermocouple/ RTD input	Control output 1 (OUT1) Control output 2 (OUT2)
H-TIO-C [1 channel heat/cool type]	Temperature input (IN) Current trans former (CT) input *	Thermocouple/ RTD input	Heat-side control output (OUT) Cool-side control output (OUT)
H-TIO-D [2 channels heat/cool type]	Temperature input 1 (IN1) Temperature input 2 (IN2) Current transformer 1 (CT1) input * Current transformer 2 (CT2) input *	Thermocouple/ RTD input	Heat-side control output 1 (OUT1) Heat-side control output 2 (OUT2) Cool-side control output 1 (OUT1) Cool-side control output 2 (OUT2)
H-TIO-E [1 channel type]	High accuracy temperature input (IN)	Thermocouple/ RTD input	Control output (OUT) Alarm output *
H-TIO-F [2 channels type]	High accuracy temperature input 1 (IN1) High accuracy temperature input 2 (IN2)	RTD input	Control output 1 (OUT1) Control output 2 (OUT2)
H-TIO-G [1 channel heat/cool type]	High accuracy temperature input (IN)	Thermocouple/ RTD input	Heat-side control output (OUT) Cool-side control output (OUT)
H-TIO-H [1 channels type]	Voltage/current input (IN)	Voltage/current input	Control output (OUT) Alarm output *
H-TIO-J [2 channel type]	Voltage/current input 1 (IN1) Voltage/current input 2 (IN2)	Voltage/current input	Control output 1 (OUT1) Control output 2 (OUT2)
H-TIO-K [1 channel position proportioning type]	Temperature input (IN) Feedback resistance input (FBR)	Thermocouple/ RTD input	Open-side control output (OUT) Close-side control output (OUT)
H-TIO-P [2 channels fuzzy control type]	Temperature input 1 (IN1) Temperature input 2 (IN2)	Thermocouple/ RTD input	Control output 1 (OUT1) Control output 2 (OUT2)
H-TIO-R [1 channel fuzzy control type]	High accuracy temperature input (IN)	Thermocouple/ RTD input	Control output (OUT) Alarm output *

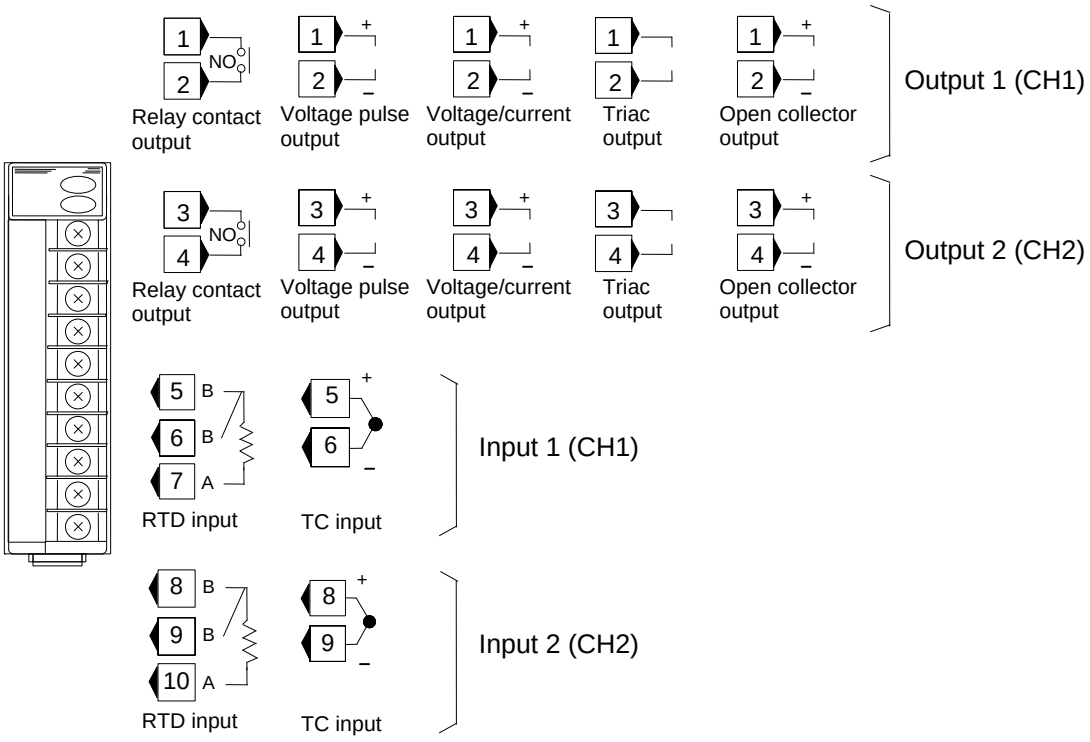
* Optional

■ Terminal configuration

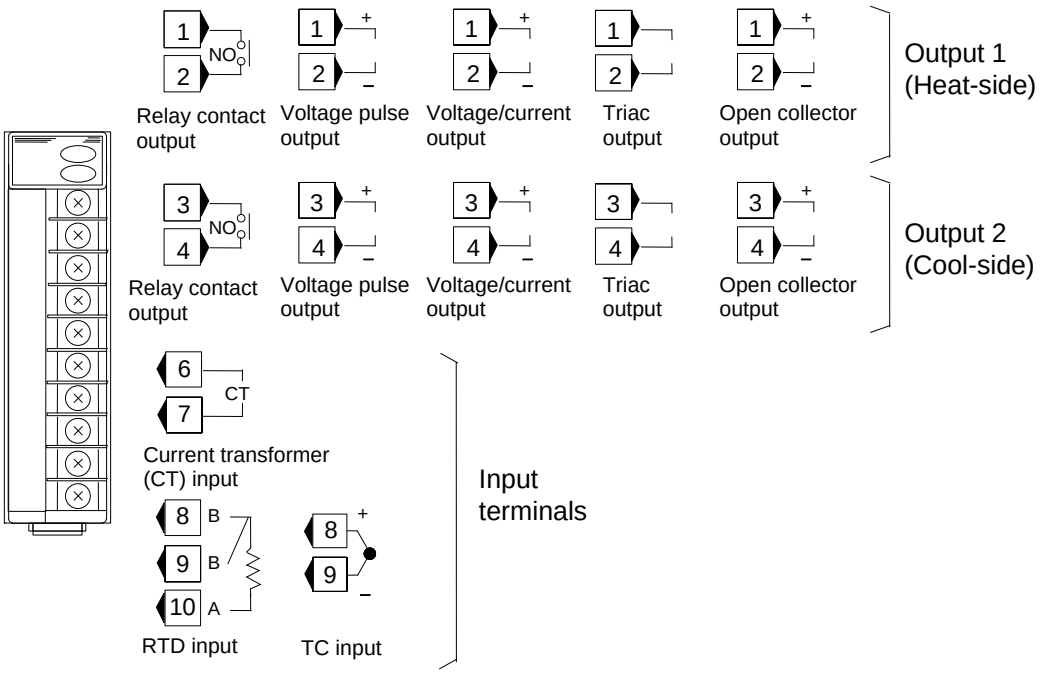
● H-TIO-A type



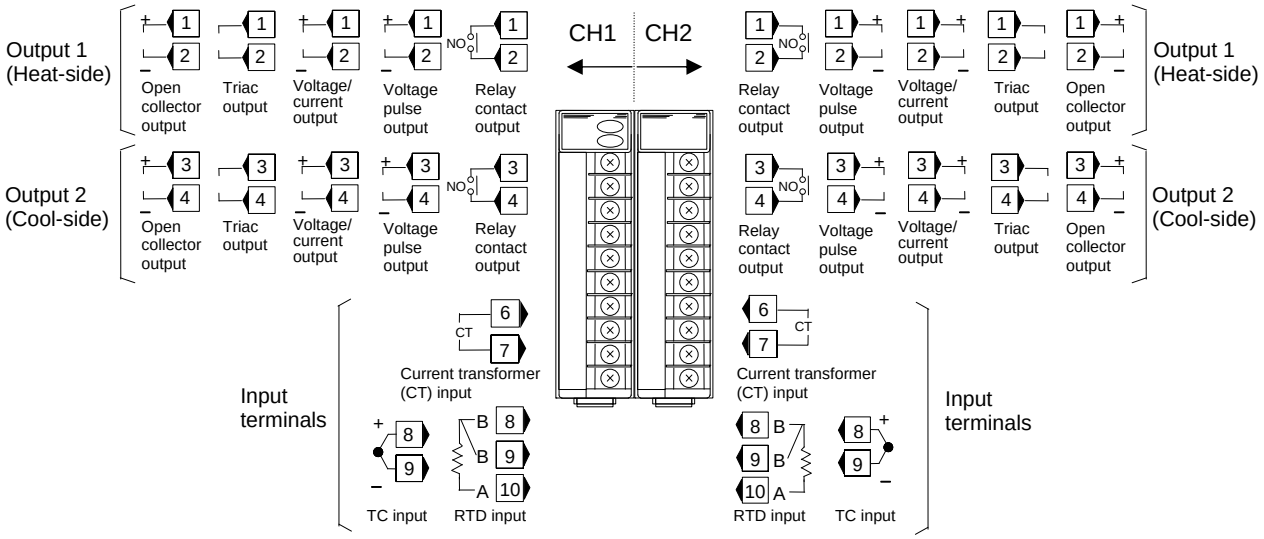
● H-TIO-B type



- **H-TIO-C type**

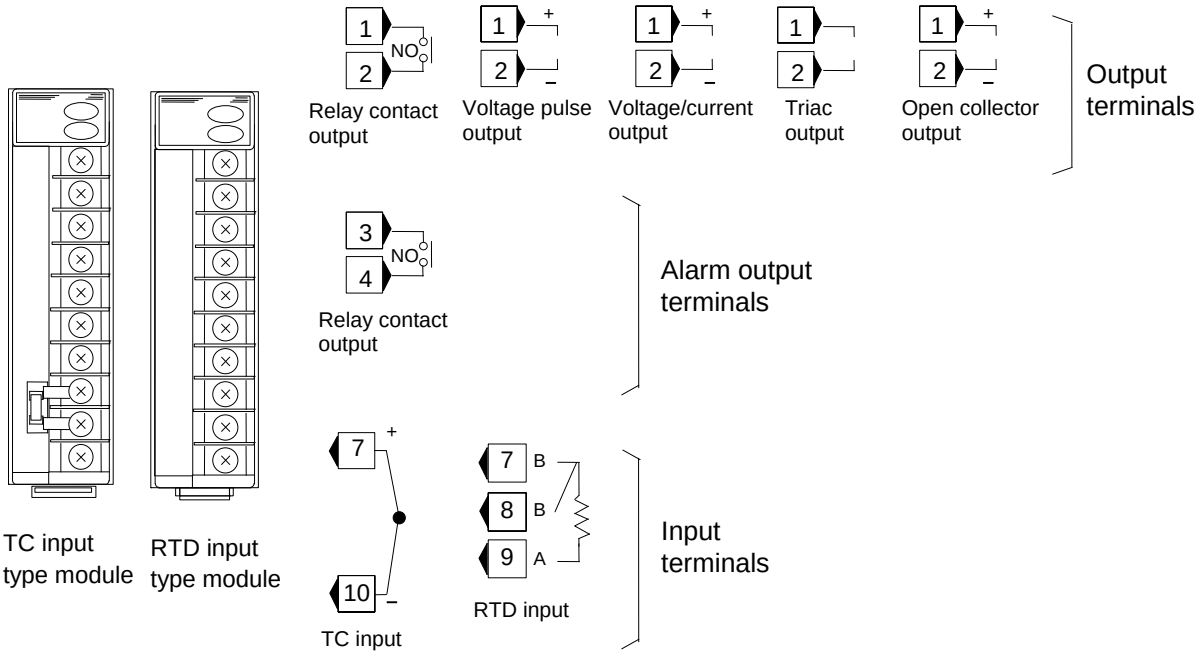


- **H-TIO-D type**

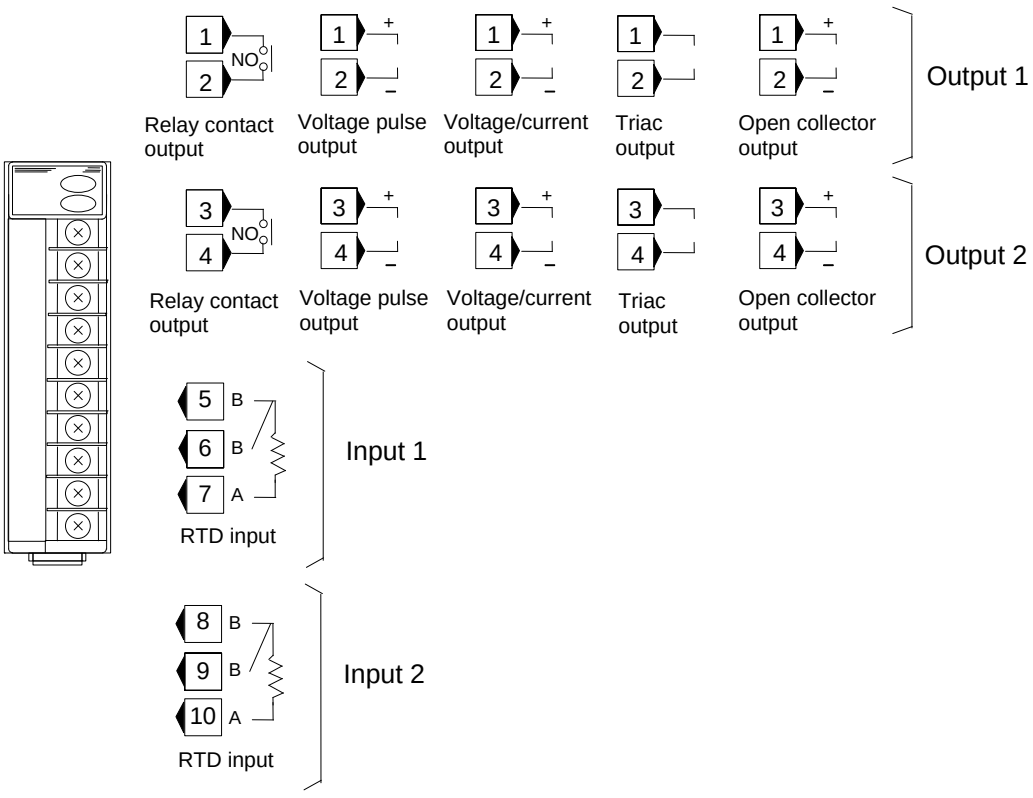


Although the terminal numbers are the same numbers for both channel 1 and channel 2, the left side as seen from the front panel of the module is channel 1 and the right side is channel 2.

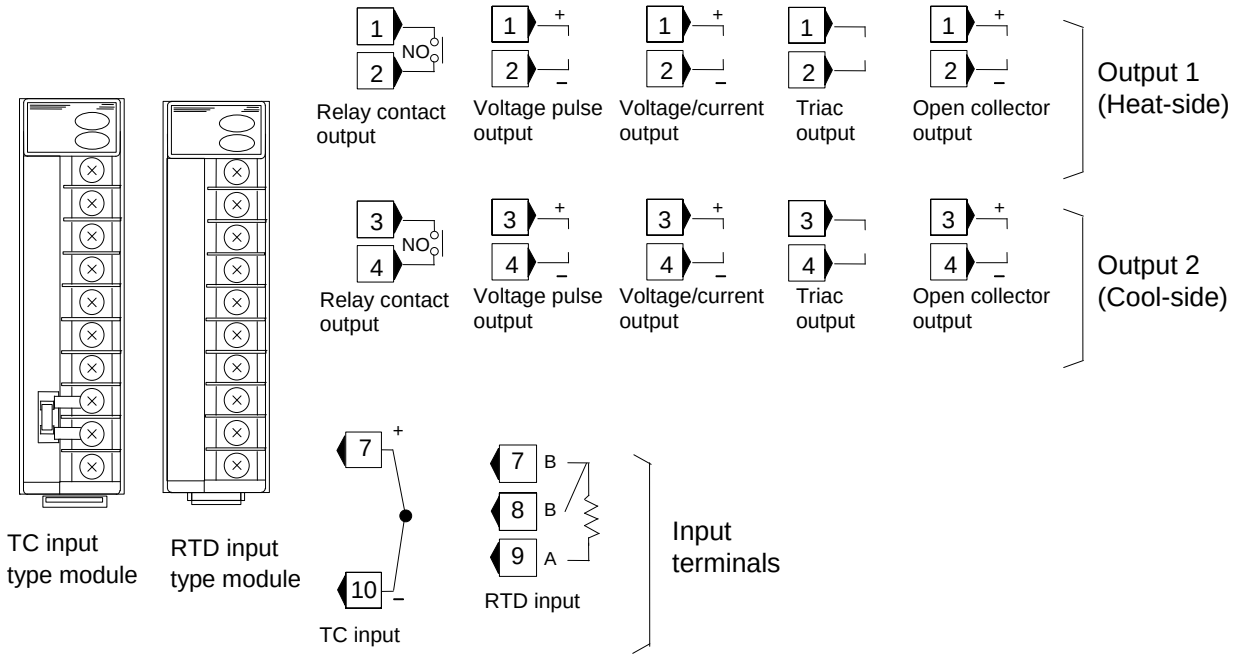
- **H-TIO-E type**



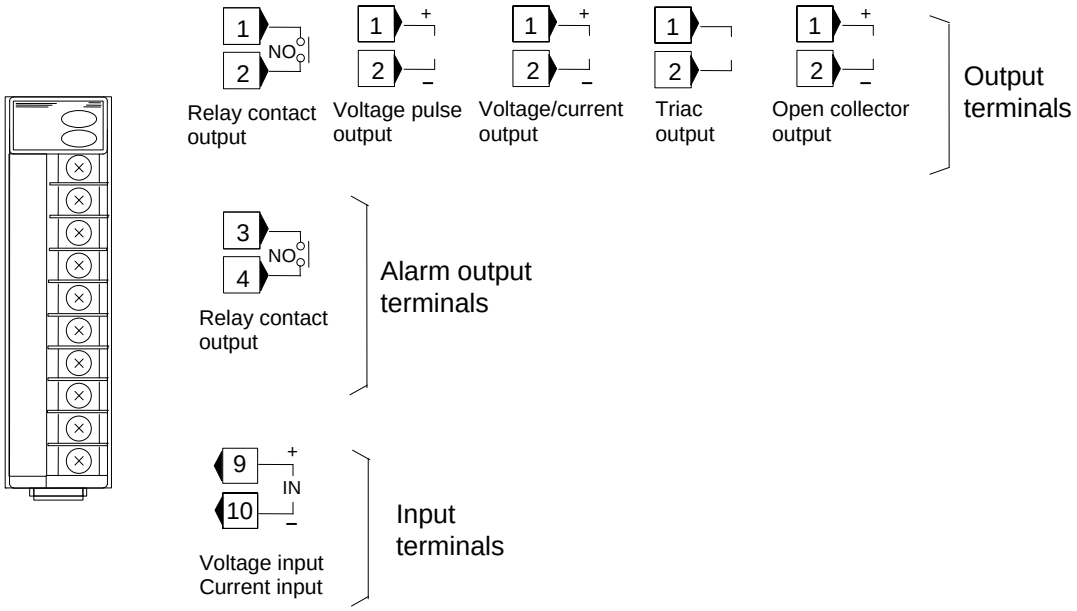
- **H-TIO-F type**



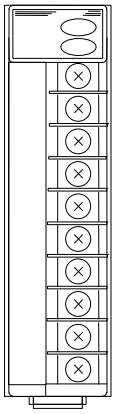
- **H-TIO-G type**

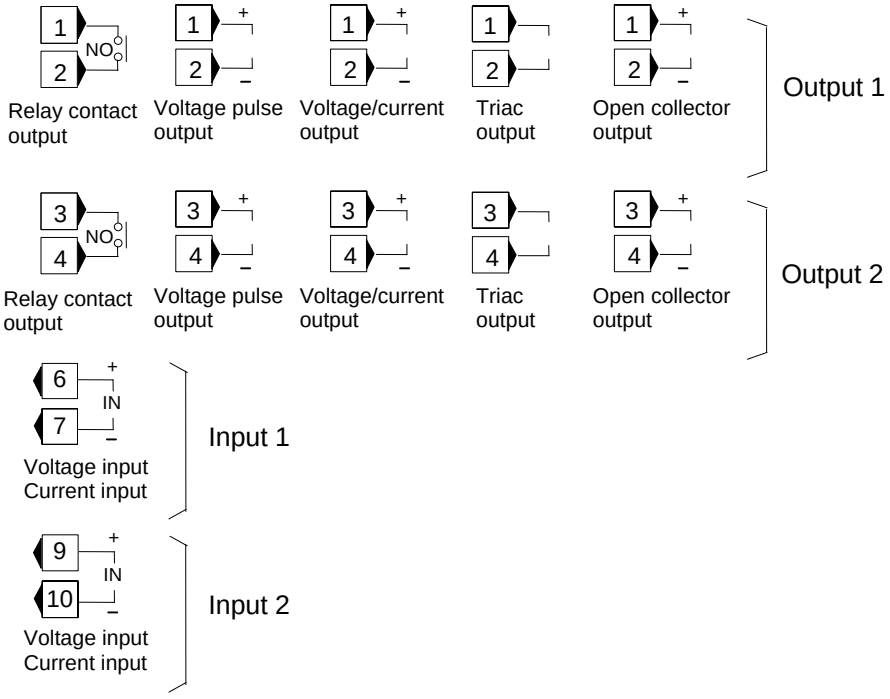


- **H-TIO-H type**

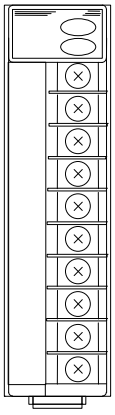


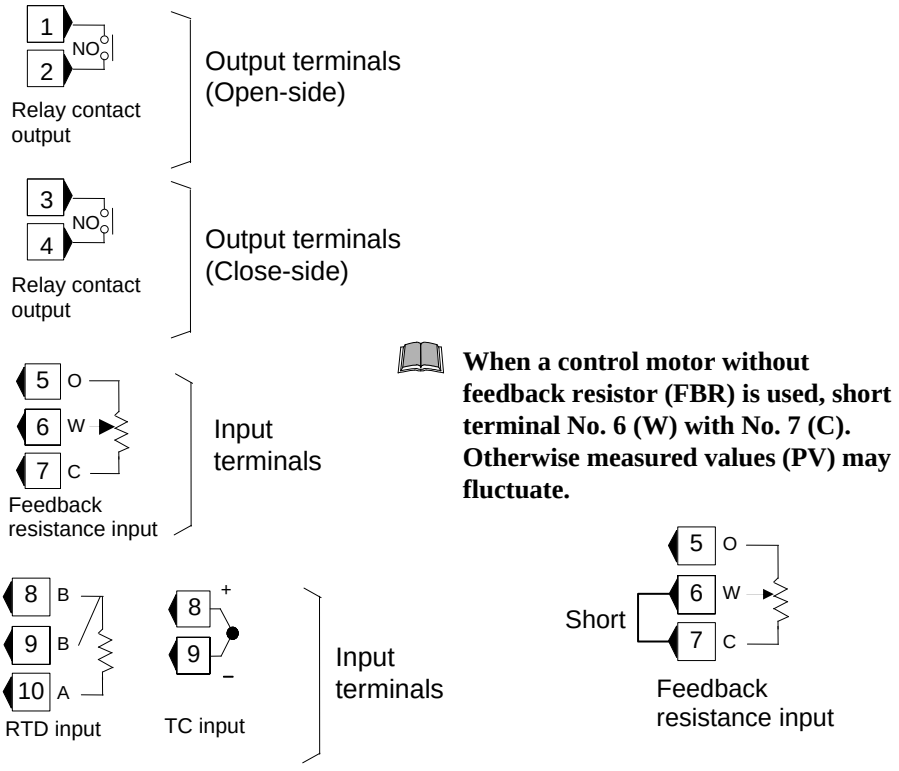
- **H-TIO-J type**



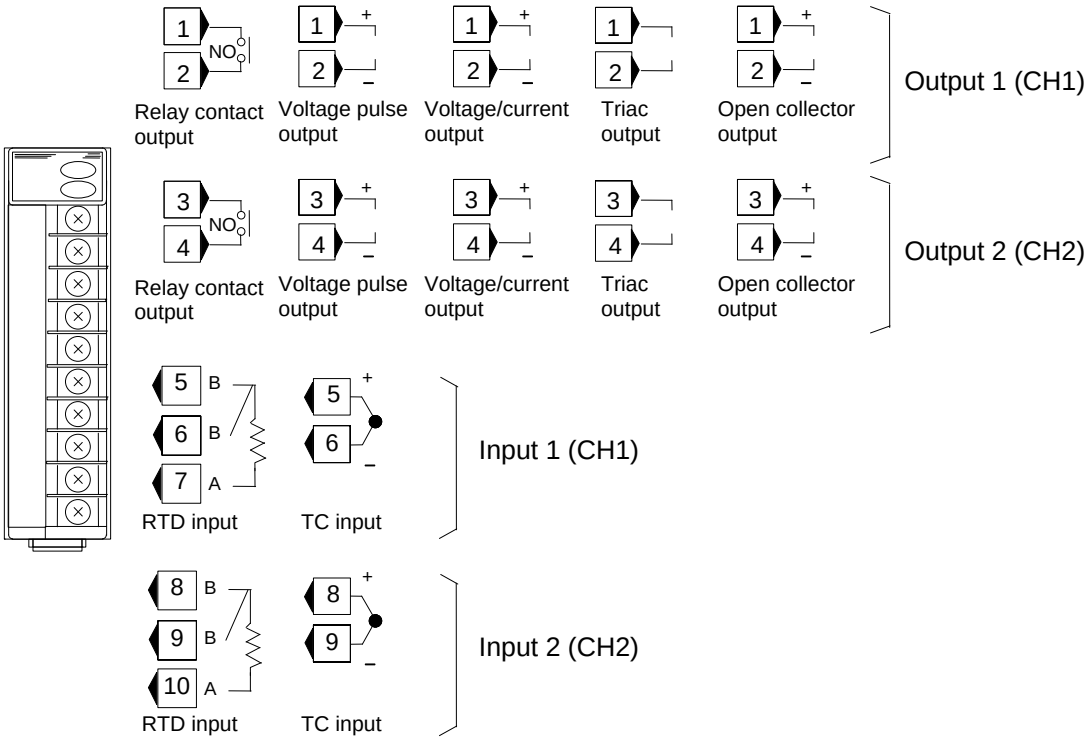


- **H-TIO-K type**

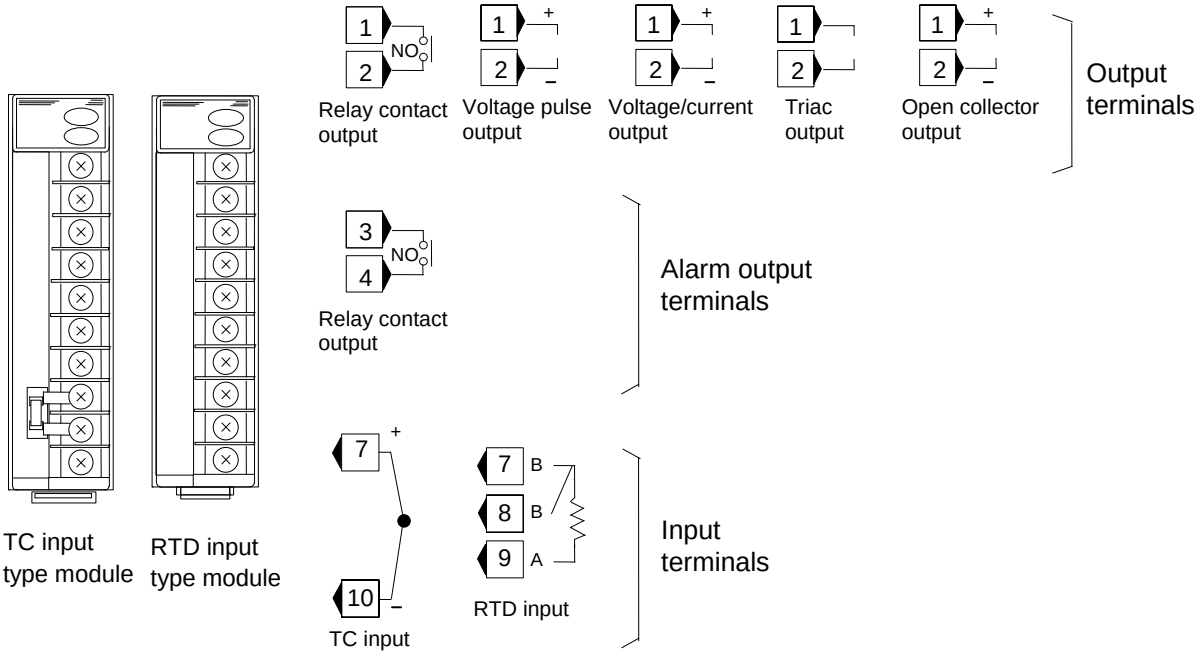




- **H-TIO-P type**



- **H-TIO-R type**

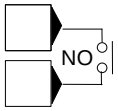


■ Output function

Any output type of relay contact output, voltage pulse output, voltage output, current output, triac output or open collector output can be selected for each heat output and heat/cool output.
(Specify when ordering)

● Relay contact output

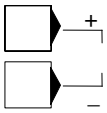
Output status: Independent 1a contact output (closed during outputting).



Rating: 250 V AC, 3 A (Resistive load)

● Voltage pulse output

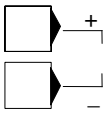
This output is for driving the SSRs and 12 V DC is output during the outputting.



Allowable load resistance: 600 Ω or more

● Current and voltage output

The current output can be selected from 4 to 20 mA DC or 0 to 20 mA DC, and the voltage output can be selected from 0 to 1 V DC, 0 to 5 V DC, 0 to 10 V DC or 1 to 5 V DC. (Specify when ordering)

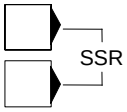


Allowable load resistance: 500 Ω or less (Current output)
1 kΩ or more (Voltage output)

It is possible only in the 1 to 5 V DC voltage output to make a common connection of the minus terminals of the outputs, including the voltage pulse output.
For details, refer to ■ **H-TIO module wiring saving (P. 44)**.

● Triac output

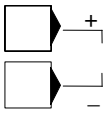
This output can directly drive AC power by the small SSR built in the module. The zero-cross control method is employed.



Capacity: 0.5 A (At an ambient temperature of 40 °C)
Maximum load voltage: 250 V AC

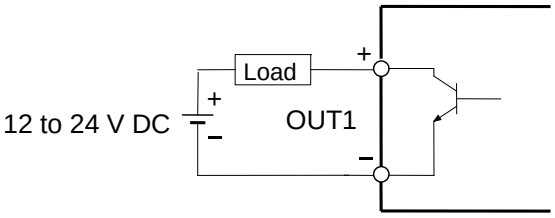
● Open collector output

This transistor sink output uses switching between the transistor emitter and collector. An external power supply of 12 to 24 V DC is connected to the load in series.

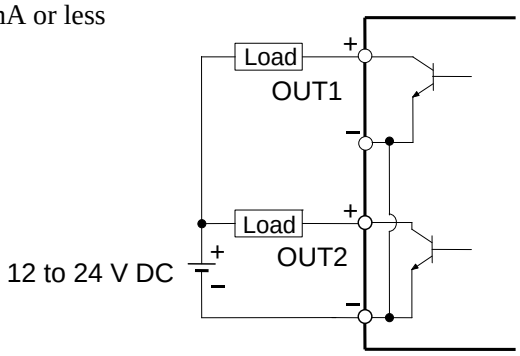


Maximum load current: 100 mA or less

Open collector output wiring example



H-TIO-A/E/H/R



H-TIO-B/C/D/F/G/J/P

The minus (–) terminals of open collector outputs, OUT1 and OUT2 are connected within the module.

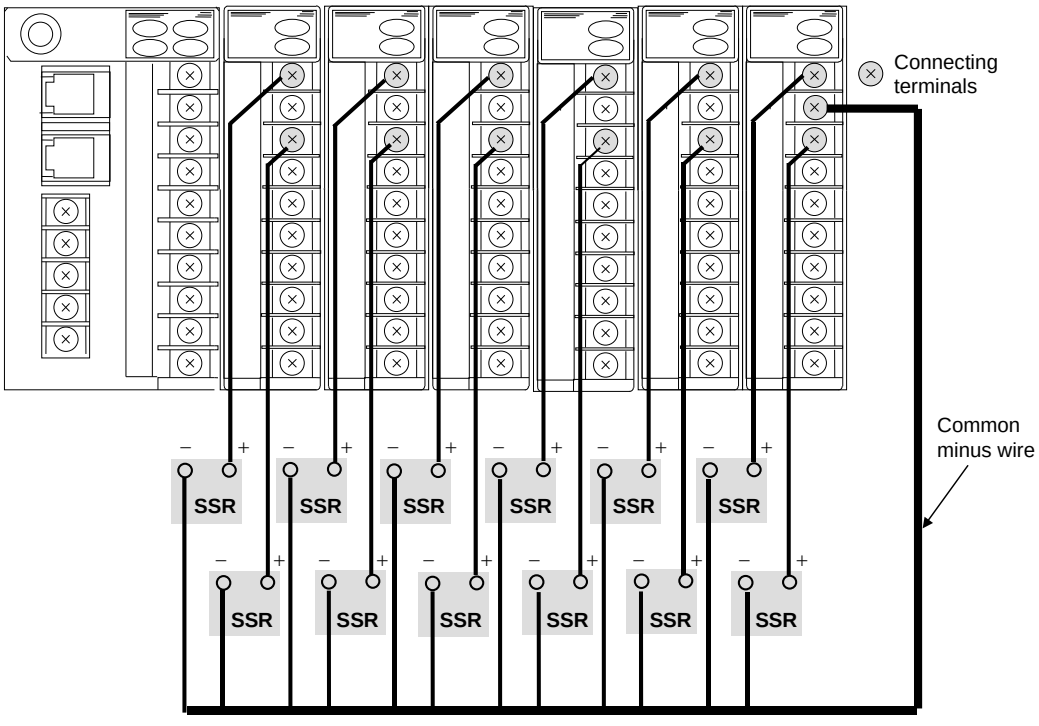
In using the open collector output, an external power supply of 24 V DC is required. Note that if this power supply is not connected, there will be no output from the module.

■ H-TIO module wiring saving

As the output terminals for voltage pulse output or 1 to 5 V DC voltage output commonly use the minus line in the control unit, it is possible to omit the remaining wiring on the minus side by commonly using a minus terminal on one module.

[Example] When twelve SSR units are connected to six H-TIO-B voltage pulse output type modules.

Six H-TIO-B modules (voltage pulse output): Output total, twelve points



For control output types other than voltage pulse output and 1 to 5 V DC voltage output, no common minus can be connected.

■ Alarm function

One H-TIO module is provided with two alarm points (Alarm 1 and Alarm 2) as standard.
Alarm 1/2 types are those selected by the H-PCP module.

Alarm type:

Deviation high alarm	Process high alarm
Deviation low alarm	Process low alarm
Deviation high and low alarm	Process high alarm with hold action
Band alarm	Process low alarm with hold action
Deviation high alarm with hold action	Deviation high alarm with re-hold action
Deviation low alarm with hold action	Deviation low alarm with re-hold action
Deviation high and low alarm with hold action	Deviation high and low alarm with re-hold action

■ Loop break alarm function (Excluding H-TIO-H/J type modules)

The loop break alarm function is used to detect a load (heater) break, a failure occurring in any external operating device (magnet relay, etc.) or a failure occurring in the control system (control loop) caused by an input (sensor) break.

■ Heater break alarm function (Optional)

The heater break alarm function is used to detect the current flowing into the load (heater) by using the current transformer (CT), there by producing a heater break alarm when a heater break occurs.
This function can be added only to the H-TIO-A/C/D type module. (1 point/control loop)

For H-TIO-A/C/D module with voltage/current output, no heater break alarm function can be used.

■ Alarm output function (Optional)

An alarm can be output from the H-TIO module itself (only for the H-TIO-A/E/H/R types).

- Number of output points: 1 point (relay contact output)
- Output type: Select any of temperature alarm output (Alarm 1), temperature alarm output (Alarm 2), heater break alarm output (HBA) [1] or loop break alarm output (LBA) [2].

  [1] Only H-TIO-A can be selected.
  [2] Only H-TIO-A/E/R can be selected.

Each alarm can be output as summary output (*OR* output) from the digital output block in the H-PCP-A/B module. For details, refer to **5.3 H-PCP Module (P. 32)**.

The respective alarm (Alarm 1/2) can be output independently for each channel by connecting the H-DO-A/B/D module. For details, refer to **5.9 H-DO Module (P. 55)**.

■ Control function

As standard, the H-TIO module employs the brilliant PID control method which can prevent overshoot or disturbance (excluding the H-TIO-K module).
The selectable control action type differs depending on the H-TIO module type. (Refer to the table below.)

Type	ON/OFF action	PID action with autotuning	Heat/cool PID action with autotuning	PID action with autotuning (With fuzzy control)	Position proportioning control action
H-TIO-A	×	×	–	–	–
H-TIO-B	×	×	–	–	–
H-TIO-C	–	–	×	–	–
H-TIO-D	–	–	×	–	–
H-TIO-E	×	×	–	–	–
H-TIO-F	×	×	–	–	–
H-TIO-G	–	–	×	–	–
H-TIO-H	×	×	–	–	–
H-TIO-J	×	×	–	–	–
H-TIO-K	–	–	–	–	×
H-TIO-P	–	–	–	×	–
H-TIO-R	–	–	–	×	–

×: Selectable –: Not selectable

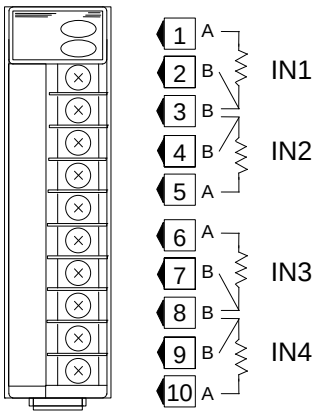
5.5 H-TI Module

The H-TI module is used to monitor temperature inputs by thermocouple or RTD sensors.

Type	Input terminal	
H-TI-A [4 channels RTD input type]	Temperature input 1 to 4 (IN1 to 4)	RTD input (Not isolated between each input channel)
H-TI-B [2 channels high accuracy type]	Temperature input 1 to 2 (IN1 to 2)	Thermocouple/RTD input (Isolated between each input channel)
H-TI-C [4 channels thermocouple input type]	Temperature input 1 to 4 (IN1 to 4)	Thermocouple input (Not isolated between each input channel)

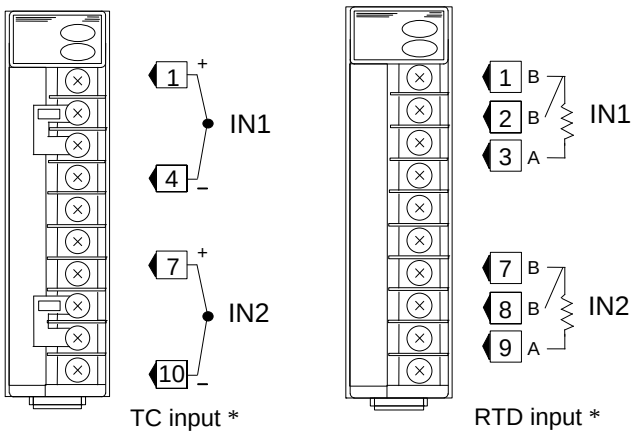
■ Terminal configuration

● **H-TI-A type**



RTD input

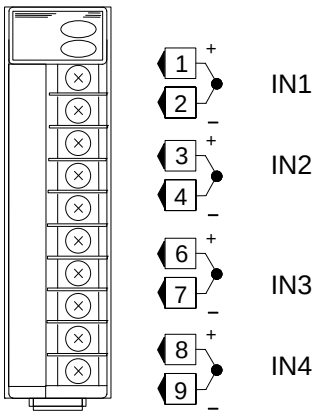
● **H-TI-B type**



TC input * RTD input *

* Input type is specified in ordering.

● **H-TI-C type**



TC input

■ TI alarm function

As standard, the H-TI module is provided with tow alarm points/channel (TI alarm 1 and TI alarm 2).
TI alarm 1/2 types are those selected by the H-PCP module.

Alarm type: Process high alarm, Process low alarm, Process high alarm (with hold action), and Process low alarm (with hold action)

Each TI alarm can be output as summary output (*OR* output) from the digital output block in the H-PCP-A/B module. For details, refer to **5.3 H-PCP Module (P. 32)**.

The respective alarm (TI alarm 1/2) can be output independently for each channel by connecting the H-DO-A/B/D module. For details, refer to **5.9 H-DO Module (P. 55)**.

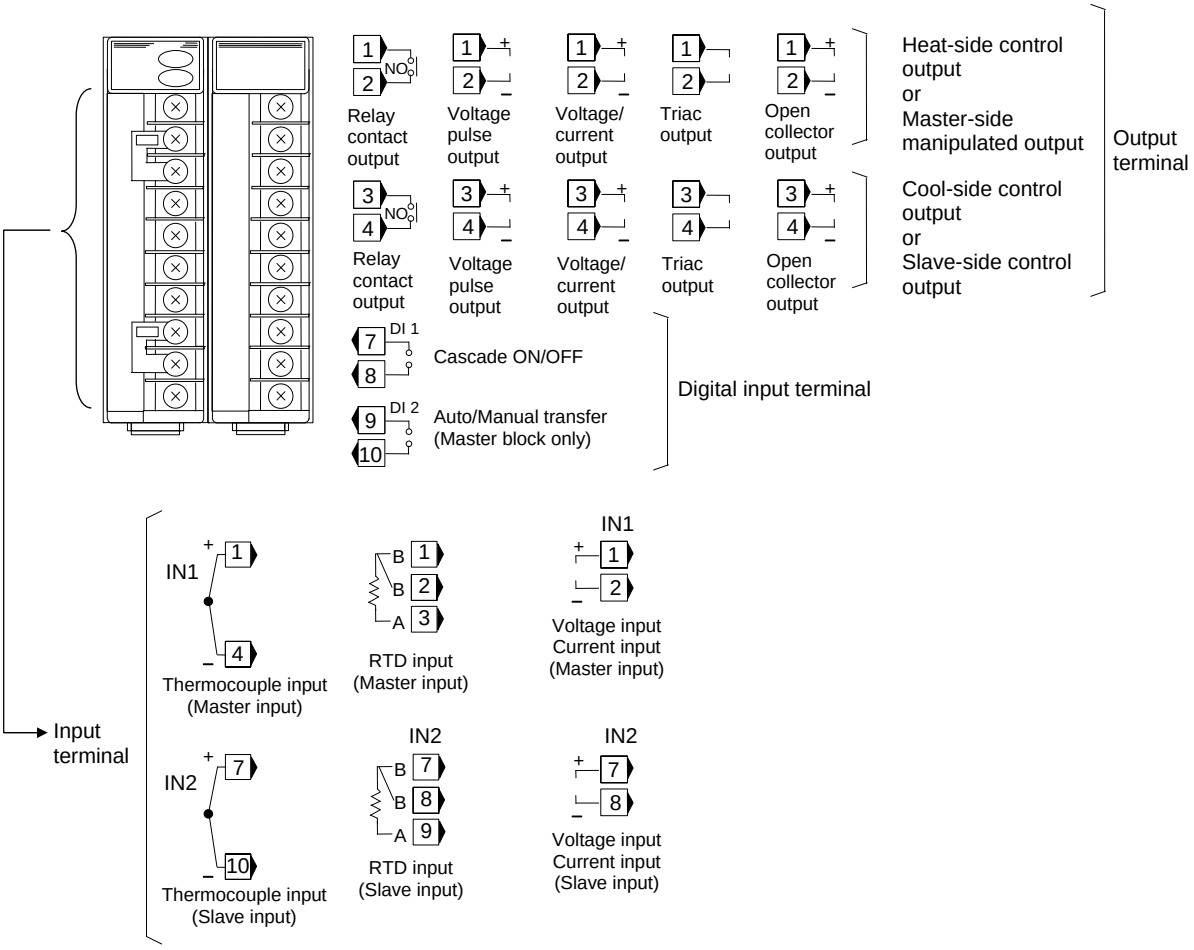
5.6 H-CIO Module

The H-CIO module is used to perform effective cascade control when there is a time lag between the controlled object and heat source.
The number of cascade control loops is 1 loop/module. The H-CIO modules corresponding to the required number of control points are connected to the H-PCP module. (Up to 5 loops/control unit)

Type	Input terminal		Output terminal
H-CIO-A-F/D [1 channel type]	Master input (IN1) Slave input (IN2) Digital input 1 (DI1) * Digital input 2 (DI2) *	Thermocouple/RTD input or Voltage/current input	Master-side manipulated output (OUT1) Slave-side control output (OUT2)
H-CIO-A-B/W [1 channel heat/cool type]	Master input (IN1) Slave input (IN2) Digital input 1 (DI1) * Digital input 2 (DI2) *	Thermocouple/RTD input	Heat-side control output of Slave-side (OUT1) Cool-side control output of Slave-side (OUT2)

* Digital input 1 (DI1): Cascade ON/OFF
Digital input 2 (DI2): Auto/Manual transfer (Master block only)

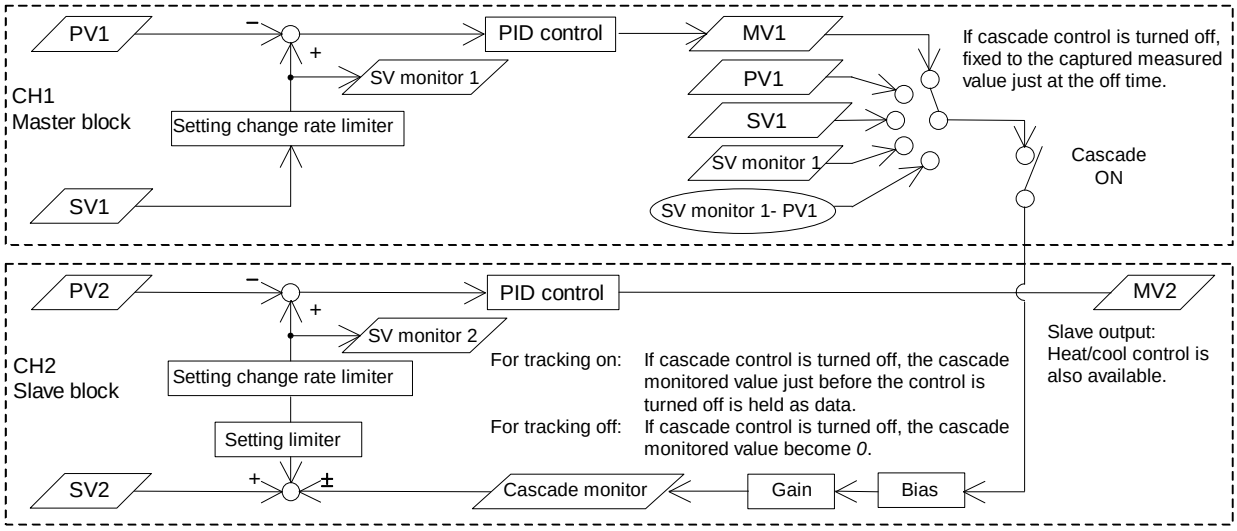
■ Terminal configuration



■ Cascade control function

There are master control and slave control blocks for cascade control. The master control block performs PID computation based on the temperature (measured value) at the measured point necessary to be finally controlled and then corrects the set value of the slave control block using the cascade signal. The slave control unit performs cascade temperature control by the set value corrected by the cascade signal.

Cascade module function configuration diagram

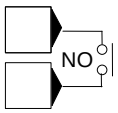


■ Output function

The desired output type can be selected from relay contact, voltage pulse, voltage, current, triac and open-collector outputs for each of OUT1 and OUT2. (Specify when ordering.)

● Relay contact output

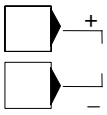
Output status: Independent 1a contact output (closed during outputting)



Rating: 250 V AC, 3 A (Resistive load)

● Voltage pulse output

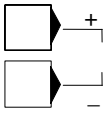
This output is for driving the SSRs and 12 V DC is output during the outputting.



Allowable load resistance: 600 Ω or more

● Current and voltage output

The current output can be selected from 4 to 20 mA DC or 0 to 20 mA DC, and the voltage output can be selected from 0 to 1 V DC, 0 to 5 V DC, 0 to 10 V DC or 1 to 5 V DC. (Specify when ordering)

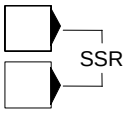


Allowable load resistance: 500 Ω or less (Current output)
1 kΩ or more (Voltage output)

As the output terminals for voltage pulse output or 1 to 5 V DC voltage output commonly use the minus line in the control unit, it is possible to omit the remaining wiring on the minus side by commonly using a minus terminal on one module. For details, refer to ■ **H-TIO Module wiring saving (P. 44)**.

- **Triac output**

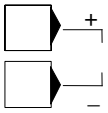
This output can directly drive AC power by the small SSR built in the module. The zero-cross control method is employed.



Capacity: 0.5 A (At an ambient temperature of 40 °C)
Maximum load voltage: 250 V AC

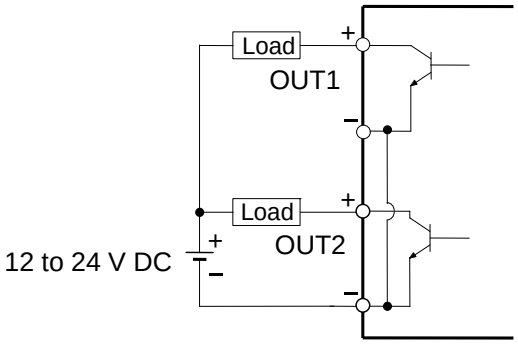
- **Open collector output**

This transistor sink output uses switching between the transistor emitter and collector. An external power supply of 12 to 24 V DC is connected to the load in series.



Maximum load current: 100 mA or less

Open Collector Output Wiring Example



The minus (–) terminals of open collector outputs, OUT1 and OUT2 are connected within the module.

■ Alarm function

One H-CIO module is provided with two alarm (Alarm 1 and Alarm 2) points as standard.
Alarm 1/2 types are those selected by the H-PCP module.

Alarm type:

- Deviation high alarm
- Deviation low alarm
- Deviation high and low alarm
- Band alarm
- Deviation high alarm with hold action
- Deviation low alarm with hold action
- Deviation high and low alarm with hold action
- Process high alarm
- Process low alarm
- Process high alarm with hold action
- Process low alarm with hold action
- Deviation high alarm with re-hold action
- Deviation low alarm with re-hold action
- Deviation high and low alarm with re-hold action

■ Loop break alarm function

The loop break alarm function is used to detect a load (heater) break, a failure occurring in any external operating device (magnet relay, etc.) or a failure occurring in the control system (control loop) caused by an input (sensor) break.

Each Alarm and loop break alarm can be output as summary output (*OR* output) from the digital output block in the H-PCP-A/B module. For details, refer to **5.3 H-PCP Module (P. 32)**.

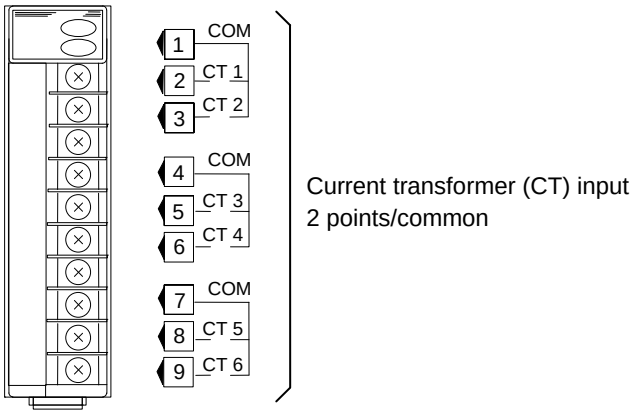
The respective alarm and loop break alarm can be output independently for each channel by connecting the H-DO-A/B/D module. For details, refer to **5.9 H-DO Module (P. 55)**.

5.7 H-CT Module

The H-CT module is used specially for CT (current transformer) input for detecting heater current.

Type	Input terminal
H-CT-A-P [CTL-6-P-N using type (0 to 30 A)]	Current transformer input 1 (CT1) Current transformer input 2 (CT2) Current transformer input 3 (CT3) Current transformer input 4 (CT4) Current transformer input 5 (CT5) Current transformer input 6 (CT6) 2 points/common
H-CT-A-S [CTL-12-S56-10L-N using type (0 to 100 A)]	

■ Terminal configuration



■ Heater break alarm function

The H-CT module, combined with the CT sensor or H-TIO module, can output a heater break alarm.
Up to 6 current transformers (CT) can be input to one H-CT module and respective H-TIO module channels can be freely assigned to these current transformers. In addition, as the specifying channel number is assigned in duplicate, 3-phase heater break can be detected by combining two or more current detectors (CT).

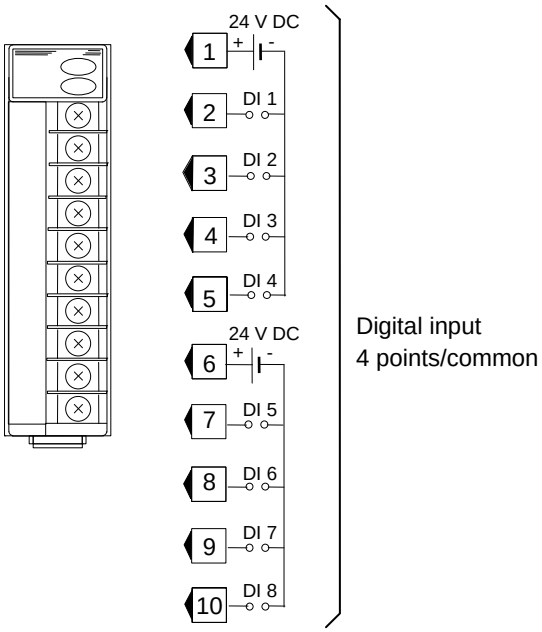
- For the heater capacity of 30 A or less, the H-CT-A-P module for 0 to 30 A (CT sensor: CTL-6-P-N using type) should be used in view of the current detection sensitivity.
- CT input cannot be assigned to the H-TIO module with voltage/current control output.
- Each CT input can be assigned from the dedicated Operation Panel, or host computer via communication.
- The heater break alarm can be output as summary output (*OR* output) from the digital output block in the H-PCP-A/B module. For details, refer to **5.3 H-PCP Module (P. 32)**.
- The respective heater break alarm can be output independently for each channel by connecting the H-DO-A/B/D module. For details, refer to **5.9 H-DO Module (P. 55)**.

5.8 H-DI Module

The H-DI module is used only for digital input.

Type		Input terminal
H-DI-A [8 points input type]	The H-DI-A type module is used to select the operation status (memory area selection, control Run/Stop selection, or alarm interlock release) of the control unit by using external contacts, etc.	Digital input 1 to 8 (DI1 to 8) 4 points/common
H-DI-B [8 points event input type]	The H-DI-B type module is used to display various event inputs on the operation panel. Each event input is logically operated (*AND*, *NAND*, *OR* or *NOR*) and the logical operation result can be also output from the H-DO-C module.	

■ Terminal configuration



Connect external power (24V DC) to the number 1 and number 6 COM (common) terminals on the H-DI module so that these terminal sides become positive (+).

■ Digital input function (H-DI-A)

The digital input function can be used to select the memory area in the control unit to which the H-DI-A module is connected, to select control Run/Stop or alarm interlock release.
The digital inputs (DI) function can be select following mode 1 to 2 in operation panel or host communication. (Factory set value: Function mode 1)

Function mode 1:

- Memory area transfer (ENABLE terminal is used)
  After area selection setting, the actual area is changed by detecting the ENABLE edge.
- Control RUN/STOP transfer
- Alarm interlock release

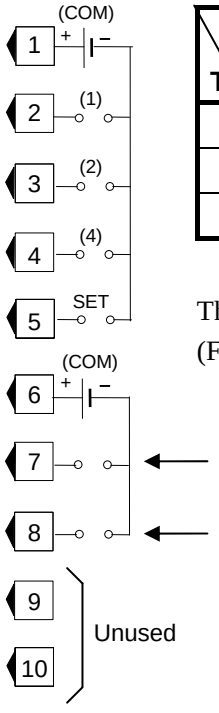
Function mode 2:

- Memory area transfer
  The actual area is changed approximately 2 seconds after area selection setting.
- Control RUN/STOP transfer
- Alarm interlock release

After the contact is closed, it takes a short time until the action of this device is actually selected. Therefore, pay attention to this delay time if the device is used together with a PLC, etc.

● Memory area selection, control Run/Stop selection and alarm interlock release

Selection or release can be performed depending on the open or close state of terminal numbers 1 to 8.
For memory area selection, configure an external contact circuit or use a contact output signal from the PLC, if necessary.



Control area / Terminal No.	1	2	3	4	5	6	7	8
1 - 2	–	×	–	×	–	×	–	×
1 - 3	–	–	×	×	–	–	×	×
1 - 4	–	–	–	–	×	×	×	×

–: Open ×: Close

The memory area (control area) is established by closing terminal number 5.
(Function mode 1)

← Control Run/Stop selection (contact closed: Run, contact opened: Stop)

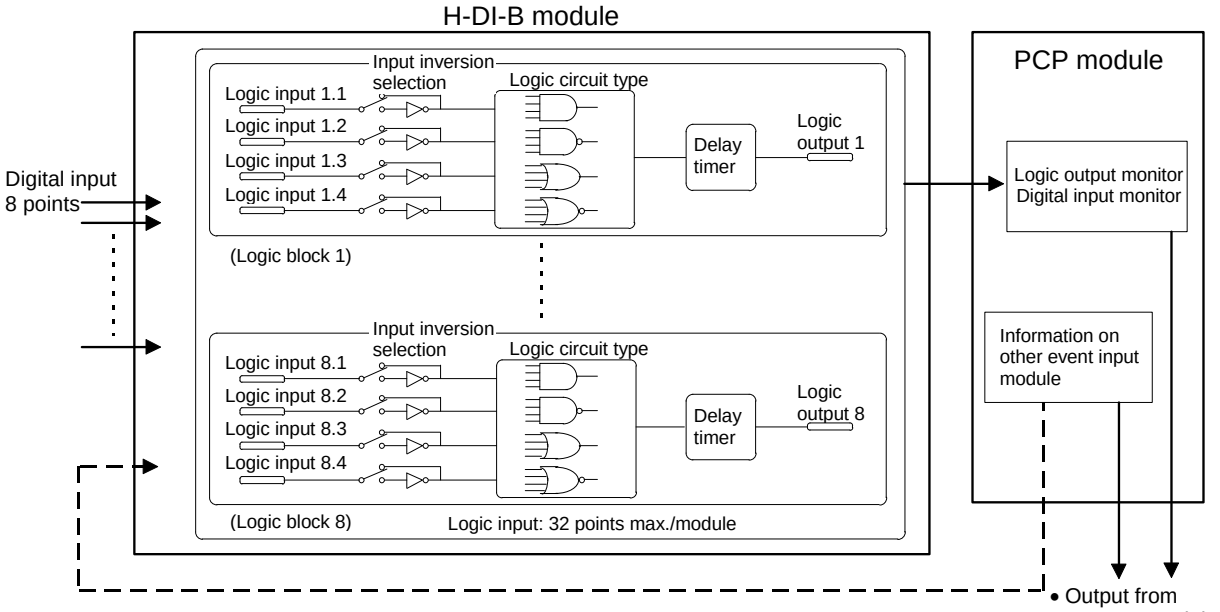
← Alarm interlock release (contact closed: alarm interlock release)
(No alarm interlock function is activated if the contact is in the normally closed state.)

Connect external power (24V DC) to the number 1 and number 6 COM (common) terminals on the DI module so that these terminal sides become positive (+).

■ Digital event input function (H-DI-B)

● Logic input function

Each logic is built by four event inputs. Up to eight logic results (logic outputs) per H-DI-B module can be monitored through communication or can be output from event output module (H-DO-C).
In addition, this function can assign the input of the H-DI-B module to any channel number of the H-DO-C module to output the result.
The logic section of event H-DI-B module consists of 4 logic input points, input reversal selection, logic circuit type selection, input delay timer and logic output.



- The desired channel No. of the digital event input module is assigned to the respective logic input.
- Logic output can be re-assigned to the input of the logical block.

5.9 H-DO Module

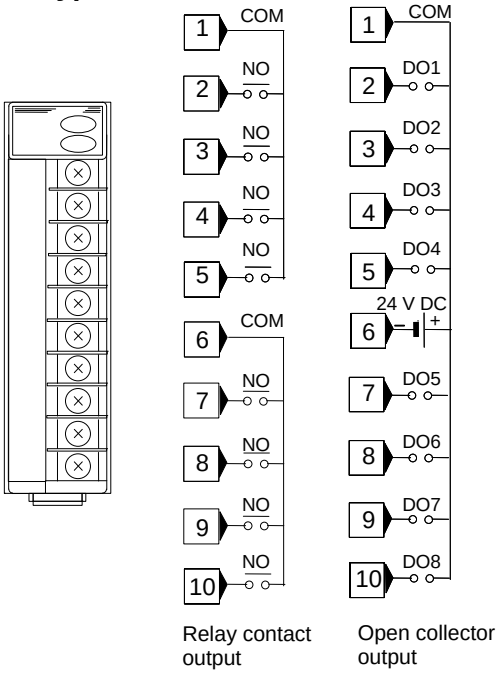
The H-DO module is used specially for digital output.

Type		Output terminal/Output connector	
H-DO-A [8 points alarm output type]	The H-DO-A modules can output alarm statuses * independently for each channel.	Relay contact output	Digital output 1 to 8 (DO1 to 8) 4 points/common
		Open collector output	Digital output 1 to 8 (DO1 to 8) 8 points/common
H-DO-B [4 points alarm output type]	The H-DO-B modules can output alarm statuses * independently for each channel.	Relay contact output	Digital output 1 to 4 (DO1 to 4) All channel independent common
H-DO-C [8 points event output type]	For H-DO-C modules, dedicated alarms or control unit operations can be independently output as event outputs.	Open collector output	Digital output 1 to 8 (DO1 to 8) 8 points/common
H-DO-D [16 points alarm output type]	The H-DO-D modules can output alarm statuses * independently for each channel.	Open collector output	Digital output 1 to 16 (DO1 to 16) 8 points/common (MIL connector)

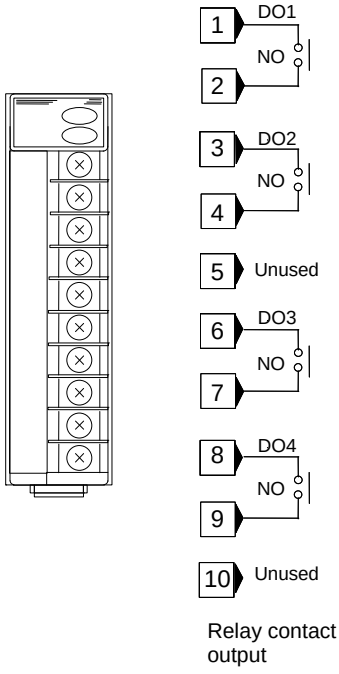
* Alarm statuses of Temperature alarm 1, Temperature alarm 2, Burnout alarm, Heater break alarm, Loop break alarm, AI alarm 1, and AI alarm 2.

■ Terminal configuration

● **H-DO-A type**

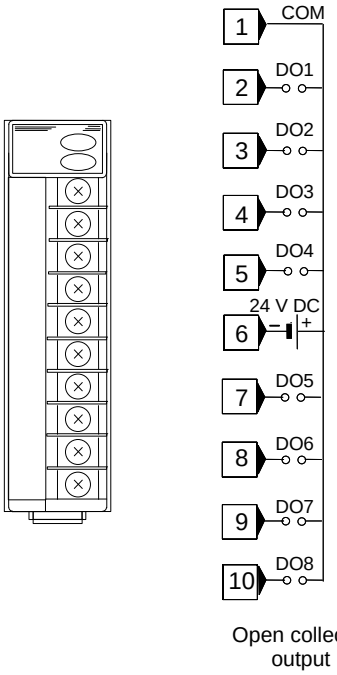


● **H-DO-B type**



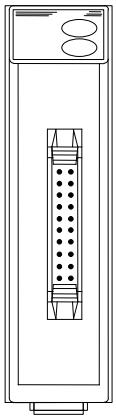
In using the open collector output, an external power supply of 24 V DC is required.

● **H-DO-C type**



Open collector output

● **H-DO-D type**



MIL connector pin arrangement (front view)

COM2 (+)	20	10	COM1 (+)
COM2 (-)	19	9	COM1 (-)
DO16	18	8	DO8
DO15	17	7	DO7
DO14	16	6	DO6
DO13	15	5	DO5
DO12	14	4	DO4
DO11	13	3	DO3
DO10	12	2	DO2
DO9	11	1	DO1

Open collector output　　Open collector output

Connector type:	HIF3BA-20PA-2.54DS(71) (MIL-standard compliant) Manufactured by HIROSE ELECTRIC CO., LTD.
Mating socket:	HIF3BA-20D-2.54R Manufactured by HIROSE ELECTRIC CO., LTD.

The following socket may also be fitted.
AXM120415 (With strain relief)
Manufactured by Panasonic Corporation. (Old company name: Matsushita Electric Works, Ltd.)

In using the open collector output, an external power supply of 24 V DC is required.

■ Alarm output function (H-DO-A, H-DO-B, H-DO-D)

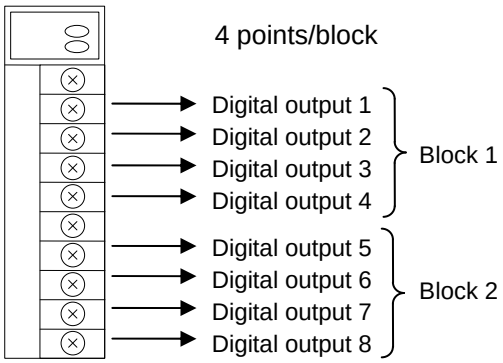
● Alarm assignment

The alarm type to be output can be freely selected for each block.

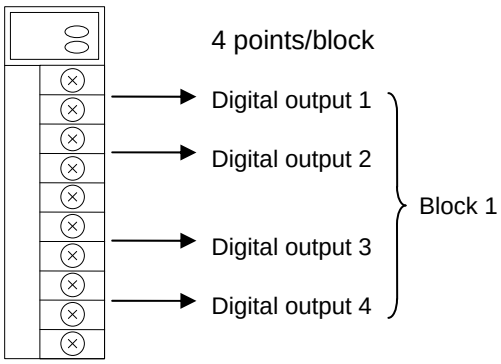
Alarm type:
- Temperature alarm 1
- Temperature alarm 2
- Heater break alarm (HBA)
- Burnout alarm
- Loop break alarm (LBA)
- AI alarm 1
- AI alarm 2

〈DO grouping〉

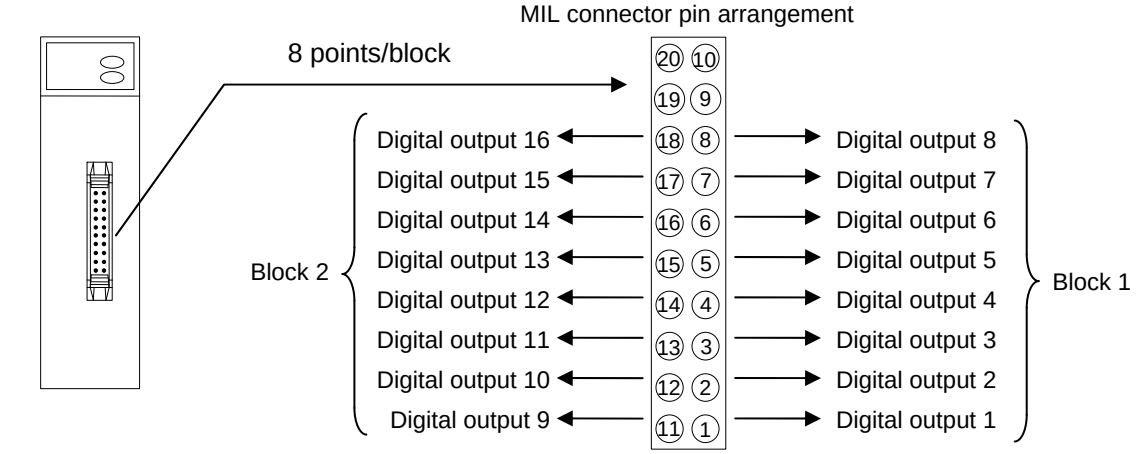
DO-A module



DO-B module



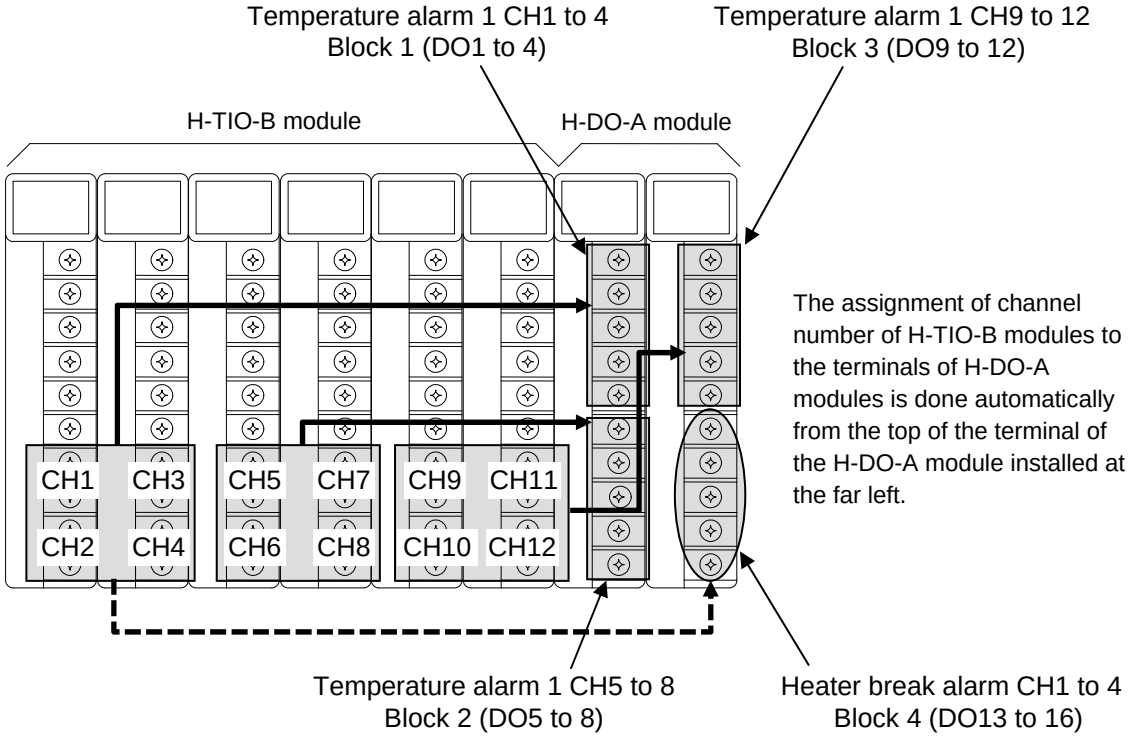
H-DO-C module



[Example]

When the temperature alarm 1 and heater break alarms of the H-TIO-B module are output independently for each channel by the H-DO-A module.

Block 1 (DO1 to 4): Temperature alarm 1
Block 2 (DO5 to 8): Temperature alarm 1
Block 3 (DO9 to 12): Temperature alarm 1
Block 4 (DO13 to 16): Heater break alarm



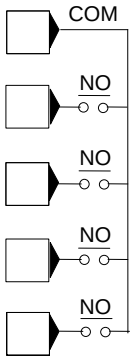
No assigned channel can be skipped. Terminals corresponding to the channel of H-DO module which does not use various alarms become vacant (unused).

■ Output function

● Relay contact output

H-DO-A type

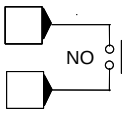
Output status: 1 a contact output
4 points/common



Rating: 250 V AC, 24 V DC
Maximum load current:
1 A/point (Resistive load)
4 A/common (Resistive load)

H-DO-B type

All point independent common output

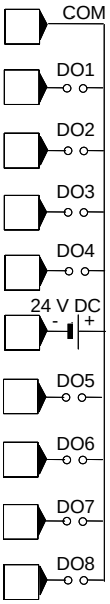


Rating: 250 V AC, 24 V DC
Maximum load current:
1 A/point (Resistive load)

● Open collector output

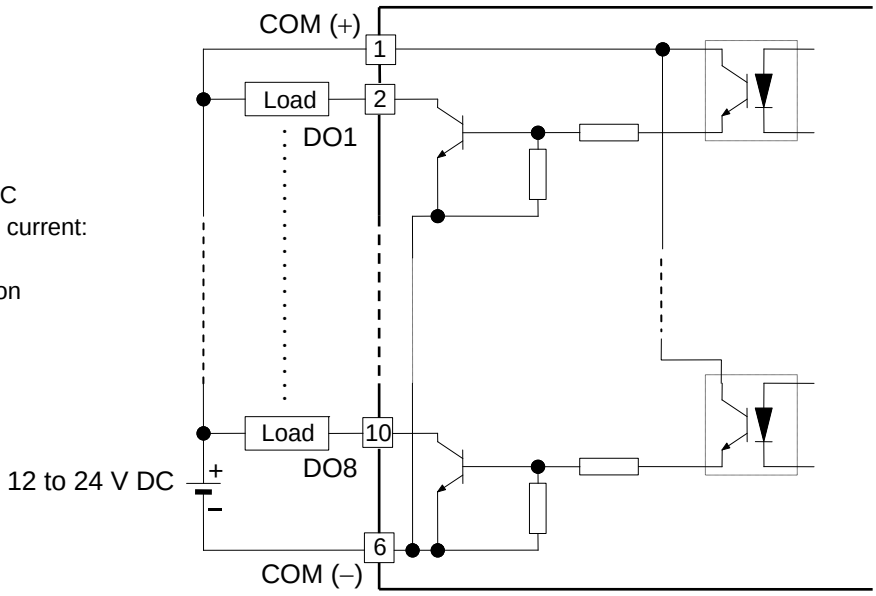
H-DO-A, H-DO-C type

The output status is an 8 points/common open collector output.



Load voltage:
12 to 24 V DC
Maximum load current:
0.1 A/point
0.8 A/common

Open Collector Output Wiring Example

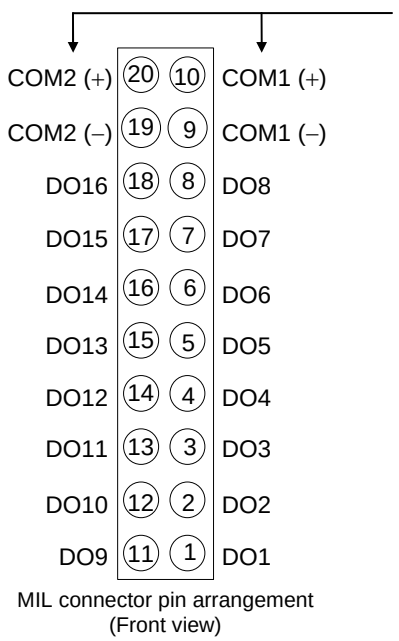


In using the open collector output, an external power supply of 24 V DC is required. Note that if this power supply is not connected, there will be no output from the module.

For the internal circuit driver of the H-DO module, connect the minus (–) terminal of an external power supply (24 V DC) to the number 6 terminal and connect the positive (+) terminal of the power supply to the common line of each output.

H-DO-D type

The output type becomes the transistor sink load output of 16 channels/2 commons (output type: 2 × 8 points/common).



MIL connector pin arrangement
(Front view)

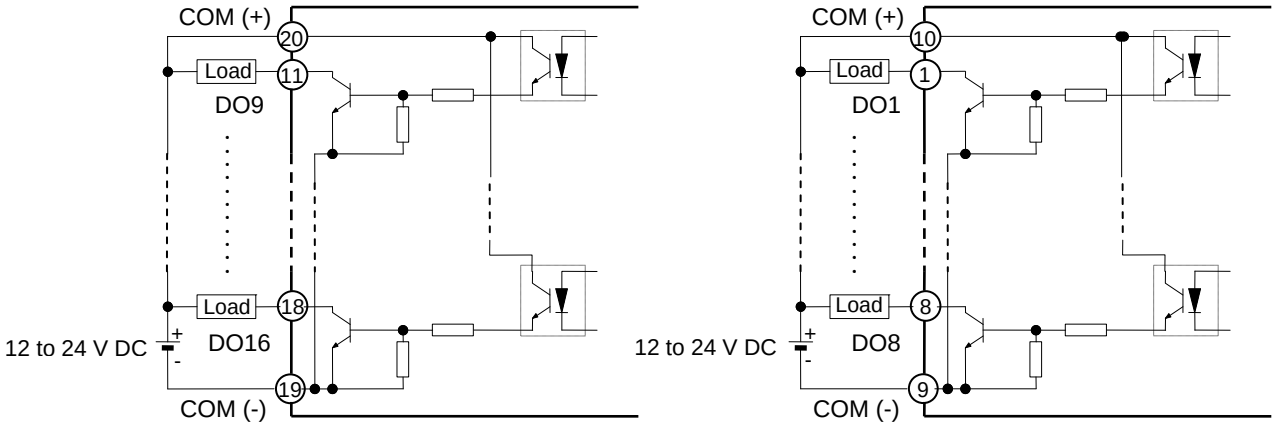
Load voltage: 12 to 24 V DC
Maximum load current:
0.05 A/point
0.4 A/common

Connector type: HIF3BA-20PA-2.54DS(71)
(MIL-standard compliant)
Manufactured by
HIROSE ELECTRIC CO., LTD.

Mating socket: HIF3BA-20D-2.54R
Manufactured by
HIROSE ELECTRIC CO., LTD.

The following socket may also be fitted.
AXM120415 (With strain relief)
Manufactured by Panasonic Corporation. (Old company name: Matsushita Electric Works, Ltd.)

Open Collector Output Wiring Example



In using the open collector output, an external power supply of 24 V DC is required. Note that if this power supply is not connected, there will be no output from the module.

To drive the output circuit within the H-DO module, connect a minus line (–) of the external power supply (24 V DC) to the number 9 pin on the DO1 to DO8 side, and a plus line (+) of the same power supply to the number 10 pin and the common line of each point from DO1 to DO8. In addition, connect a minus line (–) of the external power supply (24 V DC) to the number 19 pin on the DO9 to DO16 side, and a plus line (+) of the same power supply to the number 19 pin and the common line of each point from DO9 to DO16.

■ Event output function (H-DO-C)

The event output function enables up to eight points to be output per module of unique alarms different from ordinary temperature and AI alarms, control unit operations and comparison results which are output only under certain conditions.
The function can be set for each channel of the H-DO-C module.

● Extension alarm output function

An extension alarm is output independently of H-TIO module alarms.
As it is independently set, it can be provided as a dedicated alarm output.

Event DO function selection	Event DO corresponding channel setting	Event DO mode select setting
Temperature deviation alarm	1 to 20 CH (H-TIO/H-CIO module)	High alarm, Low alarm, High/low alarm, Band alarm High alarm [1], Low alarm [1], High/low alarm [1], Band alarm [1] High alarm [2], Low alarm [2], High/low alarm [2]
Temperature process alarm	1 to 20 CH (H-TIO/H-CIO module)	High alarm, Low alarm High alarm [1], Low alarm [1]
Temperature set value alarm	1 to 20 CH (H-TIO/H-CIO module)	High alarm, Low alarm
AI process alarm	1 to 40 CH (H-AI module)	High alarm, Low alarm High alarm [1], Low alarm [1]
TI process alarm	1 to 40 CH (H-TI module)	High alarm, Low alarm High alarm [1], Low alarm [1]

[1] With hold action [2] With re-hold action

Extension alarm output is different from the ordinary alarm output from the H-DO-A/B type module. Similarly, the ordinary alarm cannot be output from the H-DO-C type module (for event output).

The alarm differential gap and alarm delay timer are commonly set.

● Status output function

This function is used to output the control unit action status other than the extension alarm output in addition to the ordinary alarm output states (Alarm 1 status, etc.).

Event DO function selection	Event DO corresponding channel setting	Event DO mode select setting
Unused (Manual mode)	—	—
Alarm 1	1 to 20 CH (H-TIO/H-CIO module)	—
Alarm 2	1 to 20 CH (H-TIO/H-CIO module)	—
Burnout	1 to 20 CH (H-TIO/H-CIO module)	—
Heater break alarm (HBA)	1 to 20 CH (H-TIO module)	—
AI alarm 1	1 to 40 CH (H-AI module)	—
AI alarm 2	1 to 40 CH (H-AI module)	—
Loop break alarm (LBA)	1 to 20 CH (H-TIO/H-CIO module)	—
PID/AT	1 CH	—
TI alarm 1	1 to 40 CH (H-TI module)	—
TI alarm 2	1 to 40 CH (H-TI module)	—
TI burnout	1 to 40 CH (H-TI module)	—
Event DI logic output status	1 to 40 CH (H-DI-B module)	—

● Data comparison output function

This function is used to output the result of comparison between the measured value and measured value (or set value and set value) within the same group.

Event DO function selection	Event DO corresponding channel setting	Event DO mode select setting
	Data 1	Data 2
Temperature input measured value (PV) comparison Comparison between PV and PV	1 to 20 CH (H-TIO/H-CIO module)	1 to 20 CH (H-TIO/H-CIO module)
Temperature set value (SV) comparison Comparison between SV and SV	1 to 20 CH (H-TIO/H-CIO module)	1 to 20 CH (H-TIO/H-CIO module)
AI input measured value (PV) comparison Comparison between PV and PV	1 to 40 CH (H-AI module)	1 to 40 CH (H-AI module)
TI input measured value (PV) comparison Comparison between PV and PV	1 to 40 CH (H-TI module)	1 to 40 CH (H-TI module)

[Relationship between output and comparison]

Computing equation: The output turns ON at (Data 2) − (Data 1) ≤ 0

This means:
The output turns ON if (Data 2) is smaller than or equal to (Data 1). {Data 2 ≤ Data 1}
The output turns OFF if (Data 2) is larger than (Data 1). {Data 2 > Data 1}

The differential gap during comparison can be set. (All channel common setting)
Setting range: 0.00 to 10.00 % of input range

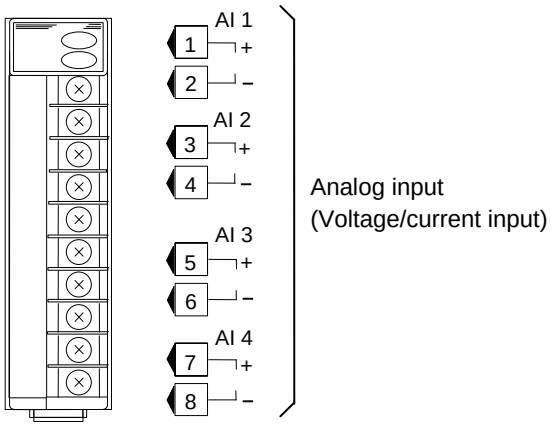
5.10 H-AI Module

The H-AI module is specially for analog input (Voltage/current input).
This H-AI module is used to monitor measured value, current value, etc. in the production line using external analog signals (voltage/current signals).

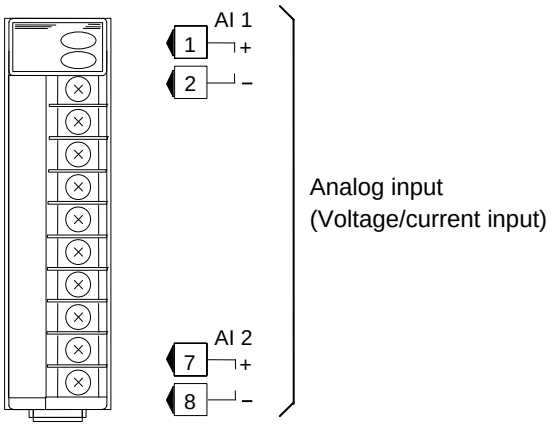
Type	Input terminal
H-AI-A [4 points input type]	Analog input 1 to 4 (AI1 to 4) Not isolated between each input channel
H-AI-B [2 points input type]	Analog input 1 to 2 (AI1 to 2) Isolated between each input channel

■ Terminal configuration

● **H-AI-A type**



● **H-AI-B type**



■ AI alarm function

For the H-AI module, two types of alarm are available per channel as standard (AI alarm 1 and AI alarm 2). Alarm types are those selected by the H-PCP module.

Alarm type: Process high alarm, Process low alarm, Process high alarm with hold action, Process low alarm with hold action

Each AI alarm can be output as summary output (*OR* output) from the digital output block in the H-PCP-A/B module. For details, refer to **5.3 H-PCP Module (P. 32)**.

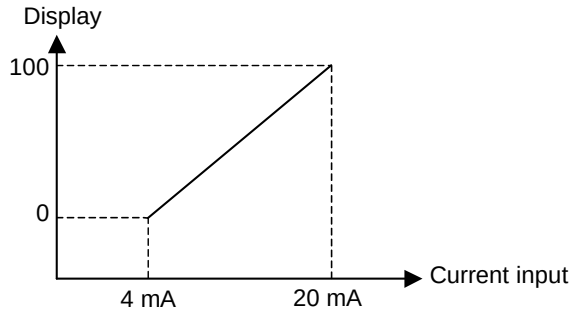
The respective alarm (AI alarm 1/2) can be output independently for each channel by connecting the H-DO-A/B/D module. For details, refer to **5.9 H-DO Module (P. 55)**.

■ Scaling function

This function is used to specify the display range (scaling) of the input value to the H-AI module.

[Example]

When the display range is scaled to 0 to 100 for a current input of 4 to 20 mA.



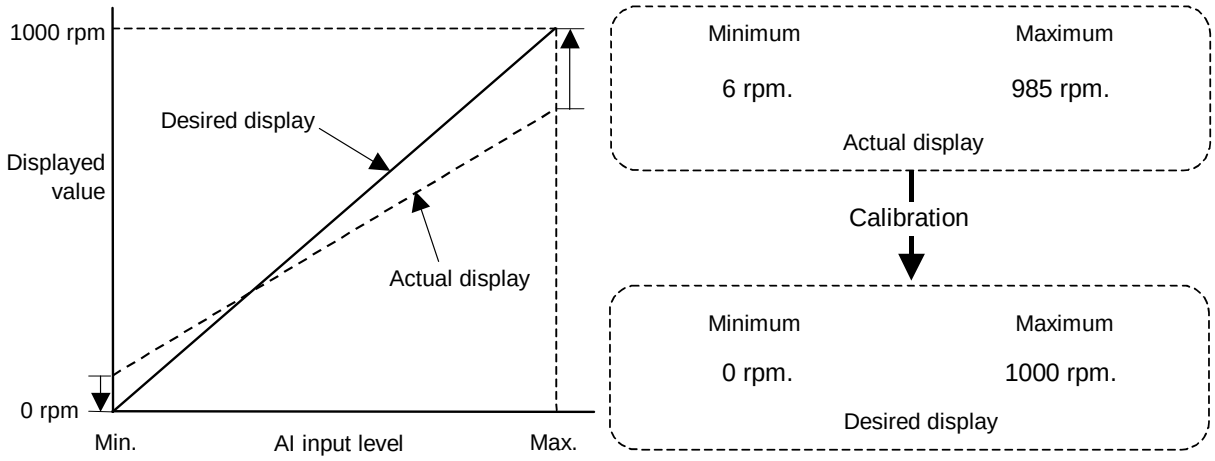
■ Input calibration function

This function is used to forcibly match the displayed value with the zero or full scale point for the purpose of correcting the AI input zero or full scale point.

If the displayed value deviates from the H-AI module input value, the displayed value is calibrated (corrected) at its zero and full scale points so as to match the H-AI module input value.

[Example]

Display of motor r.p.m. (revolutions per minute)



The maximum or minimum displayed value may deviate from the desired value due to an error occurring in the external motor r.p.m. output signal, shunt resistor or current transformer.

At this time, the displayed value is forcibly matched with the input corresponding to the maximum or minimum value, thereby matching the displayed value with the actual r.p.m.

More accurate monitoring becomes possible if calibration is performed by referring to the output from a tachometer (clamp meter for current measurement).

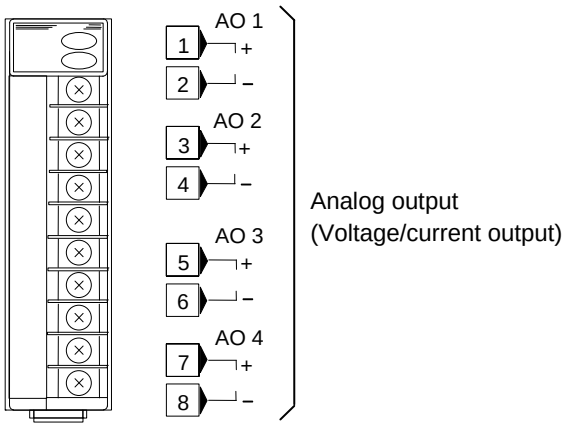
5.11 H-AO Module

The H-AO module is used to output analog signals corresponding to measured value (PV), set value (SV), etc. of the control unit to record product line states and to set external devices remotely.
It can also be used for motor r.p.m. (revolutions per minute) open loop control in combination with the H-AI module.

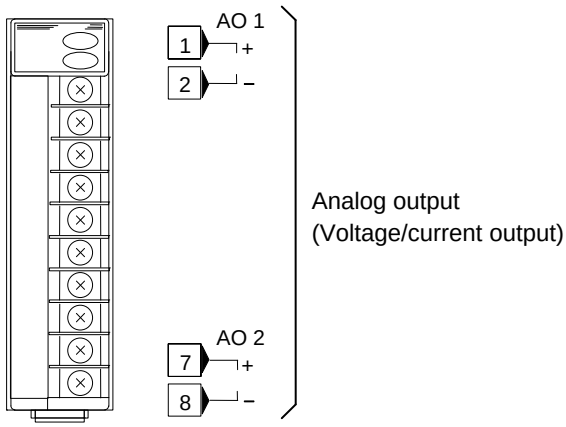
Type	Input terminal
H-AO-A [4 points output type]	Analog output 1 to 4 (AO1 to 4) Not isolated between each channel
H-AO-B [2 points output type]	Analog output 1 to 2 (AO1 to 2) Isolated between each channel

■ Terminal configuration

● **H-AO-A type**



● **H-AO-B type**



■ Analog output function

The H-AO module can output control unit related data to a recorder, etc. as analog signal.

Data item to be output	Corresponding channel range
Temperature measured value (PV)	1 to 20 channels (H-TIO/H-CIO module)
Temperature set value (SV)	1 to 20 channels (H-TIO/H-CIO module)
Temperature deviation value	1 to 20 channels (H-TIO/H-CIO module)
Heat-side control output value	1 to 20 channels (H-TIO/H-CIO module)
Cool-side control output value	1 to 20 channels (H-TIO/H-CIO module)
H-AI module input value	1 to 40 channels (H-AI module)
H-TI module input value	1 to 40 channels (H-TI module)
TIO-K module feedback resistance input value	1 to 10 channels (H-TIO-K module)

Data can be output for each control unit.
When the control unit is multi-drop connected, no data on other control units can be output.

■ Output change rate limit function

This function is used to restrict rapid analog output changes.

The setting of the function becomes valid in manual mode.

■ Zooming function

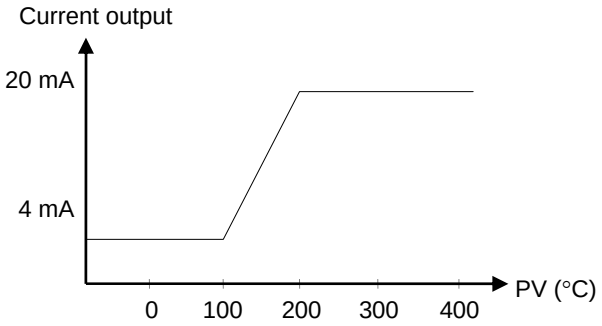
Can be set from 0 to 100 % for each of the high and low sides of the relevant output data. (High > Low)

[Example]

When a temperature of 100 to 200 °C at measured value (PV) is necessary to record for the temperature range from 0 to 400 °C.
Set the relevant values as follows.

AO function selection = Temperature measured value
Setting of channel corresponding to AO = 1 CH
AO zoom high = 50 %
AO zoom low = 25 %

In this case, a percentage of 0 to 100 % is output between 100 and 200 °C.



The setting of the zoom function becomes valid in recorder output mode.

■ AO display scaling function

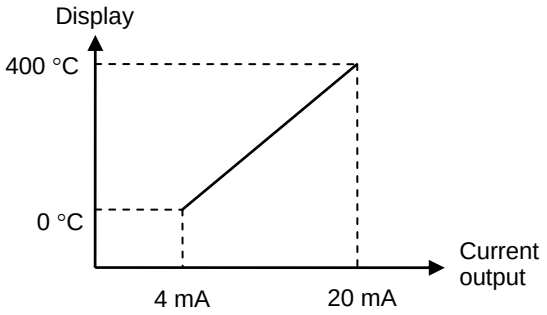
Any analog output from the H-AO module can match 1 to 5 V or 4 to 20 mA on the display.

[Example]

Using the H-AO module with an output of 4 to 20 mA requires a screen display of 0 to 400 °C
Set the relevant values as follows.

AO display scale high: 400
AO display scale low: 0

Thus, a temperature of 0 °C is displayed at an output of 4 mA, and a temperature of 400 °C, at an output of 20 mA.



The setting of the AO display scaling function becomes valid in manual mode.

6. SETTING

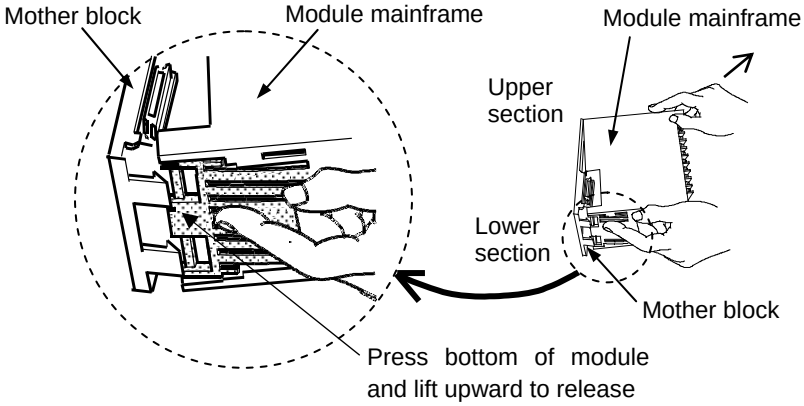
6.1 Communication Setting

⚠ WARNING

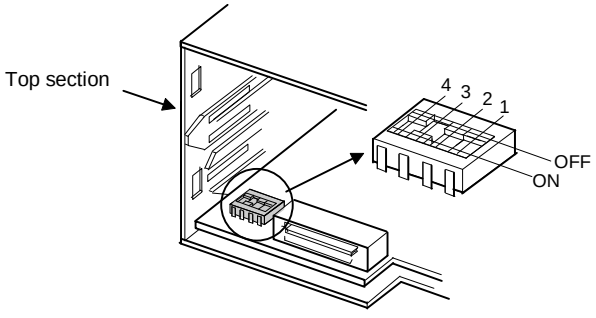
- To prevent electric shock or instrument failure, always turn off the power before setting the switch.
- To prevent electric shock or instrument failure, never touch any section other than those instructed in this manual.

Using the dip switches inside the H-PCP-A/B module, sets the communication speed and data configuration.

1. To separate the module mainframe from the mother block, press the bottom on the module, lifting upward, to release connection.



2. Data configuration and communication speed can be set with the dip switches located in the H-PCP-A/B module.



Rear view of module mainframe with mother block removed

For the Modbus (Z-1021)／MEMOBUS (Z-1001)

1	2	Data configuration
OFF	OFF	Do not set this one
OFF	ON	8-bit even parity
ON	OFF	8-bit odd parity
ON	ON	8-bit without parity

Factory set value: 8-bit without parity

For the RKC communication/Ladder communication (Z-190)

1	2	Data configuration
OFF	OFF	8-bit without parity
OFF	ON	7-bit even parity
ON	OFF	7-bit odd parity
ON	ON	Do not set this one

Factory set value: 8-bit without parity

3	4	Communication speed
OFF	OFF	2400 bps
OFF	ON	4800 bps
ON	OFF	9600 bps
ON	ON	19200 bps

Factory set value: 9600 bps

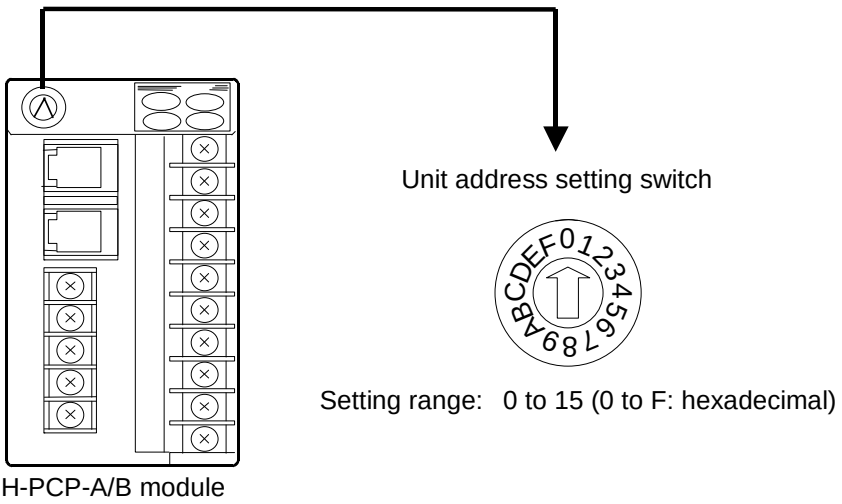
When using the ladder communication, always set the data configuration to “8-bit without parity.”

Continued on the next page.

3. After communication setting is complete, place the module mainframe opening on top of the mother block tab and snap the lower part of module mainframe on to the mother block. A snapping sound will be heard when module mainframe is securely connected to mother block.

6.2 Unit Address Setting

When each control unit is multi-drop connected to host computer or operation panel, set the address of each control unit using the unit address setting switch in the H-PCP-A/B module.
Use a very small blade screwdriver to set the unit address on the unit address setting switch located on the front of each H-PCP-A/B module.



Set the unit address such that it is different to the other addresses on the some line. Otherwise, problems or malfunction may result.

For Modbus (Z-1021 specification) or MEMOBUS (Z-1001 specification), the value obtained by adding "1" to the set address corresponds to the address used for the actual program.

Number of connectable control units
- When connected host computer or PLC: Up to 16 units
- When connected RKC operation panel:
  OPM, OPM-H, OPC, OPC-H: Up to 8 units
  OPC-V06, OPC-V07: Up to 16 units

6.3 Start-up Procedures

■ Check prior to power on

Check the following items before turning on the power to the control unit.
- Operation environments conform to **4.1 Mounting Cautions (P. 22)**.
- Wiring and connections conform to **5. WIRING (P. 29)**.
- Power supply voltage conforms to **8. SPECIFICATIONS (P. 72)**.

■ Check after power on

Check that the RUN lamps on the H-PCP-A/B and function modules are flashing.

7. TROUBLESHOOTING

This section lists some basic causes and solutions to be taken when any problem would arise in this instrument. If you can not solve a problem, please contact RKC sales office or the agent, on confirming the type name and specifications of the product.
If the instrument is necessary to be replaced, observe the following warning.

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.
- To prevent electric shock or instrument failure, do not touch the inside of the instrument.
- All wiring must be performed by authorized personnel with electrical experience in this type of work.

CAUTION

- **All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.**
- **If you add or delete a functional module, or change the arrangement of the modules, or replace a module with a different model, be sure to perform "Module initialization (identifier CL)" before setting the data. "Module initialization" stores the new module configuration in the H-PCP module. If data is set before "Module initialization" is performed, the H-PCP module will set the previously stored initial data of the old modules in the new modules, which may cause malfunction.**

☞ For details on how to initialize the module, refer to **SR Mini/SR Mini HG SYSTEM Supplementary Information Initialize Settings [Extended Communications] (IMSRM07-E□)**.

📖 **As all data on PID constants, alarm set values, etc. is managed by the H-PCP module, it is necessary to re-enter and re-set all data when the H-PCP module is replaced.**
However, re-entry and re-set are not required in the following cases.
- **When data backup software is operating in the module by the external host computer.**
- **When it is set on the operation panel so that data on the operation panel side is transferred to the control unit side when the power is turned on again.**

📖 **When replacing the function module with the same model code, initialization of a module is unnecessary. Before replacing the present module with a new one, set channel operation mode used in the former to Unused mode. Be careful not to remove the module without first setting this channel to the Unused mode, otherwise a failure will be output from the H-PCP module. However, the FAIL lamp of the H-PCP module will not light at this time.**

📖 In this instrument, even if a function module is detached, the operation of the other channels can be continued as before. After mounting the normally operating module, set the channel used by this module to the Normal mode. This operation causes the previously used temperature set value, PID constants, etc. to be transmitted from the H-PCP module, and it is possible to use the module as before.

■ H-PCP module

Problem	Possible cause	Solution
RUN lamp does not light up	Power not being supplied	Check external breaker etc.
	Appropriate power supply voltage not being supplied	Check the power supply
	Power supply terminal contact defect	Tighten more
	Power supply section defect	Replace H-PCP module
RUN lamp stays lit	Module out of place	Install back in place
	The module was not initialized after the module configuration was changed	Execute **Module initialization** or return the configuration to its original specifications
RX1, RX2 (data reception) lamp does not flash TX1, TX2 (data transmission) lamp does not flash	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	CPU section defect	Replace H-PCP module
DO is not output	Output allocation defect	Check the allocation settings
	Output circuit defect	Replace H-PCP module
FAIL is output	H-PCP module CPU section, power section defect	Replace H-PCP module
FAIL is output (but FAIL lamp not lit up) RUN lamp stays lit	The module was not initialized after the module configuration was changed	Execute **Module initialization** or return the configuration to its original specifications
	Module out of place	Install back in place

■ H-DI, H-AI, H-TI module

Problem	Possible cause	Solution
RUN lamp does not flash	Power line defect	Replace mother block
	Power supply section defect	Replace H-PCP module
	CPU section breakdown	Replace module
RUN lamp stays lit	Module different from system specifications inserted	Replace with module matching specifications
	Maximum number of linkable units exceeded	Eliminate a module
FAIL lamp lit up	CPU section breakdown	Replace module
No input values change	System set to Unused mode	Switch to Used mode
	Main CPU section breakdown	Replace H-PCP module
	Bus line defect	Replace mother block
Specific input value does not change	Sensor break	Replace sensor
	Terminal improperly tightened	Tighten more
	System set to Unused mode	Switch to Used mode
	Input circuit, CPU breakdown	Replace module

■ H-TIO, H-CIO module

Problem	Possible cause	Solution
RUN lamp does not flash	Power line defect	Replace mother block
	Power supply section defect	Replace H-PCP module
	CPU section breakdown	Replace module
RUN lamp stays lit	Module different from system specifications inserted	Replace with module matching specifications
	Maximum number of linkable units exceeded	Eliminate a module
FAIL lamp lit up	CPU section breakdown	Replace module
Specific output not output	Input cut line	Replace sensor
	External operating device defect	Inspect external operating devices
	Output section miss-wiring, cut line	Inspect wiring; replace as necessary
	Terminal screw loose	Tighten more
	Output circuit, CPU breakdown	Replace module
	Bus line defect	Replace mother block
No outputs operate	System set to **Stop** mode	Switch to **Run** mode
	System set to **Unused** mode	Switch to **Used** mode
	Load power not supplied	Supply power
	Load power supply voltage outside rating	Change to voltage within rating
	Main CPU section breakdown	Replace H-PCP module
	Bus line defect	Replace mother block
Specific output relay does not go off	Output relay contacts stuck	Replace module
	External operation device recovery defect due to leakage current at surge killer etc.	Reevaluate surge killer; reevaluate external operating device
	Output circuit, CPU breakdown	Replace module
No output relays go off	Main CPU section breakdown	Replace H-PCP module
Output chattering ON/OFF with extremely short period	Terminal tightening defect	Tighten more
ON/OFF with extremely short period	Control period too short	Change period setting
	Malfunction due to excess noise	Investigate noise filter installation
No input values change	System set to **Unused** mode	Switch to **Used** mode
	Main CPU section breakdown	Replace H-PCP module
	Bus line defect	Replace mother block
Specific input value does not change	Sensor break	Replace sensor
	Terminal improperly tightened	Tighten more
	System set to **Unused** mode	Switch to **Used** mode
	Input circuit, CPU breakdown	Replace module
Control unstable	PID constant values inappropriate	Execute autotuning and change the PID constant settings
	Terminal improperly tightened	Tighten more
	External operating device operation defects	Inspect the external operating device
	Output circuit, CPU breakdown	Replace module

■ H-DO, H-AO module

Problem	Possible cause	Solution
RUN lamp does not flash	Power line defect	Replace mother block
	Power supply section defect	Replace module
	CPU section breakdown	Replace module
RUN lamp stays lit	Module different from system specifications inserted	Replace with module matching specifications
	Maximum number of linkable units exceeded	Eliminate a module
FAIL lamp lit up	CPU section breakdown	Replace module
Specific output not operating (RUN lamp flashing)	External operating device defect	Inspect external operating device
	Output section mis-wiring, cut line	Inspect wiring; replace as necessary
	Terminal screw loose	Tighten more
	Output circuit, CPU breakdown	Replace module
	Bus line defect	Replace mother block
No outputs operate	Load power not supplied	Supply power
	Load power supply voltage outside rating	Change to voltage within rating
	Main CPU section breakdown	Replace H-PCP module
	Bus line defect	Replace mother block
Specific output relay does not go off	Output relay contacts stuck	Replace module
	External operation device recovery defect due to leakage current at surge killer etc.	Reevaluate surge killer; reevaluate external operating device
	Output circuit, CPU breakdown	Replace module
No output relays go off	Main CPU section breakdown	Replace H-PCP module
Output chattering ON/OFF with extremely short period	Terminal tightening defect	Tighten more
ON/OFF with extremely short period	Control period too short	Change period setting
	Malfunction due to excess noise	Investigate noise filter installation

■ H-CT module

Problem	Possible cause	Solution
RUN lamp does not flash	Power line defect	Replace mother block
	Power supply section defect	Replace module
	CPU section breakdown	Replace module
RUN lamp stays lit	Module different from system specifications inserted	Replace with module matching specifications
	Maximum number of linkable units exceeded	Eliminate a module
FAIL lamp lit up	CPU section breakdown	Replace module
Electrical current read-in value abnormal	CT sensor different from module specifications used	Replace CT sensor
	Heater break	Inspect heater
	Terminal loose, miss-wiring between channels	Tighten terminals, check wiring
	Input circuit, CPU breakdown	Replace module

8. SPECIFICATIONS

8.1 H-PCP-A/B Module

■ Basic functions

Data supervision:
Operating and system data

Control unit diagnosis:
Function modules configuration check

Self-diagnostic:
Check item: ROM/RAM check
Watchdog timer
CPU power supply monitoring
If error occurs in self-diagnosis, the hardware will automatically return the module outputs to the OFF position.

Data backup:
Backed up by non-volatile memory (FeRAM) *
Number of writing: Approx. ten billion times
Depending on storage and operating conditions.
Data storage period: Approx. 10 years
Lithium battery for RAM backup *
Data storage period: Approx. 10 years.
(Total time when power is turned OFF)
* To distinguish your module between the above two types, please contact RKC office or the agent.

■ Power input

Power supply voltage:
90 to 132 V AC (50/60 Hz)
[Including power supply voltage variation]
(Rating: 100 to 120 V AC)
180 to 264 V AC (50/60 Hz)
[Including power supply voltage variation]
(Rating: 200 to 240 V AC)
21.6 to 26.4 V DC
[Including power supply voltage variation]
(Rating: 24 V DC)
Specify when ordering

Power consumption:

H-PCP-A:	100 to 120 V AC:	20 VA max.
	200 to 240 V AC:	20 VA max.
	24 V DC:	30 W max.
H-PCP-B:	100 to 120 V AC:	25 VA max.
	200 to 240 V AC:	25 VA max.
	24 V DC:	30 W max.

[CE/UL/cUL (or CSA) approved instrument:
100 to 120 V AC: 40 VA max.
200 to 240 V AC: 50 VA max.
24 V DC: 21 W max.]

Surge current: 30 A or less

■ Power output (For function modules)

Output voltage/current:

H-PCP-A:	5 V DC:	1.6 A max.
	12 V DC:	0.4 A max.
H-PCP-B:	5 V DC:	1.6 A max.
	12 V DC:	1.0 A max.

[CE/UL/cUL (or CSA) approved instrument:

5 V DC:	1.7 A max.
12 V DC:	1.0 A max.]

Must be used within the maximum power consumption value.

Overcurrent protection:
Fold-back limiting method: 5 V

■ Output

Failure output:
Relay contact output
Number of outputs:
1 point
Rating: 250 V AC, 0.1 A (Resistive load)
[CE/UL/cUL (or CSA) approved instrument: 30 V DC, 0.1 A]
Electrical life: 300,000 times or more (Rated load)
Contact type: 1a contact
Failure action: Open at error occurrence

Digital output:
Relay contact output
Number of outputs:
4 points (H-PCP-B type: 2 points)
Rating: 250 V AC, 0.1 A (Resistive load)
[CE/UL/cUL (or CSA) approved instrument: 30 V DC, 0.1 A]
Electrical life: 300,000 times or more (Rated load)
Contact type: 1a contact

Open collector output
Number of outputs:
4 points (H-PCP-B type: 2 points)
Load voltage: 12 to 24 V DC
Maximum load current:
0.1 A/point, 0.8 A/common
Specify either relay contact output or open collector output when ordering.
Digital output can be selected from the following:
- Temperature alarm (alarm 1, alarm 2)
- Heater break alarm (HBA)
- Burnout alarm
- Loop break alarm (LBA)
- Temperature rise completion

■ Digital input (Only for H-PCP-B type)

Number of inputs: 3 points
Input type: Source type
Rated input voltage: 24 V DC
Input voltage range: 21.6 to 26.4 V DC
Rated input current: 6.7 mA/point (24 V DC)
Input impedance: 3.6 kΩ
Input operating voltage:
ON voltage: 18.5 V DC
OFF voltage: 9.0 V DC

Allocated functions:
1. Memory area transfer (8 memory areas)
2. Control Run/Stop and memory area transfer (4 memory areas)
3. Alarm interlock release, control Run/Stop and memory area transfer (2 memory areas)

Selectable

■ Communication functions

Communication interface:
Based on RS-422A, EIA standard
Based on RS-232C, EIA standard
Specify when ordering

Connection method:
RS-422A: 4-wire system,
half-duplex multi-drop connection
RS-232C: Point-to-point connection

Protocol:

- Based on ANSI X3.28-1976 subcategories 2.5 and B1 (RKC communication)
  Error control: Vertical parity (when parity bit is selected)
  Horizontal parity
  Data types: ASCII 7-bit code
  Data bit configuration:
  Start bit: 1
  Data bit: 7 or 8
  Parity bit: Without, Odd, Even
  Without for 8 data bits
  Stop bit: 1
- Non-protocol type
  (Ladder communication: Z-190 specification)
  Data type: Text: BCD code
  Control code:
  STX (02H), CR (0DH), LF (0AH)
  The code in ( ) expressed hexadecimal numeral
  Block length:
  128 bytes or less
  Data bit configuration:
  Start bit: 1
  Data bit: 8
  Parity bit: Without
  Stop bit: 1
- Modbus (Z-1021 specification)
  Signai transmission mode:
  Remote Terminal Unit (RTU) mode
  Function code:
  03H Read holding registers
  06H Preset single register
  08H Diagnostics (loopback test)
  10H Preset multiple registers
  Error check method:
  CRC-16
  Data bit configuration:
  Start bit: 1
  Data bit: 8
  Parity bit: Without, Odd, Even
  Stop bit: 1
- MEMOBUS (Z-1001 specification)
  Signai transmission mode:
  Remote Terminal Unit (RTU) mode
  Function code:
  03H Read holding registers
  08H Diagnostics (loopback test)
  10H Preset multiple registers
  Error check method:
  CRC-16
  Data bit configuration:
  Start bit: 1
  Data bit: 8
  Parity bit: Without, Odd, Even
  Stop bit: 1

Synchronous method:
Start/stop synchronous type

Communication speed:
2400 bps, 4800 bps, 9600 bps, 19200 bps
Selectable

■ General specifications

Dimensions: 48 (W) × 96 (H) × 100 (D) mm
Weight: 320 g

8.2 H-TIO-A/B/C/D/E/F/G/H/J/K /P/R Module

■ Input

● Temperature control module (H-TIO-A/B/C/D/P)

Number of inputs:
1 channel or 2 channels
Isolated between each channel and between input and output

Input type:
Thermocouple input:
K, J, R, S, B, E, T, N, PLII, W5Re/W26Re, U, L
RTD input: JPt100, Pt100
Specify when ordering

Input range:
Refer to **Input Range Table (P. 8)**
Specify when ordering

Resolution:
1 °C (°F) or 0.1 °C (°F)

Sampling cycle:
0.5 seconds

Signal source resistance effect:
Approx. 0.35 μV/Ω (Only for thermocouple input)

Input impedance:
1 MΩ or more (Only for thermocouple input)

Continued on the next page.

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Sensor current:
Approx. 0.25 mA (Only for RTD input)
Allowable influence of input lead:
20 Ω or less (Only for RTD input)
Input filter:
First order lag digital filter
Time constant: Settable from 1 to 100 seconds (Setting 0: Filter off)
PV bias:
−5.00 to +5.00 % of span
Action at input break:
Upscale

● High accuracy temperature control module (H-TIO-E/F/G/R)

Number of inputs:
1 channel or 2 channels
Isolated between input and output
(For H-TIO-F type, not isolated between each channel)
Input type:
Thermocouple input: K, J, R, S, B, E, T, N, PLII, W5Re/W26Re, U, L
RTD input: JPt100, Pt100
Specify when ordering
Input range:
Refer to **Input Range Table (P. 8)**
Specify when ordering
Resolution:
1 °C (°F) or 0.1 °C (°F)
0.01 °C (Only for TIO-E type RTD input)
Sampling cycle:
H-TIO-E/G/R: 0.1 seconds
H-TIO-F: 0.2 seconds
Signal source resistance effect:
Approx. 0.3 μV/Ω (Only for thermocouple input)
Input impedance:
1 MΩ or more (Only for thermocouple input)
Sensor current:
Approx. 0.3 mA (Only for RTD input)
Allowable influence of input lead:
10 Ω or less (Only for RTD input)
Input filter:
First order lag digital filter
Time constant: Settable from 0.1 to 100.0 seconds (Setting 0.0: Filter off)
PV bias:
−5.00 to +5.00 % of span
Action at input break:
Upscale or downscale can be selected

● High accuracy temperature control module [Voltage/current input] (H-TIO-H/J)

Number of inputs:
1 channel or 2 channels
Isolated between input and output
(For TIO-J type, not isolated between each channel)
Input type:
Voltage input: 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, −5 to +5 V DC, −10 to +10 V DC, −1 to +1 V DC
Current input: 0 to 20 mA DC、4 to 20 mA DC
Specify when ordering
Input range:
−5 to +105 % of span
Refer to **Input Range Table (P. 8)**
Resolution:
1/10000
Sampling cycle:
H-TIO-H: 0.1 secondes
H-TIO-J: 0.2 secondes
Input impedance:
Voltage input: 1 MΩ or more
Current input: 250 Ω
Analog input filter:
Cut-off frequency: Approx. 11.6 Hz
Rise time: Approx. 33 ms (Response of 90 %)
Digital input filter:
First order lag digital filter
Time constant: Settable from 0.1 to 100.0 seconds (Setting 0.0: Filter off)
Action at input break:
Indicates value near zero
Input scaling range:
−9999 to +10000
However, scaling is possible within a span of 10000 maximum.
Decimal point position can be varied down to 3 digits.
Noise rejection ratio:
Normal mode: Refer to item **Input filter**
Common mode: −120 dB or more (50/60 Hz)

● Temperature control module for control motor drive (H-TIO-K)

Number of inputs:
1 channel
Isolated between input and output
Input type:
Thermocouple input: K, J, R, S, B, E, T, N, PLII,W5Re/W26Re, U, L
RTD input: JPt100, Pt100
Specify when ordering

Continued on the next page.

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Input range:
Refer to **Input Range Table (P. 8)**
Specify when ordering
Resolution:
1 °C (°F) or 0.1 °C (°F)
Sampling cycle:
0.5 seconds
Signal source resistance effect:
Approx. 0.35 μV/Ω (Only for thermocouple input)
Input impedance:
1 MΩ or more (Only for thermocouple input)
Sensor current:
Approx. 0.25 mA (Only for RTD input)
Allowable influence of input lead:
20 Ω or less (Only for RTD input)
Input filter:
First order lag digital filter
Time constant: Settable from 0.1 to 100.0 seconds
(Setting 0.0: Filter off)
PV bias:
–5.00 to +5.00 % of span
Action at input break:
Upscale

■ Performance

Measured accuracy:
H-TIO-A/B/C/D/P/K: ±0.3 % of span ±1 digit
H-TIO-E/G/H/J/R: ±0.1 % of span ±1 digit
H-TIO-F: ±0.2 % of span ±1 digit
However, the accuracy of a thermocouple B type input of 0 to 399 °C (0 to 799 °F) is not guaranteed.
Cold junction temperature compensation error:
H-TIO-A/B/C/D/P/K:
Within ±1.0 °C (Range of 0 to 50 °C)
H-TIO-E/F/G//R:
Within ±0.5 °C (Range of 0 to 50 °C)
Within ±2.0 °C between -100 to -150 °C
Within ±3.0 °C between -150 to -200 °C
Only for thermocouple input
Feedback resistance input:
±0.3 % of span ±1 digit (Only for H-TIO-K type)

■ Control action

- **Temperature control module (H-TIO-A/B/C/D/P), High accuracy temperature control module (H-TIO-E/F/G/H/J/R)**

Control method:
ON/OFF action
(Only for H-TIO-A/B/E/F/H/J/R types)
Brilliant PID control (PI control can also be used.)
Control cycle:
H-TIO-A/B/C/D/P: 0.5 seconds
H-TIO-E/G/R/H: 0.1 seconds
H-TIO-F/J: 0.2 seconds
Other functions:
Overshoot prevention function
(RFB limiter method)
Enhanced autotuning function
(Excluding H-TIO-C/D/G type)
Fuzzy function (Only for H-TIO-P/R type)

- **Temperature control module for control motor drive (H-TIO-K)**

Control method:
PID control (Speed type)
PI control can also be used.
Control cycle:
0.5 seconds
Other functions:
Autotuning function
Manual output function

■ Setting range

- **Temperature control module (H-TIO-A/B/C/D/P), High accuracy temperature control module (H-TIO-E/F/G/H/J/R)**

Set value (SV):
Same as input range or scaling range
Heat-side proportional band:
0.1 to 1000.0 % of span
Cool-side proportional band:
0.1 to 1000.0 % of span
(Only for H-TIO-C/D/G type)
Integral time:
1 to 3600 seconds
Derivative time:
1 to 3600 seconds (PI control when set to 0 second)
Overlap/deadband:
–10.0 to +10.0 % of span
(Only for H-TIO-C/D/G type)
Control response parameter:
Slow, Medium and Fast (3-step selection)
Proportioning cycle:
1 to 100 seconds
(H-TIO-C/D/G type: Heat and cool are individually selectable)

- **Temperature control module for control motor drive (H-TIO-K)**

Set value (SV):
Same as input range
Proportional band:
0.1 to 1000.0 % of span
Integral time:
1 to 3600 seconds
Derivative time:
1 to 3600 seconds (PI control when set to 0 second)
Control response parameter:
Slow, Medium and Fast (3-step selection)

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Neutral zone:
0.1 to 10.0 % of motor driving time
(The time does not become less than 50 ms.)
The output is not turned on until the accumulated value of the control computation result becomes the neutral zone value or more.

Integrated output limiter:
100.0 to 200.0 %
When Open (Close) is output in succession, its output is accumulated. If the accumulated value reaches the set value of the accumulated output limiter, the Open output is not turned on, hereafter.
However, if Close (Open) is output once, the accumulated output is reset.

■ Control output

● Temperature control module (H-TIO-A/B/C/D/P), High accuracy temperature control module (H-TIO-E/F/G/H/J/R)

Relay contact output:
Rating: 250 V AC, 3 A (Resistive load)
Electrical life: 300,000 times or more (Rated load)
Contact type: 1a contact
Cycle: 1 to 100 seconds variable

Voltage pulse output:
Rating: 0/12 V DC
Allowable load resistance:
600 Ω or more
Cycle: 1 to 100 seconds variable

Current output:
Output current: 0 to 20 mA DC, 4 to 20 mA DC
Resolution: H-TIO-A/B/C/D/P:
9 bits or more
H-TIO-E/F/G/H/J/R:
11 bits or more
Allowable load resistance:
500 Ω or less
Output impedance:
5 MΩ or more
(Output minus terminals cannot be connected in common.)

Voltage output:
Output voltage: 0 to 1 V DC, 0 to 5 V DC
0 to 10 V DC, 1 to 5 V DC
Resolution: H-TIO-A/B/C/D/P:
9 bits or more
H-TIO-E/F/G/H/J/R:
11 bits or more
Allowable load resistance:
1 kΩ or more
Output impedance:
0.1 Ω or less
(Output minus terminals can be connected in common only for an output of 1 to 5 V DC.)

Triac output:
Capacity: 0.5 A
(At an ambient temperature of 40 °C)
Zero-cross method
Maximum load voltage:
250 V AC

Open collector output:
Load voltage: 12 to 24 V DC
Maximum load current:
100 mA
Leak current when OFF:
0.1 mA or less
Maximum voltage drop at ON:
2.4 V or less
(At a load current of 100 mA)
0.7 V or less
(At a load current of 10 mA)
The minus terminals of the output with the two channels specification are internally contacted in common.

● Temperature control module for control motor drive (H-TIO-K)

Relay contact output:
Rating: 250 V AC, 3 A (Resistive load)
Electrical life: 300,000 times or more (Rated load)
Contact type: 1a contact
Cycle : 1 to 100 seconds variable

■ Feedback resistance input (Only for H-TIO-K type)

Input type:
Feedback resistance input from control motor
(O: Open, W: Wiper, C: Close)
Only input display. (No relation with control.)

Input resistance value:
135 Ω standard
Can specify any one of 100 Ω, 500 Ω, 1 kΩ, 5 kΩ and 10 kΩ
Specify when ordering

Display at input break:
Displayed from −199.9 to +199.9 %
Manual output is impossible at input abnormality.

Input sampling:
1 second

Input range:
0.0 to 100.0 % (Full open to full close)
Adjustable
(Motor driving time can be also automatically set during adjustment)

■ Temperature alarm function

Number of alarms:
2 points
Alarm type:
Deviation high alarm
Deviation low alarm
Deviation high/low alarm
Deviation band alarm
Deviation high alarm with hold action
Deviation low alarm with hold action
Deviation high/low alarm with hold action
Deviation high alarm with re-hold action
Deviation low alarm with re-hold action
Deviation high/low alarm with re-hold action
Process high alarm
Process low alarm
Process high alarm with hold action
Process low alarm with hold action
Specify when ordering (Alarm action is specified for the H-PCP module.)
Setting range:
−span to +span:
Deviation high alarm, Deviation low alarm
Deviation high alarm with hold action
Deviation low alarm with hold action
0 to span:
Deviation high/low alarm, Deviation band alarm
Deviation high/low alarm with hold action
Same as input range:
Process high alarm, Process low alarm
Process high alarm with hold action
Process low alarm with hold action
Setting resolution:
Same as input resolution
Alarm output:
This module outputs alarm status to the H-PCP module as data.

■ Alarm output (Only for H-TIO-A/E/H/R type) [optional]

Number of outputs:
1 point
Temperature alarm output 1, Temperature alarm output 2, Heater break alarm output (HBA) or Loop break alarm output (LBA).
Specify when ordering
Relay contact output:
Rating: 250 V AC, 24 V DC 2 A (Resistive load)
Electrical life: 300,000 times or more (Rated load)
Contact type: 1a contact
Minimum switching voltage and current: 5 V DC 1 mA
Isolation method:
Photocoupler isolation

■ Heater break alarm (HBA) function (Only for H-TIO-A/C/D type) [optional]

Number of inputs:
1 point/control loop
Current transformer:
CTL-6-P-N, CTL-12-S56-10L-N
Specify when ordering
Setting range:
0.0 to 100.0 A
Accuracy of heater current measurement:
5 % of input value or ±2 A
(The value whichever is greater)
Input current:
0 to 30 A: CTL-6-P-N
0 to 100 A: CTL-12-S56-10L-N
Input rating:
Maximum current:
130 mA
Input impedance:
10 Ω
Alarm output:
This module outputs alarm status to the H-PCP module as data.

■ Loop break alarm (LBA) function (Only for H-TIO-A/B/C/D/E/F/G/K/P/R type)

Setting range:
LBA setting time:
1 to 7200 seconds
LBA deadband (LBD):
Same as input range
(LBD is automatically as the value of two times of integral value after the completion of autotuning.)
Alarm output:
This module outputs alarm status to the H-PCP module as data.

■ Self-diagnostic function

Check item:
RAM check, Adjustment data check, Input value check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights
Reset state and All channel control outputs are turned off.

■ Manual setting function

- **Temperature control module (H-TIO-A/B/C/D/P), High accuracy temperature control module (H-TIO-E/F/G/H/J/R)**

Auto/Manual transfer:
Either Auto or Manual control can be selected.
Setting range:
−5.0 to +105.0 %
Balanceless bumpless:
Balanceless bumpless transfer between Auto and Manual (both directions).

- **Temperature control module for control motor drive (H-TIO-K)**

Auto/Manual transfer:
Either Auto or Manual control can be selected.
Setting operation:
Manual output setting:
–5.0 to +105.0 %
(Valid in manual mode)
The output cannot be normal when feedback resistance input error occurs.
Output timing (Manual mode):
- At the change of settings
- At power-up
- At Auto/Manual transfer
- At Run/Stop transfer to control Run

In above operation, the output is made three times to the set value

■ General specifications

Dimensions:
H-TIO-A/B/C/E/F/G/H/J/K/P/R:
24 (W) × 96 (H) × 100 (D) mm
H-TIO-D: 48 (W) × 96 (H) × 100 (D) mm
Weight:
H-TIO-A/B/C/E/F/G/H/J/K/P/R:
120 g
H-TIO-D: 240 g

8.3 H-TI-A/B/C Module

■ Input

Number of inputs:
H-TI-A: 4 channels
Not isolated between each channel and between input and CPU
H-TI-C: 4 channels
Isolated between each channel and between input and CPU
H-TI-B: 2 channels
Isolated between each channel and between input and CPU
Input type:
Thermocouple input (H-TI-C/B):
K, J, R, S, B, E, T, N, PLII, W5Re/W26Re, U, L
RTD input (H-TI-A/B):
JPt100, Pt100
Specify when ordering
Input range:
Refer to **Input Range Table (P. 8)**
Specify when ordering
Resolution:
1 °C (°F) or 0.1 °C (°F)
0.01 °C (Only for TI-B type RTD input)
Sampling cycle:
H-TI-A/C: 0.5 seconds
H-TI-B: 0.1 seconds
Signal source resistance effect:
Approx. 0.3 μV/Ω (Only for thermocouple input)
Input impedance:
1 MΩ or more (Only for thermocouple input)
Sensor current:
Approx. 0.3 mA (Only for RTD input)
Allowable influence of input lead:
10 Ω or less (Only for RTD input)
Input filter:
First order lag digital filter
Time constant: Settable from 0.1 to 100.0 seconds
(Setting 0.0: Filter off)
PV bias:
–5.00 to +5.00 % of span
Action at input break:
Upscale

■ Performance

Measured accuracy:
H-TI-A/C: ±0.3 % of span ±1 digit
H-TI-B: ±0.1 % of span ±1 digit
However, the accuracy of a thermocouple B type input of 0 to 399 °C (0 to 799 °F) is not guaranteed.
Cold junction temperature compensation error:
H-TI-B:
Within ±0.5 °C (Range of 0 to 50 °C)
Thermocouple J, T type:
Within ±1.0 °C
H-TI-C:
Within ±1.0 °C (Range of 0 to 50 °C)
Within ±2.0 °C between –100 to –150 °C
Within ±3.0 °C between –150 to –200 °C
Only for thermocouple input

■ Temperature alarm function

Number of alarms:
2 points
Alarm types:
Process high alarm
Process low alarm
Process high alarm with hold action
Process low alarm with hold action
Alarm action is specified for the H-PCP module.
Setting range:
Same as input range
Setting resolution:
Same as input resolution
Alarm output:
This module outputs alarm status to the H-PCP module as data.

■ Self-diagnostic function

Check item:
RAM check, Adjustment data check, Input value check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state and All channel control outputs are turned off.

■ General specifications

Dimensions:
24 (W) × 96 (H) × 100 (D) mm
Weight:
140 g

8.4 H-CIO-A Module

■ Input

● Thermocouple input/RTD input

Number of inputs:
2 points (Master input/slave input)
Isolated between input and output
For RTD input, not isolated between input and output
Input type:
Thermocouple input:
K, J, R, S, B, E, T, N, PLII, W5Re/W26Re, U, L
RTD input: JPt100, Pt100
Specify when ordering
Input range:
Refer to **Input Range Table (P. 8)**
Specify when ordering
Resolution:
1 °C (°F) or 0.1 °C (°F)
Sampling cycle:
0.1 seconds
Signal source resistance effect:
Approx. 0.3 μV/Ω (Only for thermocouple input)
Input impedance:
1 MΩ or more (Only for thermocouple input)
Sensor current:
Approx. 0.3 mA (Only for RTD input)
Allowable influence of input lead:
10 Ω or less (Only for RTD input)
Input filter:
First order lag digital filter
Time constant: Settable from 0.1 to 100.0 seconds
(Setting 0.0: Filter off)
PV bias:
–5.00 to +5.00 % of span
Action at input break:
Upscale

● Voltage/current input

Number of inputs:
2 points (Master input/slave input)
Isolated between input and input, and between input and output.
Input type:
Voltage input: 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, –5 to +5 V DC, –10 to +10 V DC, –1 to +1 V DC
Current input: 0 to 20 mA DC, 4 to 20 mA DC
Specify when ordering
Input range:
–5 to +105 % of span
Refer to **Input Range Table (P. 8)**
Resolution:
1/10000
Sampling cycle:
0.1 seconds
Input impedance:
Voltage input: 1 MΩ or more
Current input: 250 Ω
Analog input filter:
Cut-off frequency:
Approx. 11.6 Hz
Rise time: Approx. 33 ms (Response of 90 %)
Digital input filter:
First order lag digital filter
Time constant: Settable from 0.1 to 100.0 seconds
(Setting 0.0: Filter off)
Action at input break:
Indicates value near zero
Measured accuracy:
±0.1 % of span ±1 digit
Input scaling range:
–9999 to +10000
However, scaling is possible within a span of 10000 maximum.
Decimal point position can be varied down to 1 digit.
Noise rejection ratio:
Normal mode: Refer to item **Input filter**
Common mode: –120 dB or more (50/60 Hz)

■ Performance

Measured accuracy:
±0.1 % of span ±1 digit
However, the accuracy of a thermocouple B type input of 0 to 399 °C
(0 to 799 °F) is not guaranteed.
Cold junction temperature compensation error:
Within ±0.5 °C (Range of 0 to 50 °C)
Within ±2.0 °C between -100 to -150 °C
Within ±3.0 °C between -150 to -200 °C
Only for thermocouple input

■ Control action

Control method:
Brilliant PID control (PI control can also be used.)
Heat/cool control can be also selected for the slave channel.
Specify when ordering
Control cycle:
0.1 seconds
Other functions:
Overshoot prevention function (RFB limiter method)
Enhanced autotuning function

■ Setting range

Set value (SV):
Same as input range
Heat-side proportional band:
0.1 to 1000.0 % of span
Cool-side proportional band:
0.1 to 1000.0 % of span (Only for TIO-G type)

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Integral time:
1 to 3600 seconds
Derivative time:
1 to 3600 seconds (PI control when set to 0 second)
Overlap/deadband:
–10.0 to +10.0 % of span
Control response parameter:
Slow, Medium and Fast (3-step selection)
Proportioning cycle:
1 to 100 seconds

■ Control output

Relay contact output:
Rating: 250 V AC, 3 A (Resistive load)
Electrical life: 300,000 times or more (Rated load)
Contact type: 1a contact
Cycle : 1 to 100 seconds variable
Voltage pulse output:
Rating: 0/12 V DC
Allowable load resistance:
600 Ω or more
Cycle: 1 to 100 seconds variable
Current output:
Output current: 0 to 20 mA DC and 4 to 20 mA DC
Resolution: 11 bits or more
Allowable load resistance:
500 Ω or less
Output impedance:
5 MΩ or more
Specify when ordering
(Output minus terminals cannot be connected in common.)
Voltage output:
Output voltage: 0 to 1 V DC, 0 to 5 V DC,
0 to 10 V DC
Resolution: 11 bits or more
Allowable load resistance:
1 kΩ or more
Output impedance:
0.1 Ω or less
Specify when ordering
(Output minus terminals can be connected in common only for an output of 1 to 5 V DC.)
Triac output:
Capacity: 0.5 A
(At an ambient temperature of 40 °C)
Zero-cross method
Maximum load voltage:
250 V AC
Open collector output:
Load voltage: 12 to 24 V DC
Maximum load current:
100 mA
Leak current when OFF:
0.1 mA or less
Maximum voltage drop at ON:
2.4 V or less
(At a load current of 100 mA)
0.7 V or less
(At a load current of 10 mA)

■ Temperature alarm function

Number of alarms:
2 points
Alarm type:
Deviation high alarm
Deviation low alarm
Deviation high/low alarm
Deviation band alarm
Deviation high alarm with hold action
Deviation low alarm with hold action
Deviation high/low alarm with hold action
Deviation high alarm with re-hold action
Deviation low alarm with re-hold action
Deviation high/low alarm with re-hold action
Process high alarm
Process low alarm
Process high alarm with hold action
Process low alarm with hold action
Specify when ordering (Alarm action is specified for the H-PCP module.)
Setting range:
–span to +span:
Deviation high alarm, Deviation low alarm
Deviation high alarm with hold action
Deviation low alarm with hold action
0 to span:
Deviation high/low alarm, Deviation band alarm
Deviation high/low alarm with hold action
Same as input range:
Process high alarm, Process low alarm
Process high alarm with hold action
Process low alarm with hold action
Setting resolution:
Same as input resolution
Alarm output:
This module outputs alarm status to the H-PCP module as data.

■ Loop break alarm (LBA) function

Setting range:
LBA setting time:
1 to 7200 seconds
LBA deadband (LBD):
Same as input range
(LBD is automatically as the value of two times of integral value after the completion of autotuning.)
Alarm output:
This module outputs alarm status to the H-PCP module as data.

■ Digital input

Input type:
Dry contact
Resistance value at OPEN: 500 kΩ or more
Resistance value at CLOSE: 10 Ω or less
Number of inputs:
2 points
Voltage at OPEN:
12 V DC

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Contact current:
Approx. 3 mA/point
Function:
Mode selection
Isolation method:
Photocoupler isolation
External connection:
Terminals
Aout/Manual transfer (Only for master channel)

■ Cascade function

Monitor item:
Cascade monitor:
±Input range
Normal setting value:
Cascade bias: –99.99 to +100.0 % of span
Cascade gain: –9.999 to +10.000
(No engineering unit)
Cascade ON/OFF:
0: OFF
1: ON
Cascade control is turned ON/OFF via communication or by digital input.
Initial setting value:
Cascade data selection:
0: Output values
1: Measured values
2: Local set values
3: Set value monitoring
4: Deviation (Local set values - Measured values)
Tracking function:
0: OFF
1: ON
Digital input selection function:
0: Function OFF
1: Cascade ON/OFF
2: Master channel auto/manual transfer
3: Valid for both 1 and 2

■ Self-diagnostic function

Check item:
RAM check, Adjustment data check, Input value check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state and All channel control outputs are turned off.

■ Manual setting function

Auto/Manual transfer:
Either Auto or Manual control can be selected.
Setting range:
–5.0 to +105.0 %
Balanceless bumpless:
Balanceless bumpless transfer between Auto and Manual (both directions).

■ General specifications

Dimensions:
48 (W) × 96 (H) × 100 (D) mm
Weight:
260 g

8.5 H-CT-A Module

■ Input

Input type:
Current transformer input (CT)
Number of inputs:
6 points
Number of common points:
3 points
(1-2 channel/common, 3-4 channel/common, 5-6 channel/common)
Isolation method:
Photocoupler isolation
Input current:
0 to 30 A: CTL-6-P-N
0 to 100 A: CTL-12-S56-10L-N
Specify when ordering (Current transformer is sold separately)
Accuracy of heater current measurement:
5 % of input value or ±2 A (The value whichever is greater)

■ Heater break alarm (HBA) function

Setting range:
0.0 to 100.0 A
Corresponding channel setting:
1 to 20 channels (Same channel can be set)
Alarm output:
This module outputs alarm status to the H-PCP module as data.

■ Self-diagnostic function

Check item:
RAM check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state

■ General specifications

Dimensions:
24 (W) × 96 (H) × 100 (D) mm
Weight:
120 g

8.6 H-DI-A/B Module

8.6.1 Digital input module (H-DI-A)

■ Input

Input type:
Source type
Number of inputs:
8 points
Rated input voltage:
24 V DC
Input voltage range:
21.6 to 26.4 V DC
Rated input current:
6.7 mA/point (24 V DC)
Input impedance:
3.6 kΩ
Input operation voltage:
ON voltage: 18.5 V DC
OFF voltage: 9.0 V DC
Number of common points:
4 points/common
Isolation method:
Photocoupler isolation
External connection:
Terminals

■ Additional function

Memory area transfer:
Possible to transfer 8-memory area.
Control Run/Stop transfer:
Possible to transfer Run/Stop of temperature control.
Alarm interlock release:
Possible to release the alarm interlock on all channels.

■ Self-diagnostic function

Check item:
RAM check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state

■ General specifications

Dimensions:
24 (W) × 96 (H) × 100 (D) mm
Weight:
120 g

8.6.2 Event digital input module (H-DI-B)

■ Input

Input type:
Source type
Number of inputs:
8 points
Rated input voltage:
24 V DC
Input voltage range:
21.6 to 26.4 V DC
Rated input current:
6.7 mA/point (24 V DC)
Input impedance:
3.6 kΩ
Input operation voltage:
ON voltage: 18.5 V DC
OFF voltage: 9.0 V DC
Number of common points:
4 points/common
Isolation method:
Photocoupler isolation
External connection:
Terminals

■ Additional function

DI monitor:
8 points/module (Maximum 80 points/10 modules)
Logic circuit:
Number of logic circuits:
8 pieces/module
Logic circuit type:
4 types (*AND*, *NAND*, *OR* and *NOR*)
Number of logic inputs: 4 × 8 points
Input inversion selection: 4 × 8 points
Number of logic outputs: 1 × 8 points
Logic output delay counts: 0 to 255 counts (0.2 seconds/cycle)
Logic input type:
Event DI input: 1 to 80 CH
Event DI logic output: 1 to 80 CH
Event DO output: 1 to 72 CH
Temperature first alarm: 1 to 18 CH
Temperature second alarm: 1 to 18 CH
TIO burnout status: 1 to 18 CH
TIO heater break status: 1 to 18 CH
TIO loop break status: 1 to 18 CH
AI first alarm: 1 to 36 CH
AI second alarm: 1 to 36 CH
TI first alarm: 1 to 36 CH
TI second alarm: 1 to 36 CH
TI burnout status: 1 to 36 CH
PCP module error status: Provided/Not provided
TIO temperature rise completion status: Completed/Not completedTIO's
PID/AT logical add:
Normally all channels are under control/Either of channels are under autotuning

■ Self-diagnostic function

Check item:
RAM check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state

■ General specifications

Dimensions:
24 (W) × 96 (H) × 100 (D) mm
Weight:
120 g

8.7 H-DO-A/B/C/D Module

8.7.1 Digital outout module (H-DO-A/B/D)

■ Output

Output type:
H-DO-A: Relay contact output or open collector output (Sink type)
H-DO-B: Relay contact output
H-DO-D: Open collector output (Sink type)
Number of outputs:
H-DO-A: 8 points
H-DO-B: 4 points
H-DO-D: 16 points
Number of common points:
Relay contact output:
H-DO-A: 2 points (4 points/common)
H-DO-B: All channel independent common output
Open collector output:
H-DO-A: 1 point (8 points/common)
H-DO-D: Vcc: 2 points (8 points/common)
GND: 2 points (8 points/common)
Isolation method:
Photocoupler isolation
Relay contact output:
Rating: 250 V AC, 24 V DC
Maximum load current:
1 point 1 A (Resistive load)
1 common 4 A (Resistive load)
[Only for H-DO-A type]
Minimum switching voltage/current:
5 V DC, 10 mA
Contact type: 1a contact
Open collector output:
Load voltage: 12 to 24 V DC
Maximum load current:
H-DO-A: 0.1 A/point, 0.8 A/common
H-DO-D: 0.05 A/point, 0.4 A/common

■ Alarm output function

Alarm output type:
Temperature alarm 1
Temperature alarm 2
Heater break alarm (HBA)
Loop break alarm (LBA)
Burnout alarm
AI alarm 1
AI alarm 2
Specify when ordering
Setting method:
H-DO-A/B: Sets alarm type in each block (4 channel/block)
H-DO-D: Sets alarm type in each block (8 channel/block)

■ Self-diagnostic

Check item:
RAM check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state

■ General specifications

Dimensions:
24 (W) × 96 (H) × 100 (D) mm
Weight:
H-DO-A: 140 g
H-DO-B: 130 g
H-DO-D: 140 g

8.7.2 Event digital output module (H-DO-C)

■ Output

Output type:
Open collector output
Number of outputs:
8 points
Number of common points:
1 point (8 points/common)
Isolation method:
Photocoupler isolation
Open collector output:
Load voltage: 12 to 24 V DC
Maximum load current:
0.1 A/point
0.8 A/common

■ Event output function

Extension alarm output function:
This function is used to output the unique alarms to different temperature alarm and AI alarms.
Alarm output type:
Temperature deviation alarm:
Deviation high alarm
Deviation high alarm with hold action
Deviation low alarm
Deviation low alarm with hold action
Deviation high/low alarm
Deviation high/low alarm with hold action
Deviation band alarm
Deviation high alarm with re-hold action
Deviation low alarm with re-hold action
Deviation high/low alarm with re-hold action
Temperature process alarm:
Process high alarm
Process high alarm with hold action
Process low alarm
Process low alarm with hold action

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Temperature set value alarm:
High alarm
Low alarm
AI process alarm:
Process high alarm
Process low alarm
Process high alarm with hold action
Process low alarm with hold action
TI process alarm:
Process high alarm
Process low alarm
Process high alarm with hold action
Process low alarm with hold action
- Unit common setting for both Alarm delay timer and Alarm differential gap.
- Channel numbers of H-TIO modules, etc. can be selected.
- With interlock function

Status output functions:
This function is used to output the control unit action status other than the extension alarm output in addition to the ordinary alarm output states.
Alarm output type:
Temperature alarm 1 status
Temperature alarm 2 status
Temperature burnout alarm status
Heater break alarm status
Loop break alarm status
AI alarm 1 status
AI alarm 2 status
TI alarm 1 status
TI alarm 2 status
TI burnout alarm status
PID/AT status
Event DI logic output status

Comparison output functions:
This function is used to output the result of comparison between the measured value and measured value (or set value and set value) within the same group.
Alarm output type:
Temperature process value comparison:
Comparison between PV and PV of H-TIO module
Temperature set value comparison:
Comparison between SV and SV of H-TIO module
AI process value comparison:
Comparison between PV and PV of AI module
TI process value comparison:
Comparison between PV and PV of TI module
- Unit common setting for both Alarm delay timer and Alarm differential gap.
- Channel numbers of H-TIO modules, etc. can be selected.
- With interlock function

■ Self-diagnostic

Check item:
RAM check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state

■ General specifications

Dimensions:
24 (W) × 96 (H) × 100 (D) mm
Weight:
140 g

8.8 H-AI-A/B Module

■ Input

Number of inputs:

H-AI-A:	4 points Isolated between input and CPU. Not isolated between each channel.
H-AI-B:	2 points Isolated between each channel and between input and CPU.

Input type:

Voltage input:	0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, −5 to +5 V DC, −10 to +10 V DC, −1 to +1 V DC
Current input:	0 to 20 mA DC, 4 to 20 mA DC Specify when ordering

Input range:
−5 to +105 % of span
Resolution:
1/10000
Sampling cycle:

H-AI-A:	0.2 seconds
H-AI-B:	0.1 seconds

Input impedance:

Voltage input:	1 MΩ or more
Current input:	250 Ω

Analog input filter:
Cut-off frequency:
Approx. 11.6 Hz
Rise time: Approx. 33 ms (Response of 90 %)
Digital input filter:
First order lag digital filter
Time constant: Settable from 0.1 to 100.0 seconds (Setting 0.0: Filter off)
Moving average:
Moving average of four times (Used/unused can be selected)
Can be simultaneously used.
Action at input break:
Indicates value near zero
Measured accuracy:
±0.1 % of span ±1 digit

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Input scaling range:
–9999 to +10000
However, scaling is possible within a span of 10000 maximum.
Decimal point position can be varied down to 3 digits.
Noise rejection ratio:
Normal mode: Refer to item **Input filter**
Common mode:
–120 dB or more (50/60 Hz)
Calibration function:
Zero-point calibration function:
Within –5 to +5 % of span
Full scale calibration function:
Within –95 to +105 % of span

■ Alarm function

Number of alarms:
2 points
Alarm types:
Process high alarm
Process low alarm
Process high alarm with hold action
Process low alarm with hold action
The alarm type can be selected for each alarm.
Specify when ordering (Alarm action is specified for the H-PCP module.)
Setting range:
Same as input range
Setting resolution:
Same as input resolution
Alarm output:
This module outputs alarm status to the H-PCP module as data.

■ Self-diagnostic

Check item:
RAM check, Adjustment data check, Input value check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state

■ General specifications

Dimensions:
24 (W) × 96 (H) × 100 (D) mm
Weight:
H-AI-A: 120 g
H-AI-B: 140 g

8.9 H-AO-A/B Module

■ Output

Number of inputs:
H-AO-A: 4 points
Isolated between output and CPU. Not isolated between each channel.
H-AO-B: 2 points
Isolated between each channel and between output and CPU.
Output type:
Voltage output: 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
Current output: 0 to 20 mA DC, 4 to 20 mA DC
Specify when ordering
Resolution:
12 bits or more
Output impedance:
Voltage output: Approx. 10 Ω
(0 to 10 mV DC, 0 to 100 mV DC)
0.1 Ω or less
(0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC)
Current output: 5 MΩ or more
Allowable load resistance:
Voltage output: 20 kΩ or more
(0 to 10 mV DC, 0 to 100 mV DC)
1 kΩ or more
(0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC)
Current output: 500 Ω or less
Selection of AO function:
Manual mode
Recorder mode:
Temperature measured value (PV)
Temperature set value (SV)
Temperature deviation value
Heat-side manipulated output value
Cool-side manipulated output value
H-AI module input value
H-TI module input value
H-TIO-K module feedback resistance input
Calibration function:
Correction of zero and full scale points

■ Recorder mode

Type/channel selection:
Type to be freely output and channel can be selected by AO function/ channel selection.
Output zooming function:
Measured value data to be output is expanded and then output to AO.
Output change cycle:
200 ms

■ Manual mode

Scaling:
−10000 to +10000
However, scaling is possible within a span of 10000.
Output change rate limiter:
0.1 to 100.0 %/second
(0.0 second: The rate of output change limit is turned off.)
Rise/fall common setting

■ Self-diagnostic

Check item:
RAM check, Adjustment data check, Watchdog timer
Operation at error occurrence in self-diagnosis:
FAIL lamp lights, Reset state and All channel control outputs are turned off.

■ General specifications

Dimensions:
24 (W) × 96 (H) × 100 (D) mm
Weight:
120 g

8.10 Common Specifications

■ Control unit

Power supply voltage:
90 to 132 V AC (50/60 Hz)
[Including power supply voltage variation]
(Rating: 100 to 120 V AC)
180 to 264 V AC (50/60 Hz)
[Including power supply voltage variation]
(Rating: 200 to 240 V AC)
21.6 to 26.4 V DC
[Including power supply voltage variation]
(Rating: 24 V DC)
Specify when ordering
Insulation resistance:
Between power and ground terminals:
20 MΩ or more at 500 V DC
Between input/output and ground terminals:
20 MΩ or more at 500 V DC
Withstand voltage:
Between power and ground terminals:
1500 V AC for 1 minute
Between input/output and ground terminals:
1000 V AC for 1 minute
Withstand noise:
1500 V (peak to peak)
Pulse width: 1 μs
Rise time: 1 ns
By noise simulator
Withstand vibration:
Frequency: 5 to 9 Hz
Amplitude: 1.5 mm
Frequency: 9 to 150 Hz
Acceleration: 5.0 m/s
Sweep speed: 10 Hz/min
Vibration director:
Front and back, Right and left, Up and down (Three directions)
Vibration time: 1 hour, all directions
Power failure effect:
No influence even under power failure of 20 ms or less.
Ambient temperature range:
0 to 50 °C
Ambient humidity range:
45 to 85 %RH
(Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3 kPa)
Operating environment:
No corrosive gases, no large amounts of dust or particulates.
Storage temperature range:
−20 to +70 °C
Storage humidity range:
95 %RH or less (Non condensing)
Grounding resistance:
100 Ω or less
Cooling method:
Natural cooling

A. APPENDIX

■ Maximum power consumption of H-PCP module

H-PCP module	CE/UL/cUL (or CSA) approved instrument:			Standard type		
	100 to 120 V AC	200 to 240 V AC	24 V DC	100 to 120 V AC	200 to 240 V AC	24 V DC
H-PCP-A	40 VA	50VA	21 W	20 VA		30 W
H-PCP-B	40 VA	50VA	21 W	25 VA		30 W
H-PCP-G			21 W			21 W
H-PCP-J	40 VA	50VA	21 W			
H-PCP-H				40 VA	50VA	20 W

■ Maximum current available for function modules

H-PCP module	CE/UL/cUL (or CSA) approved instrument:		Standard type	
	5 V power supply	12 V power supply	5 V power supply	12 V power supply
H-PCP-A	1700 mA	1000 mA	1600 mA	400 mA
H-PCP-B			1600 mA	1000 mA
H-PCP-G			1700 mA	1000 mA
H-PCP-J				
H-PCP-H			1600 mA	1000 mA

☞ For the detail of H-PCP-G/J/H module, please read if necessary the following separate manuals.

- H-PCP-G/H-LNK-A Instruction Manual (IMSRM52-E□)
- H-PCP-J Instruction Manual (IMS01J02-E□)
- H-PCP-H Instruction Manual (IMS01D01-E□)

The above manuals can be downloaded from the official RKC website:
http://www.rkcinst.com/english/manual_load.htm

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