Module Type Controller   SRV

Temperature Control Module for PLC Communication

V-TIO-E/V-TIO-F
Instruction Manual

IMS01P04-E4

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 this 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 t hat 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

● An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.

● 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 protect ed 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 or failure, protect the power line and the input/output lines from high currents with a protection device 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 operat ion 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. Deforma tion or discoloration will occur. Use a soft, dry cloth to remove st ains 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.

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 inst ruments made by imitating this instrument.

● Periodic maintenance is required for safe and proper operation of this instrum ent. Some components have a limited service life, or characte ristics 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 info rmation in this manual is subject to change without prior notice.

● No portion of this document may be reprinted, modified, copied, transmitted, digitiz ed, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior wr itten approval from RKC.

RKC

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1. OUTLINE

One V-TIO-E/V-TIO-F module enables temperature control corresponding to two channels. It has power supply and communication terminals in addition to temperature control input and output terminals. In addition, it has modular connectors for PLC communication/host communication. One digital input (DI) point and two digital output (DO) points can be optionally added.

[Communication type of modular connector]
Any of following communication types can be selected.

● PLC communication and host communication: Each 1 port
● Host communication: 2 ports

[Communication port assignment]
Three communication ports (COM. PORT1 to 3) of the V-TIO-E/F module can be selected from among the following four assignments.

	Assignment 1	Assignment 2	Assignment 3	Assignment 4
COM. PORT1	Host communication 1	PLC communication	Host communication 1	Host communication 2
COM. PORT2/ COM. PORT3	PLC communication	Host communication 1	Host communication 2	Host communication 1

📖 For host communication 1 or 2, its data bit configuration, communication speed and communication protocol can be independently set.

Internal communication terminals
Used when two or more temperature control modules are divided into some groups and then installed.

Temperature control module for PLC communication V-TIO-E/F

Modular connector
[COM. PORT1
  COM. PORT2
  COM. PORT3]

Selected by the PLC communication setting switch.
COM. PORT2 and COM. PORT3 become the same communication specification.

Usable modules:
Temperature control (TIO) module [Basic type]:
V-TIO-A, C
Temperature control (TIO) module [Extension type]:
V-TIO-B, D
(Up to 30 modules)

Control output

Measured input

Event input/output connector (option)
Digital input: 1 point
Digital output: 2 points

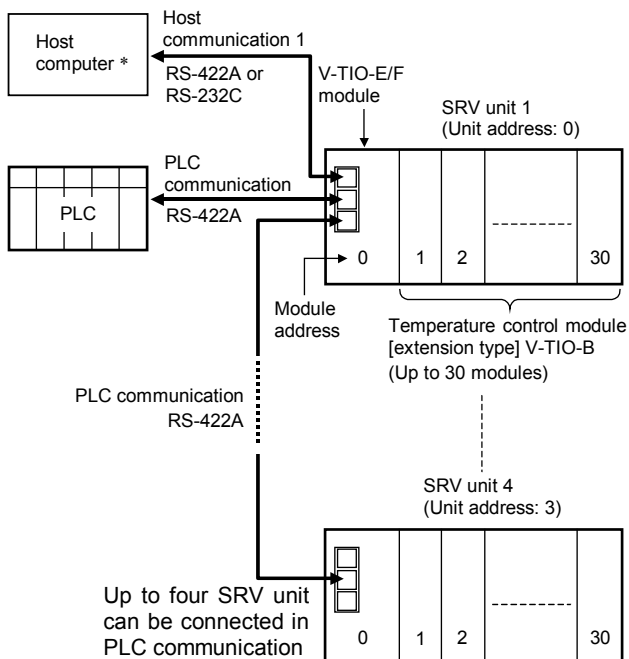Power supply input (24 V DC)

☞ For communication port assignments, see the **4. COMMUNICATION SETTING (P. 4)**.

☞ All data are set by communication. For details, see the **Module Type Controller SRV PLC/Host Communication Instruction Manual (IMS01P05-E□)**.
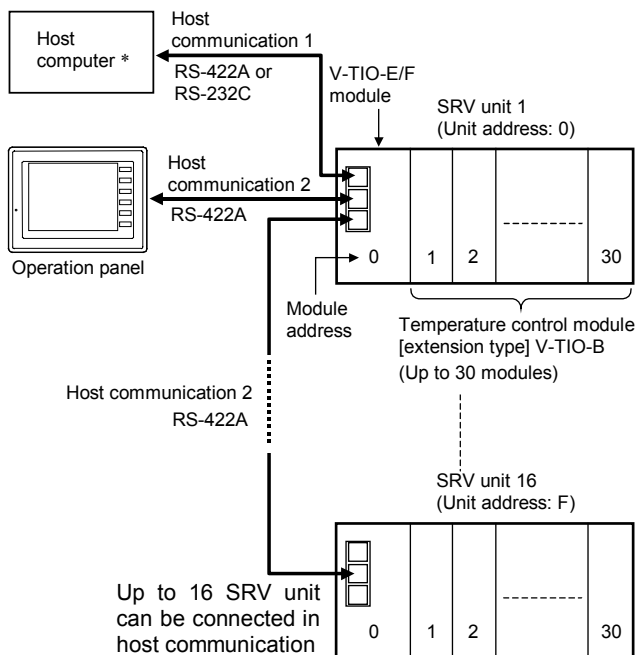
■ **System configuration example**

● **Host communication 1/PLC communication**

* The host computer connected to COM. PORT1 can communicate only with SRV unit 1.

● **Host communication 1/Host communication 2**

* The host computer connected to COM. PORT1 can communicate only with SRV unit 1.

☞ For multi-drop connection with the COM. PORT1 side, see the **Module Type Controller SRV PLC/Host Communication Instruction Manual (IMS01P05-E□)**.

2. PRODUCT CHECK

Before using this product, check each of the following:

- Model code
- Check that all of the accessories delivered are complete.
- Check that there are no scratch or breakage in external appearance (case, front panel, or terminal, etc).

V–TIO– □ □ □□□ – □ □ ＊□ □ □ – □ □ – □– □ /Y
 (1)(2)   (3)   (4)(5) (6)(7)(8) (9)(10)(11)(12)

(1) Type
 E: Module for PLC communication, heat control
 F: Module for PLC communication, heat/cool control

(2) Control action (Each channel common code)
[For heat control]
 F: PID action with autotuning (AT) (reverse action)
 D: PID action with autotuning (AT) (direct action)

[For heat/cool control]
 B: Heat/cool PID action with autotuning (AT) (air cooling)
 W: Heat/cool PID action with autotuning (AT) (water cooling)

(3) Input range (Each channel common code)
[Thermocouple input]

Type	Code	Range	Code	Range
K	K02	0 to 400 °C	KB9	32 to 752 °F
	K04	0 to 800 °C	KB8	32 to 1472 °F
	K16	−200 to +1372 °C	KB7	−328 to +2501 °F
	K09	0.0 to 400.0 °C	KC2	32.0 to 752.0 °F
	K35	−200.0 to +400.0 °C	KC1	−328.0 to +752.0 °F
J	J02	0 to 400 °C	JC2	32 to 752 °F
	J04	0 to 800 °C	JC1	32 to 1472 °F
	J15	−200 to +1200 °C	JB9	−328 to +2192 °F
	J09	0.0 to 400.0 °C	JC4	32.0 to 752.0 °F
	J27	−200.0 to +400.0 °C	JC3	−328.0 to +752.0 °F
T	T08	0 to 400 °C	TB9	32 to 752 °F
	T09	0 to 200 °C	TC1	32 to 392 °F
	T16	−200 to +400 °C	TB8	−328 to +752 °F
	T06	0.0 to 400.0 °C	TC3	32.0 to 752.0 °F
	T19	−200.0 to +400.0 °C	TC2	−328.0 to +752.0 °F
E	E01	0 to 800 °C	EA8	32 to 1472 °F
	E02	0 to 1000 °C	EA7	32 to 1832 °F
S	S05	0 to 1768 °C	SA6	32 to 3214 °F
R	R06	0 to 1768 °C	RA6	32 to 3214 °F
N	N02	0 to 1300 °C	NA6	32 to 2372 °F
B	B03	0 to 1800 °C	BB1	32 to 3272 °F
PL Ⅱ	A02	0 to 1390 °C	AA6	32 to 2534 °F
W5Re/ W26Re	W03	0 to 2300 °C	WA9	32 to 4172 °F

[RTD input]

Type	Code	Range	Code	Range
Pt100	D17	0 to 400 °C	DC5	32 to 752 °F
	D33	0 to 850 °C	DC4	32 to 1562 °F
	D16	0.0 to 400.0 °C	DC7	32.0 to 752.0 °F
	D28	−200.0 to +400.0 °C	DC6	−328.0 to +752.0 °F
JPt100	P17	0 to 400 °C	PC5	32 to 752 °F
	P23	0 to 600 °C	PC4	32 to 1112 °F
	P16	0.0 to 400.0 °C	PC7	32.0 to 752.0 °F
	P28	−200.0 to +400.0 °C	PC6	−328.0 to +752.0 °F

[Voltage/current input]

	Code	Type	Code	Type
Voltage	201	0 to 100 mV DC	401	0 to 5 V DC
	501	0 to 10 V DC	601	1 to 5 V DC
Current	701	0 to 20 mA DC	801	4 to 20 mA DC

(4) Control output (CH1),   (5) Control output (CH2)
 M: Relay contact output
 V: Voltage pulse output 0/12 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

(6) Event input (DI)   [Optional]
 N: None
 1: Control RUN/STOP
 2: Event interlock release

(7) (8) Event output 1 (DO1)   [Optional] [1]
(9) (10) Event output 2 (DO2)   [Optional] [1]
[(7), (9) code: Channel selection]
 N: None
 1: Input channel 1
 2: Input channel 2

[(8), (10) code: Output type]
 N: None
 A: Deviation high
 B: Deviation low
 C: Deviation high/low
 D: Band
 E: Deviation high with hold action
 F: Deviation low with hold action
 G: Deviation high/low with hold action
 H: Process high
 J: Process low
 K: Process high with hold action
 L: Process low with hold action
 Q: Deviation high with re-hold action
 R: Deviation low with re-hold action
 T: Deviation high/low with re-hold action
 P: Heater break alarm
 1: Control loop break alarm
 2: Burnout
 3: Temperature rise completion

(11) CT type (Each channel common code)
 P: CTL-6-P-N
 S: CTL-12-S56-10L-N

(12) Communication function (COM. PORT1) [2]
 1: RS-232C
 4: RS-422A

[1] When "N" is selected in (7) or (9), (8) or (10) becomes "N."
[2] Internal communication terminals is RS-485, COM. PORT2/ COM. PORT3 is RS-422A (Fixed).

- **For heat/cool PID control (V-TIO-F), input channel 2 becomes unused.**
- **For heat/cool PID control (V-TIO-F), Control output (CH1) corresponds to the heating output and Control output (CH2) corresponds to the cooling output.**
- **The heater break alarm function becomes invalid when the voltage/current output is selected as control output type.**
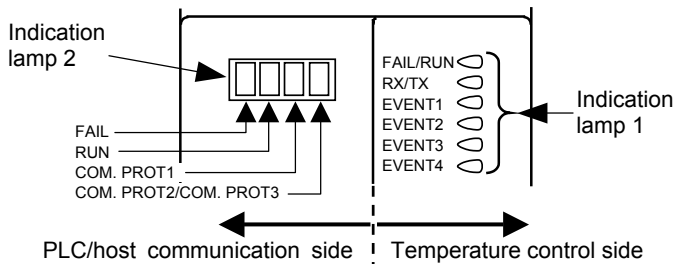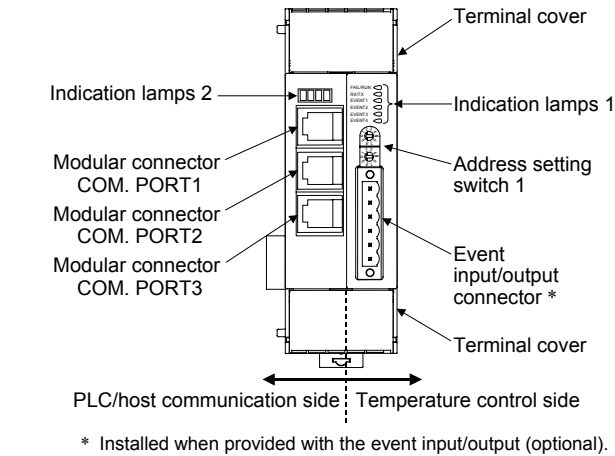
■ Accessories
 End Plate...2
 Joint connector cover 2
 Instruction Manual (IMS01P04-E4)...........................1

If any of the products are missing, damaged, or if your manual is incomplete, please contact RKC sales office or the agent.

3. PARTS DESCRIPTION

PLC/host communication side | Temperature control side

* Installed when provided with the event input/output (optional).

PLC/host communication side | Temperature control side

[Indication lamps 1]

- FAIL/RUN (for temperature control)
  When normally: A green lamp turns on (RUN)
  When abnormally: A red lamp turns on (FAIL)
  During self-diagnostic error: A green lamp flashes

- RX/TX (for internal communication)
  During data send and receive: A green lamp turns on

- EVENT 1 to 4
  Display various states by setting.
   Display contents:
   Event 1 state, Event 2 state, Comprehensive event state, Output state, Control state

[Indication lamps 2]

- FAIL (for PLC/host communication)
  When normally: A red lamp turns off
  When abnormally: A red lamp turns on
  Communication environment setting mode by the switch:
                              A red lamp flashes

- RUN (for PLC/host communication)
  When normally: A green lamp turns on
  When abnormally: A green lamp turns off
  Memory backup error: A green lamp flashes slowly
  Module configuration error: A green lamp flashes slowly
  PLC communication error: A green lamp flashes slowly
  Data collection just after the power is turned on:
                              A green lamp flashes rapidly

- COM. PORT1
  During data send and receive: A yellow lamp turns on

- COM. PORT2/ COM. PORT3
  During data send and receive: A yellow lamp turns on

4. COMMUNICATION SETTING

Set communication setting before mounting and wiring of SRV.

CAUTION

Do not separate the module mainframe from the terminal base with the power turned on. If separated, adjusted data may be destroyed; control be stopped, and no return can be made.

■ **Setting at using PLC communication**
- Address setting switch 1 (front) [See P. 5]
  Set an address of module.
- Address setting switch 2 (left side) [See P. 5]
  Set the unit address for PLC communication.
- PLC communication setting switch (left side) [See P. 5]
  Set the communication speed, data bit configuration, and protocol for PLC communication. Set the same value as communication settings of PLC.
  In addition, select the communication port of modular connector.
- Internal communication setting switch (right side) [See P. 6]
  Use this module without changing the factory set values.

■ **Setting at using host communication 1**
- Address setting switch 1 (front) [See P. 5]
  Set an address of module.
- Address setting switch 2 (left side) [See P. 5]
  Set the unit address for host communication 1.
- PLC communication setting switch (left side) [See P. 5]
  Select the communication port of modular connector.
- Host communication setting switch (left side) [See P. 6]
  Set the communication speed, data bit configuration, and protocol for host communication 1. Set the same value as communication settings of host computer.
- Internal communication setting switch (right side) [See P. 6]
  Use this module without changing the factory set values.

■ **Setting at using host communication 2**
- Address setting switch 1 (front) [See P. 5]
  Set an address of module.
- Address setting switch 2 (left side) [See P. 5]
  Set the unit address for host communication 2.
- PLC communication setting switch (left side) [See P. 5]
  Set the communication speed, data bit configuration, and protocol for host communication 2. Set the same value as communication settings of host computer.
  In addition, select the communication port of modular connector.
- Internal communication setting switch (right side) [See P. 6]
  Use this module without changing the factory set values.

Left side | Front | Right side
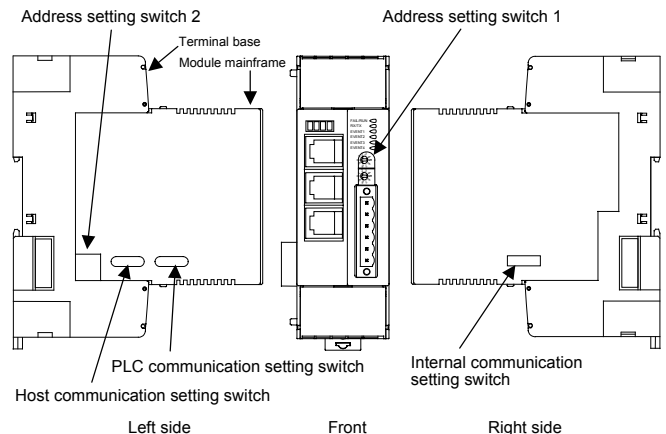
4.1 Address Setting

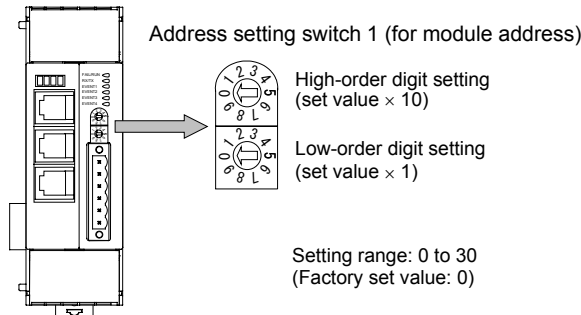Set an address. For this setting, use a small blade screwdriver.

📖 **To avoid problems or malfunction, do not duplicate an address on the same communication line.**

■ Module address setting

When using two or more modules, set the desired address to each module.
(Common to PLC communication and host communication)

Address setting switch 1 (for module address)

High-order digit setting
(set value × 10)

Low-order digit setting
(set value × 1)

Setting range: 0 to 30
(Factory set value: 0)

Module address setting differs depending on operation mode selection address settings.

● Free setting (factory set value)
Free settings can be made in the range of 0 to 30.

● Continuous setting
Set the V-TIO-E/F module address to 0 and also set other module addresses to consecutive numbers starting from 1.

📖 When in the free setting, regardless of the number of modules connected when the power is turned on, much time is required until module recognition operation comes to an end compared to the continuous setting as this operation is performed to addresses from 0 to 30.
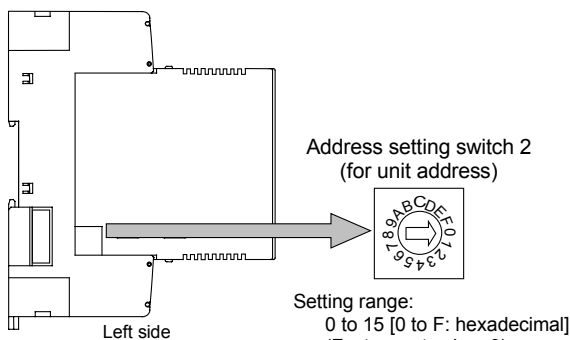
☞ For operation mode selection address settings, see the **Module Type Controller SRV PLC/Host Communication Instruction Manual (IMS01P05-E□)**.

■ Unit address setting

When two or more V-TIO-E/F modules are multi-drop connected, set an address to each V-TIO-E/F module. This becomes the unit address of the SRV unit.
(Common to PLC communication/host communication)

Address setting switch 2
(for unit address)

Left side

Setting range:
0 to 15 [0 to F: hexadecimal]
(Factory set value: 0)

● PLC communication

Up to four V-TIO-E/F modules can be connected to a PLC communication port. Therefore the unit address uses the four V-TIO-E/F modules as a group. For V-TIO-E/F modules which are multi-drop connected to the same PLC communication port, use successive numbers assigned to any one of four groups shown in the following table as their addresses.

Group	Address setting switch 2	Group	Address setting switch 2
Group 1	0	Group 3	8
	1		9
	2		A
	3		B
Group 2	4	Group 4	C
	5		D
	6		E
	7		F

📖 **Always set the unit address of each group including 0, 4, 8 or C. 0, 4, 8 or C becomes the master for communication transfer.**

● Host communication
Differently from PLC communication, there are no group restrictions. Free settings can be made in the range of 0 to F.

📖 **For Modbus, the value obtained by adding "1" to the set address corresponds to the address used for the actual program.**

4.2 Protocol Selections and Communication Speed Setting

■ PLC communication setting switch

Set the communication speed, data bit configuration, and protocol for PLC communication and host communication 2.
In addition, select the communication port of modular connector.

PLC communication
setting switch

Left side
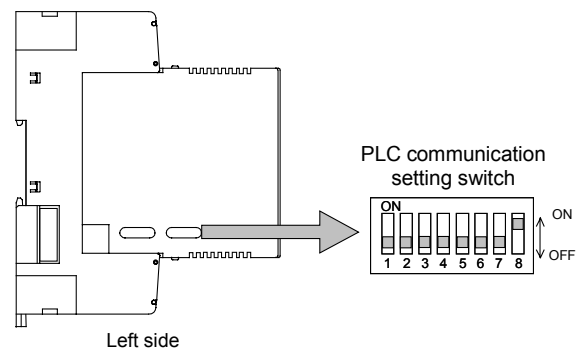
1	2	Data bit configuration
OFF	OFF	Data 8-bit, without parity, Stop 1-bit
ON	OFF	Data 7-bit *, Odd parity, Stop 1-bit
OFF	ON	Data 7-bit *, Even parity, Stop 1-bit
ON	ON	Data 7-bit *, Even parity, Stop 2-bit

* To be changed to data 8-bit only when "Host communication 2 (Modbus)" is selected.
Factory set value: Data 8-bit, without parity, Stop 1-bit

3	4	Communication speed
OFF	OFF	9600 bps
ON	OFF	19200 bps
OFF	ON	38400 bps
ON	ON	Don't set this one

Factory set value: 9600 bps

Continued from the previous page.

5	6	7	Communication protocol
OFF	OFF	OFF	Host communication 2 (RKC communication)
ON	OFF	OFF	Host communication 2 (Modbus)
OFF	ON	OFF	Don't set this one
ON	ON	OFF	PLC communication OMRON SYSMAC series special protocol C mode command (RD/WD)
OFF	OFF	ON	PLC communication MITSUBISHI MELSEC series special protocol ACPU common command (WR/WW)
ON	OFF	ON	PLC communication MITSUBISHI MELSEC series special protocol AnA/AnUCPU common command (QR/QW)
OFF	ON	ON	Don't set this one
ON	ON	ON	Don't set this one

Factory set value: Host communication 2 (RKC communication)

| 8	Modular connector PLC/host communication selection
OFF	COM. PORT1: PLC communication/host communication 2 [RS-232C/RS-422A] COM. PORT2/COM. PORT3: Host communication 1 [RS-422A]
ON	COM. PORT1: Host communication 1 [RS-232C/RS-422A] COM. PORT2/COM. PORT3: PLC communication/host communication 2 [RS-422A]

Factory set value: COM. PORT1:
Host communication 1 [RS-232C/RS-422A]
COM. PORT2/COM. PORT3:
PLC communication/host communication 2
[RS-422A]

📖 **When two or more V-TIO-E/F modules are multi-drop connected, set the PLC communication setting switches in all of the V-TIO-E/F modules to the same positions.**

📖 COM. PORT2 and COM. PORT3 become the same communication specification.

■ **Host communication setting switch**

Set the communication speed, data bit configuration, and protocol for host communication 1.

Left side
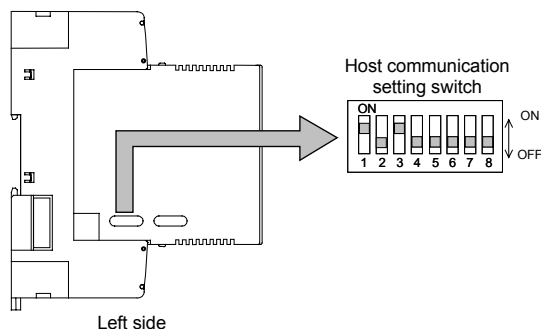
1	2	Communication speed
OFF	OFF	2400 bps
ON	OFF	9600 bps
OFF	ON	19200 bps
ON	ON	38400 bps

Factory set value: 9600 bps

3	4	5	Data bit configuration
OFF	OFF	OFF	Data 7-bit, without parity, Stop 1-bit *
OFF	OFF	ON	Data 7-bit, Even parity, Stop 1-bit *
OFF	ON	OFF	Don't set this one
OFF	ON	ON	Data 7-bit, Odd parity, Stop 1-bit *
ON	OFF	OFF	Data 8-bit, without parity, Stop 1-bit
ON	OFF	ON	Data 8-bit, Even parity, Stop 1-bit
ON	ON	OFF	Don't set this one
ON	ON	ON	Data 8-bit, Odd parity, Stop 1-bit

* When the Modbus communication protocol is selected, this setting becomes invalid.
Factory set value: Data 8-bit, without parity, Stop 1-bit

6	Communication protocol
OFF	Host communication1 (RKC communication)
ON	Host communication 1 (Modbus)

Factory set value: Host communication 1 (RKC communication)

📖 • **Switch No. 7 and 8 must be always OFF. Do not set to ON.**
• **When two or more V-TIO-E/F modules are multi-drop connected, for switch Nos.1 to 6 set the PLC communication setting switches in all of the V-TIO-E/F modules to the same positions.**

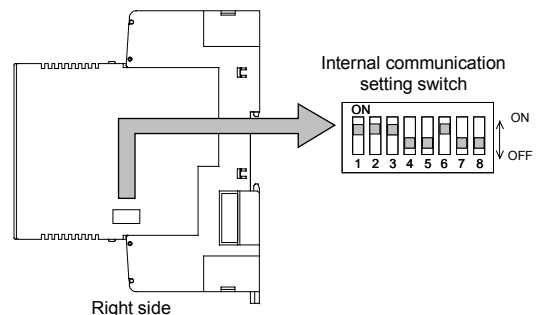■ **Internal communication setting switch**

Use this module without changing the factory set values.

[Factory set value]
• Communication speed: 38400 bps
• Data bit configuration: Data 8-bit, without parity
• Protocol: Modbus

[Factory set value of internal communication setting switch]
No. 1: ON   No. 5: OFF
No. 2: ON   No. 6: ON
No. 3: ON   No. 7: OFF
No. 4: OFF   No. 8: OFF

Right side

📖 **When connecting two or more modules (V-TIO-A, B, C or D) to the V-TIO-E/F module, match all of their communication speed, data bit configuration and communication protocol settings with the internal settings of the V-TIO-E/F module.**

☞ For details of internal communication setting switch, see the **Module Type Controller SRV PLC/Host Communication Instruction Manual (IMS01P05-E□)**.
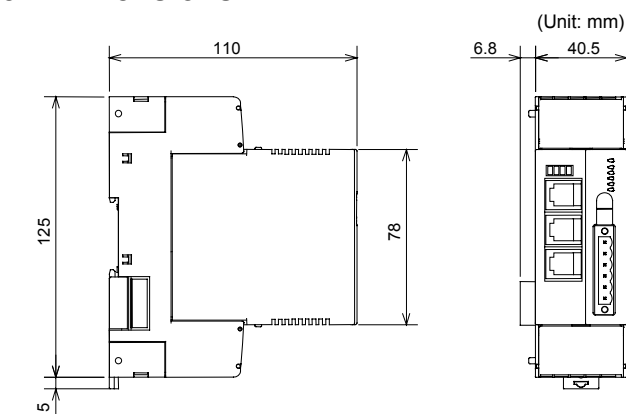
5. MOUNTING

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

5.1 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: −10 to +50 °C
- Allowable ambient humidity: 5 to 95 % 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 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) Mounting consideration
- Install the module 200 mm away from the main power line.
- Ensure at least 50 mm space on top and bottom of the control unit for maintenance and environmental reasons.

(5) This instrument is permanently connected to equipment, please take the following points.
- A switch or circuit-breaker shall be included in the building installation.
- It 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.
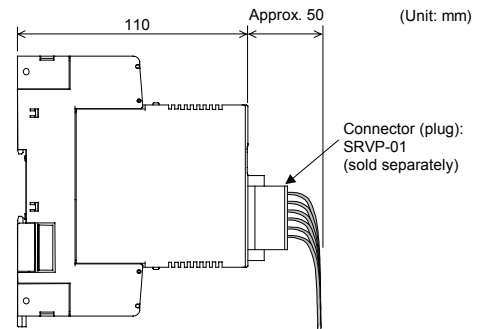
5.2 Dimensions

(Unit: mm)

📖 The above figure shows when provided with the event input/output connector, but the same also when not provided with the connector.

● **Depth in connector mounting**
Conduct installation in consideration of the sizes of the connector and cable when connector-connected.

[Usage example of SRVP-01]

5.3 DIN rail Mounting

■ Mounting procedures

1. Pull down the mounting bracket at the bottom of the module (A). Attach the hooks on the top of the module to the DIN rail and push the lower section into place on the DIN rail (B). (Fig. 1)

2. Slide the mounting bracket up to secure the module to the DIN rail. (Fig. 2)

Fig. 1   Fig. 2
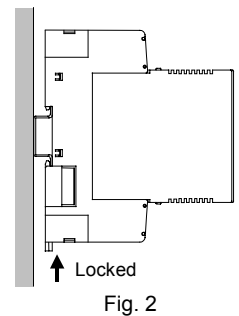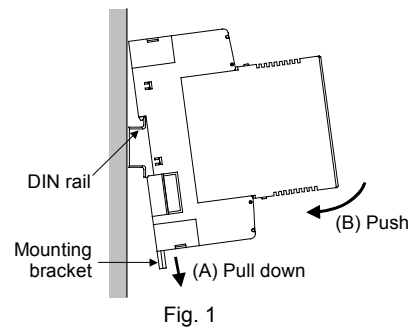
■ End Plate mounting

Hold tight both ends of the modules jointed together with the end plates and then fix the end plates with screws. Even if only one V-TIO-E/F module is used, also hold tight both ends of the module with the end plates.
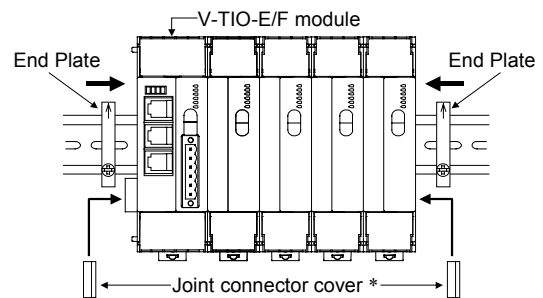
* For the conservation of the contact of connector, install a joint connector cover in module of both ends.

■ Removing procedures

Pull down a mounting bracket with a blade screwdriver (A). Lift the module from bottom, and take it off (B).
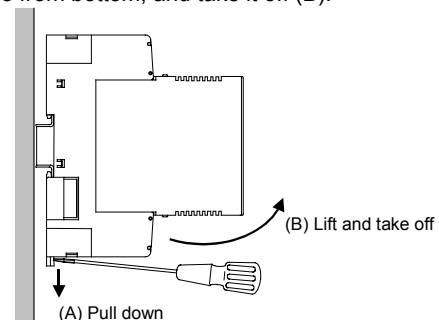
5.4 Panel Mounting

■ Mounting procedures

1. Pull down the mounting bracket (A) until locked and that a mounting hole appears.
2. Prepare one mounting bracket per module (B) sold separately (KSRX-55) and then insert it in the rear of the terminal board at top of the module until locked but a mounting hole does not disappear.
3. Mount each module directly on the panel with screws which are inserted in the mounting holes of the top and bottom mounting brackets.

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

   📖 The customer needs to provide the M3 size screws. Select the screw length that matches the mounting panel.
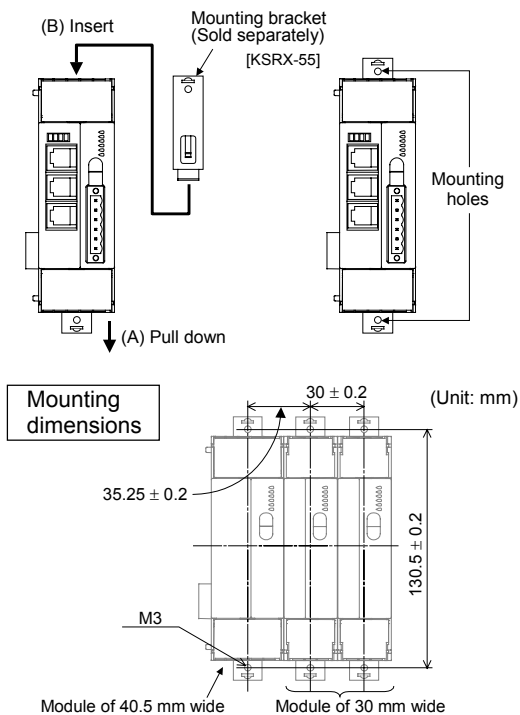

5.5 Jointing Each Module

Up to 31 SRVs consisting of the each modules can be jointed together. Joint these modules according to the following procedure.

■ Jointing procedures

1. Mount the modules on the DIN rail and then joint these modules together with the joint connector while sliding the relevant module.
2. Lift each of the joint tabs located at the top and bottom of the module and then insert it in the slot of the adjacent module to fix these two modules.

   📖 For panel mounting, first joint each module and then mount it on the panel.
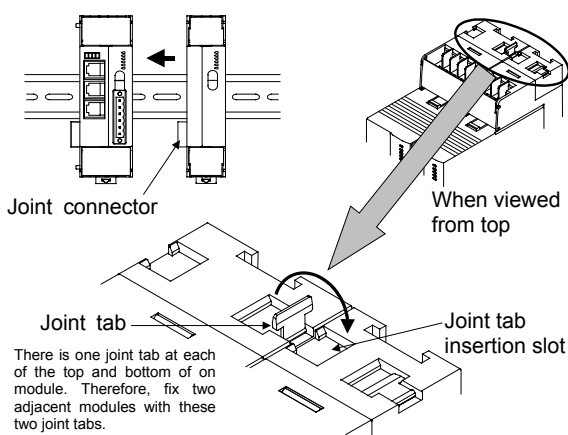

6. WIRING

┌───┐
│ ⚠ **WARNING**   │
│   │
│ To prevent electric shock or instrument │
│ failure, do not turn on the power until │
│ all the wiring is completed.   │
└───┘

6.1 Wiring Cautions

● 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.
● To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
● 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.
● Power supply wiring must be twisted and have a low voltage drop.
● For an instrument with 24 V power supply, supply power from a SELV circuit.
● 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).

## 6.2 Terminal Configuration
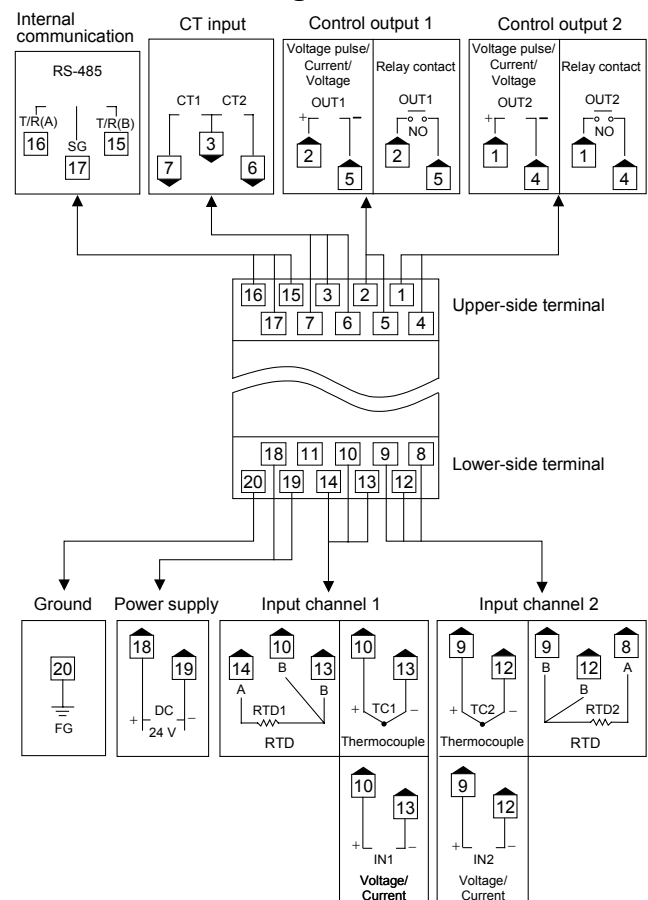
📖 • **For heat/cool PID control (V-TIO-F), input channel 2 becomes unused.**
  • **For heat/cool PID control (V-TIO-F), Control output 1 corresponds to the heating output and Control output 2 corresponds to the cooling output.**
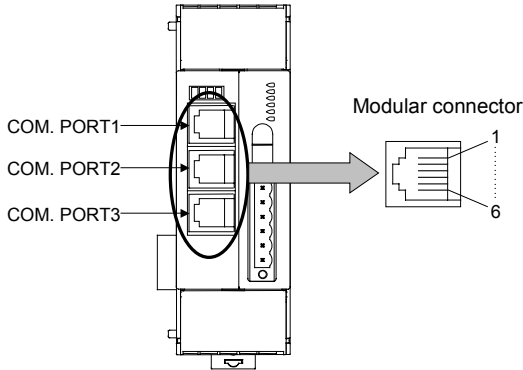
📖 • Terminal No. 11 is not used.
• Use the solderless terminal appropriate to the screw size (M3).

5.9 mm or less
3.2 mm or more

Recommended tightening torque: 0.4 N·m (4 kgf·cm)
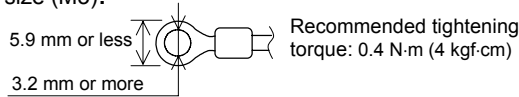
6.3 Pin Layout of Connector

■ Modular connector

Modular connector

COM. PORT1
COM. PORT2
COM. PORT3

1
6

Modular connector COM. PORT1:
   Connector for PLC or Host computer connection
   Based on RS-422A/RS-232C (Specify when ordering)

Modular connector COM. PORT2:
   Connector for PLC or Host computer connection
   Based on RS-422A

Modular connector COM. PORT3:
   Connector for SRV unit extension
   Based on RS-422A

● RS-422A

Pin No.	Signal name	Symbol
1	Receive data	R (A)
2	Receive data	R (B)
3	Signal ground	SG
4	Send data	T (B)
5	Send data	T (A)
6	Signal ground	SG

● RS-232C

| Pin No.	Signal name	Symbol
1	Unused	—
2	Send data	SD (TXD)
3	Signal ground	SG
4	Receive data	RD (RXD)
5	Unused	—
6	Signal ground	SG

📖 Customer is requested to prepare a communication cable fit for the V-TIO-E/F module to be connected by the host computer or PLC.
Connection cable W-BF-01*, W-BF-02* and W-BF-28 (RKC product) can use to connect the host computer or PLC.
   * Shields of the cable are connected to SG (No. 6 pin) of the X-TIO-E/F connector.

📖 The six-pin type modular connector should be used for the connection to the V-TIO-E/F module.
Recommended manufacturer and model:
   Hirose Electric, TM4P-66P

■ Event input/output connector

Event input/output connector (socket)

1
6
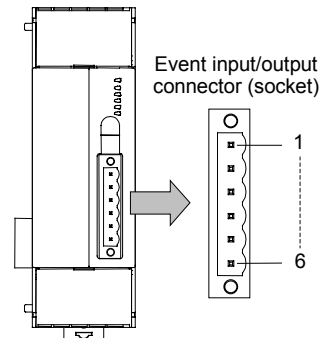
Pin No.	Description
1	Digital input (DI) (−)
2	Digital input (DI) (+)
3	Digital output (DO) 1
4	(Relay contact output)
5	Digital output (DO) 2
6	(Relay contact output)

● Circuit configuration
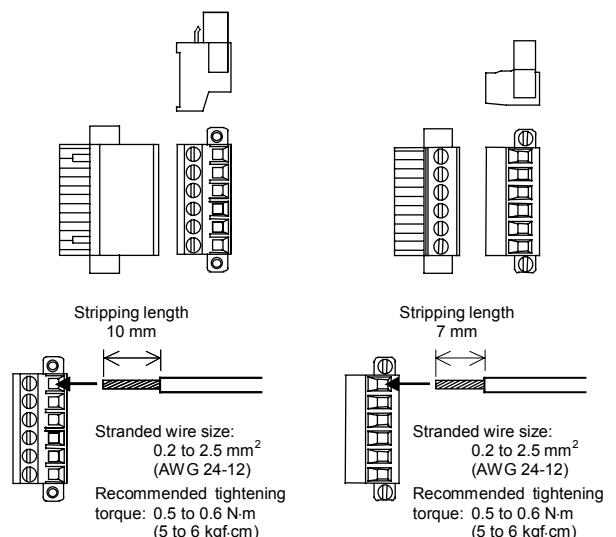

24 V DC
1
DI
2
3
Load
DO1
4
5
Load
DO2
6
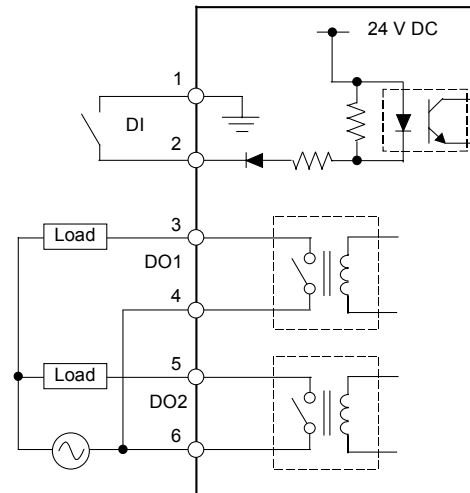
● Attention in Connector (plug) Wiring

• Use the following connector (plug) as that connected to the event input/output connector.
Connector (plug) is sold separately.
   SRVP-01 (Front-screw type)
   SRVP-02 (Side-screw type)

• The lead wires use the stranded wire.

• Use the stranded wire from size 0.2 to 2.5 mm^2 (AWG 24-12).

• Stripping length is as follows.
   SRVP-01: 10 mm
   SRVP-02: 7 mm

• Recommended tightening torque of the lead wire in the connector (plug):   0.5 to 0.6 N·m (5 to 6 kgf·cm)

   Screw size: SRVP-01: M2.5
                SRVP-01: M3

[SRVP-01] Front-screw type

Stripping length 10 mm

Stranded wire size: 0.2 to 2.5 mm^2 (AWG 24-12)
Recommended tightening torque: 0.5 to 0.6 N·m (5 to 6 kgf·cm)

[SRVP-02] Side-screw type

Stripping length 7 mm

Stranded wire size: 0.2 to 2.5 mm^2 (AWG 24-12)
Recommended tightening torque: 0.5 to 0.6 N·m (5 to 6 kgf·cm)

7. SPECIFICATIONS

■ Input

Number of inputs: 2 points
    Isolated between each channel:
      Thermocouple input, Voltage (low) input
    Not isolated between each channel:
      RTD input, Voltage (high) input,
      Current input

Input type:
- Thermocouple   K, J, T, S, R, E, B, N (JIS-C1602-1995)
                PLII (NBS)
                W5Re/W26Re (ASTM-E988-96)
- RTD   Pt100 (JIS-C1604-1997)
                JPt100 (JIS-C1604-1989, Pt100 of
                      JIS-C1604-1981)
- Voltage (low)   0 to 100 mV
- Voltage (high)   0 to 5 V, 0 to 10 V, 1 to 5 V
- Current   0 to 20 mA, 4 to 20 mA

Sampling cycle: 500 ms
PV bias: −Input span to +Input span
CT input: 2 points
        0.0 to 30.0 A (CTL-6P-N) or
        0.0 to 100.0 A (CTL-12-S56-10L-N)

■ Output

Number of outputs: 2 points
    (Isolated between input and output, and between output and power supply)

Output type:
- Relay contact: 250 V AC, 3 A (Resistive load)
        1a contact
        Electrical life 300,000 times or more
        (Rated load)
- Voltage pulse: 0/12 V DC
        (Load resistance 600 Ω or more)
- Current: 0 to 20 mA DC, 4 to 20 mA DC
        (Load resistance 600 Ω or less)
- Voltage: 0 to 5 V DC, 0 to 10 V DC, 1 to 5 V DC
        (Load resistance 1 kΩ or more)

■ Control action

Number of controls: 2 points
Control method: Brilliant PID control
    Reverse action or direct action is selectable (Specify when ordering)
    Heat/cool control is selectable (Specify when ordering)
Additional function: Autotuning function

■ Event

Number of events: 2 points/channel
Event type: Temperature event:
      Deviation high, Deviation low,
      Deviation high/low, Band,
      Process high, Process low
    Heater break alarm,
    Control loop break alarm,
    Burnout, Temperature rise completion

■ Option

● Event input
  Number of inputs: 1 point
  Input type: Dry contact input
  Input voltage: 24 V DC (Rated)
  Input current: Approx. 6 mA
  Input details: Control RUN/STOP,
      Event interlock release
      (Specify when ordering)

● Event output
  Number of outputs: 2 points
  Output type: Relay contact output
      250 V AC, 1 A (Resistive load)
      1a contact
      Electrical life 300,000 times or more
      (Rated load)

Output details: Temperature event, Heater break alarm, Control loop break alarm, Burnout, Temperature rise completion (Specify when ordering)

■ Communication

Number of communications: 2 points
- PLC communication and host communication: Each 1 port
- Host communication: 2 points (Selectable)

● PLC communication
Communication interface: Based on RS-422A, EIA standard
      Based on RS-232C, EIA standard
      (RS-232C: COM. PORT1 only)
Communication protocol:
- MITSUBISHI MELSEC series special protocol
  − ACPU common command (WR/WW)
    (A series, FX2N, FX2NC series)
  − AnA/AnUCPU common command (QR/QW)
    (AnA/QnA series, Q series)
- OMRON SYSMAC series special protocol
  C mode command (RD/WD)

Maximum connections: 4 V-TIO-E/F modules per communication port of PLC

● Host communication
Communication interface: Based on RS-422A, EIA standard
      Based on RS-232C, EIA standard
      (RS-232C: COM. PORT1 only)
Communication protocol: RKC communication or Modbus
Maximum connections: RS-422A: 16 V-TIO-E/F modules
      RS-232C: 1 V-TIO-E/F module

■ Others

Power supply voltage: 24 V DC
Power supply voltage range:
    21.6 V DC to 26.4 V DC
Current consumption: With event input/output (option):
      160 mA max./module
      Without event input/output (option):
      140 mA max./module
Allowable ambient temperature:
    −10 to +50 °C
Allowable ambient humidity:
    5 to 95 %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
Weight: With event input/output (option):
      Approx. 260 g
      Without event input/output (option):
      Approx. 250 g

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