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.

● RKIC 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 additional 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 dispersion.

● 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 Event function, alarm does not turn on 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.

● RKIC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.

● RKIC 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. RKIC 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.

● No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKIC.
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.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Assignment</th>
<th>Assignment</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM. PORT1</td>
<td>1</td>
<td>PLC</td>
<td>Host</td>
</tr>
<tr>
<td></td>
<td>Assignment</td>
<td>communication</td>
<td>communication</td>
</tr>
<tr>
<td>COM. PORT2</td>
<td>PLC</td>
<td>Host</td>
<td>Host</td>
</tr>
<tr>
<td>COM. PORT3</td>
<td>PLC</td>
<td>Host</td>
<td>Host</td>
</tr>
</tbody>
</table>

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

For communication port assignments, refer to the 4.2 Protocol Selections and Communication Speed Setting (P. 5).

All data are set by communication. For details, refer to the Module Type Controller SRV PLC/Host Communication Instruction Manual (IMS01P05-E5).

System configuration example

- Host communication 1/PLC communication

![Diagram of system configuration example 1/PLC communication]

- Host communication 1/Host communication 2

![Diagram of system configuration example 1/Host communication 2]

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

- Host communication 1/Host communication 2

![Diagram of system configuration example 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, refer to the Module Type Controller SRV PLC/Host Communication Instruction Manual (IMS01P05-E5).
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) (13)

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

(2) Control action
[For Heat control]
F: PID action with autotuning (AT) (reverse 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)

<table>
<thead>
<tr>
<th>Type Code</th>
<th>Range</th>
<th>Code</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>0 to 400 °C</td>
<td>KB9</td>
<td>32 to 752 °F</td>
</tr>
<tr>
<td>K</td>
<td>0 to 800 °C</td>
<td>KB8</td>
<td>32 to 1472 °F</td>
</tr>
<tr>
<td>K</td>
<td>–200 to –1372 °C</td>
<td>KB7</td>
<td>–328 to –2501 °F</td>
</tr>
<tr>
<td>K</td>
<td>0 to 400 °C</td>
<td>KC2</td>
<td>32 to 752 °F</td>
</tr>
<tr>
<td>K</td>
<td>-200 to -400 °C</td>
<td>KC1</td>
<td>328.0 to 752.0 °F</td>
</tr>
<tr>
<td>J</td>
<td>0 to 400 °C</td>
<td>JC2</td>
<td>32 to 752 °F</td>
</tr>
<tr>
<td>J</td>
<td>0 to 800 °C</td>
<td>JC1</td>
<td>32 to 1472 °F</td>
</tr>
<tr>
<td>J</td>
<td>–200 to –1200 °C</td>
<td>JB9</td>
<td>–328 to –2192 °F</td>
</tr>
<tr>
<td>J</td>
<td>0 to 400 °C</td>
<td>JC4</td>
<td>32 to 752 °F</td>
</tr>
<tr>
<td>J</td>
<td>-200 to -400 °C</td>
<td>JC3</td>
<td>328.0 to 752.0 °F</td>
</tr>
<tr>
<td>T</td>
<td>0 to 400 °C</td>
<td>TB9</td>
<td>32 to 752 °F</td>
</tr>
<tr>
<td>T</td>
<td>0 to 200 °C</td>
<td>TC1</td>
<td>32 to 392 °F</td>
</tr>
<tr>
<td>T</td>
<td>–200 to –400 °C</td>
<td>TB8</td>
<td>–328 to –752 °F</td>
</tr>
<tr>
<td>T</td>
<td>0 to 400 °C</td>
<td>TC3</td>
<td>32.0 to 752.0 °F</td>
</tr>
<tr>
<td>T</td>
<td>-200 to -400 °C</td>
<td>TC2</td>
<td>328.0 to 752.0 °F</td>
</tr>
<tr>
<td>E</td>
<td>0 to 800 °C</td>
<td>EA8</td>
<td>32 to 1472 °F</td>
</tr>
<tr>
<td>E</td>
<td>0 to 1000 °C</td>
<td>EA7</td>
<td>32 to 1832 °F</td>
</tr>
<tr>
<td>S</td>
<td>0 to 1768 °C</td>
<td>SA6</td>
<td>32 to 3214 °F</td>
</tr>
<tr>
<td>R</td>
<td>0 to 1768 °C</td>
<td>RA6</td>
<td>32 to 3214 °F</td>
</tr>
<tr>
<td>N</td>
<td>0 to 1300 °C</td>
<td>NA6</td>
<td>32 to 2372 °F</td>
</tr>
<tr>
<td>B</td>
<td>0 to 1800 °C</td>
<td>BB1</td>
<td>32 to 3772 °F</td>
</tr>
<tr>
<td>P/L</td>
<td>0 to 1390 °C</td>
<td>AA6</td>
<td>32 to 2534 °F</td>
</tr>
<tr>
<td>W5Re/ W26Re</td>
<td>0 to 2300 °C</td>
<td>WA9</td>
<td>32 to 4172 °F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code Code</th>
<th>Range</th>
<th>Code</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>P100</td>
<td>0 to 400 °C</td>
<td>DC5</td>
<td>32 to 752 °F</td>
</tr>
<tr>
<td>P100</td>
<td>0 to 850 °C</td>
<td>DC4</td>
<td>32 to 1562 °F</td>
</tr>
<tr>
<td>P100</td>
<td>0 to 400 °C</td>
<td>DC7</td>
<td>32.0 to 752.0 °F</td>
</tr>
<tr>
<td>P100</td>
<td>-200 to -400 °C</td>
<td>DC6</td>
<td>-328 to -752 °F</td>
</tr>
<tr>
<td>JPH100</td>
<td>0 to 400 °C</td>
<td>PC5</td>
<td>32 to 752 °F</td>
</tr>
<tr>
<td>JPH100</td>
<td>0 to 800 °C</td>
<td>PC4</td>
<td>32 to 1112 °F</td>
</tr>
<tr>
<td>JPH100</td>
<td>0 to 400 °C</td>
<td>PC7</td>
<td>32.0 to 752.0 °F</td>
</tr>
<tr>
<td>JPH100</td>
<td>-200 to -400 °C</td>
<td>PC6</td>
<td>-328.0 to 752.0 °F</td>
</tr>
</tbody>
</table>

(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]
(9) (10) Event output 2 (DO2) [Optional]

[Code of (7)]
N: None 1: Channel 1

[Code of (9)]
N: None 2: Channel 2

[Code of (8) and (10)]
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 (HBA) 1: Control loop break alarm (LBA)
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

(13) Version symbol
No code: For Japanese domestic market
Y: For International market
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 1 corresponds to the heating output and Control output 2 corresponds to the cooling output.
- For Heat/Cool PID control (V–TIO–F), Control output 1 becomes unused when control output is Voltage/Current output.
- Control loop break alarm (LBA) function cannot be used when control type is Heat/Cool PID control (V–TIO–F).

■ Accessories
End Plate ................................................. 2
Joint connector cover ...................................... 2
V-TIO/E-V-TIO-F Instruction Manual (IMS01P04-E5) ... 1

3. PARTS DESCRIPTION

![Image of terminal cover](image-url)

**Terminal cover**

**Modular connector**

**Address setting switch**

**Event input/output connector**

**Temperature control side**

**Temperature control side**

**Terminal cover**

* Installed when provided with the event input/output (optional).
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) [Refer to P. 4]
  Set an address of module.
- Address setting switch 2 (left side) [Refer to P. 4]
  Set the unit address for PLC communication.
- PLC communication setting switch (left side) [Refer to 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) [Refer to P. 6]
  Use this module without changing the factory set values.

Setting at using host communication 1

- Address setting switch 1 (front) [Refer to P. 4]
  Set an address of module.
- Address setting switch 2 (left side) [Refer to P. 4]
  Set the unit address for host communication 1.
- PLC communication setting switch (left side) [Refer to P. 5]
  Select the communication port of modular connector.
- Host communication setting switch (left side) [Refer to P. 5]
  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) [Refer to P. 6]
  Use this module without changing the factory set values.

Setting at using host communication 2

- Address setting switch 1 (front) [Refer to P. 4]
  Set an address of module.

Address setting switch 2 (left side) [Refer to P. 4]
Set the unit address for host communication 2.

- PLC communication setting switch (left side) [Refer to 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) [Refer to P. 6]
  Use this module without changing the factory set values.

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, refer to the Module Type Controller SRV PLC/Host Communication Instruction Manual (IMS01P05-E5).

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)
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.

<table>
<thead>
<tr>
<th>Group</th>
<th>Address setting switch 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

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. The data changes become valid when the power is turned on again or when changed to RUN/STOP.

<table>
<thead>
<tr>
<th>1 2 3 4 5 6 7 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF OFF 9600 bps</td>
</tr>
<tr>
<td>ON OFF 19200 bps</td>
</tr>
<tr>
<td>OFF ON 38400 bps</td>
</tr>
<tr>
<td>ON ON Do not set this one</td>
</tr>
</tbody>
</table>

Factory set value: 9600 bps

Communication protocol

<table>
<thead>
<tr>
<th>5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF OFF Host communication 2 (RKC communication)</td>
</tr>
<tr>
<td>ON OFF Host communication 2 (Modbus)</td>
</tr>
<tr>
<td>OFF ON Do not set this one</td>
</tr>
<tr>
<td>ON ON PLC communication OMRON SYSMAC series special protocol C mode command (RD/WD)</td>
</tr>
<tr>
<td>OFF ON PLC communication MITSUBISHI MELSEC series special protocol ACPU common command (WR/WW)</td>
</tr>
<tr>
<td>ON ON PLC communication MITSUBISHI MELSEC series special protocol AnA/AnUCPU common command (QR/QW)</td>
</tr>
<tr>
<td>OFF ON Do not set this one</td>
</tr>
<tr>
<td>ON ON Do not set this one</td>
</tr>
</tbody>
</table>

Factory set value: Host communication 2 (RKC communication)

Modular connector PLC/host communication selection

<table>
<thead>
<tr>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
</tr>
<tr>
<td>COM. PORT1: PLC communication/host communication 2 [RS-232C/RS-422A]</td>
</tr>
<tr>
<td>ON</td>
</tr>
<tr>
<td>COM. PORT1: Host communication 1 [RS-232C/RS-422A]</td>
</tr>
<tr>
<td>ON</td>
</tr>
<tr>
<td>COM. PORT2/COM. PORT3: PLC communication/host communication 2 [RS-422A]</td>
</tr>
</tbody>
</table>


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.

Host communication setting switch

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

<table>
<thead>
<tr>
<th>1 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF OFF 2400 bps</td>
</tr>
<tr>
<td>ON OFF 9600 bps</td>
</tr>
<tr>
<td>OFF ON 19200 bps</td>
</tr>
<tr>
<td>ON ON 38400 bps</td>
</tr>
</tbody>
</table>

Factory set value: 9600 bps
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, refer to the Module Type Controller SRV PLC/Host Communication Instruction Manual (IMS01P05-E).
Depth in connector mounting
Conduct installation in consideration of the sizes of the connector and cable when connector-connected.

Usage example of SRVP-01

Approx. 50
(Unit: mm)

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)

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.

Removing procedures
Pull down a mounting bracket with a slotted 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 module 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

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.
- Signal connected to Voltage input and Current input shall be low voltage defined as "SELV" circuit per IEC 60950-1.
- 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 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).
- In the maximum configuration (extension up to 31 modules) the 24 V DC supplied equipment may draw up to 4 A. The power supply shall be capable of delivering at least 4 A.
- Use the solderless terminal appropriate to the screw size.
  - Screw size: M3 x 6
  - Recommended tightening torque: 0.4 N·m [4 kgf-cm]
  - Specified solderless terminals: With isolation
- Make sure that during field wiring parts of conductors can not come into contact with adjacent conductive parts.

6.2 Terminal Configuration

![Terminal Configuration Diagram]

- 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.
- Heater break alarm (HBA) function cannot be used when control output is voltage/current output.
- Control loop break alarm (LBA) function cannot be used when control type is Heat/Cool PID control (V-TIO-F).
- Terminal No. 11 is not used.

6.3 Pin Layout of Connector

- Modular connector
  - 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

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal name</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receive data R (A)</td>
<td>R</td>
</tr>
<tr>
<td>2</td>
<td>Receive data R (B)</td>
<td>R</td>
</tr>
<tr>
<td>3</td>
<td>Signal ground</td>
<td>SG</td>
</tr>
<tr>
<td>4</td>
<td>Send data T (B)</td>
<td>T</td>
</tr>
<tr>
<td>5</td>
<td>Send data T (A)</td>
<td>T</td>
</tr>
<tr>
<td>6</td>
<td>Signal ground</td>
<td>SG</td>
</tr>
</tbody>
</table>

### RS-232C

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal name</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unused</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>Send data SD (TXD)</td>
<td>SD</td>
</tr>
<tr>
<td>3</td>
<td>Signal ground</td>
<td>SG</td>
</tr>
<tr>
<td>4</td>
<td>Receive data RD (RXD)</td>
<td>RD</td>
</tr>
<tr>
<td>5</td>
<td>Unused</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>Signal ground</td>
<td>SG</td>
</tr>
</tbody>
</table>

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 V-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

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Digital input (DI) (−)</td>
</tr>
<tr>
<td>2</td>
<td>Digital input (DI) (+)</td>
</tr>
<tr>
<td>3</td>
<td>Digital output (DO) 1 (Relay contact output)</td>
</tr>
<tr>
<td>4</td>
<td>Digital output (DO) 2 (Relay contact output)</td>
</tr>
</tbody>
</table>

#### Circuit configuration

- 24 V DC
- 1
- 2
- 3
- 4
- 5
- 6
- Load
- DO1
- DO2

#### 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 mm² (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-02: M3

#### 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:
  - RTD: Pt100 (JIS-C1604-1997), JPt100 (JIS-C1604-1989, Pt100 of JIS-C1604-1981)
- Voltage (low): 0 to 100 mV DC
- Voltage (high): 0 to 5 V DC, 0 to 10 V DC, 1 to 5 V DC
- Current: 0 to 20 mA DC, 4 to 20 mA DC
- (Input impedance: 250 Ω)
- 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-SS6-10L-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 (HBA),
Control loop break alarm (LBA),
Burnout, Temperature rise completion

Optional
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
  (HBA), Control loop break alarm (LBA),
  Burnout, Temperature rise completion
  (Specify when ordering)

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

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: Four 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:
RK communication
(ANSI X3.28-1976 subcategories 2.5 and B1) or Modbus
Maximum connections: RS-422A: 16 V-TIO-E/F modules
  RS-232C: One V-TIO-E/F module

Others
Power supply voltage: 21.6 to 26.4 V DC
  (Including power supply voltage variation)
Rating: 24 V DC
Current consumption:
  With event input/output: 160 mA max./module
  Without event input/output: 140 mA max./module
Allowable ambient temperature range:
-10 to +50 °C
Allowable ambient humidity range:
5 to 95 %RH (Non condensing)
Absolute humidity:
MAX.W.C 29 g/m3 dry air at 101.3 kPa
Installation environment conditions:
  Indoor use
  Altitude up to 2000 m
Weight:
  With event input/output: Approx. 260 g
  Without event input/output: Approx. 250 g