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 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 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 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.
- Sensor, contactor or SSR, and all wiring must be retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

**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.
- RKCs is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKCs 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. RKCs 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 RKC.
1. OUTLINE

The temperature control module for DeviceNet X-TIO-J can send and receive data to/from DeviceNet compatible programmable controller (PLC) by the DeviceNet that is a multi-vendor compatible open field network.

One X-TIO-J module enables temperature control corresponding to two channels. It has power supply and communication terminals in addition to temperature control input and output terminals. All data are set by communication.

Before using this product, check each of the following:

2. PRODUCT CHECK

(1) Type

X-TIO-J-Y

(2) Input channel 1, (3) Input channel 2

K: Thermocouple K
J: Thermocouple J
T: Thermocouple T
S: Thermocouple S
R: Thermocouple R
A: Thermocouple PL II
N: Thermocouple N
E: Thermocouple E
B: Thermocouple B

(4) Control output 1, (5) Control output 2

M: Relay contact output
V: Voltage pulse output 0/12 V DC

(6) CT1 input, (7) CT2 input

(8) Connector type

(9) Version symbol

Heater break alarm (HBA) function can not be used when control output is Voltage/Current output.

For details of DeviceNet communication, refer to the Module Type Controller SRX DeviceNet Communication Instruction Manual (IMS01N17-E).

For host communication using host communication terminals, refer to the Appendix B of Module Type Controller SRX DeviceNet Communication Instruction Manual (IMS01N17-E) and the Module Type Controller SRX Communication Instruction Manual (IMS01N01-E).

3. PARTS DESCRIPTION

3.1: Indication lamps 1

3.2: Terminal cover

3.3: Node address setting switch

3.4: Module address setting switch

3.5: DeviceNet connector [Open-style connector] (COM.PORT)

3.6: Joint connector (Right side)

3.7: Joint connector (Left side)

3.8: Terminal cover

3.9: Indication lamps 2

3.10: DeviceNet connector [Micro-style connector] (COM.PORT)

3.11: DeviceNet side

3.12: Temperature control side

3.13: Connectors other than the micro-style connector are the same as those of the open-style connector type. However, only the following names are different. (A function is the same)

Indication lamps 2

FAIL/RUN

RX/TX

EVENT1

EVENT2

EVENT3

EVENT4

Indication lamps 1

FAIL

RUN

NS

MS

MOD

NET

RATE

DR

DL

NS

MS

D
4. COMMUNICATION SETTING

Set communication setting before mounting and wiring of SRX.

**CAUTION**

Do not separate the module mainframe from the terminal base with the power turned on. If so, instrument failure may result.

4.1 Address Setting

**Node address setting**

To identify each device connected to the network, it is necessary to set a different address to each device (node). For the DeviceNet, as it is possible to connect up to 64 devices including a master to the network, node address (MAC ID) from 0 to 63 can be set.

For this setting, use a small slotted screwdriver.

4.2 DeviceNet Communication Setting

**Communication speed setting**

Set the communication speed of DeviceNet. For this setting, use a small slotted screwdriver.

When any number between 3 and 9 is set, the communication speed becomes “500 kbps.”

**Number of polling I/O communication data and internal data bus termination resistor setting**

With the DIP switch 1 which there is on the left side of module, set the number of polling I/O communication data of DeviceNet and termination resistor of internal data bus.
4.3 Host Communication Setting

(temperature control side)

With the DIP switch 2 which there is on the right side of module, set the communication speed, data bit configuration, protocol, and termination resistor of internal data bus for host communication of temperature control side.
5. MOUNTING

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/m² 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) Mount this instrument in the panel considering the following conditions:

- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, semiconductor functional devices, large-wattage resistors.)
- If the ambient temperature rises above 50 °C, cool this instrument with a forced air fan, cooler, etc. Cooled air should not blow directly on this instrument.
- In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
- Ensure at least 50 mm space on top and bottom of the control unit for maintenance and environmental reasons.

(5) 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.

5.2 Dimensions

The above figure is open-style connector type. The figure of micro-style connector type is the same as an open-style connector type.

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 X-TIO-J 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).

**WARNING**

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

- Depth in connector mounting

Conduct installation in consideration of the sizes of the connector and cable when connector-connected.

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For open-style connector: Approx. 50 mm

* For the conservation of the contact of connector, install a joint connector cover in module of both ends.

Locked

(A) Pull down

(B) Lift and take off

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For micro-style connector: Approx. 100 mm

* For open-style connector: Approx. 50 mm
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 29 modules (X-TIO-A/B, X-DI-A/B or X-DO-A/B) can be
connected to one X-TIO-J module. 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

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.

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 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 30 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 cannot
  come into contact with adjacent conductive parts.
6.2 Terminal Configuration

- Terminal No. 11 is not used.
- Input channel 2 can be used as remote setting input (only for Voltage/Current input). In this case, control output 2 and CT input 2 become unused.

6.3 Pin Layout of Connector

- **Open-style connector**

  - Connection plugs: SRXDN-01 (Sold separately) MSTB2.5/5-STF-5.08AUM (PHOENIX CONTACT, Inc.) or equal
  - Multi-drop type (recommended models): TMSTBP2.5/5-STF-5.08AUM (PHOENIX CONTACT, Inc.)

- **Micro-style connector**

  - Connection socket: Recommended models: SACC-M12FS-5CON-PG 9-M (PHOENIX CONTACT, Inc.)

  - Use the communication cable (thick cable or thin cable) that matched specification of DeviceNet.

  - By thickness of a cable to use and connection method, usable connection connector type is different.

  - For cable specifications, connection method and vendor, refer to the web site of ODVA (Open DeviceNet Vender Association).

  - http://www.odva.org

7. SPECIFICATIONS

- **Inputs**
  - Number of inputs: 2 points (Isolated between each channel)
  - Input type:
    - Voltage (low): 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V 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: 25 ms
  - PV bias: [Input span to] [Input span]
  - CT input: 2 points

- **Outputs**
  - 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
- **Additional function:**
  - Autotuning function
  - Output limiter function
  - Output change rate limiter function

### Events
- **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) function
- **Number of HBA:** 2 points
- **Setting range:** 0.0 to 100.0 A (0.0 A: OFF)
- **Additional function:** Number of event delay times: 1 to 255 times

### Control loop break alarm (LBA) function
- **Number of LBA:** 2 points
- **LBA time:** 1 to 7200 seconds
- **LBA deadband (LBD) setting:** 0 to Input span

### Program control
- **Number of patterns:** 16 patterns max. (With pattern link function)
- **Number of segments:** 16 segments/pattern max.
- **Time signal output:** 16 points/pattern

### DeviceNet communication
- **Protocol:** DeviceNet
- **Connection method:** Multi-drop connection, T-branch connection (Terminating resistor is necessary)
- **Communication speed:** 125 kbps, 250 kbps, or 500 kbps
- **Error control:** CRC error, Node address (MAC ID) duplication check
- **Maximum number of connection nodes:** 64 (including master)

### Host communication
- **(using host communication terminals)**
- **Communication interface:** Based on RS-485, EIA standard
- **Communication protocol:**
  - RKC communication
  - (ANSI X3.28-1976 subcategories 2.5 and B1) or Modbus
- **Maximum connections:** 31 * instruments maximum including a host computer
- * As each of the DeviceNet board and temperature control board incorporated in the X-TIO-J module is handled as one unit, one X-TIO-J module corresponds two modules.

### Others
- **Power supply voltage:** 21.6 to 26.4 V DC (Including power supply voltage variation)
- **Rating:** 24 V DC
- **Current consumption:** 200 mA max./module
- **Allowable ambient temperature:** -10 to +50 °C
- **Allowable ambient humidity:** 5 to 95 %RH (Non condensing)
- **Absolute humidity:** MAX.W.C 29.3 g/m³ dry air at 101.3 kPa
- **Installation environment conditions:** Indoor use
- **Altitude:** up to 2000 m
- **Weight:**
  - Open-style connector type: Approx. 270 g
  - Micro-style connector type: Approx. 290 g

### Standard
- **Safety standard:**
  - UL: UL61010-1
  - cUL: CAN/CSA-C22.2 No.61010-1
- **CE marking:**
  - LVD: EN61010-1
  - OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2, Class II (Reinforced insulation)
  - EMC: EN61326-1
- **C-Tick:** EN55011

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This product has been self-tested by RKC at DeviceNet Protocol Conformance Test Software Version A-17.*