

Module Type Controller SRX

Digital Input Module

X-DI-A/X-DI-B

Instruction Manual

IMS01N04-E2

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

SYMBOLS

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

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



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



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



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



: This mark indicates where additional information may be located.



WARNING

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

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take 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.

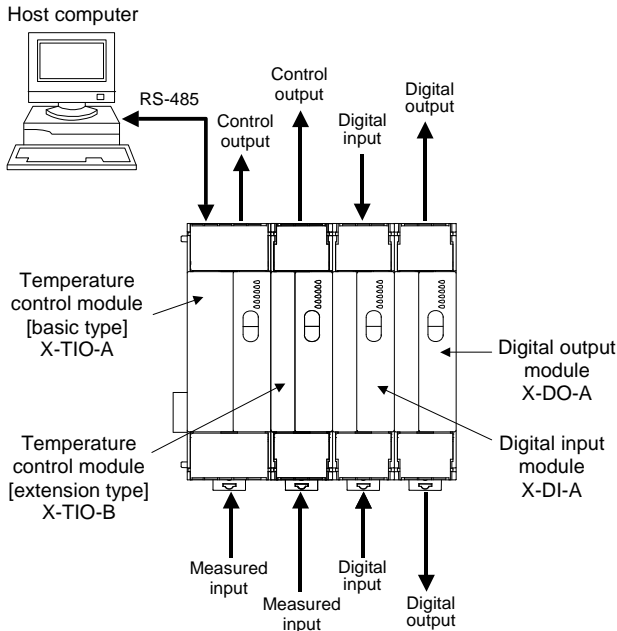
- Be sure to provide an appropriate surge control circuit respectively for the following:
 - If input/output or signal lines within the building are longer than 30 meters.
 - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an 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.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- 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.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- 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

Two types of digital input (DI) module are available: the X-DI-A with 12 input channels (terminal block only) and the X-DI-B with 28 input channels (12-point terminal block/16-point connector). As the digital input (DI) module is not provided with terminals for power supply and host communication, it is always used together with the module (temperature control module [basic type] X-TIO-A, etc.) with terminals for power supply and host communication.



SRX configuration example

■ Contents of digital input signal

The signal of the following can be selected to every temperature control channel.

- **Program operation mode selection (6 points)**
RESET, RUN, FIX, MAN, STEP, HOLD
- **Program pattern selection (5 points)**
PSET, SEL1, SEL2, SEL3, SEL4
- **Autotuning (AT)/PID control transfer (1 point)**

The DI channel is assigned by communication. For details, refer to the **Module Type Controller SRX Communication Instruction Manual (IMS01N01-E□)**.

2. PRODUCT CHECK

Check whether the delivered product is as specified by referring to the following model code.

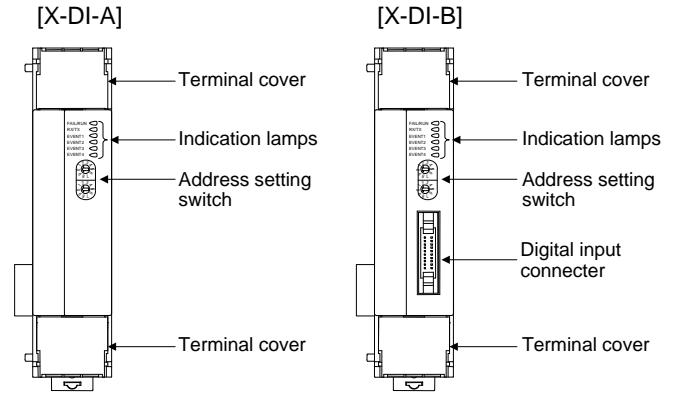
X-DI- □
(1)

(1) Type

- A: Input 12 points
(Only terminal blocks)
- B: Input 28 points
(Terminal block: 12 points, Connector: 16 points)

■ **Accessory**
X-DI-A/X-DI-B Instruction Manual (IMS01N04-E2)...1

3. PARTS DESCRIPTION



[Indication lamps]

- **FAIL/RUN**
When normally: A green lamp turns on (RUN)
When abnormally: A red lamp turns on (FAIL)
- **RX/TX**
During data send and receive: A green lamp turns on
- **EVENT 1 to 4**
During contact closed: A green lamp turns on
Event 1 to 4 is assigned to every DI channel.
If several DI channels are assigned to one EVENT lamp, the lamp is lit by the OR operation of inputs from each DI channel.

4. COMMUNICATION SETTING

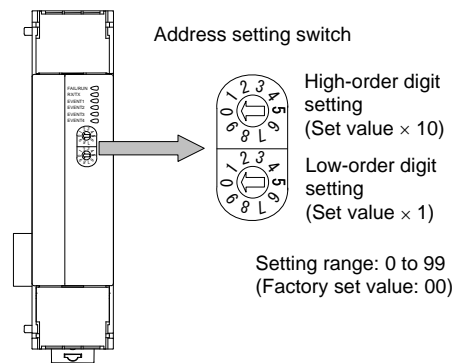
Set communication setting before mounting and wiring of SRX.

CAUTION

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

4.1 Module Address Setting

Set an address of module. For this setting, use a small slotted screwdriver.



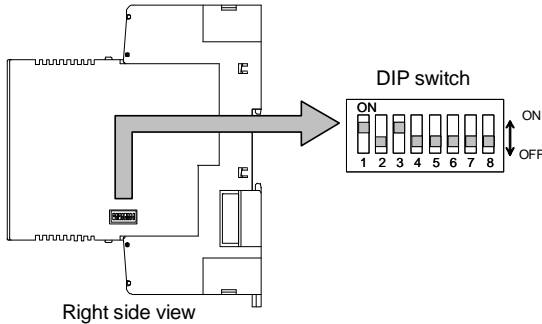
- **For Modbus, the value obtained by adding "1" to the set address corresponds to the address used for the actual program.**
- **To avoid problems or malfunction, do not duplicate an address on the same communication line.**



The above figure is X-DI-A module. The figure of X-DI-B module is the same as a X-DI-A module.

4.2 Protocol Selections and Communication Speed Setting

Use the DIP switch on the right side of module to select communication speed, data bit configuration, protocol and termination resistor of internal data bus. The data changes become valid when the power is turned on again or when changed to RUN/STOP.



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 *
OFF	OFF	ON	Data 7-bit, Even parity *
OFF	ON	ON	Data 7-bit, Odd parity *
ON	OFF	OFF	Data 8-bit, without parity
ON	OFF	ON	Data 8-bit, Even parity
ON	ON	ON	Data 8-bit, Odd parity

* When the Modbus communication protocol is selected, this setting becomes invalid.

Factory set value: Data 8-bit, without parity

6	Protocol selection
OFF	RKC communication
ON	Modbus

Factory set value: RKC communication

8	Internal data bus termination resistor setting
OFF	Termination resistor OFF
ON	Termination resistor ON

Factory set value: Termination resistor OFF



- Switch No. 7 must be always OFF. Do not set to ON.
- When two or more modules are connected on the same communication line, the DIP switch settings (switch 1 to 6) of all modules must be the same. In addition, always turn on the switch, 8 (with the internal bus termination resistance connected) in module of both ends.
- Be changed into communication time setting mode by using switch No. 4, 5 and 6.



For communication time setting mode, refer to the **Module Type Controller SRX Communication Instruction Manual (IMS01N01-E□)**.

5. MOUNTING



WARNING

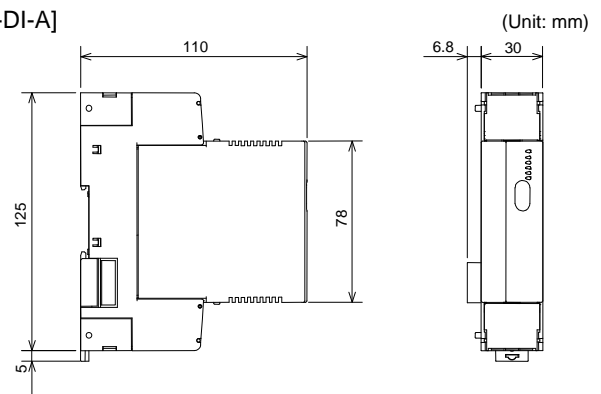
To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

5.1 Mounting Cautions

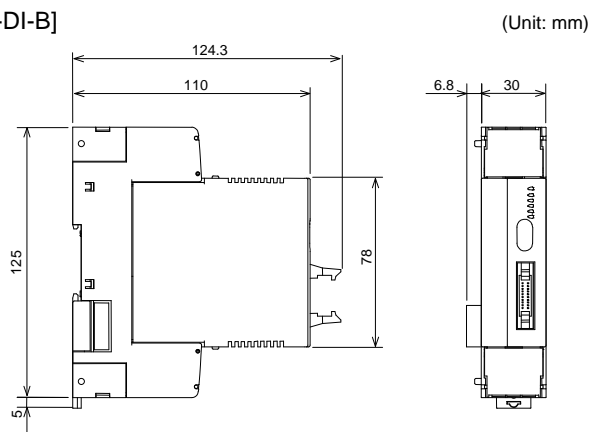
- (1) This instrument is intended to be used under the following environmental conditions. **(IEC61010-1)**
[OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]
- (2) Use this instrument within the following environment conditions:
 - Allowable ambient temperature: -10 to +50 °C
 - Allowable ambient humidity: 5 to 95 % RH
(Absolute humidity: MAX. W. C 29 g/m³ 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, semi-conductor 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.
 - High voltage equipment: Do not mount within the same panel.
 - Power lines: Separate at least 200 mm.
 - Rotating machinery: Separate as far as possible.
 - 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

[X-DI-A]



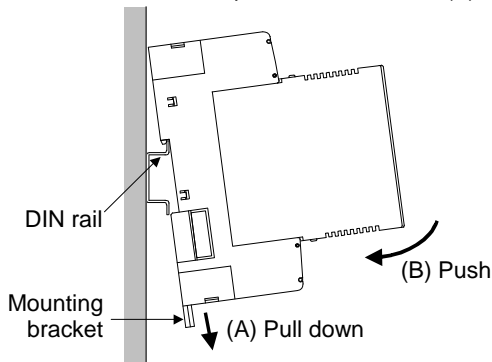
[X-DI-B]



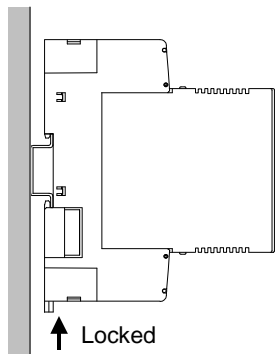
5.3 DIN rail Mounting

■ 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).

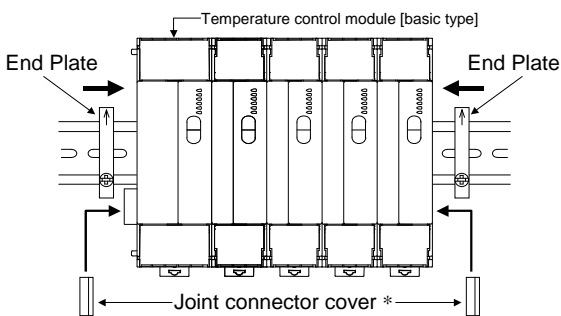


2. Slide the mounting bracket up to secure the module to the DIN rail.



■ End Plate mounting

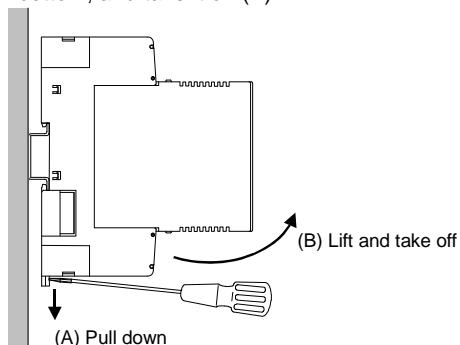
Hold tight both ends of the modules joined together with the end plates attached to the temperature control module [basic type] and then fix the end plates with screws.



* For the conservation of the contact of connector, install a joint connector cover (be attached to the temperature control module [basic type]) in module of both ends.

■ Removing procedures

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



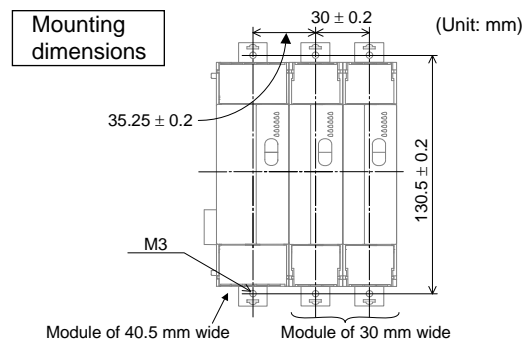
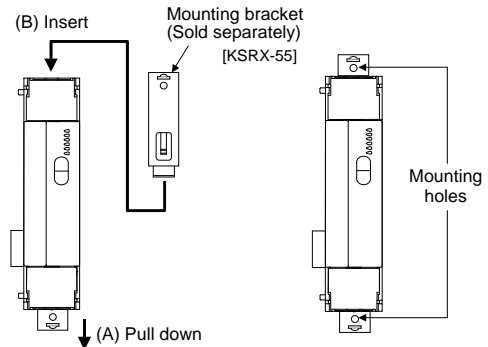
5.4 Panel Mounting

■ 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.



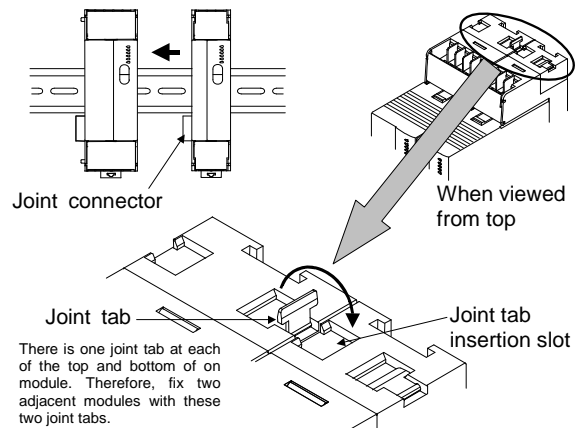
5.5 Jointing Each Module

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

■ Jointing procedure

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 wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

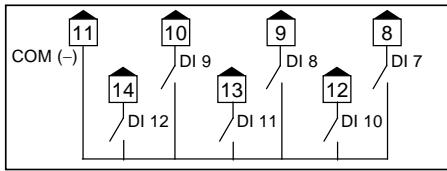
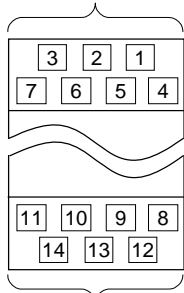
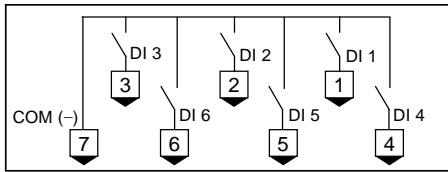
CAUTION

To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.

Terminal configuration

● X-DI-A/X-DI-B (common)

Digital input CH1 to 6

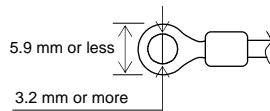


Digital input CH7 to 12



Use the solderless terminal appropriate to the screw size.

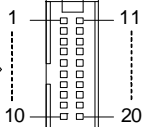
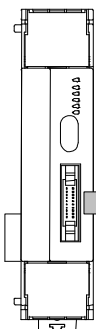
- Screw size: M3 x 6
- Recommended tightening torque: 0.4 N·m [4 kgf·cm]
- Specified solderless terminals: With isolation



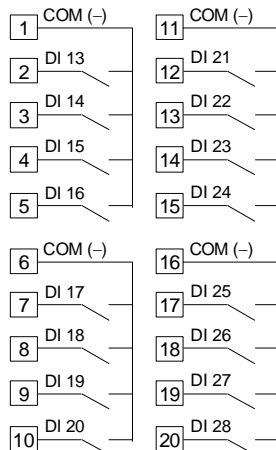
Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.

Pin layout of connector

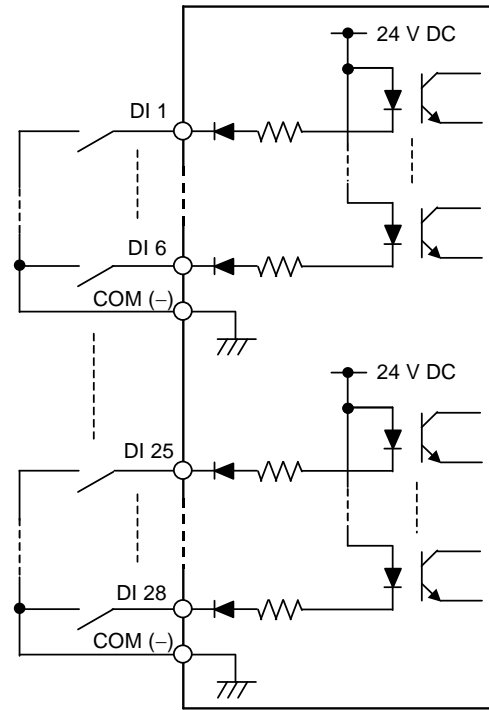
● X-DI-B



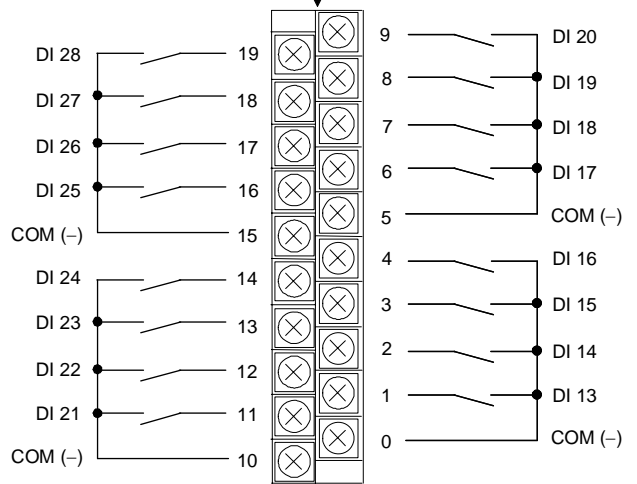
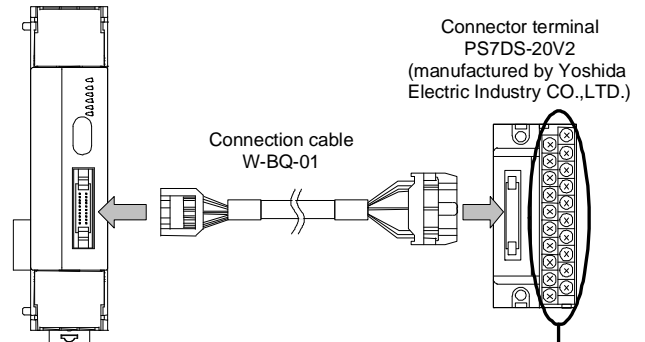
Digital input CH13 to 28



Circuit configuration



Connection example



For the connection cable, use the RKC product (Sold separately).

Cable type: W-BQ-01-3000
[Standard cable length: 3 m]
(For connector terminal connection)



Recommended connector terminal:
Manufactured by Yoshida Electric Industry CO.,LTD.
PS7DS-20V2

7. FUNCTIONS

Contents of Digital Input Signal

■ Program operation mode selection

- Transfer the program operation mode and an action in program control.
- DI channels can be freely assigned to each mode of the temperature control (TIO) module shown in the following. (Settable for each temperature control channel.)

RESET: Reset mode

RUN: Program control mode

FIX: Fixed set point control mode

MAN: Manual control mode

HOLD: Hold action mode (This action is enabled in program control)

STEP: Step action mode (This action is enabled in program control)

- Transfer timing
The RESET, RUN, FIX or MAN mode is changed when the contact is closed from the open condition (rising edge). The HOLD state is kept while the contact is being closed. At this time, no HOLD state can be released via communication (the contact status has priority over others). In addition, the HOLD state is released when the contact is opened from the closed condition (falling edge). The STEP action is taken when the contact is closed from the open condition (rising edge).

■ Program pattern selection

- Transfer the run program pattern.
- This function is enabled only in Reset mode.
- Select pattern at four contacts of SEL1, SEL2, SEL3, and SEL4, and change pattern with PSET.
- A DI channel to select the program pattern is specified to the temperature control (TIO) module. As the five contacts, PSET, SEL1, SEL2, SEL3 and SEL4 are handled as one set, each of them is assigned to five channels from the DI channel specified. (Settable for each temperature control channel.)
- Contact state and Pattern number

Contact	Pattern No.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SEL1	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x
SEL2	-	-	x	x	-	-	x	x	-	-	x	x	-	-	x	x
SEL3	-	-	-	-	x	x	x	x	-	-	-	-	x	x	x	x
SEL4	-	-	-	-	-	-	-	-	x	x	x	x	x	x	x	x

-: Contact open x: Contact closed

- Transfer timing
After selecting the pattern number by four contacts SEL1, SEL2, SEL3 and SEL4, the pattern number is changed when contact PSET is closed from the open condition (rising edge).

■ Autotuning (AT)/PID control transfer

- Switch START/STOP of autotuning (AT) function. Become PID control during autotuning (AT) suspension.
- A DI channel to select START/STOP of autotuning (AT) function is specified to the temperature control (TIO) module. (Settable for each temperature control channel.)
- Transfer timing
The autotuning (AT) function starts activating when the contact is closed from the open condition (rising edge). In addition, the autotuning (AT) function stops activating (canceled) when the contact is closed from the open condition (rising edge).

8. SPECIFICATIONS

■ Inputs

Input type:	Dry contact input
	Open state: 500 kΩ or more
	Close state: 10 Ω or less
	Contact current: 2.3 mA TYP.
	Voltage at open: Approx. 24 V DC
Number of inputs:	X-DI-A: 12 points (6 points/common): Terminal
	X-DI-B: 28 points Terminal: 12 points (6 points/common)
	Connector: 16 points (4 points/common)

■ Digital input function

Settable for each temperature control channel.	
Program operation mode selection:	RESET, RUN, FIX, MAN, HOLD, STEP
Program pattern selection:	PSET, SEL1, SEL2, SEL3, SEL4
Autotuning (AT)/PID control transfer:	AT/PID

■ LED display

Number of display:	6 points
Display contents:	Operation: RUN/FAIL lamp
	Communication: RX/TX lamp
	Event: EVENT1 to 4 lamps

■ Communications

Communication interface:	Based on RS-485, EIA standard
Communication protocol:	RKC communication ANSI X3.28-1976 subcategories 2.5 and A4) or Modbus
Connection:	Internal bus

■ Others

Power supply voltage:	21.6 to 26.4 V DC (Including power supply voltage variation)
Rating:	24 V DC (Supplied by temperature control module [basic type])
Current consumption:	X-DI-A: 115 mA max./module X-DI-B: 160 mA max./module
Ambient temperature range:	-10 to +50 °C
Ambient humidity range:	5 to 95 %RH (Non condensing) Absolute humidity: MAX.W.C 29 g/m ³ dry air at 101.3 kPa
Installation environment conditions:	Indoor use Altitude up to 2000 m
Weight:	X-DI-A: Approx. 150 g X-DI-B: Approx. 160 g

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