Ethernet Communication Converter

COM-ML-1 [For SRZ] Installation Manual

IMR02E13-E1

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

For detailed handling procedures and various function settings, refer to separate **COM-ML-1 [For SRJ] Instruction Manual (IMR02E17-E□)**. The manual can be downloaded from the official RKC website: http://www.rkcinst.com/english/manual_load.htm

■ Product check

COM-ML-1 [For SRZ] Installation Manual (IMR02E13-E□)..... 1
COM-ML-1 [For SRZ] Quick Operation Manual (IMR02E14-E□)..... 1
COM-ML-1 [For SRZ] Host Communication Data List (IMR02E15-E□) 1
COM-ML-1 [For SRZ] PLC Communication Data List (IMR02E16-E□)..... 1

■ Safety precautions

⚠ WARNING

- To prevent injury to persons, damage to the instrument and the 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 the instrument and the equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to the instrument and the 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 may occur and warranty is void under these conditions.

⚠ CAUTION

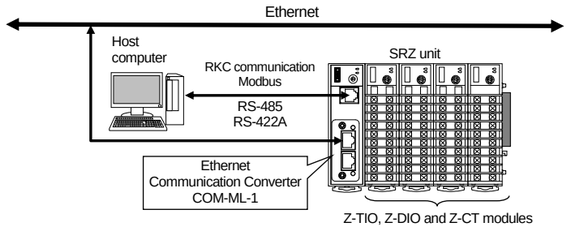
- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- 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 to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- All wiring must be in accordance with local codes and regulations.
- 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 a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- 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 dissipation.
- 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 may occur. Use a soft, dry cloth to remove stains from the instrument.
- 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 explanation purpose.
- 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.

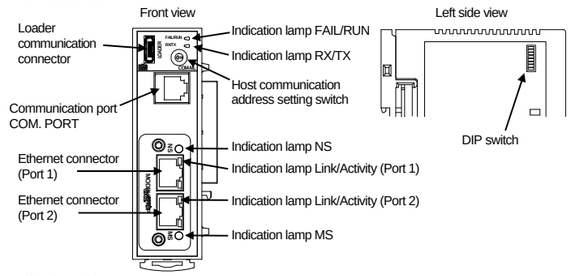
1. OUTLINE

COM-ML-1 [For SRZ] (hereafter called COM-ML) is communication converter to connect the RKC module type controller SRZ to the Ethernet [Modbus/TCP or PLC communication (MAPMAN)]. Multi-zone temperature control system can be easily achieved by connecting functional modules (Z-TIO, Z-DIO and Z-CT modules) of SRZ to COM-ML. Host communication (RKC communication, Modbus) is also possible. The combination of COM-ML and functional module of SRZ is called an SRZ unit.



2. PARTS DESCRIPTION

■ Mainframe



Indication lamp

FAIL/RUN [Green or Red]	• When normal:	A green lamp is on (RUN)
	• During setting of default IP address setting:	A green lamp flashes (RUN)
	• Self-diagnostic error (Recoverable fault):	A green lamp flashes (FAIL)
	• Self-diagnostic error (Major fault):	A red lamp is on (FAIL)
RX/TX [Green]	During host communication data send and receive: Turns on	
NS (Network status) [Green or Red]	• No power or no IP address:	Turns off
	• In Process Active or Idle state: (The green lamp flashes during the PLC communication)	A green lamp is on
	• Waiting for connection:	A green lamp flashes
	• Duplicate IP address, or FATAL error:	A red lamp is on
	• Process Active Timeout:	A red lamp flashes
Link/Activity (Port 1/Port 2) [Green and Yellow]	• No link, no activity:	Turns off
	• Link established, 100 Mbps:	A green lamp is on
	• Activity, 100 Mbps:	A green lamp flickering
	• Link established, 10 Mbps:	A yellow lamp is on
	• Activity, 10 Mbps:	A yellow lamp flickering
MS (Module status) [Green or Red]	• No power:	Turns off
	• Normal operation:	A green lamp is on
	• Major fault:	A red lamp is on
	• Recoverable fault:	A red lamp flashes

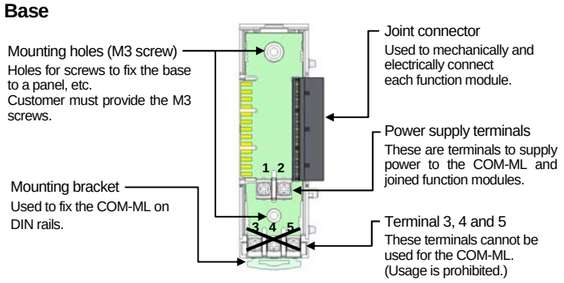
Communication port (modular connector) and communication connector

COM. PORT	Use to connecting the Operation panel or Host computer. [RS-485 or RS-422A]
Loader communication connector	Use to connecting the communication converter and personal computer when loader communication is performed.
Ethernet connector (Port 1/Port 2)	Use to connecting the Ethernet.

Switch

Host communication address setting switch	Sets unit address for host communication.
DIP switch	• Sets communication speed and communication protocol corresponding to host communication. • Sets DIP switch setting validity/invalidity. • Sets the default IP address settings.

■ Base



3. MOUNTING

⚠ WARNING

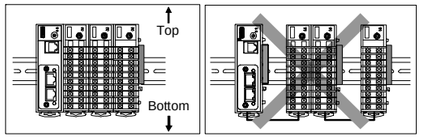
To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

3.1 Mounting Cautions

(1) Use this instrument within the following ambient temperature and ambient humidity.
- Allowable ambient temperature: −10 to +50 °C
- Allowable ambient humidity: 5 to 95 %RH (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

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

(3) Mount this instrument in the panel considering the following conditions:
- Provide adequate ventilation space so that heat does not build up.
- Ensure at least 50 mm space on top and bottom of the instrument for maintenance and environmental reasons.
- Do not mount this instrument directly above the 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, or the like. 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.
- For correct functioning mount this instrument in a horizontal position.
- Be sure the COM-ML and function modules are joined when using them.



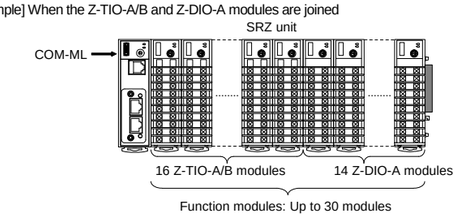
(4) If this instrument is permanently connected to equipment, it is important to include a switch or circuit-breaker into the installation. This should be in close proximity to the equipment and within easy reach of the operator. It should be marked as the disconnecting device for the equipment.

3.2 Joining Each Module

Before joining the COM-ML and function modules, use the DIP switch to make the communication settings. For the setting procedure, refer to COM-ML-1 [For SRZ] Quick Instruction Manual (IMR02E14-E□).

The maximum number of function modules (Z-TIO, Z-DIO and Z-CT) described in the following can be joined per COM-ML. For details on joining function modules with the COM-ML, refer to the **Z-TIO INSTRUCTION MANUAL (IMS01T01-E□)**.
- When joining function modules of the same type: Up to 16 modules
- When joining function modules of two or more different types: Up to 30 modules (However, the maximum joinable number of function modules of the same type is 16.)

[Example] When the Z-TIO-A/B and Z-DIO-A modules are joined



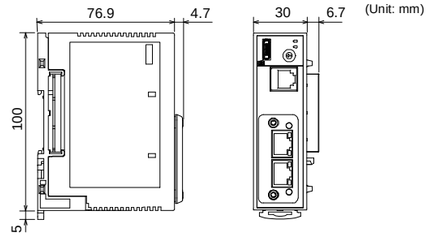
When the number of correspondence channels is specified using the model code, only the amount of data corresponding to the specified number of channels can be sent or received. (PLC communication specification only)

The number of the correspondence channels	Z-TIO module	Z-DIO module
64 channels	64 channels (Up to 16 modules) *	128 channels (Up to 16 modules) *
48 channels	48 channels (Up to 12 modules) *	96 channels (Up to 12 modules) *
32 channels	32 channels (Up to 8 modules) *	64 channels (Up to 8 modules) *
16 channels	16 channels (Up to 4 modules) *	32 channels (Up to 4 modules) *

* The number indicated in parentheses is the maximum joinable number per module when the indicated number of correspondence channels is specified. The amount of data that can be sent or received does not increase even when modules exceeding the maximum number are joined.

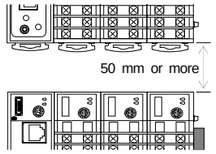
3.3 Dimensions

(Unit: mm)



● Space required between each module vertically

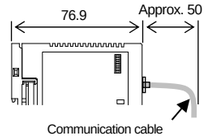
When the module is mounted on the panel, allow a minimum of 50 mm at the top and bottom of the module to attach the module to the mainframe.



● Depth for communication cables mounting

Space for communication cables must be considered when installing

(Unit: mm)



■ Procedure for mounting or removing

The procedure for mounting or removing the COM-ML is the same as that of the function module (Z-TIO, Z-DIO or Z-CT). Both DIN rail mounting and screw mounting are available.
For the mounting or removing, refer to the **Z-TIO INSTRUCTION MANUAL (IMS01T01-E□)**.

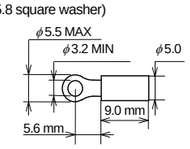
4. WIRING

⚠ WARNING

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

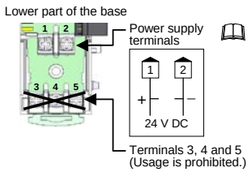
4.1 Wiring Cautions

- To avoid noise induction, keep communication 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 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).
- Supply the power to only one of the joined modules. When power is supplied to any one of the joined modules, all of the joined modules will receive power.
- Select the power capacity which is appropriate for the total power consumption of all joined modules (including COM-ML) and the initial current surge when the power is turned on.
  Power consumption (at maximum load): 120 mA max. (at 24 V DC)
  Rush current: 12 A or less
- When connecting the wiring to the terminals on the base, use the specified solderless terminals. Only these specified solderless terminals can be used due to the insulation between the terminals.
  Screw Size: Power supply terminals: M3 × 7 (with 5.8 × 5.8 square washer)
  Recommended tightening torque: 0.4 N·m (4 kgf·cm)
  Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm²
  Specified solderless terminal:
  Manufactured by J.S.T MFG CO., LTD.
  Circular terminal with isolation V1.25–MS3
  (M3 screw, width 5.5 mm, hole diameter 3.2 mm)



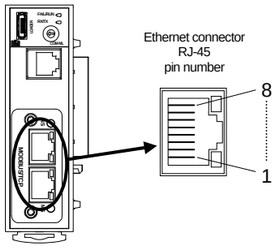
- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.

4.2 Terminal Configuration



Supply the power to only one of the joined modules or COM-ML.
When power is supplied to any one of the joined modules or COM-ML, all of the joined modules and COM-ML will receive power.

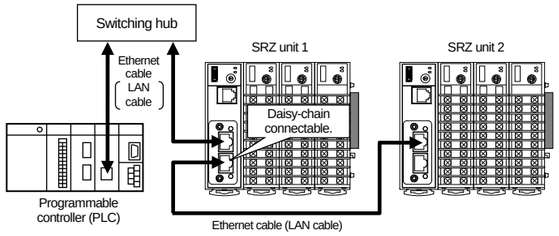
4.3 Connection to Ethernet



Pin No.	Signal name	Symbol
1	Send data +	TX+
2	Send data –	TX–
3	Receive data +	RX+
4	Unused	—
5	Unused	—
6	Receive data –	RX–
7	Unused	—
8	Unused	—

■ Connection Example

The Ethernet cable (LAN cable) which is marketed can be connected. The Ethernet cable (LAN cable) must be provided by the customer.



Ethernet straight through cable and Ethernet crossover cable may be used.

4.4 Connection to Host Computer

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

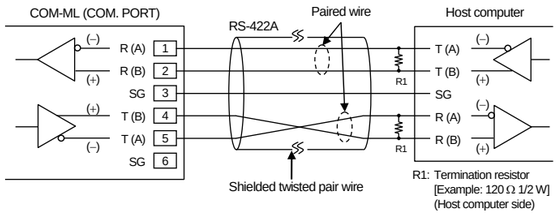
RS-485

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

The six-pin type modular connector should be used for the connection to the COM-ML. (Recommended manufacturer and model: Hirose Electric, TM4P-66P)

■ RS-422A

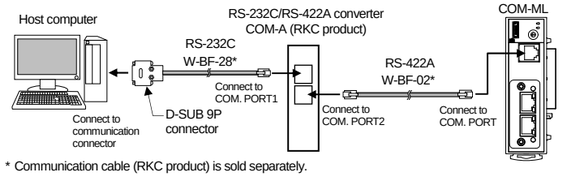
Up to 16 SRZ units can be connected to a host computer communication port.



If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors to the COM-ML and the other party unit.

● When the interface of host computer is RS-232C (RS-232C ↔ RS-422A)

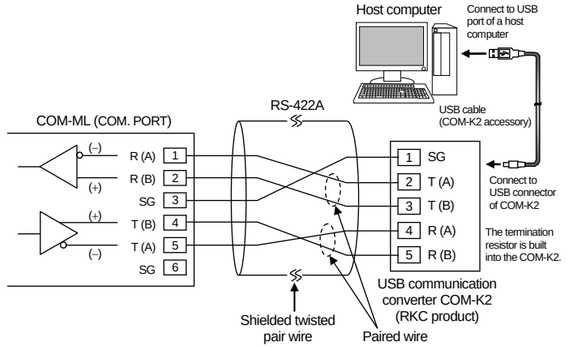
Connect the RS-232C/RS-422A converter between the host computer and the COM-ML.



* Communication cable (RKC product) is sold separately.

● When the host computer has a USB connector

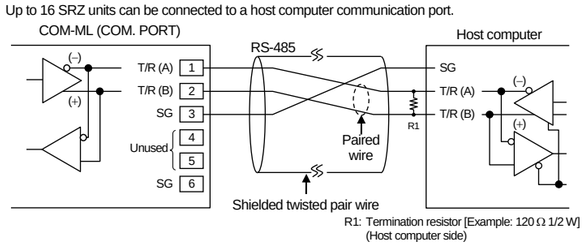
Connect the USB communication converter between the host computer and the COM-ML.



For the COM-K2, refer to the **COM-K2 Instruction Manual**.

■ RS-485

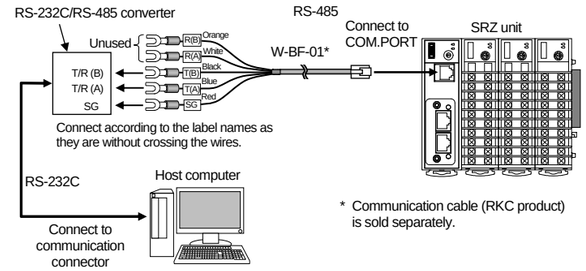
Up to 16 SRZ units can be connected to a host computer communication port.



If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors to the COM-ML and the other party unit.

● When the interface of host computer is RS-232C

Connect the RS-232C/RS-485 converter between the host computer and the COM-ML.

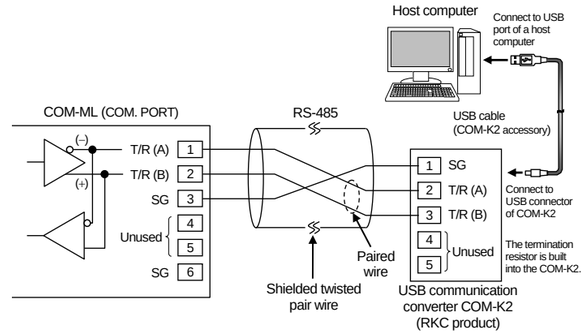


Be sure to insulate the wires that are not used by covering them with insulating tape.

Recommended RS-232C/RS-485 converter:
CD485, CD485/V manufactured by Data Link, Inc. or equivalent.

● When the host computer has a USB connector

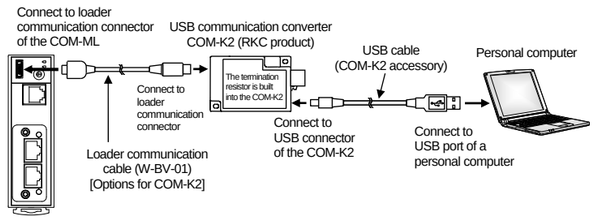
Connect the USB communication converter between the host computer and the COM-ML.



For the COM-K2, refer to the **COM-K2 Instruction Manual**.

■ Loader communication

Connect a USB communication converter between the personal computer and the COM-ML.



The module address for loader communication is fixed at "0."

During the loader communication, the COM-ML requires an external power source. The COM-ML will not function on the USB power from a personal computer alone.

For the COM-K2, refer to the **COM-K2 Instruction Manual**.

5. SPECIFICATIONS

■ Ethernet communication

● Modbus/TCP

Physical layer:	10BASE-T/100BASE-TX automatic recognition
User layer:	Modbus/TCP
Communication data:	Based on host communication (Modbus) map
Connector type:	RJ-45 (2 ports)

● PLC communication (MAPMAN)

Physical layer:	10BASE-T/100BASE-TX automatic recognition
User layer:	TCP/IP
	MITSUBISHI MELSEC series special protocol
	Frame: QnA-compatible 3E fame (SLMP 3E frame)
	Code: Binary or ASCII
Connector type:	RJ-45 (2 ports) [Only a single PLC is connectable]

■ Host communication

Interface:	Based on RS-422A, EIA standard
	Based on RS-485, EIA standard
Connection method:	RS-422A: 4-wire system, half-duplex multi-drop connection
	RS-485: 2-wire system, half-duplex multi-drop connection
Synchronous method:	Start/Stop synchronous type
Protocol:	RKC communication (ANSI X3.28-1976 subcategories 2.5 and B1) or Modbus-RTU
Communication speed:	4800 bps, 9600 bps, 19200 bps, 38400 bps
Maximum connections:	16 SRZ units per communication port of host computer

■ Loader communication

Connection method:	Connection with a loader communication cable for our USB converter COM-K2 (sold separately).
Synchronous method:	Start/Stop synchronous type
Protocol:	RKC communication (ANSI X3.28-1976 subcategories 2.5 and B1)
Communication speed:	38400 bps
Maximum connections:	One SRZ unit

■ General specifications

Power supply voltage:	21.6 V DC to 26.4 V DC [Including power supply voltage variation] (Rated 24 V DC)
Power consumption (at maximum load):	120 mA max. (24 V DC) Rush current: 12 A or less
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:	Indoors use, Altitude up to 2000 m
Weight:	Approx. 130 g

6. MODEL CODE

COM- ML - 1 ☐ ∗ 02 /☐ ☐ ☐ ☐
(1) (2) (3) (4) (5) (6) (7)

(1) Network communication
1: Modbus/TCP

(2) Host communication
4: RS-422A 5: RS-485

(3) Corresponding to the RKC controller
02: SRZ

(4) Factory setting (Specify a communication protocol)
No code: No need to factory preset a communication protocol. *
1: A communication protocol needs to be factory preset.

(5) Host communication protocol
No code: No need to specify when the factory setting is not required.
1: RKC communication (ANSI X3.28-1976 subcategories 2.5 and B1)
2: Modbus

(6) Network communication protocol
No code: No need to specify when the factory setting is not required.
1: Modbus/TCP
5: MAPMAN (MITSUBISHI PLC: QnA-compatible 3E fame/SLMP ASCII)
6: MAPMAN (MITSUBISHI PLC: QnA-compatible 3E fame /SLMP binary)

(7) The number of the correspondence channels (Only MAPMAN [PLC communication])
No code: No need to specify when the factory setting is not required.
A: 16 channels
B: 32 channels
C: 48 channels
D: 64 channels

* Factory setting when "No need to factory preset a communication protocol" is specified.
Host communication protocol: RKC communication
Network communication protocol: Modbus/TCP
The number of the correspondence channels: 64 channels

The first edition: JAN. 2018 [IMQ00]

RKC INSTRUMENT INC.
Website: http://www.rkcinst.com/
HEADQUARTERS: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN
PHONE: 03-3751-9799 (+81 3 3751 9799)
E-mail: info@rkcinst.co.jp

JAN. 2018