EtherCAT Communication Converter

COM-ML [For SRZ] Installation Manual

IMR02E09-E3

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 [For SRZ] Instruction Manual (IMR02E11-E□)**.
The manual can be downloaded from the official RKC website:
https://www.rkcinst.com/english/manual_load.htm

■ Product check

COM-ML [For SRZ] Installation Manual (IMR02E09-E3).....1
COM-ML [For SRZ] Communication Data List (IMR02E10-E□).....1
Joint connector cover (KSRZ-517A).....2
Power terminal cover (KSRZ-518A).....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

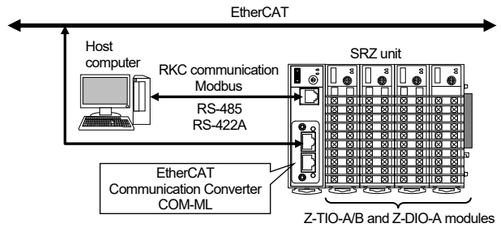
- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may 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 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.
- Various symbols are used on the equipment, they have the following meaning.
  ⚠ : Caution (This symbol is used where the instruction manual needs to be consulted for the safety of operator and equipment.)
  This symbol on the left side of the product denotes caution for electric shock and damages to the equipment. Read the following items before using this product.
  - ■ Safety precautions "WARNING"
  - **3. MOUNTING** "**WARNING**" and **4. WIRING** "**WARNING**"

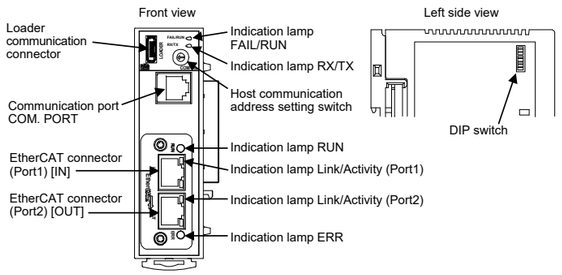
1. OUTLINE

The COM-ML is a EtherCAT gateway for RKC SRZ.
Multi-zone temperature control system can be easily achieved by connecting function modules (Z-TIO-A/B and Z-DIO-A modules) of SRZ to COM-ML. The combination of COM-ML and function module of SRZ is called an SRZ unit.



2. PARTS DESCRIPTION

■ Mainframe



Indication lamp

FAIL/RUN [Green or Red]	• When normal:	Green lamp turns on (RUN)
	• Self-diagnostic error (Recoverable fault):	Green lamp flashing (FAIL)
	• Self-diagnostic error (Major fault):	Red lamp turns on (FAIL)
RX/TX [Green]	During host communication data send and receive: Green lamp turns on	
RUN [Green or Red]	• INIT or No power:	Turns off
	• ORERATIONAL:	Green lamp turns on
	• PRE-ORERATIONAL:	Green lamp blinking
	• SAFE-ORERATIONAL:	Green lamp single flashing *
	• EXCEPTION:	Red lamp turns on
Link/Activity (Port1/Port2) [Green]	• No link or No power:	Turns off
	• Link sensed, activity detected:	Green lamp flashing
	• Link sensed, no activity:	Green lamp turns on
ERR [Red]	• No error or No power:	Turns off
	• Invalid configuration:	Red lamp blinking
	• Unsolicited state change:	Red lamp single flashing *
	• Application watchdog timeout:	Red lamp double flashing *
	• PDI watchdog timeout:	Red lamp turns on

* Single flashing: Repeats ON (200 ms)/OFF (100 ms).
Double flashing: Repeats ON (200 ms)/OFF (200 ms)/ON (200 ms)/OFF (1000 ms).

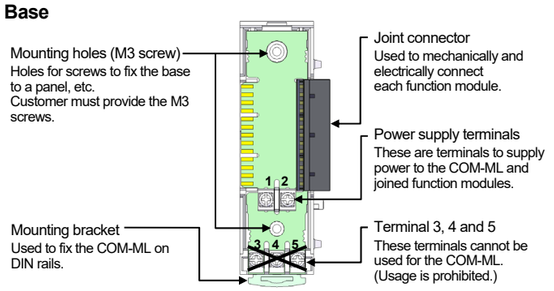
Communication port (modular connector) and communication connector

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.
EtherCAT connector (Port1) [IN]	Designed to connect EtherCAT with master instrument or slave instrument located near the master instrument.
EtherCAT connector (Port2) [OUT]	Designed to connect EtherCAT with the next slave instrument.

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.

■ Base



3. MOUNTING

⚠ WARNING

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

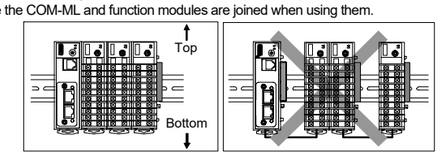
3.1 Mounting Cautions

(1) This instrument is intended to be used under the following environmental conditions.
(IEC 61010-1) [POLLUTION DEGREE 2]

(2) Use this instrument within the following environment conditions:
- Allowable ambient temperature: –10 to +50 °C
- Allowable ambient humidity: 5 to 95 %RH (Absolute humidity: MAX. W. C 29.3 g/m^3 dry air at 101.3 kPa)
- Installation environment conditions: Indoor use, Altitude up to 2000 m

(3) Avoid the following 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.

(4) Mount this instrument in the panel considering the following conditions:
- 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, 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.
- For correct functioning mount this instrument in a horizontal position.
- Be sure the COM-ML and function modules are joined when using them.



(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.

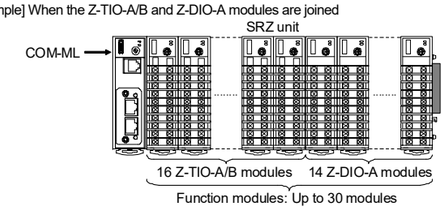
3.2 Joining Each Module

Before joining the COM-ML and function modules, use the DIP switch to make the communication settings. For the setting procedure, refer to 5. HOST COMMUNICATION SETTINGS (rear side).

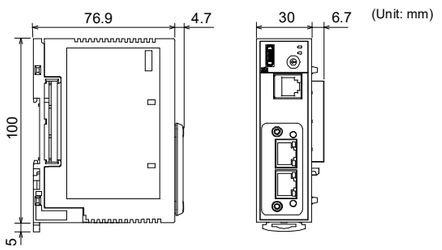
The maximum number of function modules (Z-TIO-A/B, Z-DIO-A) described in the following can be joined per COM-ML. For details on joining function modules with the COM-ML, refer to the **Z-TIO INSTRUCTION MANUAL (IMS01T01-E□)**.

- 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.)

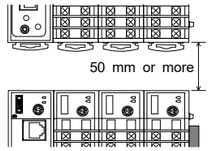
[Example] When the Z-TIO-A/B and Z-DIO-A modules are joined



3.3 Dimensions

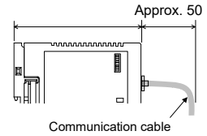


- **Space required between each instrument vertically**
  When the COM-ML is mounted on the panel, allow a minimum of 50 mm at the top and bottom of the COM-ML to attach the COM-ML to the mainframe.



- **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-A/B or Z-DIO-A). Both DIN rail mounting and screw mounting are available.
For the mounting or removing, refer to the **Z-TIO INSTRUCTION MANUAL (IMS01T01-E□)**.

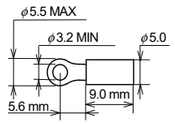
4. WIRING

⚠ 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.

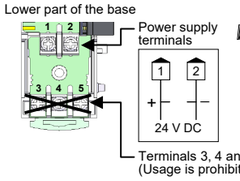
4.1 Wiring Cautions

- 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 a "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).
- 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)
  FG terminal M3 × 6
  Recommended tightening torque: 0.4 N·m (4 kgf·cm)
  Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm^2
  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.



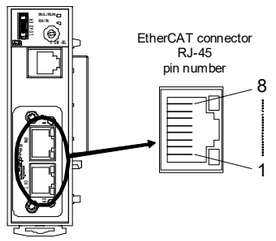
4.2 Terminal Configuration

Lower part of the base



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

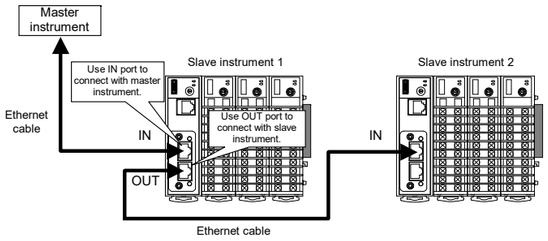
4.3 Connection to EtherCAT



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

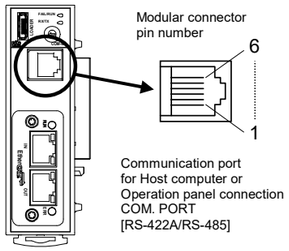
Can connect with the Ethernet cable which is marketed. The Ethernet cable must be provided by the customer.



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

The details of the EtherCAT are connected to the website of ETG (EtherCAT Technology Group), and obtain necessary information.
URL: https://www.ethercat.org/

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

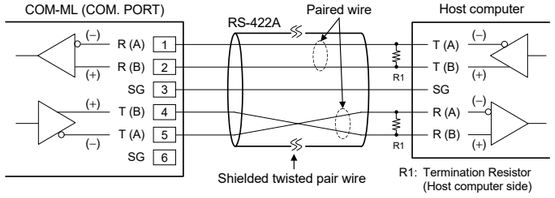
RS-485

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

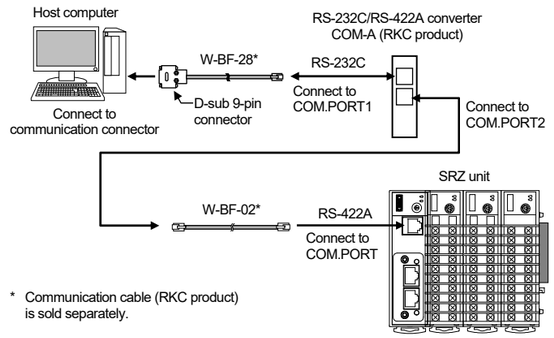
Up to 16 SRZ units can be connected to a host computer communication port.



If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors to the host computer side.

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

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

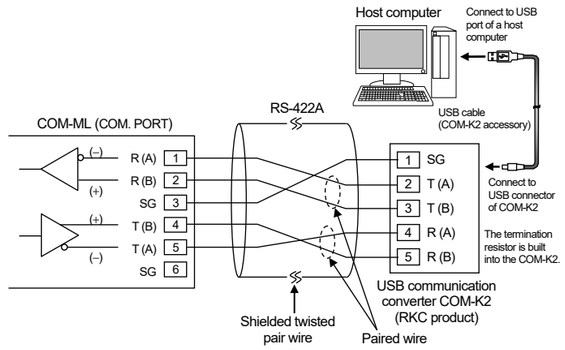


W-BF-02 and W-BF-28 communication cable (RKC product) can be used as communication cable (sold separately). If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

Recommended RS-232C/RS-422A converter: COM-A (RKC product)
For the COM-A, refer to the **COM-A/COM-B Instruction Manual (IMSRM33-E□)**.

● When the host computer has a USB connector

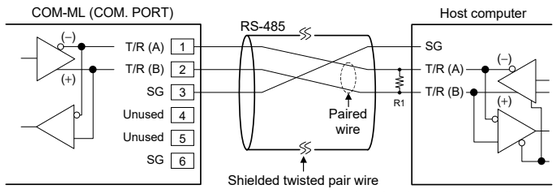
Connect the USB communication converter between the host computer and the COM-ML.



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

■ RS-485

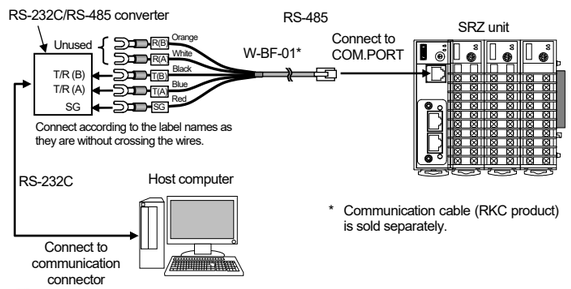
Up to 16 SRZ units can be connected to a host computer communication port.



If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors to the host computer side.

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

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



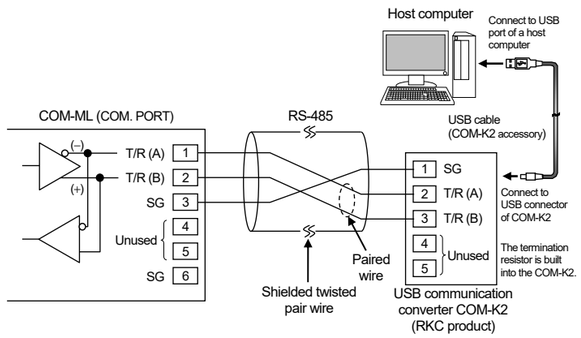
Be sure to insulate the wires that are not used by covering them with insulating tape.

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

W-BF-01 communication cable (RKC product) can be used as communication cable (sold separately). If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

● When the host computer has a USB connector

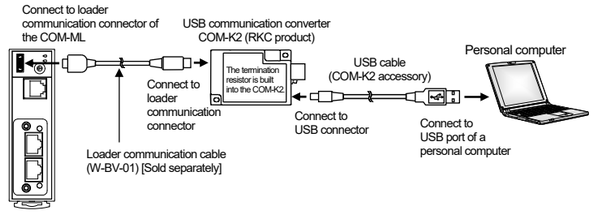
Connect the USB communication converter between the host computer and the COM-ML.



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

■ Loader communication

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



The Loader port is only for parameter setup. Not used for data logging during operation.

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.

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

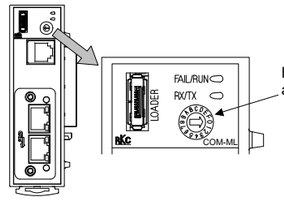
For the COM-K2, refer to the **COM-K2 Instruction Manual**.

5. HOST COMMUNICATION SETTINGS

5.1 Address Settings

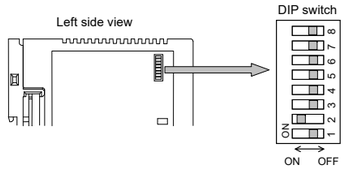
Set the address for host communication. Use a small flat-blade screwdriver to configure the setting.

Set the address such that it is different to the other addresses on the same line. Otherwise, problems or malfunction may result.



5.2 DIP Switch Settings

Use the DIP switch to set the speed and protocol of host communication, and DIP switch enable/disable.



1	2	Host communication speed
OFF	OFF	4800 bps
ON	OFF	9600 bps
OFF	ON	19200 bps
ON	ON	38400 bps

← Factory set value: 19200 bps

3	Communication protocol/Data bit configuration
OFF	RKC communication (Data 8-bit, without parity, Stop 1-bit)
ON	Modbus (Data 8-bit, without parity, Stop 1-bit)

← Factory set value: RKC communication

4	5	6	7	
OFF	OFF	OFF	OFF	Fixed (Do not set this one)

8	DIP switch enable/disable
OFF	Enable (enable the DIP switch settings)
ON	Disable (enable the host communication or loader communication settings)*

← Factory set value: Enabled

* The only host communication or loader communication settings that are enabled are the host communication speed and protocol and the data bit configuration.

When the communication protocol is set with the DIP switch, the data bit configuration is automatically set to "data 8-bit, without parity, stop 1-bit." To change to another data bit configuration, set the configuration in host communication or loader communication.

If you wish to set the data bit configuration, host communication speed, and communication protocol in host communication or loader communication, first set DIP switch No. 8 to ON.

6. SPECIFICATIONS

■ EtherCAT communication

Physical layer:	100BASE-TX
User layer:	EtherCAT
Correspondence protocol:	CANopen over EtherCAT
Communication object:	Service data object (SDO), Process data object (PDO)
Connector type:	RJ-45 (2 ports)

■ Host communication

Interface:	Base on RS-422A, EIA standard Base on RS-485, EIA standard
Protocol:	RKC communication (ANSI X3.28-1976 subcategories 2.5 and B1) Modbus-RTU
Communication speed:	4800 bps, 9600 bps, 19200 bps, 38400 bps
Maximum connections:	16 SRZ units per communication port of host computer
Termination resistor:	Externally connected

■ Loader communication

Connection method:	Connection with a loader communication cable for our USB converter COM-K2 (sold separately).
Protocol:	RKC communication (ANSI X3.28-1976 subcategories 2.5 and B1)
Communication speed:	38400 bps
Maximum connections:	1 SRZ unit

■ General specifications

Power supply voltage:	24 V DC
Power supply voltage range:	21.6 V to 26.4 V DC [Including power supply voltage variation]
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

■ Standard

Safety standard:	UL:	UL 61010-1
	cUL:	CAN/CSA-C22.2 No.61010-1
CE marking:	LVD:	EN61010-1 POLLUTION DEGREE 2, Class II (Reinforced insulation)
	EMC:	EN61326-1
RCM:		EN55011

7. MODEL CODE

COM-ML-3 □∗02
(1) (2) (3)

(1) Ethernet communication type
3: EtherCAT

(2) Host communication interface (COM. PORT)
4: RS-422A 5: RS-485

(3) Corresponding to the RKC controller
02: SRZ

■ Other peripherals and accessories (Sold separately)

Communication cable [Modular ↔ Y-shaped terminal lugs] (W-BF-01-□, □: Cable length)
Communication cable [Modular ↔ Modular] (W-BF-02-□, □: Cable length)
Communication cable [Modular ↔ D-sub 9-pin] (W-BF-28-□, □: Cable length)
Communication converter COM-K2-1 (Optional: with loader communication cable)
End plate (DEP-01, Package of 2 plates)

The first edition: FEB. 2010 [IMQ00]
The third edition: JUL. 2019 [IMQ00]

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JUL. 2019