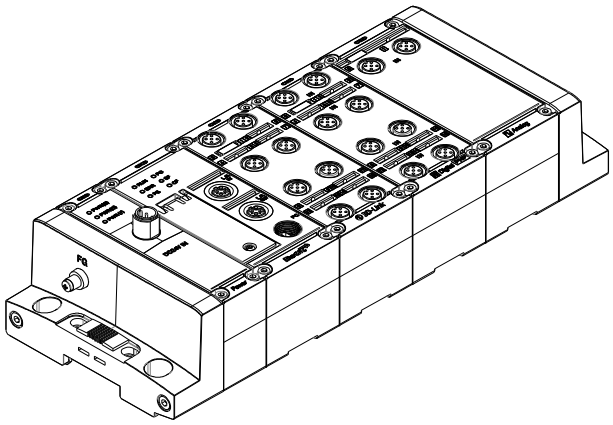
CKD

Remote I/O
RT Series

System Construction

INSTRUCTION MANUAL

SM-A46342-A/3



- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's "**RT Series**". This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- This product is intended to be used by persons with sufficient knowledge and experience in the following areas.
  CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training with respect to them.
  - Electricity (qualified electrician or equivalent)
  - The industrial network communications used
  - FA systems in general
  - Each of the systems that use manifold solenoid valves, IO-Link, etc.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them.
- Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.
- The PC software RTXTools
  CKD does not offer any warranties whatsoever regarding information provided in relation to this software. This includes any warranties regarding descriptions, accuracy, safety, marketability, and fitness for particular uses or purposes.
  CKD Corporation shall not be responsible for any damage arising from the software.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the pneumatic or water control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards and relevant laws and regulations, which include the following:

ISO4414, JIS B8370, JFPS2008 (the latest edition of each standard),
the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards, and relevant laws and regulations.

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ DANGER	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ WARNING	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ CAUTION	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ DANGER

Do not use the product for the following applications:

- Medical devices involved in sustaining or managing people's lives or physical health
- Mechanisms and mechanical devices used for the purpose of moving and transporting people
- Important safety parts for mechanical devices

⚠ WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications.

This product is intended for use in general industrial machinery, equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments.

- Use for applications where safety is required
- In applications for nuclear power, railroad systems, aviation, ships, vehicles, and medical equipment
- In applications for equipment that directly touches beverages or food
- For safety measures for amusement equipment, emergency shut-off circuits, press machines, or brake circuits
- Use for applications where life or assets could be significantly affected, and special safety measures are required

(An exception will be made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Never modify or additionally machine this product.

These may cause failure or malfunction. In addition, they are not covered by our warranty.

Do not handle the product or remove pipes and devices until safety is confirmed.

The product may operate in an unexpected way, causing injury to people or damage to equipment.

- Inspect and service the machine and devices only after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that has pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Observe the warnings and cautions on the following pages to prevent accidents.

⚠ CAUTION

Use the product in a specified manner.

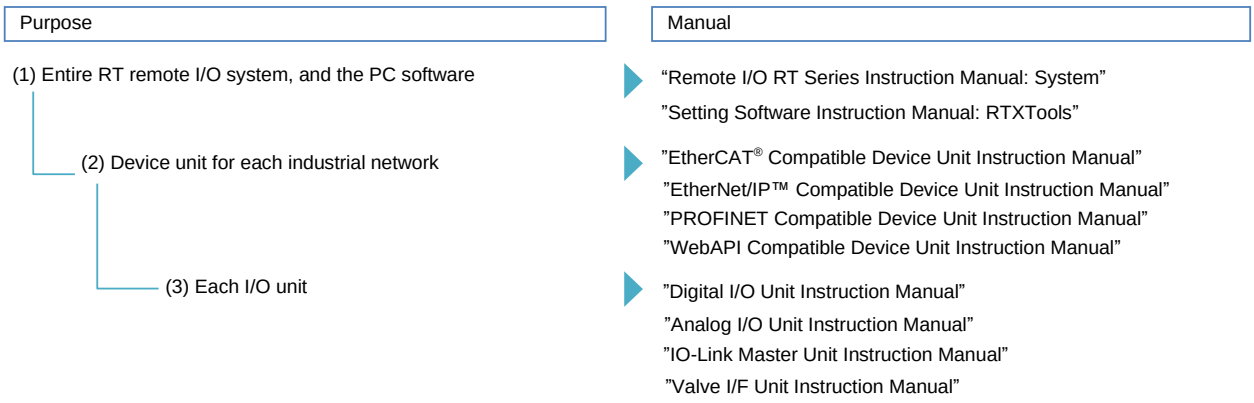
If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CONTENTS

INSTRUCTION MANUAL FOR THIS PRODUCT

The manuals related to the Remote I/O RT Series are separated by purpose as follows.
(1) Entire RT remote I/O system, and the PC software
(2) Device unit for each industrial network
(3) Each I/O unit

"Remote I/O RT Series Instruction Manual: System Construction" is mandatory. Other manuals are not mandatory but must be referred to according to the units used.



List of Related Instruction Manuals

Instruction Manual No.	Instruction Manual name	Description
SM-A46342-A	Remote I/O RT Series Instruction Manual: System Construction (this manual)	Instruction manual for the entire remote I/O RT Series system Includes explanations of the PC software RTXTools, the power supply unit RT-XP24A01N, and the End unit RT-XEE☐N00N.
SM-A90084-A	Setting software Instruction Manual: RTXTools	Instruction manual for RTXTools: setting software
SM-A46343-A	EtherCAT® Compatible Device unit Instruction Manual	Instruction manual for the EtherCAT compatible device unit RT-XTECN00N
SM-A71112-A	EtherNet/IP™ Compatible Device unit Instruction Manual	Instruction manual for the EtherNet/IP compatible device unit RT- XTENN00N
SM-A87934-A	PROFINET Compatible Device unit Instruction Manual	Instruction manual for the PROFINET compatible device unit RT-XTEPN00N
SM-A95119-A	WebAPI Compatible Device unit Instruction Manual	Instruction manual for the WebAPI compatible device unit RT-XTEAN00N
SM-A46344-A	IO-Link Master Unit Instruction Manual	Instruction manual for the IO-Link master unit RT-XLMSA08N
SM-A46345-A	Digital I/O Unit Instruction Manual	Instruction manual for the digital I/O unit RT-X☐DG☐☐☐☐
SM-A46347-A	Analog I/O Unit Instruction Manual	Instruction manual for the analog I/O unit RT-X☐AGA02N
SM-A46346-A	Valve I/F Unit Instruction Manual	Instruction manual for the valve I/F unit TVG☐P-TB-☐-KA1☐

Always read the instruction manual for each product connected to the remote I/O RT Series.
The product types that can be connected are:
- Upper master units in each industrial network (connected to a device unit)
- IO-Link devices (connected to the IO-Link master unit)
- Manifold solenoid valves (connected to the valve I/F unit)
- Other sensors/actuators (connected to a digital I/O unit, analog I/O unit, or IO-Link master unit)

	A video is available to show how to assemble the units, install the software, and how the LEDs blink. If necessary, refer to the video at the following URL RT product page: https://www.ckd.co.jp/kiki/en/product/detail/1064	

TERMS RELATED TO THE "SYSTEM CONSTRUCTION"

Term	Definition
Remote I/O system	Devices for industrial networks. As a communication unit, a device unit can be used with any combination of functional units; digital I/O, analog I/O, and IO-Link master units.
Entire remote I/O system	Refers to the remote I/O system's overall hardware configuration.
Configuration tool for upper masters	Configuration software for the industrial network for upper masters (e.g., PLCs). (For example, for EtherCAT, it refers to Sysmac Studio by Omron Corporation, TwinCAT by Beckhoff, etc.)
PC software	Refers to RTXTools, a piece of dedicated PC software for settings and checking the status of a remote I/O system. Use a commercially available USB cable to connect it to the device unit.
Device unit	In a remote I/O system, a unit that functions as an interface between an industrial network and each connected I/O unit.
EtherCAT compatible device unit	Device unit compatible with EtherCAT as an industrial network.
EtherNet/IP compatible device unit	Device unit compatible with EtherNet/IP as an industrial network.
Unit	Generic term for I/O unit, device unit, power supply unit, and End unit.
I/O unit	In a remote I/O system, a unit that is connected to a device unit and is something other than a power supply unit or End unit.
Fixed I/O unit	I/O unit with a fixed size assigned to the upper master. E.g.) Digital I/O unit, analog I/O unit, valve I/F unit
Variable I/O unit	I/O unit with a size assigned to the upper master that varies depending on the use. E.g.) IO-Link master unit
Digital I/O unit	In a remote I/O system, an I/O unit that functions as a digital input or output.
Analog I/O unit	In a remote I/O system, an I/O unit that functions as an analog input or output.
IO-Link master unit	In a remote I/O system, a unit that functions as an IO-Link master.
Valve I/F unit	In a remote I/O system, an I/O unit that functions as an interface with manifold solenoid valves.
Power supply unit	In a remote I/O system, a unit that functions as a supply power for the device unit and I/O units.
End unit	In a remote I/O system, a unit that is connected at the left or right end.
Input unit	Generic term for a digital input or analog input unit in a remote I/O system.
Output unit	Generic term for a digital output or analog output unit in a remote I/O system.
Input/output unit	In a remote I/O system, a generic term for a unit that performs digital input/output or analog input/output.
Connected I/O unit	Refers in particular to I/O units that are connected to a device unit to form a remote I/O system.
CH	Basic unit for counting connections to external devices (e.g. analog I/O units) that input and output numerical values.
Port	Basic unit for counting connections with communication functions, such as IO-Link communication.
Point	Basic unit for counting connections for bit information, such as digital I/O units and valve I/F unit.
CH/point/port number	Number of a CH/point/port in the I/O units.
Connector	Hardware connector. The shape and size are indicated. For example, M12.
Unit ID	Identifier that indicates the functional type of the unit. It is used during automatic recognition of the I/O units that make up the system, and for logging functions. Consists of eight hexadecimal digits. The digits consist of the following: Top 4 digits: unit type, bottom 4 digits: input data size or output data size.
Unit position number	Position number of the device units and I/O units in the remote I/O system. The device unit is 0. The numbers of the I/O units are as follows: - If the device unit is at the left end of the remote I/O system: The I/O unit directly connected to the device unit = 1, and the numbers increase from left to right - If the device unit is between groups of I/O units: The I/O unit at the left end of the remote I/O system = 1, and the numbers increase from left to right
Output power supply	Power supply to the external output device.
Unit/input power supply	Power supply for connected I/O units and external input devices.
Process data	In an industrial network, a generic term for data that is transmitted cyclically.
Error code	In the remote I/O system diagnostic information or CH/point/port diagnostic information, this displays a hexadecimal number as 8 bits (Note 1) or 16 bits (Note 2) when the corresponding bits are on. Note 1: For remote I/O system diagnostic information. Note 2: For unit diagnostic information or CH/point/port diagnostic information.

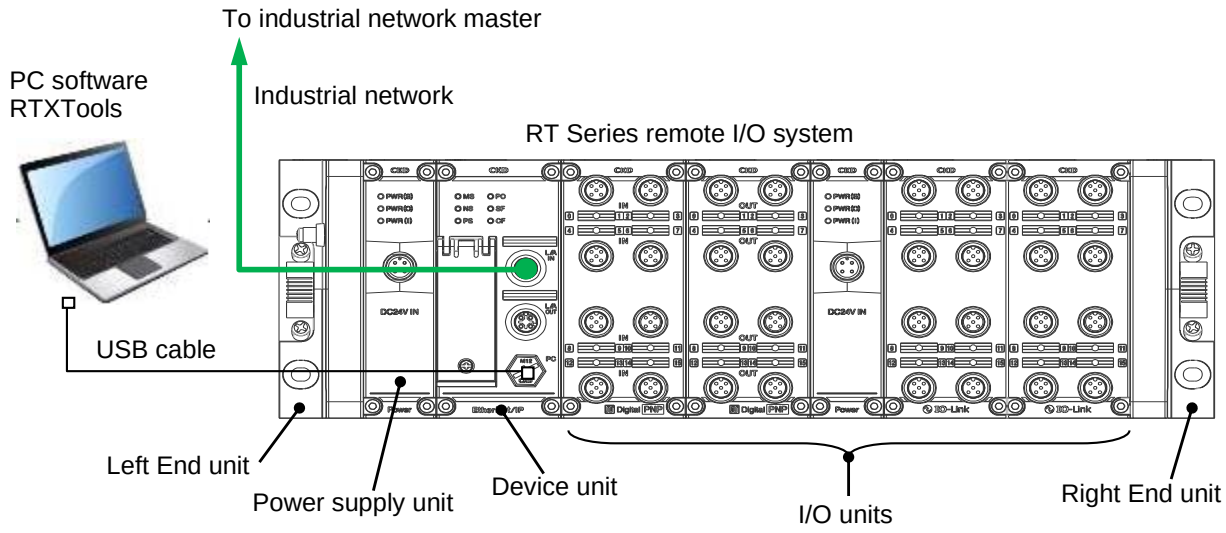
Term	Definition
Error log function	Function by which the device unit logs faults (errors) in itself or units connected to it. It logs the errors in its own non-volatile memory. A history of up to 255 errors can be stored. It is also possible to just log errors that meet specified conditions.
Error log filter function	Function for just logging errors that meet specified conditions.
Log filter function settings	In the device unit's error logging function, set which filters are enabled in the function for just logging specific errors.
Log filter (error type) settings	Set the error type to be filtered if log filter (error type) is enabled as a filter.
Log filter (unit ID) settings	Set the unit ID to be filtered if log filter (unit ID) is enabled as a filter.
Log filter (unit position number) settings	Set the unit position number to be filtered if log filter (unit position number) is enabled as a filter.
Log filter (CH/point/port number) settings	Set the CH/point/port number to be filtered if log filter (CH/point/port number) are enabled as a filter.
Error type	Type of the error (fault) recognized by the device unit. Used for remote I/O system diagnostic information and error logging functions. The types are: System error, hardware error, user operation waiting, power failure, unit output error, unit input error
Unit configuration error	Error that occurs if the device unit does not automatically recognize a connected I/O unit correctly when it is powered on, or if it detects a change in the number of connected I/O units during operation.
Remote I/O system diagnostic information function	Diagnostic information that indicates the types of errors occurring in the entire remote I/O system. The device unit's DIP switch SW8 setting is used to select whether to add it to the data sent to the master in cyclic communication.
CH/point/port diagnostic information	Diagnostic information for each CH/point/port of the unit. There are 16 bits per CH/point/port, and each bit corresponds to a different type of fault. If there is a fault, the function is 1 (on). The type of fault varies depending on the unit type.
Unit diagnostic information	Data obtained by OR-ing together all the CH/point/port diagnostic information (16 bits) for all CH/points/ports of the unit. If a fault is occurring, the value of the unit diagnostic information will be greater than 0.
Communication error operation setting	Function that determines whether the outputs of all I/O units (Note 1) will be kept or cleared when a communication error (industrial network communication or internal bus communication) occurs, or whether the behavior will follow the individual settings of the I/O units. Note 1: Refers to a digital output, valve I/F unit, IO-Link master unit (when in digital output mode), or analog output.
ON/OFF operation count monitoring function	Function by which the device unit reads and records all the count values of all connected units (digital I/O unit and valve I/F unit) that have an ON/OFF operation count function. The monitoring itself is performed by each I/O unit.
Analog input/output value byte order specification function	Function by which the device unit changes the byte order of the analog input/output values of connected analog I/O units according to the "analog value byte order" setting.
Forced setting function	Function to forcibly configure an I/O unit's input or output settings via the PC software.
Power monitoring function	Function by which the device unit monitors the respective voltages of the unit/input power and output power being supplied from the power supply unit closest to the device unit itself (on the left when facing it). In the event of an error, a unit/input or output power failure error will occur.
User operation waiting	Error that occurs if the system is not behaving as intended due to a setting change or error, and is restored by powering it off and on again.
Memory read/write error	Error that occurs if the various types of memory cannot be read from or written to, or the data that has been read is incorrect.
Factory setting error	Error that occurs if the device unit's serial number or MAC address is the initial value.
Initialized set memory	Error that occurs when the setting memory is initialized and the system started up while the device unit's DIP switch SW5 (initialize parameters on start-up) is off.

1. SYSTEM OVERVIEW

The remote I/O RT Series is a device for various industrial networks.
By attaching various types of units (such as digital I/O, analog I/O, IO-Link master) to a device unit for each network, the remote I/O RT Series can be connected to a master for various industrial networks.

If connecting the PC software (free of charge) to the device unit via USB, it is possible to check the information and status of the entire RT Series remote I/O system, and the settings and status of each unit.

The remote I/O system is controlled through an industrial network from external devices such as PLCs. Also, the devices are mounted inside or outside the equipment to make them more intelligent or require less wiring.
The control panel can be smaller by wiring the master and the remote I/O system with an industrial network and installing the remote I/O system outside the control panel.

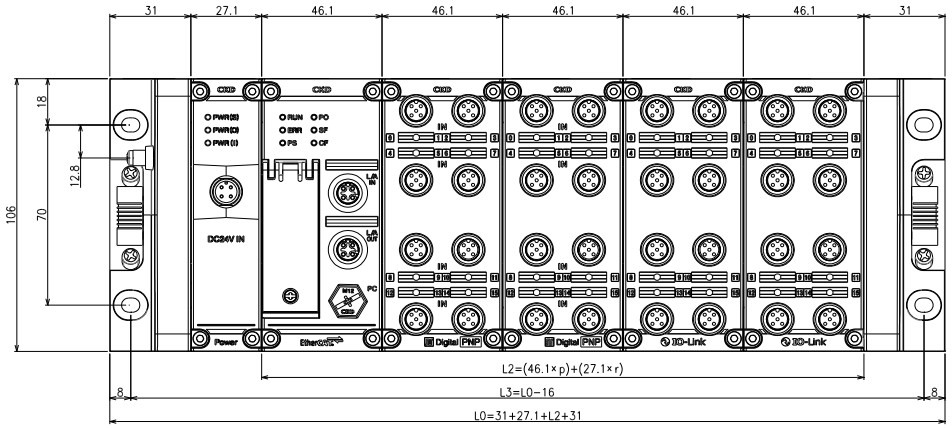


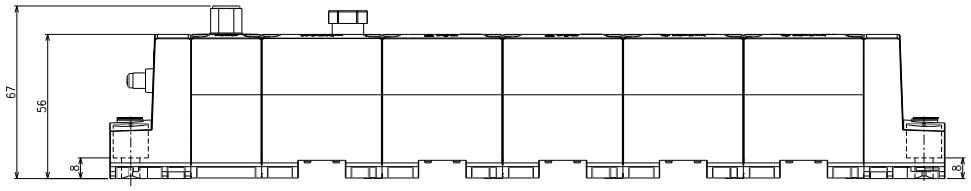
1.1 Features

Features include:

- Device unit that supports various industrial networks. (As of January 2023, EtherCAT and EtherNet/IP are supported.)
- One device unit and up to 17 I/O units can be connected to a remote I/O system.
- More power supply units can be added to suit the current consumption of the device unit, I/O unit, and external loads.
- Diagnostic information for the entire remote I/O system can be cyclically transmitted to an upper master via an industrial network.
- It is possible to specify what output operation to perform in the event of a communication error either for all the units together or separately for each one.
- The settings for the entire remote I/O system can be configured using industrial network communication or the PC software (free of charge).
- A device unit can log its own or connected I/O units' errors to its own non-volatile memory. In addition, it is possible to use the PC software to save the time series data to a file.
- An IO-Link master unit can be installed and IO-Link devices connected to it.
  Supports both IO-Link process data communication (cyclic communication) and ISDU communication (message communication).
  IO-Link port-to-port communication cycle times can be synchronized.
- Service data for the IO-Link devices can be accessed via the IO-Link master unit.
- Manifold solenoid valves can be fitted via the valve I/F unit.
- Various other monitoring functions are supported.
- Using the PC software, it is possible to check the information and status of the entire remote I/O system, and the settings, status, current values, etc. of each unit.

1.2 External Dimensions





Unit: mm
p = number of I/O units
r = number of power supply units

The total width of the remote I/O must be 922.5 mm or less.

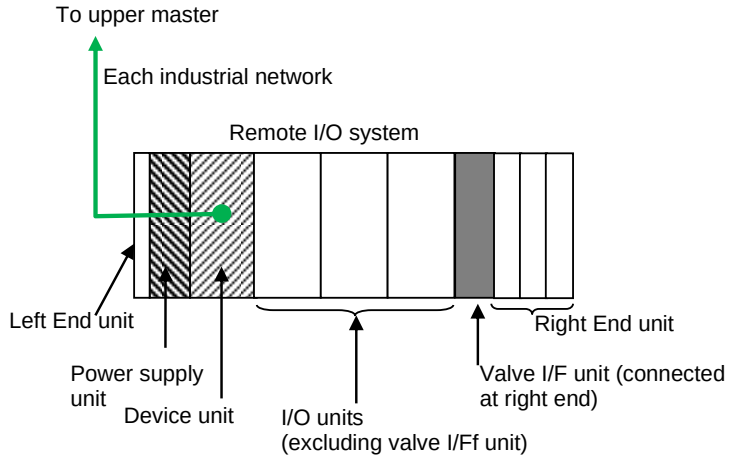
An example of a configuration with total width close to 922.5 mm is as follows:
E.g.)

Unit name	Quantity	Width (mm) per unit	Width (mm)
End unit (left end)	1	31	31
Power supply unit (e.g.: 1 unit)	1	27	27
Device unit	1	46.1	46.1
I/O unit	17	46.1	783.7
End unit (right end)	1	31	31
		Total	918.8

1.3 System Structure

1.3.1 System structure

E.g.)



Note: A right unit is required if a Valve I/F unit is not used.

The system consists of the following units:

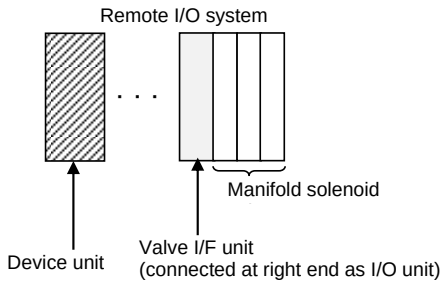
Unit type	Restrictions on the connection position in the remote I/O system	Restrictions on the number of units in the remote I/O system	
Left End unit	Left end of the remote I/O system.	1	The width of the entire remote I/O system must be 922.5 mm or less
Device unit	Connected on the right of the left End unit.	1	
Input unit	Located between the left End unit and valve IF unit (or right End unit).	A total of up to 17 (But a maximum of 1 valve I/F unit)	
Output unit			
Input/output unit			
IO-Link master unit			
Valve I/F unit (Note 1)	Always located on the right of the remote I/O system, together with any manifold solenoid valves. Note: Manifold solenoid valves can be connected to it.		
Power supply unit	Directly connected to the right of the left End unit Note: When adding more, they can be connected anywhere in the remote I/O system.	1 (required on the left) More can be added as required (No restrictions on the number of units that can be added, as long as the entire width stays within 922.5 mm)	
Right End unit	Right end of the remote I/O system.	1	

Note 1: CKD manifold solenoid valves can be connected on the right of valve I/F unit. One valve I/F unit itself can be connected. Also, a supply/exhaust block and End block R are connected on the right of the manifold solenoid valve.

1.3.2 Position of the device unit

The device unit can be placed either on the right or left of the I/O unit.

Note: However, the valve I/F unit must be at the right end of the remote I/O system.
Therefore, a valve I/F unit is the only kind of I/O unit that the device unit must be on the left of (see figure below).

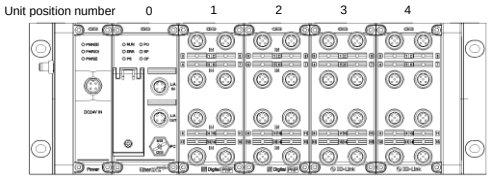
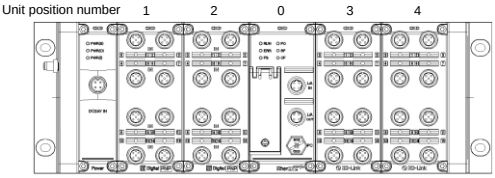


■ Unit position numbers

Unit position numbers are assigned to the device unit and I/O units (Note 1).

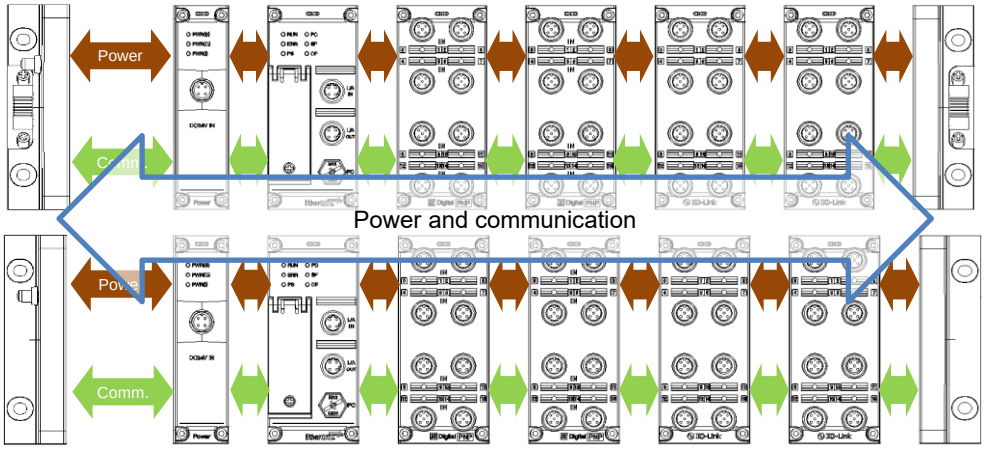
Note 1: This does not include the power supply units (left end and additional).

Since the maximum number of I/O units is 17, the unit position numbers are from 1 to 17 (device unit = 0).
The unit position numbers are as follows, depending on the position of the device unit:

Position of the device unit	Order of unit position numbers	Example of unit position numbers
On the left of all I/O units	The device unit = 0, and the designations continue in ascending order to the right	
On the right of a group of I/O units, or between groups of them	The device unit = 0, the I/O unit at the left end of the remote I/O system = 1, then the designations go in ascending order to the right	

■ Internal buses of the remote I/O system

In the remote I/O system, power and communication are both shared between the device unit and multiple I/O units via internal buses.



1.4 Component Devices of the System

1.4.1 List of units for the system

■ Device unit

Unit name	Model No.	Unit type	Main function	Connector style	Number of CH/points	Assigned I/O size	Polarity
EtherCAT compatible device unit	RT-XTECN00N	Device unit	EtherCAT	-	-	-	-
EtherNet/IP compatible device unit	RT-XTENN00N	Device unit	EtherNet/IP	-	-	-	
PROFINET compatible device unit	RT-XTEPN00N	Device unit	PROFINET	-	-	-	-
WebAPI compatible device unit	RT-XTEAN00N	Device unit	WebAPI	-	-	-	-

■ I/O units

There are fixed I/O units and a variable I/O unit.

Fixed I/O units

These are I/O units with a fixed size assigned to the upper master.

Unit name	Model No.	Unit type	Main function	Connector style	Number of CH/points	Assigned I/O size	Polarity
Digital I/O unit	RT-XADGA16A	Input	Digital	M12	16 points	2 bytes	PNP
	RT-XADGA16B				16 points	2 bytes	NPN
	RT-XADGB08A			M8	8 points	1 byte	PNP
	RT-XADGB08B				8 points	1 byte	NPN
	RT-XADGC32A			Push-in Terminal	32 points	4 bytes	PNP
	RT-XADGC32B				32 points	4 bytes	NPN
	RT-XBDGA16A	Output		M12	16 points	2 bytes	PNP
	RT-XBDGA16B				16 points	2 bytes	NPN
	RT-XBDGC32A			Push-in Terminal	32 points	4 bytes	PNP
	RT-XBDGC32B				32 points	4 bytes	NPN
Analog I/O unit	RT-XAAGA02N	Input	Analog	M12	2 CH	4 bytes	
	RT-XBAGA02N	Output			2 CH	4 bytes	
Valve I/F unit	TVG□P-TB-□-KA1D	Valve I/F	IP65/IP67 type	-	32 points	4 bytes	PNP
	TVG□P-TB-□-KA1C			-	32 points	4 bytes	NPN

Variable I/O unit

This is an I/O unit with a size assigned to the upper master that is not fixed, but varies depending on the devices connected.

Unit name	Model No.	Unit type	Main function	Connector style	Number of CH/points	Assigned I/O size	Polarity
IO-Link master unit	RT-XLMSA08N	IO-Link	IO-Link master	M12	8 ports	Variable (up to 64 bytes / up to 64 bytes) (Note 1)	-

Note 1: The default process data size per port is input 4 bytes / output 4 bytes.

■ Other units

Unit name	Model No.	Unit type	Main function		Connector style	Number of CH/points	Assigned I/O size	Polarity
Power supply unit	RT-XP24A01N	Power supply	24 V power input Supplies the following to inside the system - Unit/input: 24 VDC ±10%, 3 A - Output: 24 VDC +10%-5%, 3 A		M12	-	-	-
End unit	RT-XEELN00N	End (direct)	Direct screw mounting	Left end, FG ground	-	-	-	-
	RT-XEERN00N			Right end	-	-	-	-
	RT-XFELN00N	End (DIN)	DIN rail mounting	Left end, FG ground	-	-	-	-
	RT-XFERN00N			Right end	-	-	-	-

Reference: Structure of model Nos.

RT-X(1)(2)(3)(4)(5)

(1) : Unit type

Model No. (1)	Unit type	Description
T	Device unit	Unit for connecting to an industrial network
A	Input unit	Unit for performing input
B	Output unit	Unit for performing output
L	IO-Link master unit	Unit that functions as an IO-Link master
V	Valve I/F unit	Unit for connecting manifold solenoid valves to
E	End unit (Direct screw mounting)	Unit directly mounted with screws at the left or right end of the remote I/O system Note: If using RT-XVVB□□□□, this End unit must be used.
F	End unit (DIN rail mounting)	Unit mounted with a DIN rail at the left or right end of the remote I/O system Note: If using RT-XVVA□□□□, this End unit must be used.
P	Power supply unit	Unit that powers the units in the remote I/O system

(2) : Main function

Model No. (2)	Main function	Applicable unit types
EC	EtherCAT	For device unit
EN	EtherNet/IP	For device unit
EP	PROFINET	For device unit
EA	WebAPI	For device unit
DG	Digital	For input units or output units
AG	Analog	For input units or output units
MS	Master	For IO-Link master unit
VC	For TVG series	For valve I/F units
EL	Left end	For End units (direct screw or DIN rail mounting)
ER	Right end	For End units (direct screw or DIN rail mounting)
24	24 V power supply	For power supply unit

(3) : Connector style

Model No. (3)	Connector style	Applicable unit types
A	M12	For digital input units, digital output units, analog input units, analog output units, IO-Link master unit, and power supply unit
B	M8	For digital input units
O	Push-in Terminal	For digital input units and digital output units
N	No connector specified	For device unit

(4) : Number of CH/points

Model No. (4)	Number of CH/points	Applicable unit types
01	1 CH/point	For power supply unit
02	2 CH/points	For analog input unit and analog output unit
08	8 CH/points	For digital input unit (M8 type only) and IO-Link master unit
16	16 CH/points	For digital input unit (M12 type only) and digital output unit
32	32 points	For valve I/F unit, digital input unit and digital output unit
00	Number of CH/points cannot be specified	For device unit and End units

(5) : Polarity

Model No. (5)	Polarity	Applicable unit types
A	PNP	For digital input units and digital output units
B	NPN	For digital input units and digital output units
N	Polarity cannot be specified	For analog input units, analog output units, IO-Link master units, power supply units, and End units

1.4.2 Related software

Software name	Function	How to get
PC software RTXTools	Use it by connecting the PC to the USB port (micro-B) on the device unit with a commercially available USB cable. The main functions include: - Settings - Monitoring current values - Maintenance Refer to "9. PC SOFTWARE(RTXTools) OPERATION" for more information.	Download the installer from the CKD website below product page:: https://www.ckd.co.jp/kiki/en/product/detail/1064
Remote I/O System Dedicated Profile	A profile for the remote I/O system, in accordance with the industrial network used. E.g.) ESI file: Use it by importing it into the EtherCAT master's configuration tool.	Download it from the CKD website below RT product page:: https://www.ckd.co.jp/kiki/en/product/detail/1064

1.4.3 Accessory list

■ Parts that need to be provided by the user

Name	Specifications	Recommended
Power cable (For power supply unit)	Cable with M12 socket round connector, 4-core, for DC, straight to open-end-cable	XS2F-D421-☐8☐-☐ made by OMRON Corporation
I/O cable (For digital input unit)	Cable with M8 plug round connector, 3-core, for DC, straight to open-end-cable	XS3H-M321-☐ made by OMRON Corporation
I/O cable	Cable with M12 plug round connector, 4-core, for DC, straight to open-end-cable	XS2H-D421-☐ made by OMRON Corporation
Communication cable (For device unit)	Cable with M12 plug round connector, 4-core, for DC, straight to RJ45	XS5W-T421-☐MC-K made by OMRON Corporation
	Cable with M12 plug round connector, 4-core, for DC, straight to open-end-cable	XS5H-T421-☐M0-K made by OMRON Corporation
USB cable for configuring settings (commercial product) (For the PC software)	USB (A) male 〈=〉 USB (micro-B) male Length: 1.0 m	-
Mounting screws	Required for direct screw mounting M5 x 4 pcs Length 20 mm or more	-

■ Standard accessories

Name	Specifications	Model No. (Can also be purchased from CKD)
Waterproof cap for device unit's USB connector	One is included with a device unit as a standard accessory	RT-CM12
Tie rod	Two dedicated tie rods are included with a power supply unit as a standard accessory	RT-TR-P
	Two tie rods are included with each of the following as a standard accessory: Device unit, digital I/O unit, analog I/unit, and IO-Link master unit	RT-TR-1
	Two dedicated tie rods are included with a right End unit as a standard accessory	RT-TR-E
Hexagon socket head bolt for tightening tie rods	Two hexagon socket head bolts (M4 x 20) for tightening tie rods are included with a left End unit as a standard accessory	-

■ Parts that can be purchased from CKD

The following optional parts can be purchased:

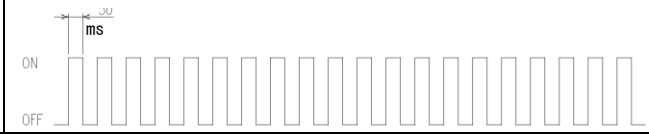
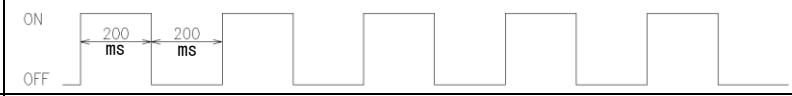
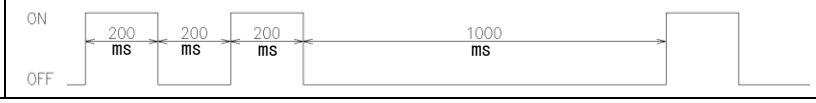
Name		Model No.	Specifications
Auxiliary bracket	Direct screw mounting	RT-SPE	- Attach to the unit with two M3 x 6 screws - Direct screw mounting using two M5 hexagon socket head bolts One is required for every four units, including the device unit
Waterproof cap	For M12 connectors	RT-CM12	Applicable units: Device unit, digital I/O unit (M12 connector style), analog I/O unit, and IO-Link master unit Can achieve the following degree of protection: IP65/IP67
	For M8 connectors	RT-CM8	Applicable unit: M8 connector style on a digital input unit Can achieve the following degree of protection: IP65/IP67
Nameplate		RT-NP	Small resin plate for attaching to a connector face For all units

1.5 System Specifications

Item	Description
Working temperature range	-10°C to +55°C
Ambient atmosphere	No corrosive gases or heavy dust
Degree of protection	IP65/IP67
Communication specifications	Depend on the device unit
Number of device unit that can be connected	1
Number of power supply units that can be connected	1 required. More can be added according to the required current consumption. No limit on the number of power supply units, provided no more are connected than the hardware limit allows.
Number of I/O units that can be connected	1 to 17 units
Number of hard connectable units	The width of the entire remote I/O system must not exceed 922.5 mm
Mounting method	Either direct screw mounting or DIN rail mounting.
Reset method	By powering off the 24 V unit/input power and 24 V output power to the power supply unit, then powering them on again.

■ LED blinking statuses

The blinking statuses of the LEDs on the front of the remote I/O system's units are as follows for all units:

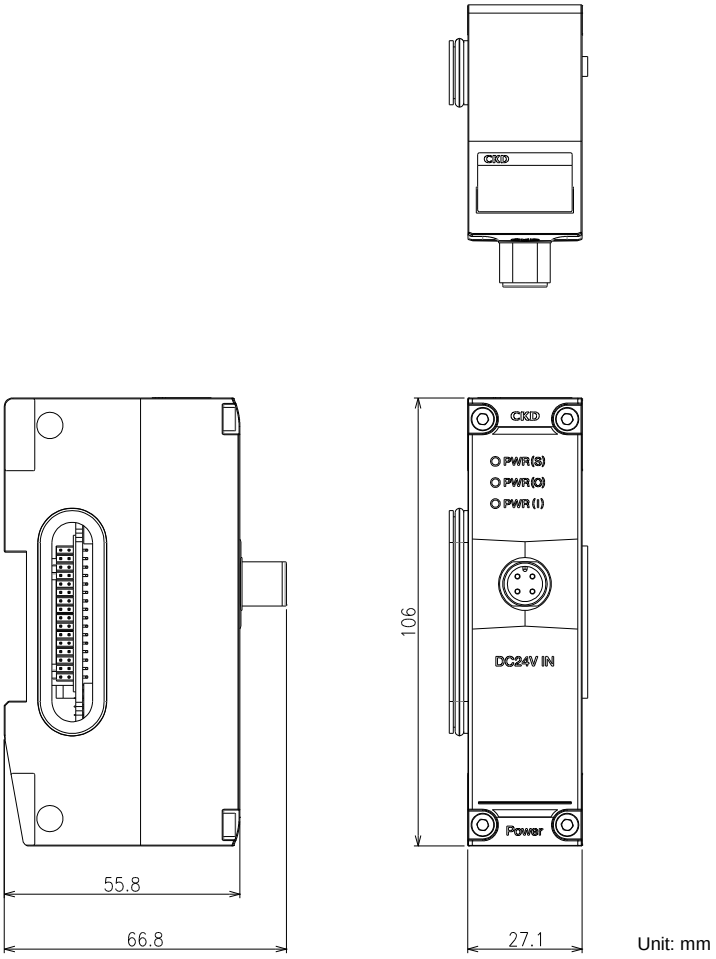
Blinking status	Blinking timing
Blinking (fast)	
Blinking (slow)	
Blinking (once)	
Blinking (twice)	

A video is available to show how the LEDs actually blink. If necessary, refer to the video at the following URL

RT product page:
https://www.ckd.co.jp/kiki/en/product/detail/1064

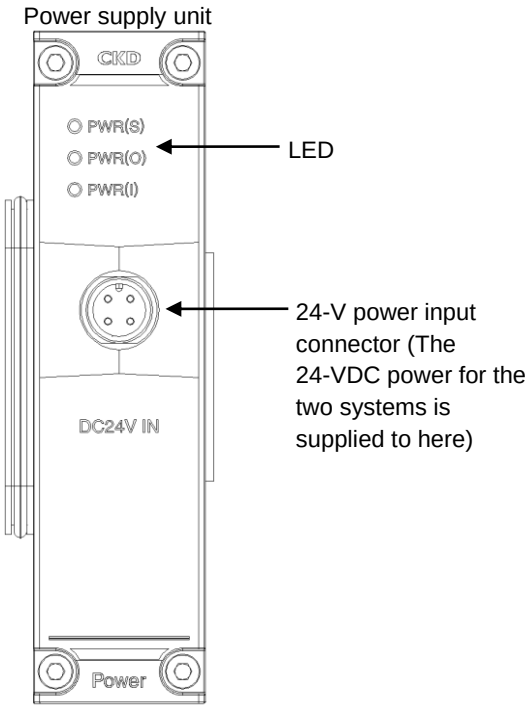
1.6 Power Supply Unit

1.6.1 External dimensions



Unit: mm

1.6.2 Names and functions of each part



■ LED

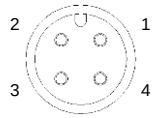
Specification list

Name	Description
PWR(S)	Indicates the status of the unit/input 24 V.
PWR(O)	Indicates the status of the output 24 V.
PWR(I)	Indicates the status of the internal 5 V.

Status list

Name	Status	Meaning
PWR(S)	Off	Unit/input 24 V is off, or there is a supply fault
	Green on	Normal supply to the internal bus for the unit/input 24 V
PWR(O)	Off	Output 24 V is off, or there is a supply fault
	Green on	Normal supply to the internal bus for the output 24 V
PWR(I)	Off	Internal 5 V is off, or there is a supply fault
	Green on	Normal supply to the internal bus for the internal 5 V

■ 24 V power input connector

M12 (A) 4-pin male	Pin number	Description
	1	Unit/input 24 V (+)
	2	Output 24 V (+)
	3	Unit/input 24 V (-)
	4	Output 24 V (-)

For the power's 24 V input connector, purchase a cable or connector that satisfies the specifications.
Compatible specifications: M12 plug (male), 4-core, for DC

■ Recommended power cable

Product name	Specifications	Number of cores	Cable extraction method	Manufacturer	OMRON Corporation model No.
XS2F cable with round connector on one end	M12 socket to open-end-cable, for DC	4 cores	Straight to open-end-cable	OMRON Corporation	XS2F-D421-☐8☐-☐

The unit/input 24 VDC power and output 24 VDC power can also be supplied in parallel from the same 24 V power (power supply unit).

1.6.3 Unit specifications

<table>
<tr><th colspan="3">Item</th><th>Description</th></tr>
<tr><td colspan="2">Type</td><td></td><td>Power supply unit</td></tr>
<tr><td rowspan="4">Input specifications</td><td colspan="2">Input connector</td><td>M12 (A) 4-pin male</td></tr>
<tr><td rowspan="2">External power supply</td><td>Unit/input</td><td>24 VDC ±10%, Class 2, 3 A</td></tr>
<tr><td>Output</td><td>24 VDC +10%-5%, Class 2, 3 A</td></tr>
<tr><td colspan="2">Protection functions</td><td><table><tr><th>Degree of protection</th><th>Power line</th></tr><tr><td>Short circuit protection</td><td>Yes</td></tr><tr><td>Overcurrent protection</td><td>Yes</td></tr><tr><td>Overvoltage protection</td><td>Yes</td></tr><tr><td>Reverse connection protection</td><td>Yes</td></tr></table></td></tr>
<tr><td colspan="3">Units the power is supplied to</td><td>Units on the right of the power supply unit when facing it (up to the I/O unit on the left of any additional power supply units)
Note: For information on how to calculate the supplied power, see "1.6.4 How to calculate the supplied power".</td></tr>
<tr><td colspan="3">LED</td><td>3 (PWR(S), PWR(O), PWR(I))</td></tr>
<tr><td colspan="3">Working temperature range</td><td>-10°C to 55°C</td></tr>
<tr><td colspan="3">Relative humidity</td><td>30% to 85% RH</td></tr>
<tr><td colspan="3">Ambient atmosphere</td><td>No corrosive gases or heavy dust</td></tr>
<tr><td colspan="3">Installation location</td><td>Indoor use</td></tr>
<tr><td colspan="3">Altitude</td><td>Up to 2000 m</td></tr>
<tr><td colspan="3">Pollution degree</td><td>3</td></tr>
<tr><td colspan="3">Degree of protection</td><td>I IP65/IP67</td></tr>
<tr><td colspan="3">Size (W x H x D)</td><td>27.1 × 106 × 55.8 (mm)</td></tr>
<tr><td colspan="3">Net weight</td><td>Approx. 125 g (including two tie rods for power supply unit)</td></tr>
<tr><td colspan="3">Standard accessories</td><td>Two tie rods for power supply unit (RT-TR-P)</td></tr>
</table>

Note 1: IP65/IP67 is not part of the UL certification.

1.6.4 How to calculate the supplied power

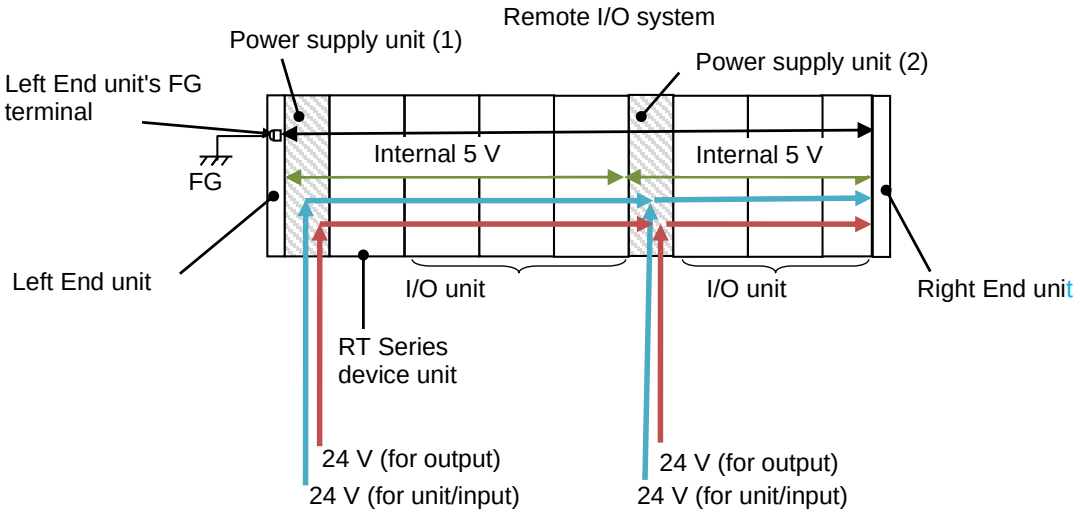
The power supply unit supplies 24 VDC power to two systems:
- Unit/input 24 VDC power
- Output 24 VDC power

Based on this, the power supply unit powers to the following units via an internal bus:
- Unit power supply for the device unit and connected I/O units (internal 5 V)
- Each unit's external input devices
- Each unit's external output devices

The power supply unit powers the device unit and I/O unit connected on its right (when facing it).
It powers the I/O unit between itself and the End unit or a second power supply unit.

An additional power supply unit will similarly power the I/O unit connected on its right.
It will power the I/O unit between itself and the End unit or a third power supply unit.
The same will apply to a fourth and any subsequent ones.

There is no limit on the number of power supply units (as long as the width of the entire remote I/O system stays within 922.5 mm or less).



Calculate the following total, then add power supply units so that the unit/input 24 VDC power and output 24 VDC power are each less than 3 A (Note 1).

Note 1: It is recommended selecting a capacity that is at least approximately 1.6 times the calculated value, taking into account the efficiency of the power supply and inrush currents that may occur when external connected devices are switched on or off.

1) Unit/input power supply:
   - Unit current consumption of the device unit and each I/O unit itself
   - Input current x number of points used
   - Current consumption of external input devices

2) Output power supply:
   - Current consumption of external output devices

Note: The above-mentioned unit/input power and output power can also be supplied from the same external power source.

■ Calculating the current consumption

Calculate the current consumption of each unit, then calculate the number of power supply units and the current consumption of the power supplied to each power supply unit.

E.g.) One power supply unit

Unit type (example)	Model No. (example)	Current consumption per unit (in mA)			
		Unit/input power supply		Output power supply	
		Internal	External	Internal	External
Left End unit	RT-XEELN00N	-	-	-	-
Power supply unit (Supplying the following units with unit/input power and output power)	RT-XP24A01N	-	-	-	-
EtherCAT compatible device unit	RT-XTECN00N	100		20	-
Digital input unit	RT-XADGA16A	110	E.g.) 100 mA x 8 connectors: 800	-	-
Digital output unit	RT-XBDGA16A	20	-	45	E.g.) 700
IO-Link master unit (When all connectors are in IO-Link mode)	RT-XLMSA08N	100	E.g.) If 8 of CKD's FSM3 units are connected: 360	-	-
Right End unit	RT-XEERN00N	—	—	—	—
Total	—	330	—	65	E.g.）700

* In the above example, current consumption of less than 1 mA is indicated by "-" and is excluded from the calculation.

E.g.) Two power supply units

Unit type (example)		Model No. (example)	Current consumption per unit (in mA)			
			Unit/input power supply		Output power supply	
			Internal	External	Internal	External
Left End unit		RT-XEELN00N	-	-	-	-
Power supply unit (1)	Power supply unit (Supplying the following units with unit/input power and output power)		-	-	-	-
	EtherCAT compatible device unit	RT-XTECN00N	100		20	-
	IO-Link master unit	RT-XLMSA08N	100	E.g.) If 8 of CKD's FSM3 units are connected: 360	-	-
	IO-Link master unit	RT-XLMSA08N	100	E.g.) If 8 of CKD's FSM3 units are connected: 360	-	-
	IO-Link master unit (When all connectors are in IO-Link mode)	RT-XLMSA08N	100	E.g.) If 8 of CKD's FSM3 units are connected: 360	-	-
Power supply unit (2)	Power supply unit (Supplying the following units with unit/input power and output power)	RT-XP24A01N	-	-	-	-
	IO-Link master unit (When all connectors are in digital input mode)	RT-XLMSA08N	100	E.g.) 800 (100 x 8 connectors)	-	-
	IO-Link master unit (When all connectors are in digital output mode)	RT-XLMSA08N	100	E.g.) 800 (100 x 8 connectors)	-	-
	Valve I/F unit	TVG□P-TB-□-KA1D			75	E.g.) 800
Total		—	615	—	95	E.g.) 800

* In the above example, current consumption of less than 1 mA is indicated by "-" and is excluded from the calculation.

1.6.5 Power supply when multiple power supply units are used

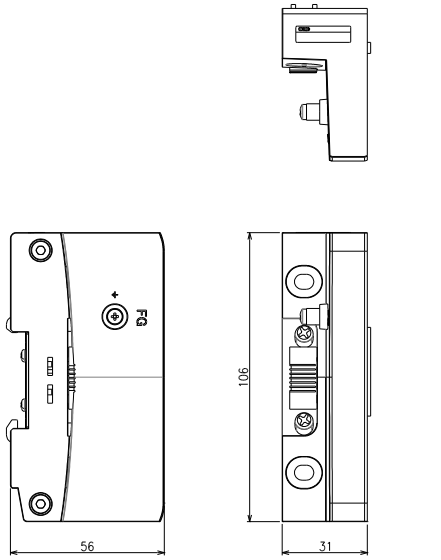
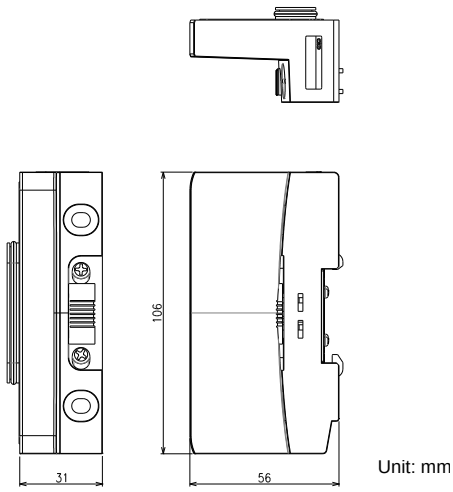
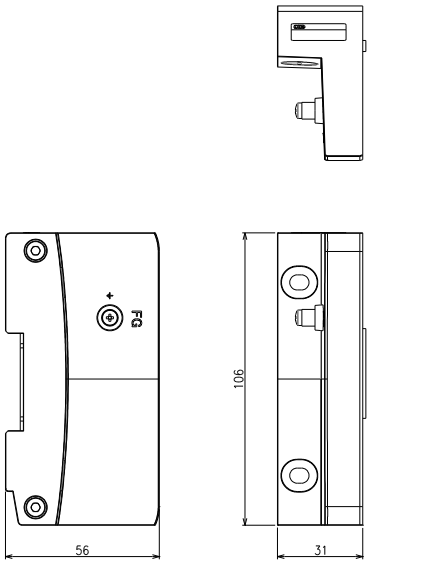
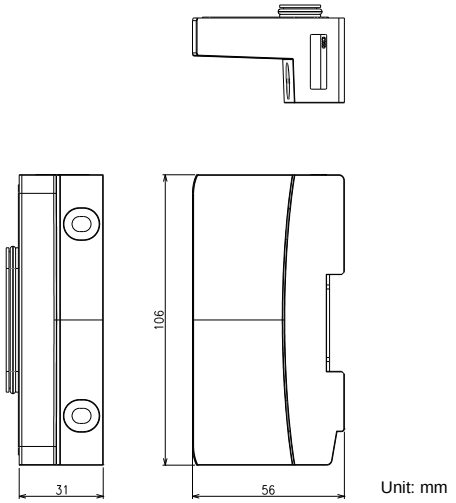
If using more than one power supply unit, power all of them on at the same time (within 3 seconds of each other).

If the power supply units are powered on 3 or more seconds apart (Note 1), a "unit configuration error" may occur.

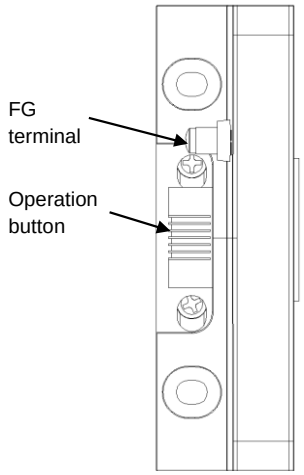
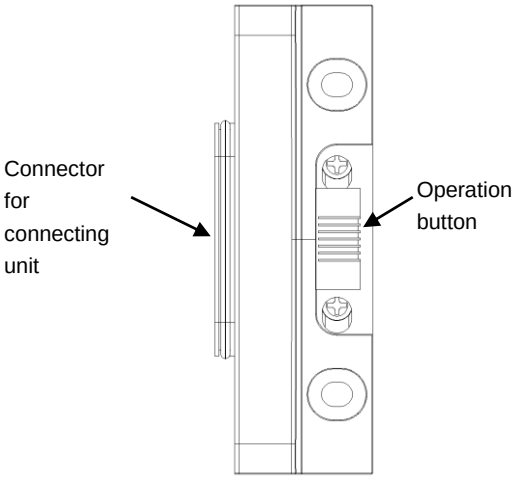
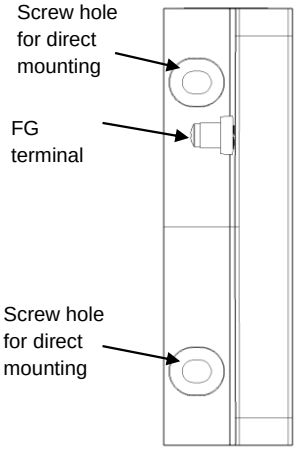
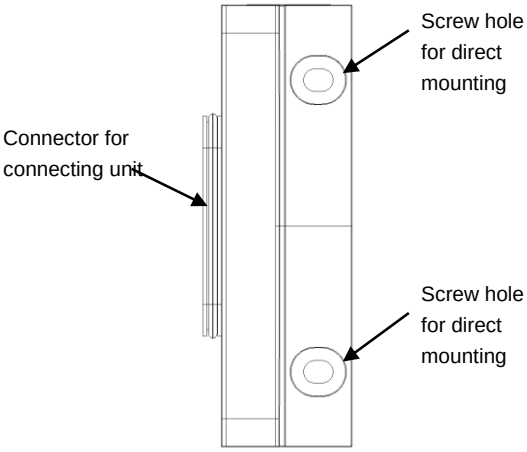
Note 1: With an EtherCAT compatible device unit, the ERR LED will blink red and the SF LED will blink yellow (fast). When this happens, EtherCAT communication will be stopped.

1.7 End Units

1.7.1 External dimensions

Mounting method	Left End	Right End (not required when using a valve I/F unit)
DIN rail mounting	 Unit: mm	 Unit: mm
Direct screw mounting	 Unit: mm	 Unit: mm

1.7.2 Names and functions of each part

Mounting method	Left End	Right End (not required when using a valve I/F unit)
DIN rail mounting		
Direct screw mounting		

1.7.3 Unit specifications

Item	Description	
Type	The following four types: - DIN rail mounting / left End (not required when using a valve I/F unit) - DIN rail mounting / right End - Direct screw mounting / left End - Direct screw mounting / right End (not required when using a valve I/F unit)	
Working temperature range	-10°C to 55°C	
Relative humidity	30% to 85% RH	
Ambient atmosphere	No corrosive gases or heavy dust	
Installation location	Indoor use	
Altitude	Up to 2000 m	
Pollution degree	3	
Degree of protection	IP65/IP67	
FG terminal	Left End units (for DIN rail mounting or direct screw mounting) only	
Size (W x H x D)	31 x 106 x 56 (mm)	
Mass	DIN rail mounting	Approx. 140 g (left end) Approx. 165 g (right end)
	Direct screw mounting	Approx. 160 g (left end) Approx. 165 g (right end)
Standard accessories	- Left End unit: 2 hexagon socket head bolts (M4 x 20) for tightening tie rods - Right End unit: 2 dedicated tie rods (RT-TR-E)	

Note 1: IP65/IP67 is not part of the UL certification.

Note 2: . FG terminal is a terminal to increase noise resistance. The mark indication is as shown on the right. 

2. DESIGN

⚠WARNING

Safety measures must be taken to ensure that the entire system will operate on the safe side even if there is a communication error between the product and the upper masters in the industrial network.

Abnormal operation may lead to serious injury.

Do not use the product as an interlock.

Doing so may lead to accidents caused by malfunctions.

⚠CAUTION

Only use it with a good understanding of how each unit will behave if there is a fault.

Each unit's instruction manual describes how it will behave if there is a fault.

When using a variable I/O unit (e.g.: IO-Link master unit), for the size of the basic unit of communication on the upper master side (e.g.: a PDO in the case of EtherCAT), set a suitable value in accordance with the external devices that are connected.

It will not be possible to correctly read from or write to the external devices connected to the variable I/O unit if one of them is larger than the size set for the variable I/O unit.

Therefore, configure the following two settings in accordance with the connected external devices:

- Variable I/O unit's size setting
- Size of the basic unit of communication on the upper master side (e.g.: a PDO in the case of EtherCAT)

When using variable I/O units, adjust the settings so that the process data size per variable I/O unit is an even number.

If the input and/or output process data size per variable I/O unit (e.g. IO-Link master unit) is an odd bytes, adjust the settings of the variable I/O unit so that the input and output process data size is an even bytes. If the process data size is an odd number, it may become an unintended I/O status.

Before using the device unit, thoroughly read and understand the instruction manual for the industrial network communication system used.

The product may operate in an unexpected way, causing injury to people or damage to equipment.

Before use, thoroughly check the settings on the upper master side.

Inappropriate settings on the upper master side can cause the I/O units to malfunction.

For information about programming in general and in relation to communication protocols for industrial networks, refer to the manuals by the manufacturers of the PLCs used.

If integrating the product into other equipment or devices, take thorough measures to protect against noise, including installing a noise filter, etc.

Interference by noise may lead to malfunction.

Do not directly drive loads for which surge voltages occur.

It may damage the product.

If the conditions for CE marking immunity needs to be met, take measures to protect against lightning surges on the equipment side.

The product does not have resistance corresponding to CE marking lightning surge immunity.

3. INSTRUCTIONS FOR USE

Instructions		Reference
Prior checking	Check the remote I/O configuration.	"1.3 System "
	Check the power supply units' current consumption (related to: the number of power supply units used).	"1.6.4 How to calculate the supplied power"
	Decide whether to use remote I/O diagnostic information (related to: the device unit's DIP switch SW8).	"8.1 Remote I/O System Diagnostic Information Function"
	Check if a variable I/O unit (e.g., IO-Link master unit) is present among the I/O units.	"1.4.1 List of units for the system"
	Decide whether to use direct screw mounting or DIN rail mounting for the remote I/O system.	"4.1.4 Installation"
	Check the parts required for assembly and installation (tie rods, auxiliary bracket).	"4.1.3 Assembly" "4.1.4 Installation"
	If there are any variable I/O units (e.g.: IO-Link master unit), check the sizes of the parts of them that are variable. (E.g.: For an IO-Link master unit, this means the sizes of each output and input of the connected IO-Link devices for the ports used as IO-Link mode)	"7. I/O ASSIGNMENT"
	- Check the remote I/O's PDO communication I/O size and assignment information. - Design the assignment variables (arrays, structures, etc.) on the industrial network master side.	
	Decide what the output operation will be in the event of a communication error. (Related to: the device unit's DIP switches SW3 and SW4, and each unit's settings.)	"8.4 Function for output settings in the event of a communication error "
↓	↓	-
Hardware mounting, wiring, and setup	Mount the industrial network master.	Manual for each industrial network master
	↓	-
	- Assemble the remote I/O. - Mount the remote I/O (DIN rail mounting or direct screw mounting).	"4.1 Installation"
	↓	-
	Wire the industrial network communication cables to the device unit.	"4.2 Wiring"
	↓	
	- Wire the 24 V power supply to the power supply units. - Wire the FG for the left End unit.	
	↓	
	Wire each external I/O to the I/O units. Note: For an IO-Link master unit, IO-Link devices must also be connected.	
	↓	-
	Set the following switches on the device unit: - DIP switches: Whether there will be diagnostic information; operation in the event of a communication error; etc. - Rotary switches: Node addresses for industrial network	Instruction manual for each device unit
↓	↓	-
Setup on the industrial network master side	In the master-side configuration tool, install the product's profile information for each industrial network.	"10.3 Operations in the Master-Side Configuration Tool"
	↓	
	Register the product (Note 1) in the master-side configuration tool. Note 1: For some industrial networks, the I/O units' module configuration is also registered.	

Instructions		Reference
Setup on the industry network master side (cont.)	↓	-
	In the master-side configuration tool, set the following: - Add the product to the industrial network system. - Set the module configuration (I/O unit configuration). - A basic unit of communication for the industrial network used will have been generated from its dedicated profile. Edit the basic unit based on the assignment of the variable I/O units (e.g.: IO-Link master unit). Note: When using variable I/O units, it is mandatory to manually set the I/O size for their cyclic communication in the master-side configuration tool.	"7. I/O ASSIGNMENT"
	↓	-
	The settings* from the master-side configuration tool will be downloaded to the remote I/O. Note: For some industrial networks, this will include the I/O units' module configuration.	"10.3 Operations in the Master-Side Configuration Tool"
	↓	-
	- For cyclic communication: Assign a basic unit of communication (e.g.: a PDO in the case of EtherCAT) in the master-side configuration tool. Create master-side variables for cyclic communication with the remote I/O. - For message communication: Create a communication program.	Manual for each industrial network master
↓	↓	-
Checking remote I/O's settings and status	Supply 24 V power to the power supply units Note: If there is more than one power supply unit, power them all on within 3 seconds.	"1.6.5 Power supply when multiple power supply units are used" "5. POWERING UP"
	↓	-
	Set up the remote I/O.	"6. SETTINGS"
	● If setting up from the PC software	"9. PC SOFTWARE(RTXTools "
	Connect the PC software to the device unit with a USB cable.	
	↓	
	Check the configuration of the actual remote I/O using the PC software.	
	↓	
	Set up the configuration of the actual remote I/O using the PC software.	
	↓	
	Set up the device unit and each I/O unit using the PC software. Note: For variable I/O units in particular, the input/output size must be set to an appropriate value. The power must be turned off and on again when the I/O size is changed via the PC software or upper message communication.	
	● If setting via message communication from the upper master	Manual for each industrial network master Instruction manual for each device unit
	Create a program to specify the index (address) of each setting and to perform a write operation via a communication command from the upper master.	
	↓	-
	(If necessary) Check the output wiring, depending on the forced output setting from the PC software.	"9.6.5 "Forced I/O SETS" tab"
↓	↓	-
Checking industrial network communication, and start control from the upper master	Check the industrial network communication (e.g.: check the LEDs on the upper master and device unit).	Manual for each industrial network master
	↓	
	Check that data is read from and written to the remote I/O via cyclic communication from the industrial network master.	
	↓	
	(If necessary) Check that data is read from and written to the remote I/O via message communication. Note: The power must be turned off and on again when the I/O size is changed via the PC software or upper message communication.	

4. INSTALLATION AND WIRING

⚠CAUTION

Do not connect energized external devices to the product when it is not energized itself.
It may cause malfunction or failure.

4.1 Installation

⚠CAUTION

Do not remove the nameplate.
It may cause malfunction or failure due to incorrect adjustments, mistakes during maintenance and inspections, or using the wrong instruction manual.
It may also lead to non-compliance with safety standards.

Do not subject it to excessive impacts due to dropping or vibrations.
The product may get damaged or malfunction.

4.1.1 Degree of protection

⚠WARNING

Consider the required degree of protection.
The degree of protection for the entire remote I/O system will be IP65/IP67.

The product must be used under the following conditions in order to achieve a degree of protection of IP65 or IP67:

- The product and external devices must be wired up correctly using cables with M12 or M8 connectors.
- Put waterproof caps on unused connectors. If it is going to be used in an environment where it will constantly be exposed to water, take measures to protect it, such as putting covers over it.
- If the degree of protection is IP65, avoid using the product in situations where the units will constantly be directly exposed to water droplets or cutting oil.

4.1.2 Installation environment

⚠WARNING

Do not use it in an atmosphere that contains flammable or explosive gases.
It may cause a fire or explosion. The product is not explosion-proof.

Take adequate shielding measures if using it in a place:

- Where noise is generated from static electricity, etc.
- Where there are strong electric fields
- Where power lines pass nearby

Inadequate measures may result in malfunction or failure.
Also, check the effectiveness of the shielding measures after integrating the product into the individual devices and equipment.

⚠ CAUTION

Avoid using it in ambient temperatures that are outside the specified range.
It may cause malfunction or failure.

Install it in a place:

- Where it will not be exposed to direct sunlight
- Where it will not be affected by dust or things that generate heat
- Where it will not be subjected to vibrations or impacts
- Where it will not be subjected to radiant heat from nearby heat sources
- Where there is no cyclic variation in temperature
- Where no dust, wiring debris, or other foreign objects will get inside it
- Where there are no corrosive gases
- Where it will not be exposed to liquids

Failure to do so may lead to malfunction or failure.

Do not install or use the product underwater or in a place where it will constantly be exposed to water or oil.
It may lead to electrical leakage or fire. Oil drops and oil mist are also strictly prohibited.

Do not use it in places where there are sources of surge voltages or surge currents.
If there is any equipment or devices (such as motors) that produce large surge voltages or surge currents near the units, their internal circuit can degrade or get destroyed.

4.1.3 Assembly

⚠ WARNING

Do not touch the connectors or gaskets for connecting them to others when handling units.
It may cause malfunction of failure.

⚠ CAUTION

Use tie rods to connect units together.
Failure to use an appropriate number of tie rods with an appropriate model No., having loose hexagon socket head bolts (M4 x 20) at the left end, or not using any tie rods at all may result in the following trouble:

- Poor electrical connections between units
- Failure to achieve the right degree of protection
- Products falling or otherwise getting damaged (when an external force is applied)

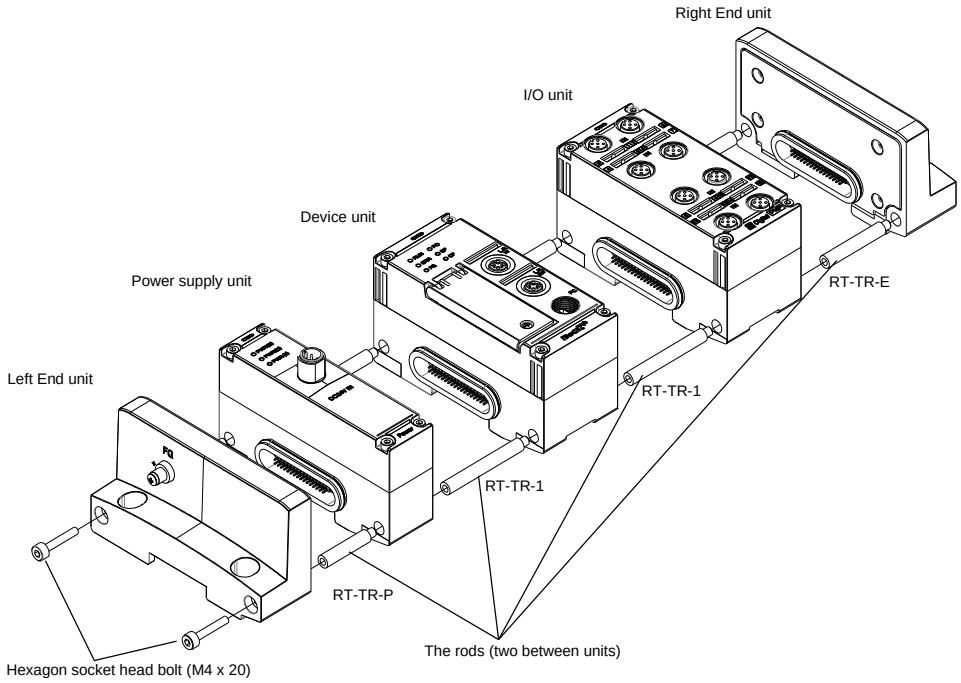
Tighten the hexagon socket bolts and tie rods together according to the specified tightening torque when connecting units together by direct screw mounting.
Tightening beyond the specified torque range may damage the units or hexagon socket head bolts. If the tightening torque is different from the specified value, the product will not comply with IP65/IP67.

Be careful not to get your fingers caught when connecting units together.
It may cause injury.

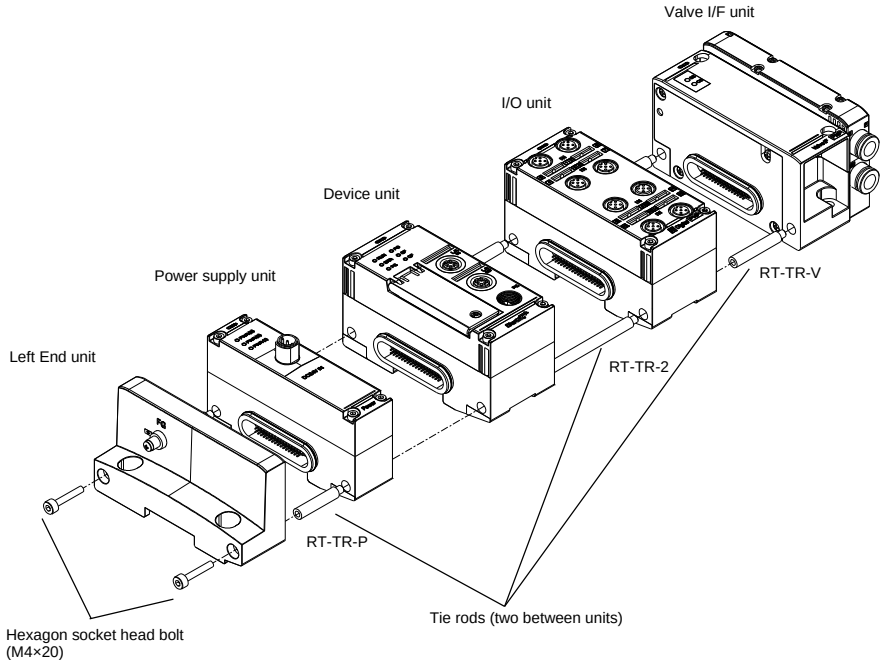
Follow the specified number of connecting units.
The maximum number of connecting units is 18 including device unit and I/O unit. Also, total length must be 922.5 mm or less.

■ Connections between units

Pass tie rods between the units, then tighten the left End unit with M4 x 20 hexagon socket head bolts.
E.g.1) Without valve I/F unit



E.g.2) With valve I/F unit

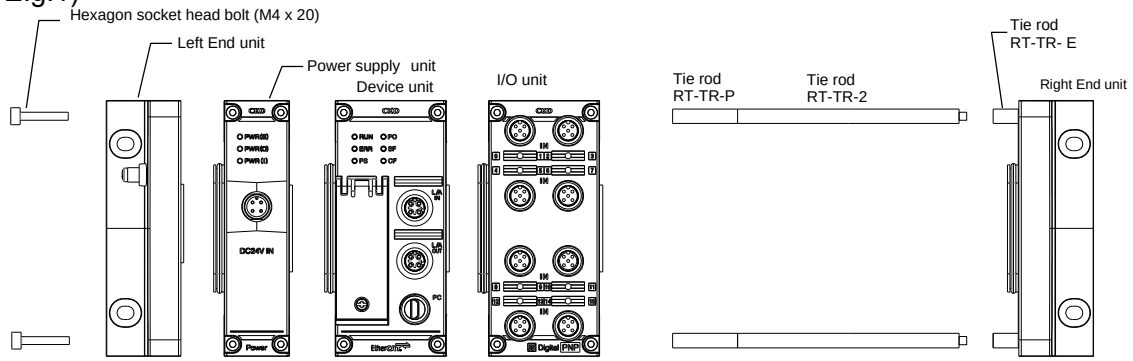


Note: The diagram above and those below omit manifold solenoid valves to the right of the valve I/F unit for the purpose of explaining the assembly.

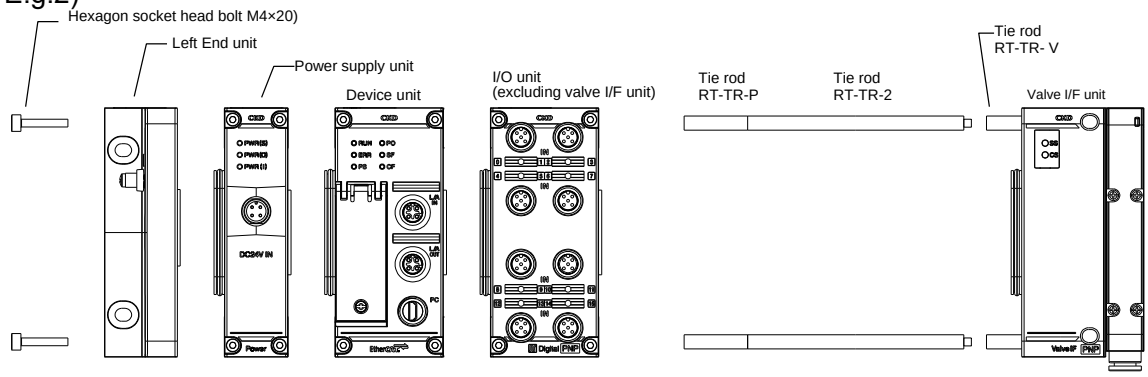
1 Connect the following tie rods in advance.
Choose the tie rods as few as possible.

Tie rod model No.	Applicable unit	Specifications
RT-TR-P	For one power supply unit	M4 x 27 mm, 2 pcs
RT-TR-1	For one device unit and one I/O unit	M4 x 46 mm, 2 pcs
RT-TR-2	For one device unit and two I/O units	M4 x 92 mm, 2 pcs
RT-TR-4	For one device unit and four I/O units	M4 x 184 mm, 2 pcs
RT-TR-8	For one device unit and eight I/O units	M4 x 368 mm, 2 pcs
RT-TR-V	For one valve I/F unit	M4 x 32 mm, 2 pcs
RT-TR-E	For right End unit	M4 x 35 mm, 2 pcs

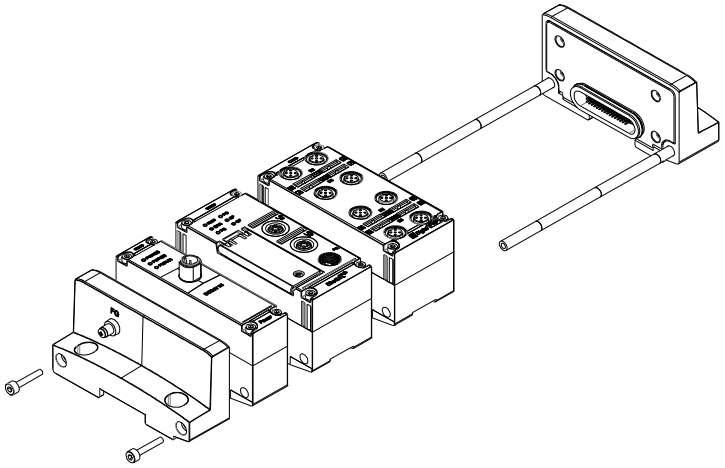
E.g.1)



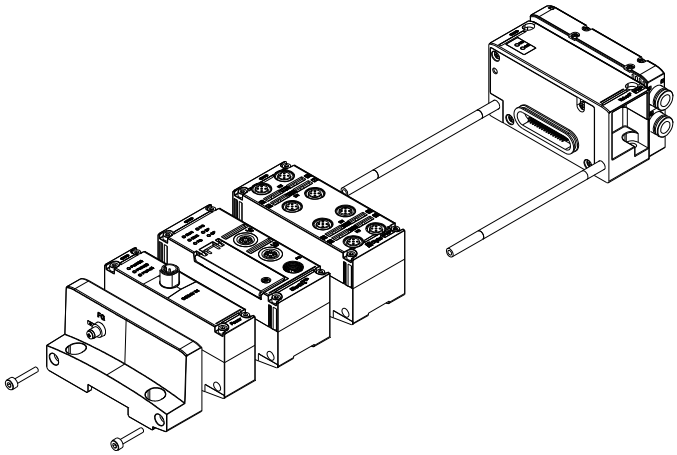
E.g.2)



E.g.1)



E.g.2)

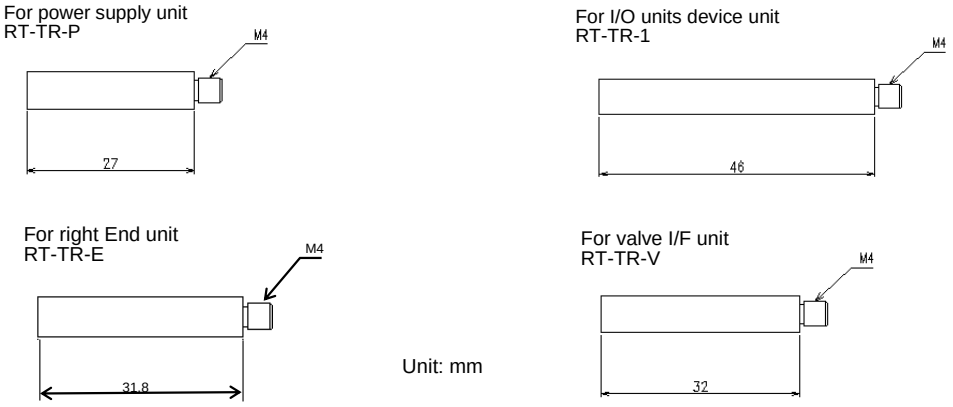


2 Pass the tie rods through each unit, and then push adjacent units together.

3 Tighten the left End unit with hexagon socket head bolts (M4 x 20) (tightening torque 1.2 N·m ± 0.05 N·m).
Hexagon socket head bolts (M4 x 20) are a standard accessory with the left End unit.

4 Check that all units are connected without any gaps.

Tie rod external dimensions



■ Calculating the mass and width

Calculate the mass and width of the entire remote I/O system. The width must be 922.5 mm or less.

Unit type (example)	Model No. (example)	Mass	Width
Left End unit (direct screw mounting)	RT-XEELN00N	130 g	31mm
Left End unit (DIN rail mounting)	RT-XFELN00N	140 g	31mm
Power supply unit	RT-XP24A01N	125 g	27mm
EtherCAT compatible device unit	RT-XTECN00N	230 g	46.1mm
Digital input unit	RT-XADGA16A	245 g	46.1mm
Digital output unit	RT-XBDGA16A	245 g	46.1mm
Analog input unit	TX-AAGA02N	230 g	46.1mm
Analog output unit	RT-XBAGA02N	230 g	46.1mm
IO-Link master unit	RT-XLMSA08N	230 g	46.1mm
Valve I/F unit (for TVG series)	TVG☐P-TB-☐-KA1☐	(Note 1)	(Note 1)
Right End unit (direct screw mounting)	RT-XEERN00N	150 g	31mm
Right End unit (DIN rail mounting)	RT-XFERN00N	165 g	31mm

Note 1:The weight differs depending on the model number.

A video is available to show how to assemble the units. (For connecting, adding units, and reducing units)
If necessary, refer to the video at the following URL.

RT product page:
https://www.ckd.co.jp/kiki/en/product/detail/1064

4.1.4 Installation

⚠CAUTION

Install the remote I/O on a flat surface.
If the entire remote I/O system gets twisted or distorted, it may cause air leakage or poor contact.

Do not install it in places that are used as scaffolding.
Excessive loads caused by climbing or stepping on it may damage it.

Follow the specified tightening torque when mounting directly with screws.
Tightening beyond the specified torque range can damage the units or screws.
If the tightening torque is different from the specified value, the product will not comply with IP65/IP67.

Do not place the connections under stress when carrying it.
If there is a large number of connected units, the connections may get damaged.

Heavy objects must be transported and installed by multiple people.

With the remote I/O system, it is possible to use either direct screw mounting or DIN rail mounting.

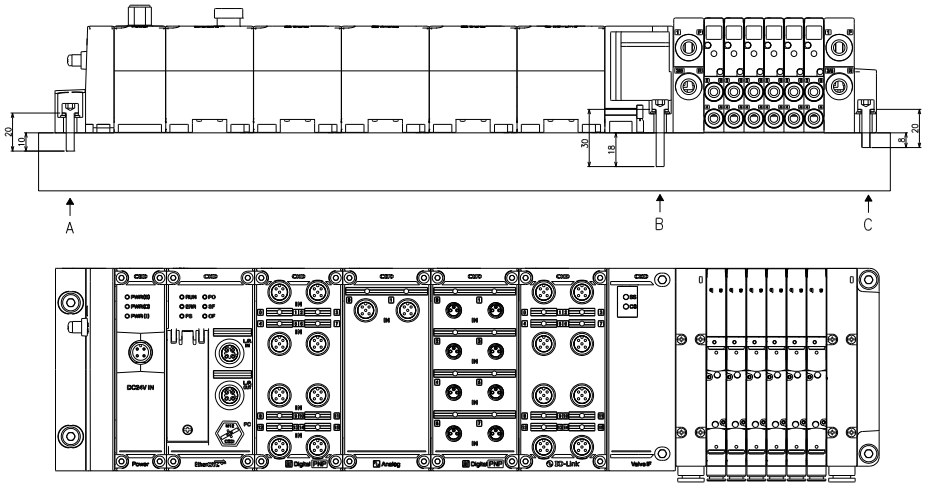
■ Method for direct screw mounting

The mounting points differ depending on whether a valve I/F unit is used.

When using a valve I/F unit

Attach screws to the left End unit, the valve I/F unit, and the manifold solenoid valve End block R.

Tighten the mounting screws in the six places below. The size is M5.
- Two mounting holes for the left End unit (A in the figure below)
- Two mounting holes for the Valve I/F unit (B in the figure below)
- Two mounting holes for the manifold solenoid valve End block R (C in the figure below)



Use screws with the length listed in the table below, and tighten them to the correct torque.

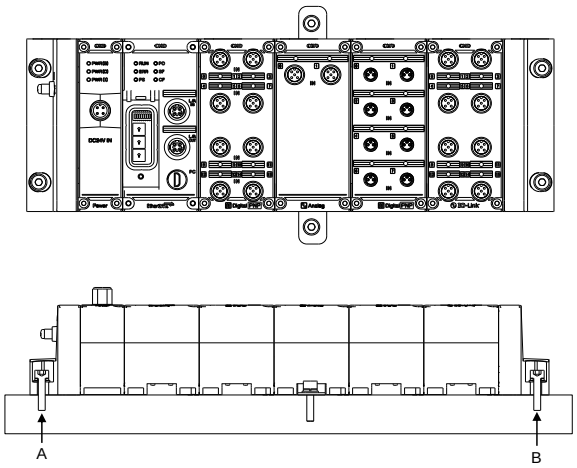
At A (Left End unit)			**At B (Valve I/F unit)**			**At C (Manifold solenoid valve End block R)**		
Mounting screws	Screw length	Tightening torque	Mounting screws	Screw length	Tightening torque	Mounting screws	Screw length	Tightening torque
M5	20 mm or more	1.2 N·m	M5	Valve I/F unit for TVG series: 30 mm or more	1.2 N·m (Note 1)	M5	20 mm or more	1.2 N·m (Note 1)

Note 1:The value is for reference. Check the value according to the condition of use.

When not using a valve I/F unit

Attach screws to the left End unit and right End unit.

Tighten the mounting screws in the four places below. The size is M5.
- Two mounting holes for the left End unit (A in the figure below)
- Two mounting holes for the right End unit (B in the figure below)

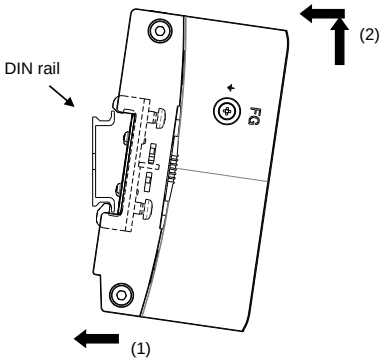


Use screws with the length listed in the table below, and tighten them to the correct torque.

At A (Left End unit)			**At B (Right End unit)**		
Mounting screws	Screw length	Tightening torque	Mounting screws	Screw length	Tightening torque
M5	20 mm or more	1.2 N·m	M5	20 mm or more	1.2 N·m

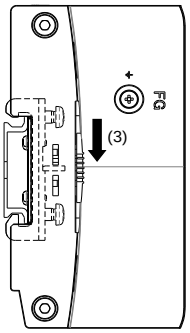
■ Method for DIN rail mounting

1 Attach the tabs to the DIN rail in the order (1) then (2) in the figure below.



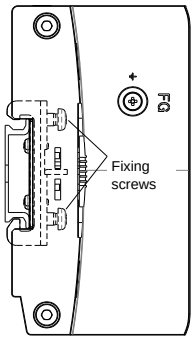
When the screws are loose, move up the operation button and put it on the DIN rail from underneath.

2 Push the upper tab in the direction of (3) in the figure below.



Move down the operation button, and cover the upper retainer on the DIN rail.

3 Tighten the DIN rail fixing screws while holding the unit down to prevent gaps (tightening torque: 1.4 N·m ± 0.2 N·m).



Tighten the fixing screws while pushing the button down to the bottom.

■ Strengthening with auxiliary bracket

⚠CAUTION

Use auxiliary bracket if the remote I/O system consists of four units or more (including the device unit).

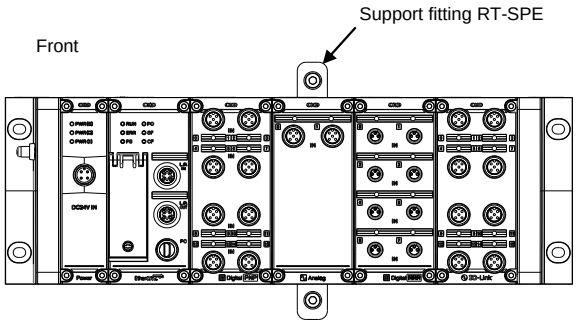
Failure to use fittings correctly may result in the following trouble:

- Poor electrical connections between units
- Failure to achieve the right degree of protection
- Products falling or otherwise getting damaged (when an external force is applied, or an excessive load is placed on an End unit, etc.)

For direct screw mounting, if there are four or more units including the device unit, use the following separately sold auxiliary bracket to prevent the weight from causing distortion between the units.

Attach an auxiliary bracket for direct screw mounting (RT-SPE) to the intermediate connected units.

One RT-SPE is required for every four units, including the device unit

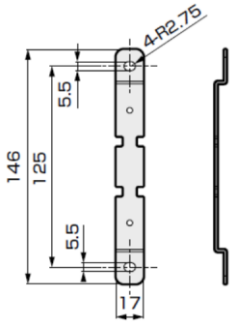


For direct screw mounting

Model No.	Mounting screws	Screw length	Tightening torque	Specifications
RT-SPE	M3	6 mm	0.5 ± 0.05 N·m	Attach to the unit with two M3 x 6 screws
	M5	20 mm or more	1.2 ± 0.05 N·m	Screw on directly with two M5 hexagon socket head bolts

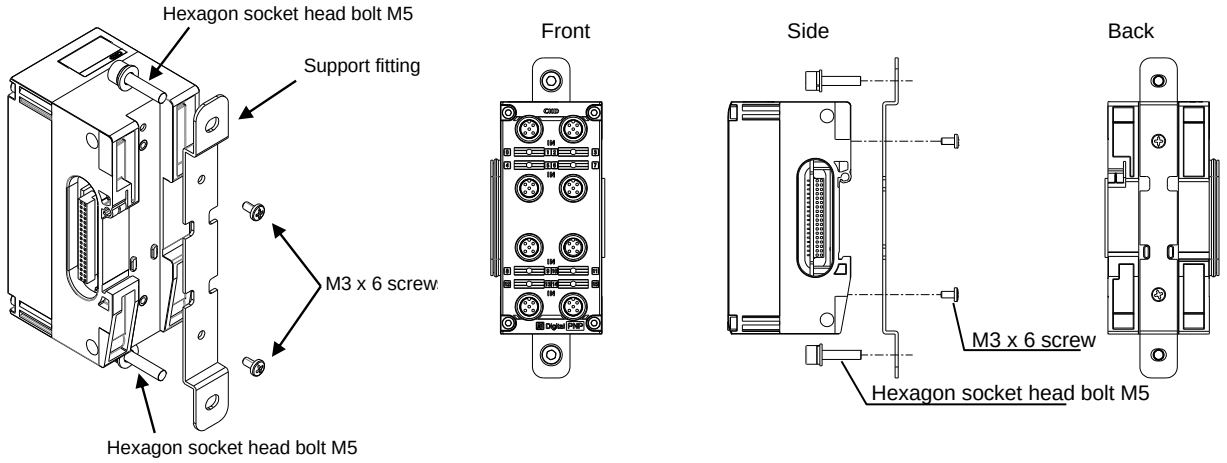
- Appearance of the auxiliary bracket

- External dimensions of the auxiliary bracket



Unit: mm

- Attaching the auxiliary bracket



4.2 Wiring

⚠WARNING

Use the specified cable for the communication cable.
Using cables other than those specified can cause communication malfunctions, and result in personal injury or damage to equipment.

⚠CAUTION

Check the working voltage and polarity before wiring and energizing.
The product may get damaged or malfunction.

Do not carry out wiring work while the product is energized.
The product may get damaged or malfunction.

Ensure that no water, solutions, or oil gets inside the connectors when wiring the product.
The product may get damaged or malfunction.

Wire correctly, after checking the products' rated voltages and terminal layouts.
Incorrect wiring or connecting a power source with a different rating may result in fire or failure.

Use separate wiring (separate tubing) from the power lines or high-voltage lines for the product's wiring.
Interference in signal lines caused by noise or surge currents from power lines or high-voltage lines may cause the product to malfunction.

Provide the product with its own ground. In particular, make it a dedicated ground that is separate from the drive system inverter, etc., and make the ground distance from the product short.
This is to improve the noise resistance of the product.

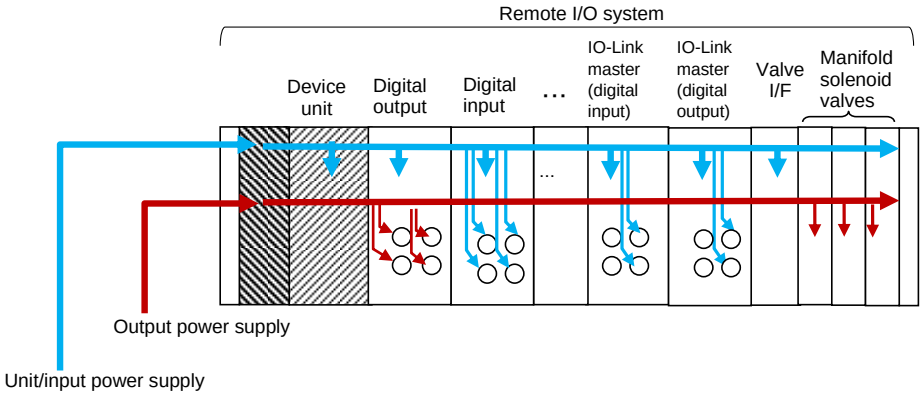
Do not subject cables to forces by bending or pulling them repeatedly or placing heavy objects on them.
Wiring that subjects cables to repeated bending stresses and tensile forces can cause disconnection.

Use the appropriate power supply when conformity to UL is required.
The unit must be used with a DC power supply which satisfy the SELV requirements and UL1310 Class 2 compliant. Also, the power supplies should be separated unit/input and output.

4.2.1 Power supply wiring

The power supply unit supplies the power for the following two systems via internal buses:

Power supply	Description	Supplied to
Unit/input power supply	The power supplied to connected I/O units / external input devices.	Control power supply for I/O units
		External devices connected to the following units: - Digital input unit - Analog input unit - IO-Link master unit
Output power supply	The power supplied to external output devices.	External devices connected to the following units: - Digital output unit - Analog output unit - Manifold solenoid valves connected to a valve I/F unit

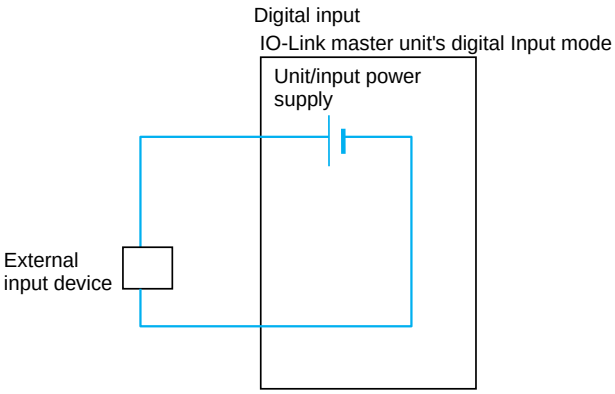


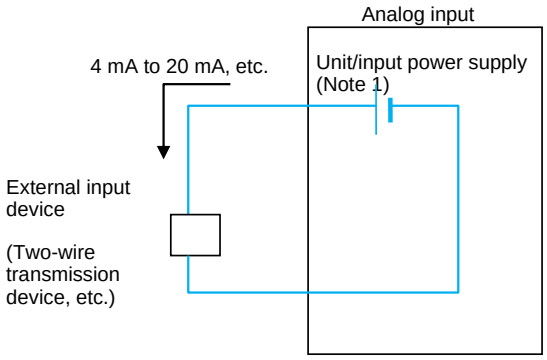
See "1.6.2 Names and functions of each part ■ Recommended power cable" for what power cable to use.

■ Connections to external devices

A schematic diagram of the connections to external devices is shown below.
For the specific wiring, refer to the instruction manual for each I/O unit.

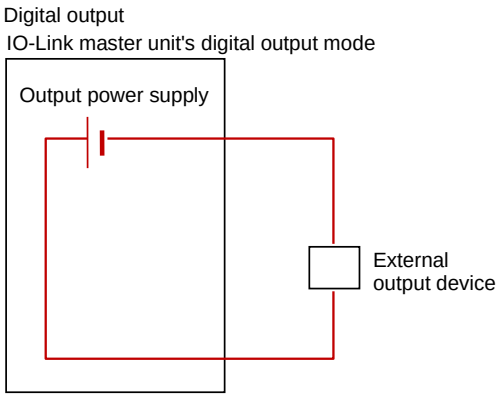
Unit/input power supply

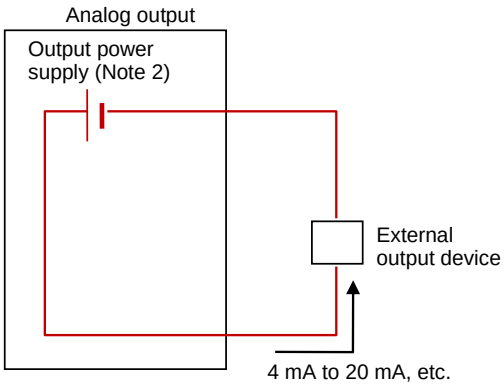




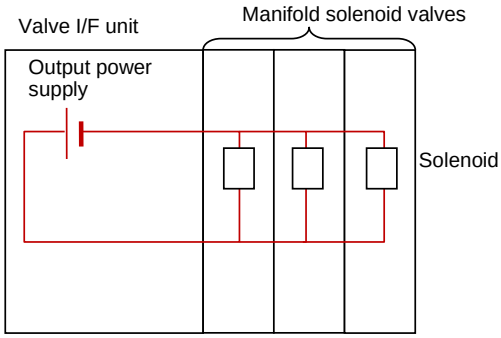
Note 1: For analog input, it is possible to set whether to supply input power based on whether the external input device requires power for analog signals.

Output power supply





Note 2: For analog outputs, it is possible to set whether to supply output power based on whether the external output devices require power for analog signals.



5. POWERING UP

⚠WARNING

Do not touch the product with wet hands.
It may cause an electric shock.

⚠CAUTION

Turn on the power to the product first if connecting it to external devices that use different power systems.
Turning on the power to the product afterward may cause malfunction or failure.

Be careful about inrush currents at power-up.
Depending on the loads connected, the initial charging current may trigger the overcurrent protection and cause a malfunction.

Power all the power supply units on at the same time (within 3 seconds) if using more than one power supply unit.
If the power supply units are powered on 3 or more seconds apart, a "unit configuration error" may occur.

In order to power on the remote I/O system, the unit/input 24 V and output 24 V power supply to the power supply units must be powered on. If the power supply is normal, three LEDs on the power supply unit (PWR(S), PWR(O), PWR(I)) and two LEDs on the device unit (PS, PO) will be green on.

At power-up, the device unit automatically recognizes the connected I/O units (creates a table of the relationships between the unit position numbers and unit IDs).

A "unit configuration error" occurs if automatic recognition has still not succeeded more than 8 seconds after power-up.
In addition, when multiple power supply units are used, a "unit configuration error" may occur if the power supply units are powered on 3 or more seconds apart (Note 1).

Note 1: With an EtherCAT compatible device unit, the ERR LED will blink red and the SF LED will blink yellow (fast). When this happens, EtherCAT communication will be stopped.

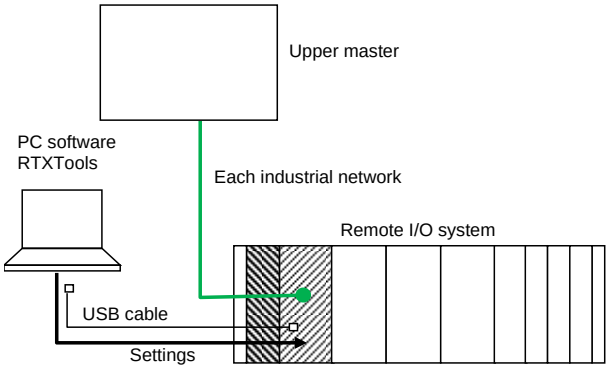
To reset the remote I/O system, turn the unit/input 24 V and output 24 V power supply to the power supply units off then on again (also referred to simply as "powering off and on again", etc. in this document).
It is not possible to perform a software reset of individual units or the entire remote I/O system (from the PC software or an upper system) or a hardware reset of individual units while they are energized.

6. SETTINGS

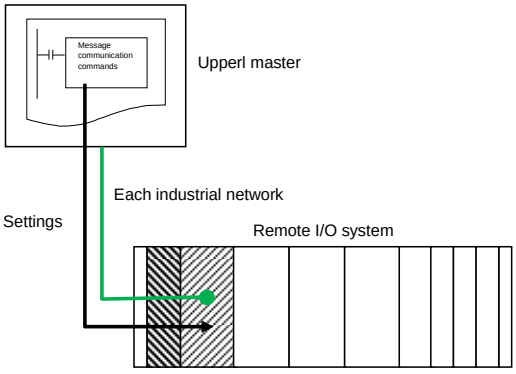
6.1 Overview

There are two ways to configure the remote I/O system's settings: using the PC software(RTXTools) and using industrial network communication.

- Using PC software



- Using industrial network communication



6.1.1 Using PC software

1 Select each unit on the "Unit Configuration" main tab, and click the Settings button.

2 Select the "Unit SETS" tab, then the " CH/connector/port-each SETS " tab or "Connector-each SETS" tab for each unit.

6.1.2 Using industrial network communication

Message communication commands from the upper master are used to set up objects.

E.g.) In the case of EtherCAT, SDO communication commands are used to set up the object dictionary. For more information, see the section on object dictionaries for the EtherCAT compatible device unit manual and the sections on setting up each I/O unit.

Example object dictionary for the IO-Link master unit

Index	Sub index	Description	Value	Initial value
0x8XX0	5	Port 0 Input size	0x00 to 0x20	0x04
	6	Port 0 Output size	0x00 to 0x20	0x04
	7	Port 0 Serial number	ASCII code of up to 16 characters	0x00 (null)
	8	Port 0 port-specific operation setting	0x0000 to 0xFFFF	0x0F01

* "XX" in the above Index is the unit position number (0x00 to 0x11).

Note: It may be required to set the address of the device unit. For more information, refer to the instruction manual for each device unit.

6.2 List of Common Settings for Device unit

Common settings for device unit	Description	Value
Unit/input power monitoring	Set whether the device unit monitors the unit/input power supplied by the power supply unit closest to it. In the event of an error, a "Unit/input power voltage error" will occur.	- OFF (factory setting) - Monitor
Output power supply monitor	Set whether the device unit monitors the output power supplied by the power supply unit closest to it. In the event of an error, an "output power supply voltage error" will occur.	- Off - Monitor (factory setting)
Analog value byte order	Set the byte order used when the device unit transmits to or receives from the upper master analog input or output values for the connected analog I/O units.	- Big endian (factory setting) - Little endian
Save log ON/OFF and number of saved logs	Set whether the device unit logs its own or connected I/O units' errors in its own non-volatile memory.	- 0: Do not log (factory setting) - 1 to 255: Log 1 to 255 entries
Saving logs (method)	Select how the error log will be saved.	- Stop at maximum number (factory setting) - Repeat (overwrite)
Log saving time	Select when to save the error log.	- 0: Save in real-time - 1 to 60: Save every specified number of minutes (The factory setting: 30)
Log filter ON/OFF	Set the filter target via each of the following bits of 1 byte: Bit 7: Log filter error type Bit 6: Log filter unit ID Bit 5: Log filter unit position number Bit 4: Log filter CH/point/port number	- ON: Filter - OFF: Do not filter (The factory setting is 0x00: log everything)
Log filter (error type)	Only log errors for the specified error type.	0x00 to 0xFF (factory setting: 0x00)
Log filter (unit ID)	Only log errors for the specified unit ID.	0x00000000 to 0xFFFFFF (The factory setting: 0x00000000)
Log filter (unit position number)	Only log errors for the unit with the specified unit position number.	0 to 17 (factory setting: 0)
Log filter (CH/point/port number)	Only log errors for the specified CH/point/port number.	0 to 31 or 255 (error with the entire unit) (The factory setting: 0)

7. I/O ASSIGNMENT

A cyclic communication area for each I/O unit is assigned to the remote I/O system's upper industrial network master, in order of unit position number.

However, for a variable I/O unit (e.g.: IO-Link master unit), the size assigned to the upper industrial network master is variable rather than fixed, so care is required when setting it up on the upper master side.

7.1 Important Notes for When Using a Variable I/O Unit

⚠CAUTION

When using a variable I/O unit, configure the following two settings in accordance with the external devices connected to it:

- Variable I/O unit's size
- Size of the basic unit of communication on the upper master side (e.g.: a PDO in the case of EtherCAT)

  It will not be possible to correctly read from or write to the external devices connected to the variable I/O unit if one of them is larger than the size set for the variable I/O.

When using variable I/O units, adjust the settings so that the process data size per variable I/O unit is an even number.

If the input and/or output process data size per variable I/O unit (e.g. IO-Link master unit) is an odd bytes, adjust the settings of the variable I/O unit so that the input and output process data size is an even bytes. If the process data size is an odd number, it may become an unintended I/O status.

Keep this in mind when using an IO-Link master unit or other variable I/O unit as an I/O unit.

8. COMMON SYSTEM FUNCTIONS

This section lists the common functions of a remote I/O system.
For the individual functions of each I/O unit, refer to its own instruction manual.

8.1 Remote I/O System Diagnostic Information Function

This function adds diagnostic information about the entire remote I/O system to the data sent to the upper master using cyclic communication, based on the device unit's DIP switch settings.

If the device unit's DIP switch SW8 (remote I/O system diagnostic information ON/OFF) is on, the device unit inserts 8 bits of diagnostic information at the beginning of the process data.

The following bits are assigned for each error type in the remote I/O system diagnostic information:

Bit	Error type in remote I/O system diagnostic information	Error name	Description	Units it can occur in
0	Unit input error	Off_On cycle threshold (input) over detection	The count of the number of times the input signal has changed from OFF to ON has exceeded the set threshold.	Digital input unit
		Analog input max/min range error	There is a max/min range error.	Analog input unit
		Analog input user set value upper/lower limit error	There is a user set value upper/lower limit error.	Analog input unit
		Device mismatch	There is a device mismatch with the IO-Link devices connected to the IO-Link master unit.	IO-Link master unit (IO-Link mode)
		IO-Link COMM error	Cannot communicate with the IO-Link devices connected to the IO-Link master unit.	IO-Link master unit (IO-Link mode)
1	Unit output error	Output signal line error	"Signal line error detection" is set to "Enable", and an error (short circuit, disconnection, or overheating) has been detected in an output signal line to an external output device.	Digital output unit Analog output unit Valve I/F unit
		Off_On cycle threshold (output) over detection	The count of the number of times the output signal has changed from OFF to ON has exceeded the set threshold.	Digital output unit Valve I/F unit
		Analog output max/min range error	There is a max/min range error.	Analog output unit
		Analog output user set value upper/lower limit error	There is a user set value upper/lower limit error.	Analog output unit
		IO-Link master unit signal line error	"Signal line error detection" is set to "Enable", and an overcurrent or short circuit has been detected in the pin 4 line.	IO-Link master unit (digital output mode)
2	Reserved	Fixed at 0 (OFF)	-	-
3	Power failure	Power line error	"Power line error detection" is set to "Enable", and an error (short circuit, disconnection, or overheating) has been detected in a power line to an external device.	Digital input unit Analog input unit
		Unit/input power voltage error	The device unit has detected that the voltage of the unit/input 24 V being supplied by the power supply unit closest to it (on the left when facing it) is greater than or equal to 24 VDC ± 25%.	Device unit
		Output power supply voltage error	The device unit has detected that the voltage of the output 24 V being supplied by the power supply unit closest to it (on the left when facing it) is greater than or equal to 24 VDC ± 25%.	Device unit
		Power line error	"Power line error detection" is set to "Enable", and an overcurrent or short circuit has been detected in the pin 1 line.	IO-Link master unit (IO-Link or digital input mode)

Bit	Error type in remote I/O system diagnostic information	Error name	Description	Units it can occur in
4	Reserved	Fixed at 0 (OFF)	-	-
5	User operation waiting	Manual output state on recovery from signal line or power line error	"Signal line error recovery operation" or "Power line error recovery behavior" is set to "Manual", and the unit has recovered from a signal line error but is maintaining the same operation as during the error and waiting for the user to turn the power off and on again.	Digital output unit Analog output unit Valve I/F unit
		Reflect setting waiting	When one of the following occurs in an IO-Link master unit: - The per-unit process data sizes have changed compared to what they were at start-up. - The per-port select operation mode has changed compared to what it was at start-up.	IO-Link master unit
		Hold force OFF	When a digital input unit detects a disconnection at start-up.	Digital input unit
6	Hardware error	Hardware error	One of the connected I/O units has a fault that a hardware error is suspected to be the cause of.	Device unit or I/O unit
		Memory read/write error	The various memory types cannot be read from / written to, or the data read from them is incorrect.	Device unit IO-Link master unit
7	System error	Unit configuration error	The device unit does not automatically recognize the connected I/O units correctly when it is powered on, or it has detected a change in the number of I/O units connected during operation.	Device unit
		Factory setting error	The device unit's serial number or MAC address is the initial value.	Device unit
		Initialized set memory	The setting memory was initialized and the system started up while the device unit's DIP switch SW5 (initialize parameters on start-up) was off.	Device unit
		Process data overflow	The process data size with the upper master as a device unit exceeds the maximum size.	Device unit
		Internal bus communication error	There is a communication error on a remote I/O system internal bus.	Device unit
		Process data size error	There is an IO-Link device connected whose size is larger than the size (input size or output size) set in the IO-Link master unit.	IO-Link master unit (IO-Link mode)
		Data mapping error	The process data size of the entire IO-Link master exceeds the specification.	IO-Link master unit (IO-Link mode)
		Allocation error	The IO-Link master unit was not assigned to the device unit correctly.	IO-Link master unit
		Parameter check	A problematic value was attempted to be set.	Analog input unit Analog output unit
		PDO mapping	-.	EtherCAT compatible device unit

8.2 CH/Point/Port Diagnostic Information Function and Unit Diagnostic Information Function

The diagnostic information per CH/point/port for each I/O unit is stored in the device unit as "CH/point/port diagnostic information".

Note: The types of errors vary depending on the type of unit. For more information, refer to the instruction manual for each I/O unit.

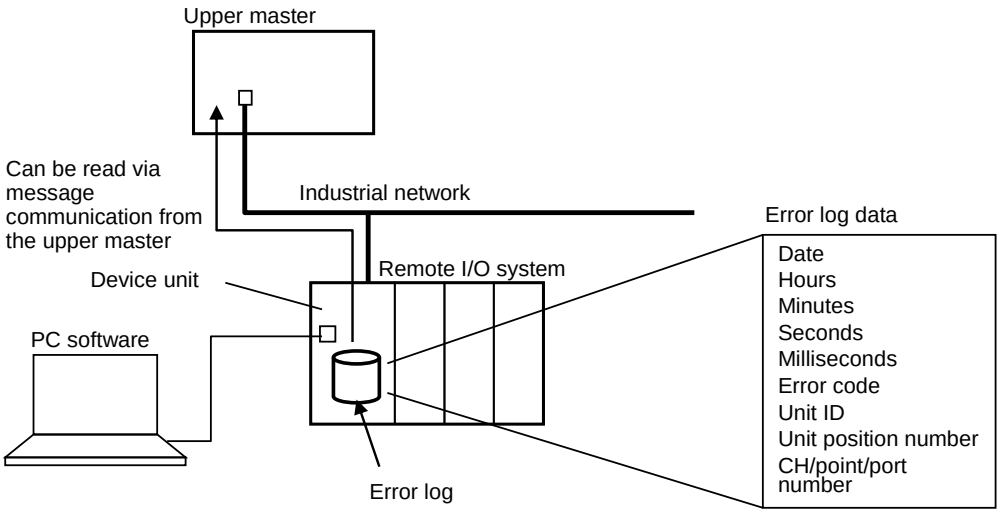
In addition, the "CH/point/port diagnostic information" data for each applicable unit is also logically added (OR) together and stored in the connected I/O units as "unit diagnostic information". Therefore, if an error is occurring, the value of the corresponding unit's diagnostic information will be greater than 0x0000.

The device unit's diagnostic information is stored in the device unit as "device unit diagnostic information".

8.3 Error Log Function

This is a function by which the device unit logs faults (errors) in itself or I/O units connected to it. It logs the errors in its own non-volatile memory.
A history of up to 255 errors can be stored. It is also possible to make it just log errors that meet specified conditions, and log recoveries.

It is possible to carry out monitoring via the PC software, and output data in CSV format.
The logged data can also be read from the upper master via message communication.



8.3.1 Error log contents

The error log data contains the following:

Name	Description		Value
Date	Date when the device unit received the error information. It is stored as the number of days since January 1, 2000.	(Note 1)	0 to 65535 (decimal)
Hours	Hours when the device unit received the error information.		0 to 23 (decimal)
Minutes	Minutes when the device unit received the error information.		0 to 59 (decimal)
Seconds	Seconds when the device unit received the error information.		0 to 59 (decimal)
Milliseconds	Milliseconds when the device unit received the error information. The values are in 10-ms steps.		0 to 99 (decimal)
Error code	16 bits of data depending on each unit. Saves the difference from the last time it was received.		0x0000 to 0xFFFF (hexadecimal)
Unit ID	ID that indicates the functional type of the unit.		0x00000000 to 0xFFFFFFFF (hexadecimal)
Unit position number	Position information for the I/O unit. (Does not include the power supply units.) Assigned in ascending order from 1, starting from the left-most power supply unit and proceeding to the right. 1 to 17.		0 to 17 (decimal)
CH/point/port number	Number of the CH, point, or port where the error occurred.		0 to 31 (decimal) or 255 (error regarding the unit as a whole)

Note 1: The time in the device unit is set via the "Set time for RT" button in the PC software. See "9.6.2 "Unit SETS" tab".

■ Error code

For the device unit

The following 16 bits of CH/point/port diagnostic information, expressed in hexadecimal.
Refer to the Instruction Manual for details since it varies depending on the corresponding network.

CH/point/port diagnostic information		Error description	Settable?
Bit	Genre		
15	Hardware	Memory read/write error	No
14	System	Factory setting error	No
13	System	Unit configuration error	No
12	System	Process data overflow	No
11	System	Reserved	No
10	Power supply	Unit/input power voltage error	Yes (depending on the "Unit/input power monitoring" setting)
9	Reserved	Reserved	-
8	Power supply	Output power supply voltage error	Yes (via the "Output power supply monitor" setting)
7	System	Internal bus communication error	No
6	System	Initialized set memory	No
5	Reserved	Reserved	-
4	Reserved	Reserved	-
3	Hardware	Hardware error	No
2	Reserved	Reserved	-
1	Reserved	Reserved	-
0	Reserved	Reserved	-

For I/O units

16 bits of CH/point/port diagnostic information specific to each I/O unit, expressed in hexadecimal.
For more information, refer to the instruction manual for each I/O unit.

■ Unit ID

Unit ID	Model No.	Type	Main function	Connector	Number of points	Polarity
07000000	RT-XTECN00N	Device unit	EtherCAT compatible	-	-	-
07010000	RT-XTENN00N	Device unit	EtherNet/IP compatible	-	-	-
07060000	RT-XTEPN00N	Device unit	PROFINET compatible	-	-	-
07070000	RT-XTEAN00N	Device unit	WebAPI compatible	-	-	-
2B280100	RT-XADGB08A	Input	Digital	M8	8 points	PNP
2B2C0100	RT-XADGB08B	Input	Digital	M8	8 points	NPN
2C080200	RT-XADGA16A	Input	Digital	M12	16 points	PNP
2C0C0200	RT-XADGA16B	Input	Digital	M12	16 points	NPN
2D680400	RT-XADGC32A	Input	Digital	Push-in Terminal	32 points	PNP
2D6C0400	RT-XADGC32B	Input	Digital	Push-in Terminal	32 points	NPN
2C100002	RT-XBDGA16A	Output	Digital	M12	16 points	PNP
2C140002	RT-XBDGA16B	Output	Digital	M12	16 points	NPN
2D700004	RT-XBDGC32A	Output	Digital	Push-in Terminal	32 points	PNP
2D740004	RT-XBDGC32B	Output	Digital	Push-in Terminal	32 points	NPN
51080400	RT-XAAGA02N	Input	Analog	M12	2 CH	-
51100004	RT-XBAGA02N	Output	Analog	M12	2 CH	-
6D020004	RTX-VVCN32A	Valve I/F	TVG	-	32 points	PNP
6D820004	RTX-VVCN32B	Valve I/F	TVG	-	32 points	NPN
D300221E (Factory setting) (Note 1)	RT-XLMSA08N	IO-Link	Master	M12	8 ports	-
E0000000	RT-XP24A01N	Power supply	24 V power supply	M12	1 point	-
E7000000	RT-XEELN00N	End (direct)	Left end	-	-	-
E7010000	RT-XEERN00N	End (direct)	Right end	-	-	-
E7020000	RT-XFELN00N	End (DIN)	Left end	-	-	-
E7030000	RT-XFERN00N	End (DIN)	Right end	-	-	-

Note 1: The unit ID of the IO-Link master will change depending on:
- The operation mode of each port.
- The IN and OUT sizes of the connected IO-Link devices if the operation mode is IO-Link mode.

8.3.2 Error log filtering

It is possible to choose to only log errors that meet specified conditions.

Specifying what to log can be carried out by selecting one or more from the following:
- Log the specified error type.
- Log errors for the specified unit ID.
- Log errors for the unit with the specified unit position number.
- Log errors for the specified CH/point/port number.

8.3.3 Error log monitoring

The error log can be viewed in the "Error" main tab in the PC software.

8.3.4 Error log clearing

The error log can be cleared by clicking the "Clear error log" button in the "Error" main tab in the PC software.

8.3.5 Error log output

The error log can be output to a CSV file by clicking the "Save" button in the "Error" main tab in the PC software.
It is also possible to read the logged data from the upper master via message communication (e.g.: SDO communication).

For more information, refer to the instruction manual for the device unit.

■ Log data file specifications

Item	Description
Extension	.csv
Output item	Surrounded by double quotes
Per error	One line
End of line	CRLF
Save location	File name: Can be set to anything by the user
Settable file names	Up to 259 single-byte alphanumeric characters (character encoding: UTF-8), including the file path

CSV format:
"Date","Time","Error code","Error","Unit","NO.","CH"
E.g.)
"2000/1/1","00:00:00,55","0x8000","Power line error detection", "Digital input 16 CH/points","2","15"

8.3.6 Error log settings

<table>
<tr><th>Setting item</th><th>Description</th></tr>
<tr><td>Save log ON/OFF and number of saved logs</td><td>Set the maximum number of entries to log.
- Do not log (factory setting).
- Log N entries (N = 1 to 255).</td></tr>
<tr><td>Saving logs (method)</td><td>Select how to save logs from the following.
- Repeat (overwrite) (factory setting)
- Stop at maximum number</td></tr>
<tr><td>Log saving time</td><td>Select when to save logs from the following.
- 0x00: Save immediately when an error occurs
- 0x01 to 0x3C: Save every set value (minutes) (The factory setting: 0x1E: 30 minutes)</td></tr>
<tr><td>Error log filter</td><td>Set whether to filter.
Specify what to do via each bit of the following logging filter setting byte:
- 1 (ON): Filter
- 0 (OFF): Do not filter
<table>
<tr><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td>Log filter error type</td><td>Log filter unit ID</td><td>Log filter unit position number</td><td>Log filter CH/point/port number</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
If this setting is 0x00, log everything (factory setting: 0x00).</td></tr>
<tr><td>Log filter error type</td><td>Filter based on error type.
Set the error type to filter for.</td></tr>
<tr><td>Log filter unit ID</td><td>Filter based on unit ID.
Set the unit ID to filter for. However, for variable I/O units, matching is determined based on the upper 2 bytes.</td></tr>
<tr><td>Log filter unit position number</td><td>Filter based on unit position number.
Set the unit position number to filter for.</td></tr>
<tr><td>Log filter CH/point/port number</td><td>Filter based on CH/point/port number.
Set the CH/point/port number to filter for.</td></tr>
</table>

The setting method for an EtherCAT compatible device unit is shown below as an example.

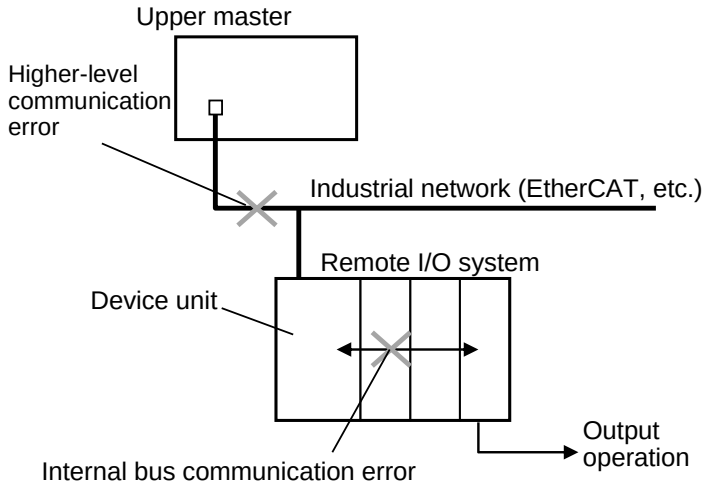
E.g.) Maximum number of saved logs = 10, Saving logs (method) = Repeat (overwrite),
Error log saving time = Save immediately when an error occurs,
Log filter type = Only log errors for CH 1 of the digital input unit with unit position number 3

Setting item	Set value
Save log ON/OFF and number of saved logs	10
Saving logs (method)	0: Repeat (overwrite)
Log saving time	0: Save immediately when an error occurs
Type of log filter	0x70 (Bit 6: Unit ID filter enable = 1, Bit 5: Unit position number filter enable = 1, Bit 4: CH/Point/Port number filter enable = 1, other bits = 0)
Log filter (error type)	0x00
Log filter (unit ID)	0x2C0C0200I (digital input unit, 16 points, NPN)
Log filter (unit position number)	3
Log filter (CH/point/port number)	1

8.4 Function for Output Settings in the Event of a Communication Error

This function sets what the output operation will be when a communication error occurs (upper communication or internal bus communication). It is possible to set whether to hold or clear the output (Note 1) for all units together, or set separately for each I/O unit whether to hold the output or output a value specified individually for that unit.

Note 1: Refers to a digital output, an IO-Link master unit (when in digital output mode), or an analog output unit.



There are two setting methods depending on the device unit's DIP switch settings: either set the same operation for all units at once, or set individual operations for them via the parameter settings for each unit.

* The device unit's DIP switch settings are only read once, at power-up.

8.4.1 To set the same operation for all units at once

1 Set the device unit's DIP switch SW3 (output settings in the event of a communication error/ priority to hardware) to ON.

2 When the device unit's DIP switch SW4 (hold/clear) is on, all outputs will be held.
When it is OFF, they will all be cleared (Note 1).

Note 1: The digital outputs and IO-Link master unit (when in digital output mode) will switch OFF.
The analog output units' output power supply will switch OFF.

8.4.2 To set individual operations for each unit

1 Set the device unit's DIP switch SW3 (output settings in the event of a communication error/ priority to hardware) to OFF.

2 At the same time, set individual operations for each I/O unit via the PC software or industrial network.
In each I/O unit's "Communication error operation" setting, specify the following:
- Digital output, IO-Link master unit (when in digital output mode): Specify either ON, OFF, or hold.
- Analog output unit: Specify either output power supply OFF, operation set by user, or hold.

9. PC SOFTWARE(RTXTools) OPERATION

The PC software serves the following functions:
- Configuring the settings for each connected unit in the remote I/O system
- Monitoring the current values of each connected unit in the remote I/O system
- Maintenance for the remote I/O system (displaying error information, forced input or output, saving log files, LED latch clear, etc.)

9.1 From Installation to Start-Up

1 Download the installer for the software from the CKD website below
RT product page: :
https://www.ckd.co.jp/kiki/en/product/detail/1064

2 Install the software on your PC.

Note: Install the USB driver on the PC only if the operating system is Windows 7.

3 Connect the PC to the USB port on the device unit using a commercially available USB cable.

4 Power on the remote I/O system's power supply units.

Note: If there are multiple power supply units, make sure to power them all on at the same time (within 3 seconds).

5 Double-click the executable file (RTXTools.exe) to start up the software.

9.2 RTXTools Specifications

9.2.1 Operating environment

Item	Description
OS	Windows 10 32 bit / 64 bit Windows 7 Professional Service Pack 1
Memory	4 GB or more recommended
Hard disk	At least 500 MB of free space
Display	1280 pixels x 800 pixels or higher recommended
CPU	Intel Atom x5Z8350 or higher recommended
Interface	Has at least one USB Type-A port

9.3 Function List

Classification	Function name	Description	Corresponding screens/operations	Related units
Connecting/updating communication	Automatically get communication ports	Get the serial ports connected to the PC and list them as possible places for the software to communicate with. Using the selected port, establish communication with the device unit.	Software settings window	Device unit
	Connect/disconnect communication	It is possible to connect and disconnect communication using the "Connect" and "Disconnect" buttons.	Software settings window	Device unit
	Continue communication	The software communicates constantly with the device unit, and automatically gets information from the remote I/O system when it does so.	Common	Device unit
Display unit configuration	Display the units that constitute the remote I/O system, and the order they are connected in.	Display the information graphically.	"Unit configuration" main tab	All units
		Display the information in a list.	"I/O Memory" main tab	All units
Settings	Display and configure setting data	Configure the settings for each actual unit.	Display and configure settings on the following sub windows from the "Unit configuration" main tab: - "Unit SETS" tab - "Connector-each SETS" tab - "CH/point/port-each SETS"" tab Note: Clicking the "Set all items" button will transfer the settings configured on the PC to the actual unit.	All units
	Import/export setting data	Read the specified file (.conf) / save the current setting data to a file (.conf).	"Import" or "Export" button on the "Exp/Imp Setting" main tab	All units
	Read initial values in setting data	Read the initial values in the setting data.	"Factory default" button in the "Unit SETS", "Connector-each SETS", and "CH/point/port-each SETS" tabs	All units
	Verify setting data	Compare the current set values on the device unit with the set values on the unit the user intends to change. If the set values are different, they are shown in yellow.	Displayed in the "Unit configuration" main tab "Unit SETS", "Connector-each SETS", and " CH/point/port-each SETS " tabs	All units
Monitoring current values	Display current values of process data	Display the current values of the inputs and outputs for each unit, in bytes.	"I/O Monitor" main tab "I/O Memory" main tab	I/O units
	Display process data	Display the total of the process data	"I/O Memory" main tab	I/O units

	size	sizes of the connected I/O units.		

Classification	Function name	Description	Corresponding screens/operations	Related units
Display error information		Display error information for each CH/point/port or each unit. Note: The remote I/O system diagnostic information can be viewed as process input values for the device unit.	"Error" main tab "Unit current status" tab	All units
Forced input or output	Display forced input / display forced output	Display the forced input state. Display the forced output state.	"I/O Monitor" main tab "Forced I/O SETS" tab	Digital / analog / IO-Link master units
	Set forced input	Set the forced input state.	"Forced I/O SETS" tab	Digital / analog / IO-Link master units
	Set forced output	Set the forced output state.		Digital / analog / IO-Link master/ Valve I/F unit
Log data	Display log data	Show the log data stored by the device unit.	"Error" main tab	Device unit
	Clear log data	Clear the log data.		Device unit
	Save log data to file	Output the error log displayed in the "Error" main tab as a CSV (comma separated values) file.		Device unit
Basic display/settings	Display state of device unit switches	Get the state of the device unit's DIP switches and display it in hexadecimal.	"Unit current status" tab	Device unit
	Display current consumption (theoretical value)	Display information for the user to refer to when deciding how many power supply units to insert.	"Unit configuration" main tab, "Unit current status" tab	All units
	Display LED state	For each unit, show the state of the LEDs currently displayed on the actual unit.	"Unit configuration" main tab, "Unit current status" tab	All units
	Display version	Display the software version of the units.	"Unit current status" tab	All units
	Set date and time	Set the time on the device unit.	"Unit SETS" tab	Device unit
Other	Reset device unit LED latch state	Release the latch state of the LEDs on the front of the device unit, based on button presses by the user.	"Unit current status" tab	Device unit
	Display factory settings	Display the device unit data that cannot be changed by the user.	"Unit current status" tab	Device unit
	Concurrent access notification	Show that the web and PC software are being accessed simultaneously, in order to indicate user activity.	-	Device unit
IO-Link master unit-related	Instruct unit to write actual device configuration	Take the configuration information (Note 1) for each port of the IO-Link devices connected to the IO-Link master unit, and write it to the IO-Link master unit.	"Set with device" button and port selection operation in the IO-Link master's "Port-each SETS" tab	IO-Link master unit
	ISDU communication	Specify an IO-Link device's service data index / sub index, then press the button to read/write service data from/to it.	IO-Link master's "ISDU" tab	IO-Link master unit
	Read error log of IO-Link devices	Read the following error log of IO-Link devices, based on button presses by the user. - Event codes in event communication - Error responses in ISDU communication	IO-Link master's "Error log" tab	IO-Link master unit
	Clear data storage	Send a "clear data storage" instruction to the IO-Link master unit, based on button presses by the user.	"Clear data storage" and port selection buttons in the IO-Link master's "Unit current status" tab	IO-Link master unit
Digital/ Valve I/F unit-related	Reset Off_On cycle	Reset the Off_On cycle, based on button presses by the user.	"Reset Off_On cycle" and "Select point" buttons in the "Unit current status" tab	Digital/ Valve I/F unit
Language	Change displayed language	Change the language displayed in the software.	Software settings window	-
Software version	Display PC software information	Display the version of the software.	Software settings window	-

Note 1: The IO-Link device configuration information consists of the following data:

Device ID, vendor ID, serial number, revision, input data size, output data size

9.4 Screen Changes

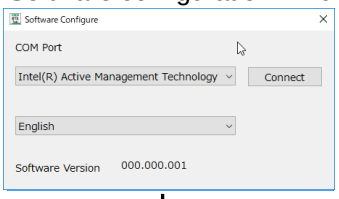
⚠CAUTION

Do not disconnect the USB cable from the PC or the device unit, or power off the remote I/O system while set values are being written from the PC software RTXTools.
A "memory read/write error" may occur, or the set values may get cleared.
If either of these occurs, write the setting data again. Then, power the remote I/O system off and on again. If the problem persists, contact CKD.

After the software starts up, the screen will change as follows:

Start-up

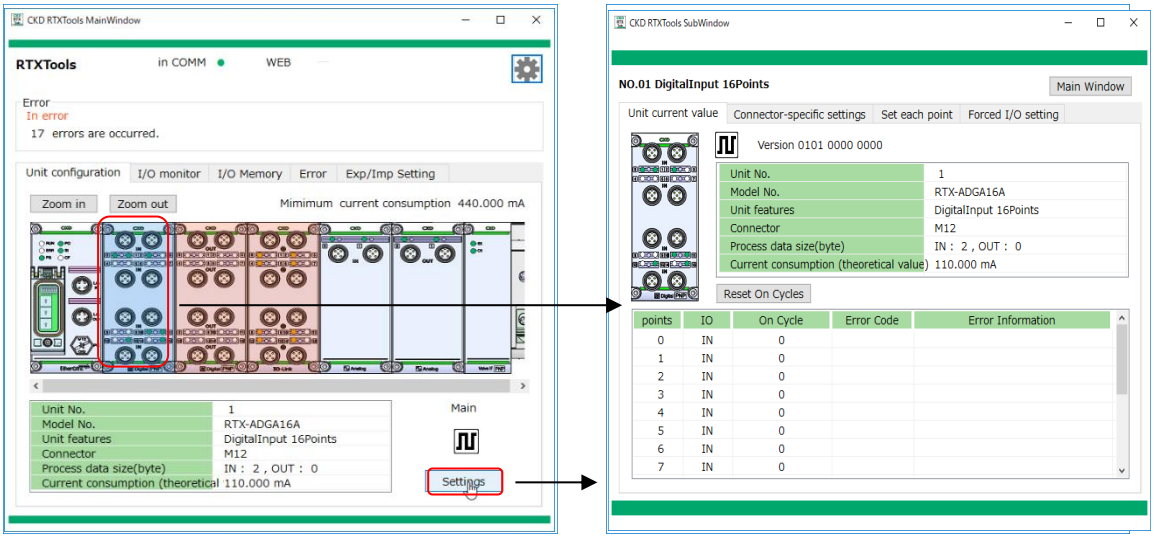
Software configuration window



Select the communication port and click the "Connect" button

Main window

Sub windows



Main tab	Description
Unit configuration	Show the configuration of the units.
I/O monitor	Graphically show the input/output status.
I/O Memory	Show the input/output status in hexadecimal.
Error	Show the errors and error log as lists.
Exp/Imp Setting	Import/export set values.

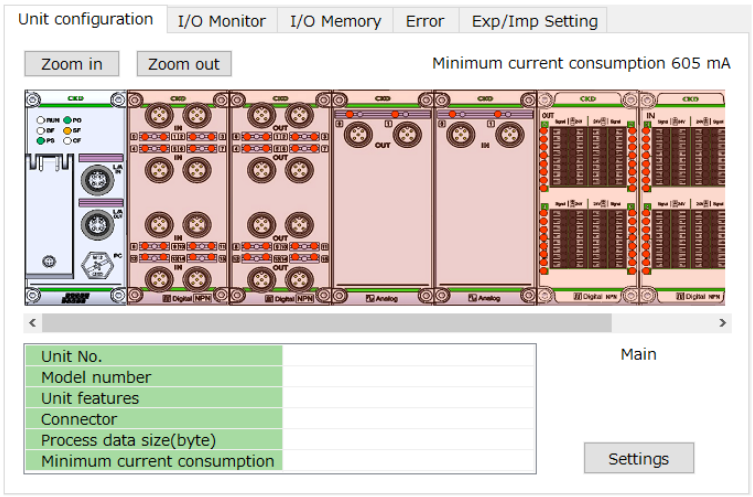
Tab (Note 1)	Description
Unit current value	Show the current state of the displayed unit.
Unit Setting	Configure the settings for each unit individually.
Connector-specific settings	Configure the settings for each connector individually (digital input units only).
Set each CH/point/port	Configure the settings for each CH/point/port individually.
Forced I/O setting	Display / configure the settings for forced input/output.
ISDU	Show ISDU communication information (IO-Link master units only).
Get error	Get/display the error history (IO-Link master units only).

Note 1: The types of tabs displayed will change depending on which unit is selected.

Note: The main window and sub windows can be displayed at the same time. Up to 18 sub windows can be opened.

9.5 Main Window

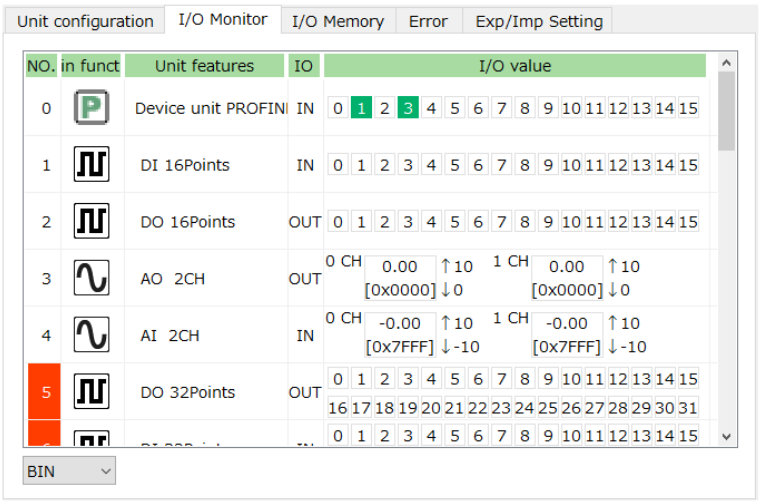
9.5.1 "Unit configuration" main tab



Displays the configuration of each I/O unit in the connected remote I/O system.

Navigate to the sub window for a unit by double-clicking on the unit diagram or clicking on the "Settings" button at the bottom right of the unit selection.

9.5.2 "I/O Monitor" main tab



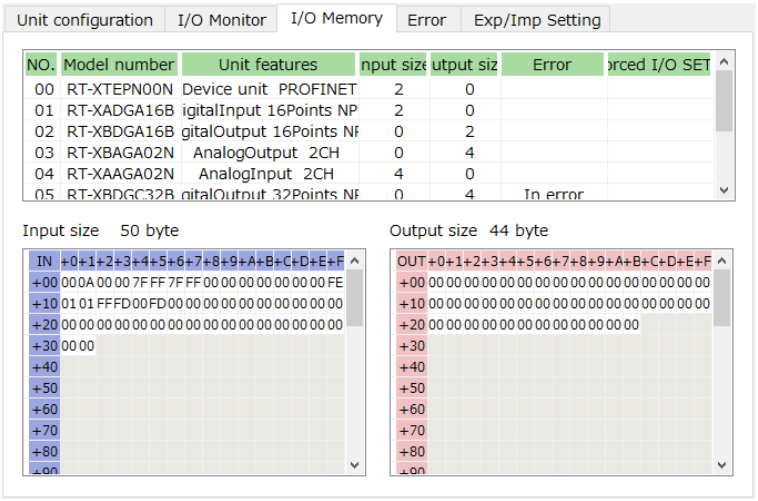
Lists the current values of the I/O for each I/O unit in the connected remote I/O system.

The I/O units are displayed in order of connection position number.

With the display toggle button in the lower left part, select one of the following:
- "BIN": The bits are displayed for each point as on: green, off: white (Note 1)
- "DEC": Decimal display for each unit
- "HEX": Hexadecimal display for each unit

Note 1:
Forcing: with circle, Normal: with square

9.5.3 "I/O Memory" main tab

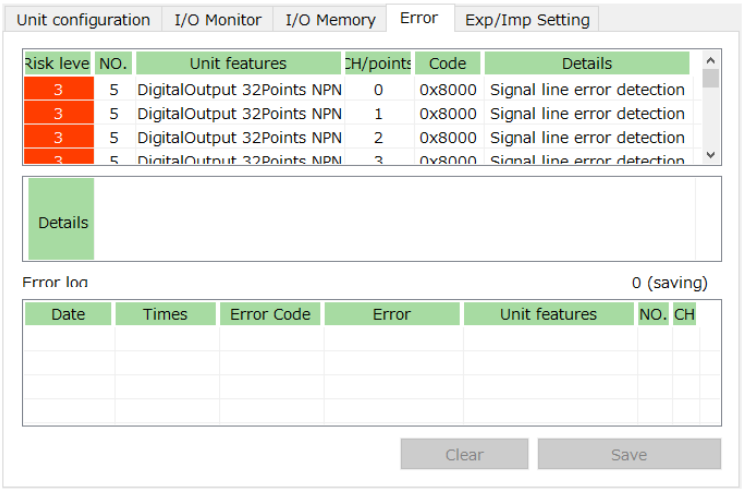


Displays the input size, output size, errors, and forced I/O settings for each I/O unit of the connected remote I/O system.
The I/O units are displayed in order of unit position number.
For I/O units that have errors, the "Error information" column displays "In error".

The bottom of the screen displays the current values in bytes (not including the forced output values) that are being communicated with the upper master of the entire remote I/O system. One cell is 1 byte, and 16 rows represent 16 bytes.

When any unit is selected, the part that unit's data is assigned to gets a blue border in the current value table at the bottom of the screen (as in the screen on the left).

9.5.4 "Error" main tab



Lists the errors that are occurring in each I/O unit of the connected remote I/O system, in order of risk level.

Risk level:
"3": Electrical and physical errors (power line error, signal line error, hardware error, etc.)
"2": Software errors (min range error, etc.)
"1": Temporary errors (Concurrent access notification, Parameter setting error)

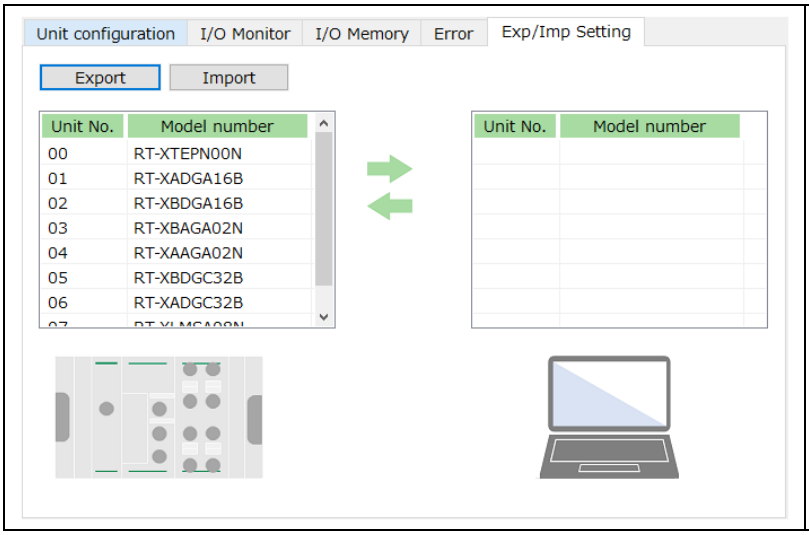
Also, the "Error log" at the bottom of the screen displays past errors in the order they occurred.

In "Code" above or "Error Code" in error log below, the CH/point/port diagnostic information for the unit is displayed as a hexadecimal number with the corresponding bits set to 1 (ON).

The error log can be output to a CSV file by clicking the "Save" button.

The error log can be cleared by clicking the "Clear" button.

9.5.5 "Exp/Imp Settings" main tab

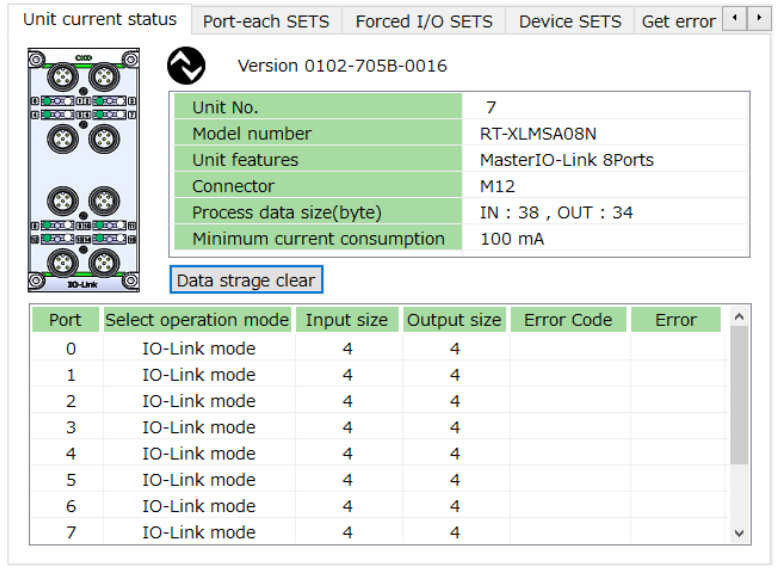


Export or import setting data.

Save the setting data for all the units (listed on the left) of the connected remote I/O system to an external file (.conf) (via the "Export" button). Or, specify an external setting data file (.conf) and import the setting data for the units in it (listed on the right) into the connected remote I/O system (via the "Import" button).

9.6 Sub Windows

9.6.1 "Unit current status" tab



* The screen shown above is the "Unit current status" tab for an IO-Link master unit.

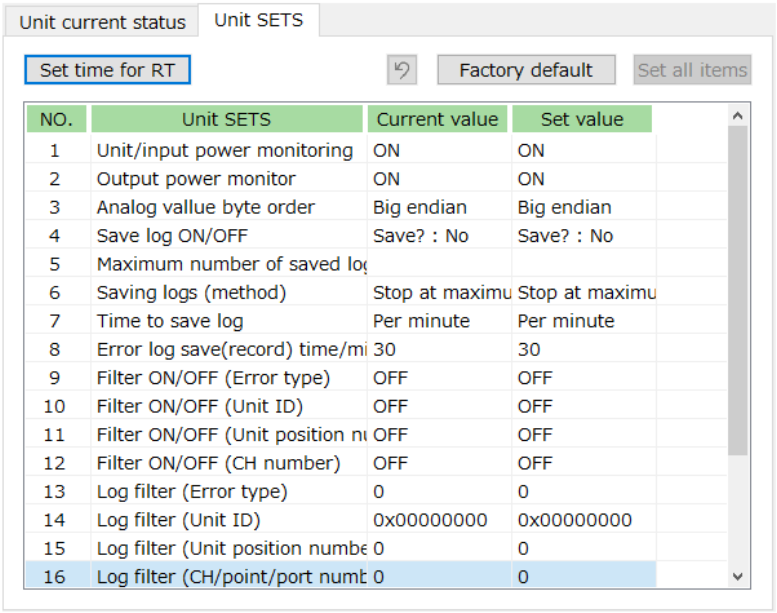
Displays information on each unit or its CHs/points/ports.
For CHs/points/ports, it displays the error codes, error information (and the Off_On cycle, depending on the unit).

* The types of tabs displayed will change depending on which unit is selected.
The buttons that appear in the center will also change depending on which unit is selected, as follows:
- IO-Link master: "Clear data storage"
- Digital input / digital output: "Reset Off_On cycle"
- Device unit: "Latch reset"

9.6.2 "Unit SETS" tab

⚠WARNING

Check the settings of each unit before operating.
Setting the units incorrectly can cause malfunction, and result in personal injury or damage to equipment.



NO.	Unit SETS	Current value	Set value
1	Unit/input power monitoring	ON	ON
2	Output power monitor	ON	ON
3	Analog vallue byte order	Big endian	Big endian
4	Save log ON/OFF	Save? : No	Save? : No
5	Maximum number of saved lo		
6	Saving logs (method)	Stop at maximu	Stop at maximu
7	Time to save log	Per minute	Per minute
8	Error log save(record) time/mi	30	30
9	Filter ON/OFF (Error type)	OFF	OFF
10	Filter ON/OFF (Unit ID)	OFF	OFF
11	Filter ON/OFF (Unit position n	OFF	OFF
12	Filter ON/OFF (CH number)	OFF	OFF
13	Log filter (Error type)	0	0
14	Log filter (Unit ID)	0x00000000	0x00000000
15	Log filter (Unit position numbe	0	0
16	Log filter (CH/point/port numt	0	0

* The screen shown above is the "Unit SETS" tab for a device unit.

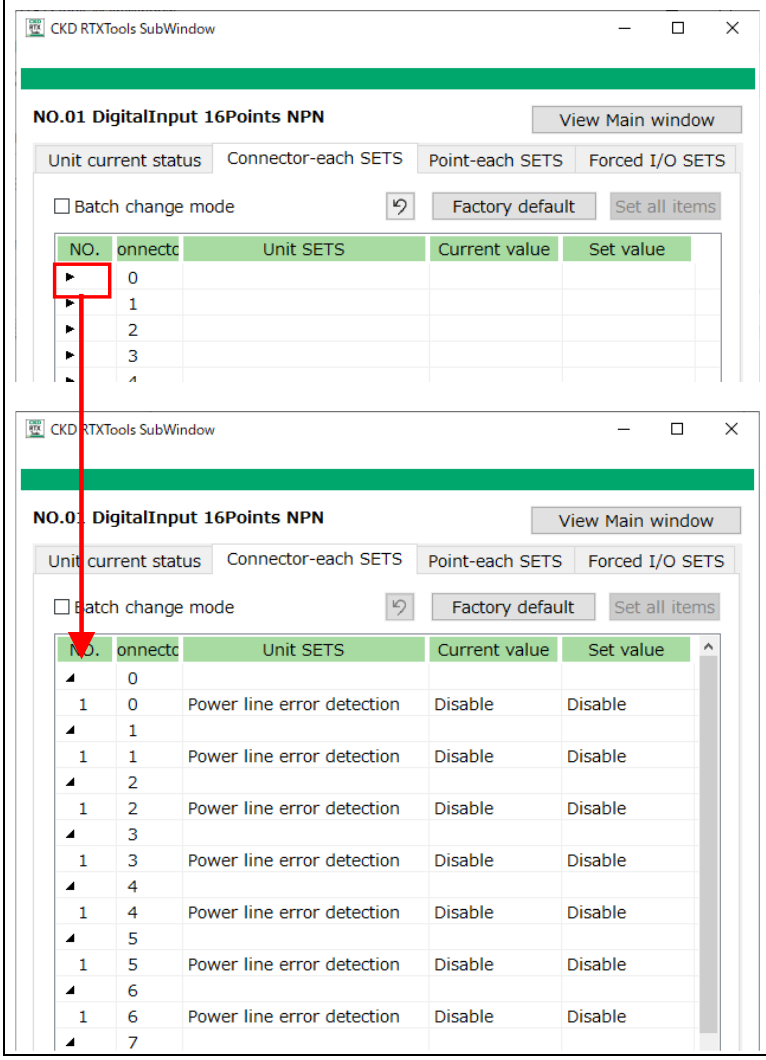
Sets each unit individually.

The device unit's date and time are set by clicking the "Set time for RT" button.

Click the "Set all items" to transfer the settings that have been configured on the PC to the actual unit.

* The types of tabs displayed will change depending on which unit is selected.

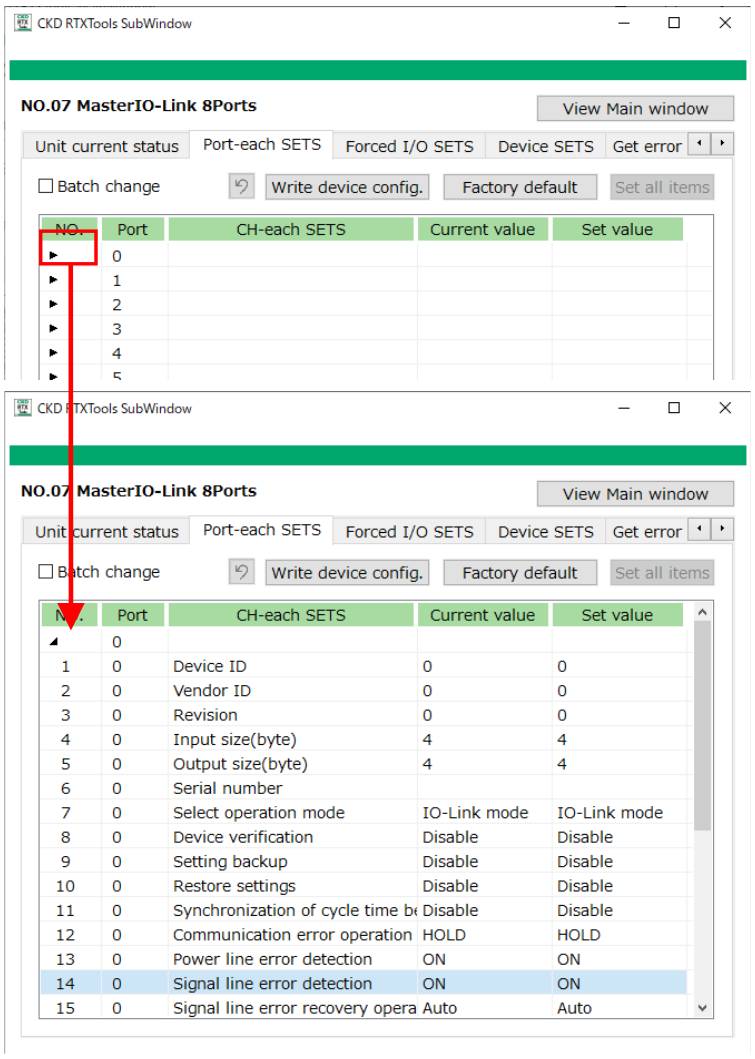
9.6.3 "Connector-each SETS" tab (digital input units only)



Set the digital input units' power line error detection individually for each connector.

1. Click the "▸" in the "NO." column of the connector number's row. The setting screen for that connector number will expand.
2. Set a value in the "Set value" column.
3. Click the "Set all items" button to transfer the settings that have been configured on the PC to the actual unit.

9.6.4 "CH/point/port-each SETS" tab



* The screen shown above is the "Port-each SETS" tab for an IO-Link master unit.

Configure per CH/Point/Port settings.

1. Click the "▸" in the "NO." column of the CH/point/port number's row. The setting screen for that CH/point/port number will expand.
2. Set a value in the "Set value" column.
3. Click the "Set all items" button to transfer the settings that have been configured on the PC to the actual unit.

Click the "Set with device" button when taking the configuration information (Note 1) for each port of the IO-Link master unit and writing it to the IO-Link master unit (only when in IO-Link mode). A screen will appear prompting the user to select the desired port number. Select the port number to get and write the actual configuration information for, then click the "OK" button.

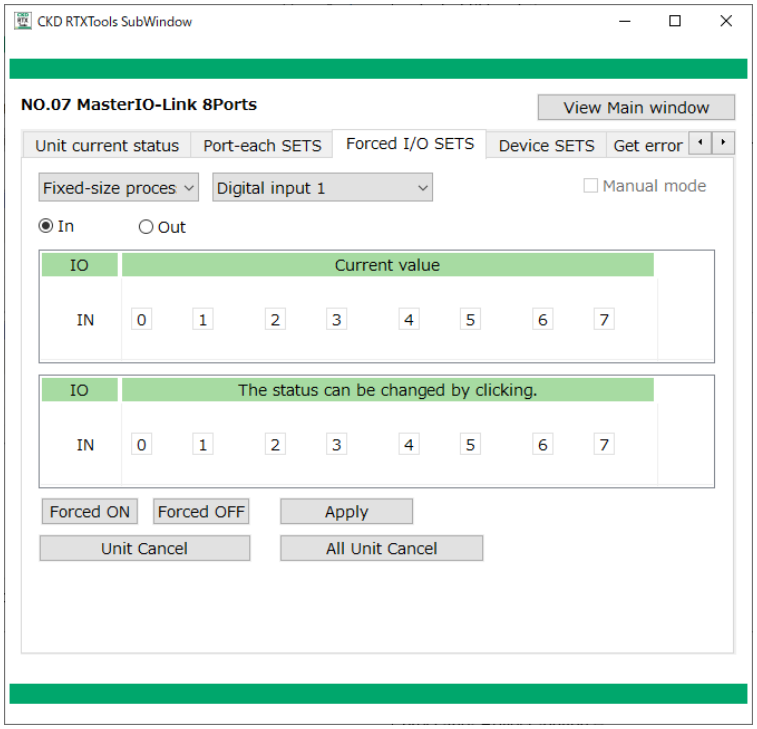
Note 1: The IO-Link device configuration information consists of the following: Device ID, vendor ID, revision, input size, output size, and serial number

* The types of tabs displayed will change depending on which unit is selected.

9.6.5 "Forced I/O SETS" tab

⚠WARNING

Confirm that the surroundings and equipment are safe when operating with forced input or output. (Note)
It may result in personal injury or damage to equipment.
Note: The forced input or output function forces the signal state to change.



* The screen shown above is the "Forced I/O SETS" tab for an IO-Link master unit.

Configure the forced I/O settings for the selected I/O unit.
There is individual operation and general operation.

● Individual operation:
- For digital input and digital output, click on the point to toggle the status between on and off. - Press the "Reflect" button to set it.

- For analog input and output units, select CH, change the value, and press the "Reflect" button.

- For an IO-Link master unit, the following steps are carried out (they cannot be performed when the IO-Link master unit has a "Reflect setting waiting" error):

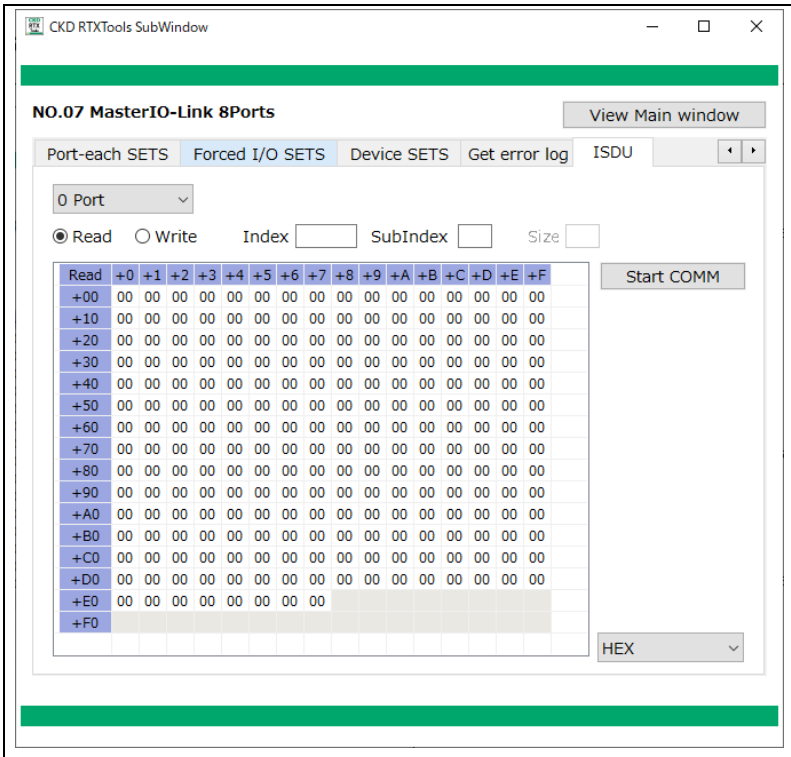
1. Select fixed length process data (and its data type (Note 1)) or a port.
2. Select "In" or "Out".
3. Enter the forced value in hexadecimal.
4. Click the "Reflect" button.

Note 1: If "Digital input 1" is selected, the corresponding area is indicated by a blue border.

● General operation
Operating the buttons will affect all points.
After pressing the appropriate button below, press the "Reflect" button.
- "Forced ON": Force all values to be ON or 0xFF.
- "Forced OFF": Force all values to be OFF or 0x00.
- "Unit Cancel": Release the forced state.

To release the entire remote I/O system, press the "All Unit Cancel" button.

9.6.6 "ISDU" tab (IO-Link master unit only)



Specify an IO-Link device's service data index / sub index, then read/write service data from/to it (only when in IO-Link mode).

Check "Read" or "Write".
When writing, enter the write data in bytes at the bottom.

Enter the index number (Note 1) of the IO-Link device's service data in "Index" and the sub index number (Note 1, Note 2) in "SubIndex", enter the "Size" (only when writing), then click the "Start COMM" button.

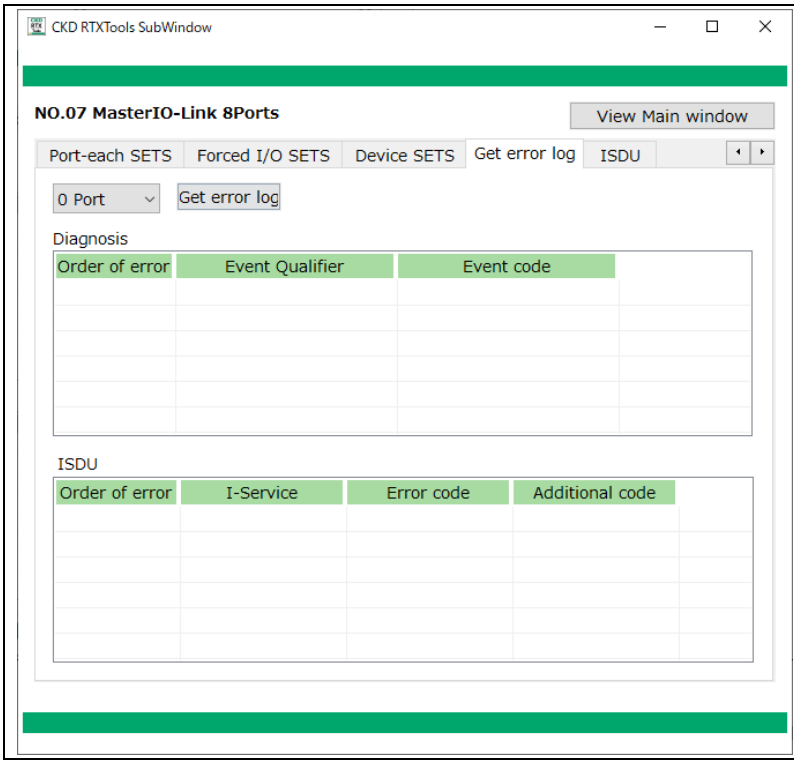
Note 1: To enter hexadecimal numbers, enter 0x first. Otherwise, they will be regarded as decimal numbers.
Note 2: If nothing is entered for the sub index number, it will be treated as "0".

When reading, the read data is displayed in bytes at the bottom.

The success or failure of the result is displayed below the "Start COMM" button as follows:
- Success: "Succeeded"
- Failure: "Failed"

"Unused" is displayed when not in IO-Link mode.

9.6.7 "Get error log" tab (IO-Link master unit only)



Click the "Get error log" button to display the error log in the following fields:
- "Diagnosis": Event codes in the event communication
- "ISDU": Error responses in ISDU communication (only for ports operating in IO-Link mode)

If there is no error log, it displays "No error".

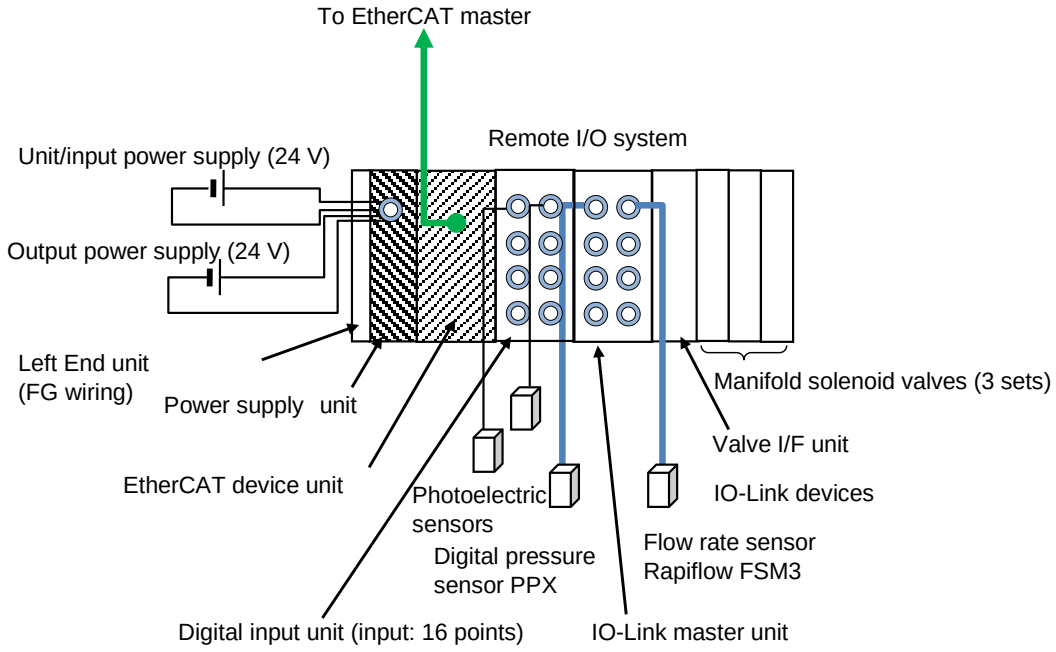
* When errors are retrieved from the PC software, the current error log data is cleared from the IO-Link master unit.

10. PRACTICAL EXAMPLE

This section shows a practical example of a system structure that performs EtherCAT PDO communication with the master.

10.1 System Structure

The example shows a configuration with a single digital input unit, IO-Link master unit, and two IO-Link devices connected to the IO-Link master unit.



E.g.)

Remote I/O system unit type	Peripherals	Unit name	Model No.	Quantity	Specifications
End (left)	-	Left End unit (DIN rail mounting)	RT-XFELN00N	1	
Power supply	-	Power supply unit	RT-XP24A01N	1	The following is supplied to the power supply unit from an external source: Unit/input power supply and output external power supply: 24 VDC, 1.3 A
Device unit	-	EtherCAT compatible device unit	RT-XTECN00N	1	
Digital I/O	-	Digital input unit	RT-XA-DGA16B	1	Digital input: 16 points, NPN
-	Photoelectric sensor			2	Reflective-type. Current consumption: Max 30 mA/sensor
IO-Link Master	-	IO-Link master unit	RT-XLMSA08N	1	8 ports
-	IO-Link device	Port 0: CKD digital pressure sensor PPX	PPX-R01PC-6M	1	Process data: Input 4 bytes, output 0 bytes
-		Port 1: CKD compact flow rate sensor Rapiflow FSM3	FSM3-C005U1BH1L1NG	1	Process data: Input 4 bytes, output 0 bytes
Valve I/F	Valve	Valve interface (with supply/ exhaust function)	TVG*P-TB-***-*-KA1*	3	

10.2 Prior Checking

Check the following in advance:

Item		This example	
Power supply unit's current consumption (Note 1)	Unit/input	- Total current consumption of each unit - Input current x number of points used - Total current consumption of the external input devices	Note: Take into account the efficiency of the power supply and inrush currents that may occur when external connected devices are switched on or off. For this reason, select a capacity that is at least approximately 1.6 times the total obtained on the left.
	Output	- Total load current of the connected loads - Total current consumption of the external output devices	
Whether to use remote I/O system diagnostic information		Device unit's DIP switch SW8 = on (remote I/O system diagnostic information will be used)	
Mode of each IO-Link port		Port 0: IO-Link mode Port 1: IO-Link mode Note: Ports 2 to 7 will also be left in the default IO-Link mode, and will not have any IO-Link devices connected to them.	
Output operation in the event of a communication error		Device unit's DIP switch SW3 = off (set individually for each unit)	
I/O size and assignment for PDO communication for the remote I/O system		Input: - Device unit remote I/O system diagnostic information: Input 1 byte - Digital input unit: Input 1 byte - IO-Link master unit: Total input: 14 bytes (if ports 2 to 7 are excluded) - Digital input 1: Input 1 byte - Digital input 2: Input 1 byte - Port error flag: Input 1 byte - IO-Link error flag: Input 1 byte - Event flag: Input 1 byte - "IO-Link input data enable flag": Input 1 byte - IO-Link device digital pressure sensor PPX: Input 4 bytes - Compact flow rate sensor Rapiflow FSM3: Input 4 bytes Output: - IO-Link master unit: Total output: 2 bytes (if ports 2 to 7 are excluded) - Digital output 1: Output 1 byte - Event flag clear: Output 1 byte - Valve I/F unit: Output 4 bytes	

Note 1: Power design: Example below.

Classification		Unit name	Unit/input power supply	Output power supply
Unit		EtherCAT compatible device unit	100 mA or less	15 mA or less
		Digital input unit	110 mA or less	5 mA or less
		IO-Link master unit	50 mA or less	
		Valve I/F unit	15 mA or less	75 mA or less
Peripherals	Connected to digital input unit	Photoelectric sensor	30 mA x 2 sensors	
	Connected to IO-Link master unit	CKD digital pressure sensor PPX	30 mA or less	
		CKD compact flow rate sensor Rapiflow FSM3	45 mA or less	
Total)			410 mA	95 mA
			Select a power supply with a capacity of at least 1.6 times the above. E.g.: Assume that the above power supply is shared, and that the external power supply is of 1.0 A-type.	

10.3 Operations in the Master-Side Configuration Tool

1 Download the dedicated profile for the industrial network used by the product (device unit) from the following CKD website
RT product page: :
https://www.ckd.co.jp/kiki/en/product/detail/1064

2 Import the dedicated profile for the industrial network used into the master-side configuration tool.

3 In the master-side configuration tool, manually configure the followings:
- Registration of the product (device unit) with the EtherCAT system
- Module configuration (I/O unit configuration) settings

4 In the master-side configuration tool, run "Edit PDO Mapping Settings" for the IO-Link master unit.
* The sizes of "Port1 Input Data" and "Port2 Input Data" will match the process data size of an IO-Link device connected with the default 4 bytes. Therefore, there is no need to add the basic unit of communication for the industrial network used.

5 Download the settings from the master-side configuration tool to the product (device unit).

10.4 I/O Assignment in PDO Communication

The I/O assignment to the master in PDO communication is as follows:

Connection position number	Unit	Name in the dedicated profile for the industrial network used	I/O	Assigned data (bytes)
0	EtherCAT compatible device unit	Diagnostic information	Input	1 byte
+1	Digital input unit	RT-XA-DGA16B	Input	2 bytes
+2	IO-Link master unit	RT-XLMSA08N	Input	14 bytes
			Output	2 bytes
+3	Valve I/F unit	RT-XVVCN32B	Output	4 bytes

10.5 Operations in the PC software

1 Supply power to the power supply unit.

2 Connect the PC software and the device unit with a USB cable.

3 The PC software starts up, it displays the Unit Configuration screen.

4 Switch to the "I/O Memory" main tab and check the process data size.

Position number	Unit	Input size	Output size
0	Device unit EtherCAT	1 byte	0 bytes
1	Digital input unit	2 bytes	0 bytes
2	IO-Link master unit	14 bytes	2 bytes
3	Valve I/F unit	0 byte	4 bytes

5 Double-click each unit's on-screen graphic, or select it and click the "Settings" button.
Enter the settings for each unit as follows:

Position number	Unit	Settings	
		Settings configured for each unit ("Unit SETS" tab)	Settings configured for each CH/point/port ("CH/point/port-each SETS" tab)
0	EtherCAT compatible device unit	Configure the following settings as required: - Unit/input power monitoring - Output power supply monitor - Settings related to logging etc. If necessary, click the "Set date and time" button.	None
1	Digital input unit	None	Configure the settings for power line error detection, input filter time, etc. as required.
2	IO-Link master unit	None	- Configuration information: Leave the input size of target ports 0 and 1 at the default value of 4 bytes. Apart from that, change the vendor ID, device ID, revision, and serial number. Alternatively, to get the configuration information from the actual IO-Link device, click the "Set with device" button. Select the target ports and click the "OK" button to write their configuration information to the IO-Link master unit. - Select operation mode: Leave the default value of "IO-Link Mode" for both port 0 and port 1. - Device verification: Change both port 0 and port 1 to "Verify". - Configure the other settings as required. - After configuring the above settings, turn the power off and on again.
3	Valve I/F unit	None	Configure the settings for signal line error detection, counter thresholds, etc. as necessary.

10.6 Checking the State of EtherCAT Communication, and Starting Control from the Upper Master

1 Check the state of EtherCAT communication.
- Check that the EtherCAT master's LEDs are normal.
- Check that device unit's LEDs are as follows:

Device unit LED	Status
RUN	Green on
ERR	Off
L/A IN	Green blinking (fast)
L/A OUT	Off (if there is no OUT connection)
SF	Green on
CF	Off

2 Check the product's PDO communication-based reading/writing of data from/to the EtherCAT master.

11. MAINTENANCE AND TROUBLESHOOTING

11.1 Maintenance

⚠WARNING

Never disassemble or modify the product.
These may cause failure or malfunction. In addition, they are not covered by our warranty.

Do not touch the product with wet hands while it is energized.
It may cause an electric shock.

Do not touch the connectors or gaskets for connecting units when handling or replacing units.
It may cause malfunction of failure.

Switch off the power supply, stop the supply of compressed air, and check that there is no residual pressure before performing maintenance such as adding or removing I/O units
The product may operate in an unexpected way, causing injury to people or damage to equipment.

Make sure to read and understand the instruction manual thoroughly before connecting or removing an I/O unit.
Not doing so may cause malfunction of failure.

⚠CAUTION

Ensure there is enough space to perform maintenance and inspections properly.

Check safety before performing maintenance.
Output devices may operate suddenly depending on the communication state.

Be careful not to get injured, e.g., by knocking your hands or getting them caught somewhere when removing connections between units.
The unit connectors are tightly coupled with gaskets.

Do not subject it to excessive impacts due to dropping or vibrations.
The product may get damaged or malfunction.

Do not remove the nameplate.
It may cause malfunction or failure due to incorrect adjustments, mistakes during maintenance and inspections, or using the wrong instruction manual.
It may also lead to non-compliance with safety standards.

Plan and perform daily and periodic inspections so that maintenance can be managed correctly.
If maintenance is not properly managed, the product's functions may deteriorate significantly. This may lead to faults (such as short service life, damage, and malfunctions) or accidents.

Perform proper functional testing after completing any maintenance or inspection work.
Not performing proper functional testing may lead to malfunction or failure.

Dispose of products by getting a professional waste disposal company to handle it, in accordance with the laws on waste disposal and cleaning.

11.1.1 Inspection

⚠CAUTION

Always shut off the power supplies before checking the following items.
Take due care over items that cannot be inspected unless the power is on.

Perform the following checks periodically (once to twice a year) so that the remote I/O system can be used for a long time.
Perform inspections at shorter intervals if using the product in an environment with extremely high temperatures, high humidity, a lot of dust, etc.

Inspection item	Inspection method	Action
Appearance inspection (Is there any dirt, dust, etc. on the unit?)	Visual check	Remove any dirt, dust, etc.
Are any screws or connectors loose?	Check for looseness	Tighten them.
Are any cables damaged or cracked?	Visual check	Replace the cables.
Is the power supply voltage normal?	Check with a tester	Inspect the power supply system, and always use the specified power supply and within the specified voltage range.

* Depending on what condition the product is in, it may not be possible to accept it for repairs.

11.1.2 Cleaning

⚠CAUTION

Do not use benzine, thinners, etc.
It may cause the surfaces to get damaged or the display to disappear.

In order to use the devices under optimum conditions, clean and inspect them periodically.

1 For daily cleaning, wipe the product with a soft dry cloth.

2 When stains cannot be removed by wiping with a dry cloth, moisten the cloth with diluted neutral detergent (2%), wring it out well, and wipe the stains again.

3 Wipe again with a dry cloth.

11.2 Troubleshooting

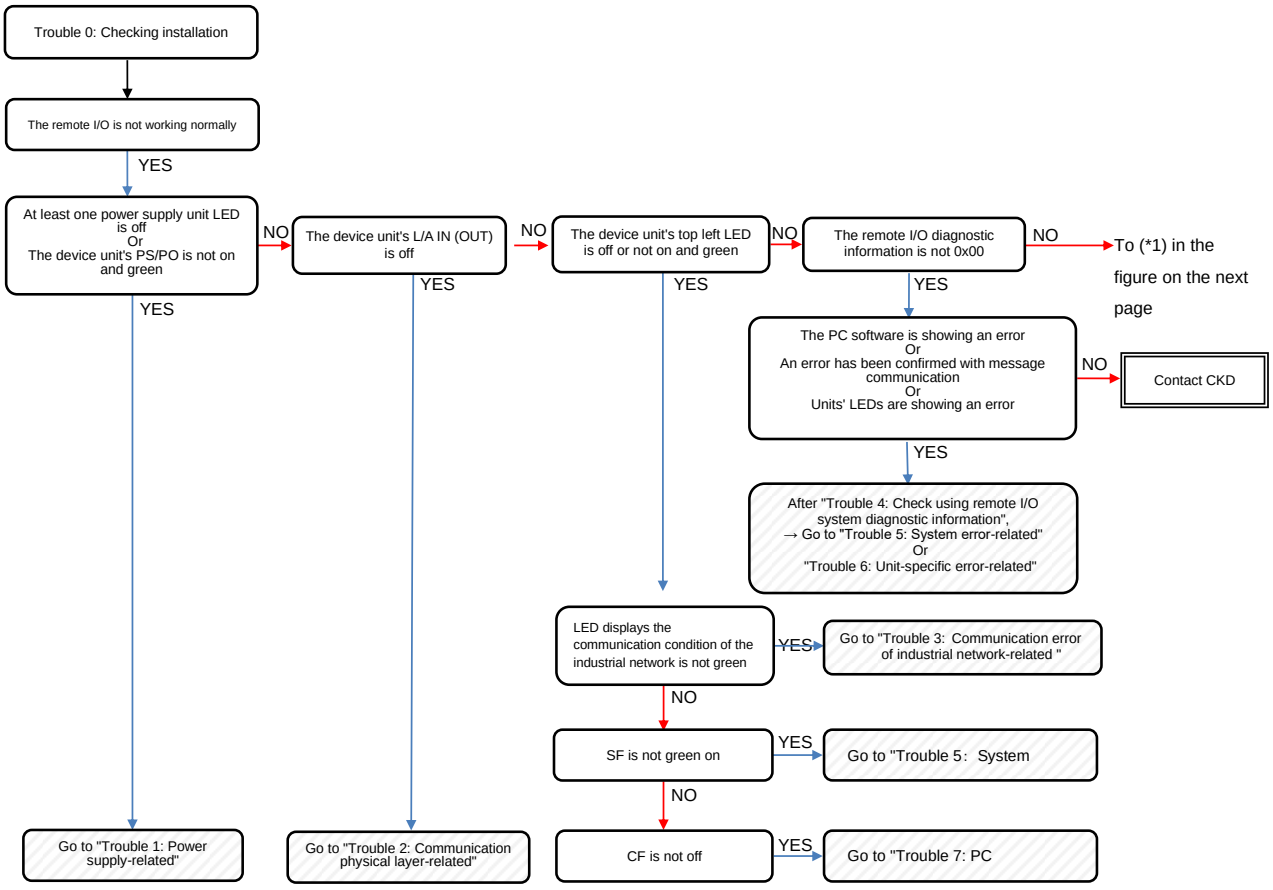
⚠CAUTION

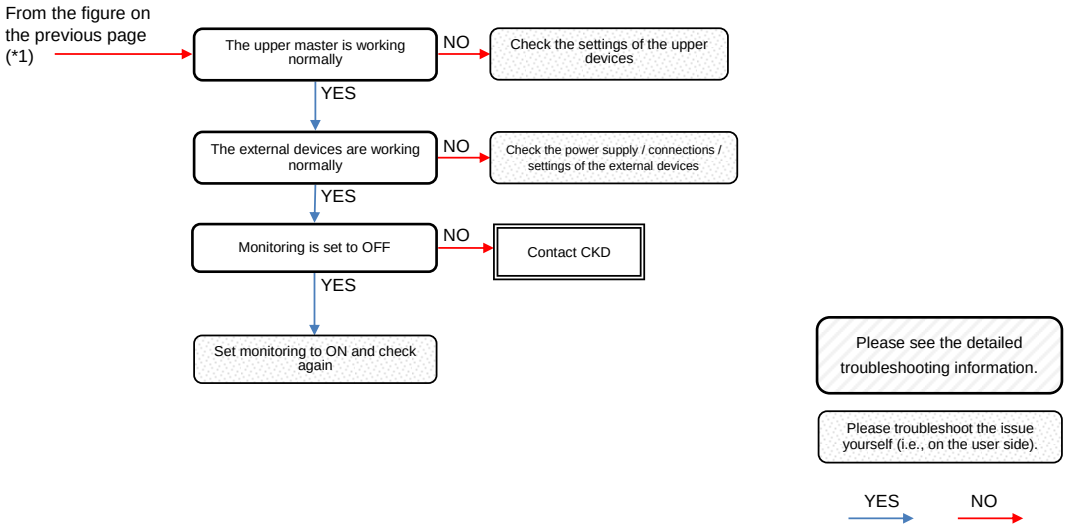
Stop operating the product if it or any of its component devices are different from normal (for example not functioning normally).
The component devices may malfunction.

If a malfunction occurs in the remote I/O system, use the flowchart below for troubleshooting the problem.
Troubleshoot the remote I/O system as an entire system, not as a collection of individual devices.

11.2.1 Troubleshooting flowchart

Use the flowchart below for troubleshooting the problem. For more information, refer to the corresponding Trouble No. in "11.2.2 Troubleshooting list".





11.2.2 Troubleshooting list

Details for each Trouble No. in the preceding flowchart are given below.

Trouble No: Group name	Problem	Likely causes	Countermeasures
Trouble 0: Checking installation	There is a unit configuration error (Note 1), or a potential operational problem due to a mistake made during installation. Note 1: If a mistake has been made with a physical connection or a connection between units, it will be treated as a "unit configuration error" (see "Trouble 5: System errors").	Tie rods were not used when connecting units.	The units must be connected using the following tie rods: - RT-TR-P: For power supply units - RT-TR-1: For device unit or I/O unit (other than valve I/F unit) - RT-TR-V: For valve I/F unit - RT-TR-E: For right End unit
		Suitable tie rods have not be used.	
		The connections between units have not been tightened enough (specified torque 1.2 N·m ± 0.05 N·m).	Tighten the hexagon socket bolts (M4 x 20) and tie rods together using the specified torque.
		The width of the remote I/O system is greater than 922.5 mm.	Change the unit configuration so that the width of the remote I/O system is 922.5 mm or less.
	For direct screw mounting: The weight has caused the remote I/O system to become distorted between units that are intermediate between the direct screw mountings on the left and right. For DIN rail mounting: The weight has caused the remote I/O system to become distorted between units that are intermediate between the left and right.	No auxiliary bracket (RT-SPE for direct screw mounting) has been attached to the intermediate connected units. One auxiliary bracket needs to be attached for every four units, including the device unit.	Attach auxiliary bracket (RT-SPE) to the intermediate units (one for every four units, including the device unit).
Trouble 1: Power supply-related	A power supply unit's PWR(S) is off.	The unit/input 24 V is off.	Check the following items to ensure that the correct unit/input power is being supplied: - Are the power cables wired up correctly? - Are any power cables disconnected? - Is there a power supply failure? - Is the power supply voltage within the specified range?
		The unit/input 24 V is not being supplied (is outside the range 24 VDC -10% to 24 VDC +10%).	
		The capacity of the power being supplied is not enough.	Calculate the total of the below, and add more power supply units so that it is less than 3 A per power supply unit (Note 1). - Unit consumption current of each I/O unit itself (including the amount consumed by the input internal circuit) - Input current x number of points used - Current consumption of external input devices Note 1: It is recommended selecting a capacity that is at least

Trouble No: Group name	Problem	Likely causes	Countermeasures
			approximately 1.6 times greater, taking into account the efficiency of the power supply and inrush currents that may occur when external connected devices are switched on or off.
Trouble 1: Power supply-related (Continued)	A power supply unit's PWR(S) is off. (Continued)	The power supply unit's fuse has blown, due to an overcurrent and such.	- Check the connections between the units for problems. - Replace the power supply unit.
	A power supply unit's PWR(O) is off.	The output 24 V is off.	Check the following items to ensure that the power supply for the output is correct: - Are the power cables wired up correctly? - Are any power cables disconnected? - Is there a power supply failure? - Is the power supply voltage within the specified range?
		The output 24 V is not being supplied (is outside the range 24 VDC -5% to 24 VDC +10%).	
		The capacity of the power being supplied is not enough.	Calculate the total of the below, and add more power supply units so that it is less than 3 A per power supply unit: - Load current of the connected loads - Current consumption of external output devices
		The power supply unit's fuse has blown, for example, due to an overcurrent.	- Check the connections between the units for problems. - Replace the power supply unit.
	A power supply unit's PWR(O) is green on, but its PWR(S) and PWR(I) are off.	The unit/input 24 V is not being supplied correctly. Or, the power supply unit's internal fuse has blown.	Check the unit/input 24 V power supply. If the problem persists, contact CKD.
	A power supply unit's PWR(S) and PWR(I) are green on, but its PWR(O) is off.	The output 24 V is not being supplied correctly. Or, the power supply unit's internal fuse has blown.	Check the output 24 V power supply. If the problem persists, contact CKD.
	A power supply unit's PWR(S) and PWR(O) are green on, but its PWR(I) is off.	There is a failure in one of the power supply unit's internal ICs.	Replace the power supply unit.
	The device unit's PS LED is blinking red (fast).	The device unit has detected that the voltage of the unit/input 24 V is outside the range 24 VDC ± 25%.	Check whether the voltage of the unit/input 24 V for the power supply unit is within the correct range.
	The device unit's PS LED is yellow on.	It is latched after recovering from a voltage error in the unit/input 24 V.	Turn the power off and on again, or perform a "latch reset" from the PC software.
	The device unit's PO LED is blinking red (fast).	The device unit has detected that the voltage of the output 24 V is outside the range 24 VDC ± 25%.	Check whether the voltage of the output 24 V for the power supply unit is within the correct range.
	The device unit's PO LED is yellow on.	It is latched after recovering from a voltage error in the output 24 V.	Turn the power off and on again, or perform a "latch reset" from the PC software.
Trouble 2: Communication physical layer-related	L/A IN and L/A OUT are both off when L/A OUT (downstream) is in use.	The link has not been established.	Check the following items and turn the power off and on again. - Is the device on the upper side powered on? - Are any communication cable connectors loose? - Are there any sources of noise along the communication line?
	L/A IN is off when L/A OUT (downstream) is not in use.		

Trouble No: Group name	Problem	Likely causes	Countermeasures
Trouble 2: Communication physical layer-related (Continued)	L/A IN and L/A OUT are both green on when L/A OUT (downstream) is in use.	The link has been established, but no data has been received.	Check the following items and turn the power off and on again. - Is the master running? - Are (two or more) upper EtherCAT devices' L/A IN and L/A OUT LEDs off? (If so, are the devices powered on?) - Are any communication cable connectors loose? - Are there any sources of noise along the communication line?
	L/A IN is green on when L/A OUT (downstream) is not in use.		
Trouble 3: Communication error of industrial network-related	-	-	Refer to the device unit instruction manual compatible to each network.
	Cannot communicate with the industrial network master.	The process data size of RT registered with the industrial network master and the actual process data size does not match.	Check the process data size of RT.(Note 2) Match the process data size of RT registered with the industrial network master and the actual, as necessary. Note 2: Refer to “9.5.3 [I/O memory Tab]”.
	Diagnostic information has not added.	Adding the diagnostic information has not set.	Set the DIPSW No.8 of the device unit to ON and turn the power off and on again.
Trouble 4: Check using remote I/O system diagnostic information	If the device unit's DIP switch SW8 (remote I/O system diagnostic information ON/OFF) is on, check the following via the cyclic communication from the upper master:		Refer to "Trouble 7: PC software-related" below to see what kinds of factors are causing each error.
	Bit 0 (unit input error) is 1 (on).	The cause could be any of the following: - The Off_On cycle is over the threshold for digital input. - A max/min range error or user set value upper/lower limit error has been triggered for analog input. - Device mismatch or IO-Link COMM error has been triggered in the IO-Link master unit.	Refer to the instruction manual for each I/O unit.
	Bit 1 (unit output error) is 1 (on).	The cause could be any of the following: - A signal line error has occurred in digital output or a valve I/F unit. - The Off_On cycle is over the threshold for digital output or a valve I/F unit's output signal. - A max/min range alarm or user set value upper/lower limit alarm has been triggered for analog output. - A signal line error has occurred in an IO-Link master unit (digital output mode).	Refer to the instruction manual for each I/O unit.
	Bit 3 (power failure) is 1 (on).	The cause could be any of the following: - A power line error has occurred in digital or analog input. - A Unit/input power voltage error (device unit) has occurred. - An output power supply voltage (device unit) has occurred. - A power line error has occurred in the IO-Link master unit (IO-Link or digital input mode), a digital input unit, analog input unit, or analog output unit.	Refer to the instruction manual for each device unit or the IO-Link master unit instruction manual.

Trouble No: Group name	Problem	Likely causes	Countermeasures
Trouble 4: Check using remote I/O system diagnostic information (Continued)	Bit 5 (user operation waiting) is 1 (on).	The cause could be any of the following: - Manual output occurred when an error was detected in a digital output unit, analog output unit, or valve I/F unit. - A "Reflect setting waiting" has occurred in digital input. - A "Reflect setting waiting" has occurred in an IO-Link master unit. - A "Hold force OFF (disconnection detection)" has occurred in a digital input unit or analog input unit.	Refer to the instruction manual for each I/O unit.
	Bit 6 (hardware error) is 1 (on).	The cause could be any of the following: - A hardware error has occurred in one of the connected I/O units. - A memory read/write error (device unit or IO-Link master unit) has occurred.	Refer to the instruction manual for each I/O unit.
	Bit 7 (system error) is 1 (on).	See "Trouble 5: System error-related" below.	
Trouble 5: System error-related (Check using remote I/O system diagnostic information)	The device unit's SF LED is blinking yellow (fast).	Unit configuration error (device unit) has occurred.	Refer to the instruction manual for each device unit.
	The device unit's SF LED is blinking red (twice).	Factory setting error (device unit) has occurred.	
	The device unit's SF LED is blinking green (fast).	Initialized set memory (device unit) has occurred.	
	The device unit's SF LED is blinking green (slow).	Process data overflow (device unit) has occurred.	
	The device unit's SF LED is blinking red (fast).	Internal bus communication error (device unit) has occurred.	
	The IO-Link master unit's even number (left) LED is blinking yellow (slow).	Process data size error (IO-Link master unit) has occurred.	Refer to the IO-Link master unit instruction manual.
	-	Data mapping error (IO-Link master unit) has occurred.	
	The IO-Link master unit's even number (left) LED is blinking yellow (fast) .	Allocation error (IO-Link master unit)	
Trouble 6: Unit-specific error-related (Examples on the right)	When using an IO-Link master unit, "device mismatch" occurred upon the IO-Link devices were being verified at power-up (start-up).	A user has changed the IO-Link device configuration for IO-Link. Or, IO-Link devices are connected incorrectly.	Refer to the IO-Link master unit instruction manual.
	When using an IO-Link master unit, input from IO-Link devices cannot be read correctly.	Input data has been read without using "IO-Link input data enable flag".	

Trouble No: Group name	Problem	Likely causes	Countermeasures
Trouble 7: PC software-related	In the error information in the PC software's main window and in the diagnostic information and log area in the "Error" main tab, the following was confirmed: - An I/O unit's error code in the CH/point/port diagnostic information is not 0x0000. Or, - In the case of EtherCAT, the value of the unit diagnostic information read from the upper master is not 0x0000.	In unit-specific CH/point/port diagnostic information, an error is or was occurring.	- In the PC software's "Error" main tab, identify the error from the "error code" of one of the I/O units. - Based on logged CSV data or the PC software, identify the location of the error from the unit position number / CH/point/port number. Then, identify the error from the error code in the log data. - If the unit position number has been identified based on the PC software or the error logging function, it is possible to read the CH/point/port diagnostic information from the upper master by means of a communication command.

12. APPENDIX: LIST OF REMOTE I/O SYSTEM OPERATIONS IN THE EVENT OF A FAULT

This section lists the operations performed by the remote I/O system in the event of a fault and when recovering from one.

12.1 Communication Error

■ On occurrence

Upper communication error

Device unit				Operation of each I/O unit
DIP switch setting SW3 (output settings in the event of a communication error/ priority to hardware)		DIP switch setting SW4 (hold/clear)		
ON	Set for all units at once	ON	Hold all outputs	For the digital output, valve I/F unit, IO-Link master unit (when in digital output mode), and analog output, hold the previous output.
		OFF	Clear all outputs	For the digital output, valve I/F unit, and IO-Link master unit (when in digital output mode), output OFF. For the analog output, switch off the analog output power supply.
OFF	Set individually for each unit	-		According to the operation setting in the event of a communication error (specifying off/on/hold) for each I/O unit.

Internal bus communication error

Device unit				Operation of each I/O unit
DIP switch setting SW3 (output settings in the event of a communication error/ priority to hardware)		DIP switch setting SW4 (hold/clear)		
ON	Set for all units at once	ON	Hold all outputs	For the digital output, valve I/F unit, IO-Link master unit (when in digital output mode), and analog output, hold the previous output.
		OFF	Clear all outputs	For the digital output, valve I/F unit, and IO-Link master unit (when in digital output mode), output OFF. For the analog output, switch off the analog output power supply.
OFF	Set individually for each unit	-		According to the operation setting in the event of a communication error (specifying off/on/hold) for each I/O unit.

■ On recovery

Upper communication error

Device unit				Operation of each I/O unit
DIP switch setting SW3 (output settings in the event of a communication error/ priority to hardware)		DIP switch setting SW4 (hold/clear)		
ON	Set for all units at once	ON	Hold all outputs	Recovers automatically.
		OFF	Clear all outputs	
OFF	Set individually for each unit	-		

Internal bus communication error

Device unit				Operation of each I/O unit
DIP switch setting SW3 (output settings in the event of a communication error/ priority to hardware)		DIP switch setting SW4 (hold/clear)		
ON	Set for all units at once	ON	Hold all outputs	Does not recover.
		OFF	Clear all outputs	
OFF	Set individually for each unit	-		

12.2 Each Connection Line Error

I/O units	Digital input unit	Digital output unit	Analog input unit	Analog output unit	IO-Link master unit			Valve I/F unit
					IO-Link mode	Digital input mode	Digital output mode	
Error name	**Power line error (pin 1 line error)**	**Signal line error (pin 2 or 4 line error)**	**Power line error (pin 1 line error)**	**Power line error (pin 1 line error)**	**Power line error (pin 1 line error)**	**Power line error (pin 1 line error)**	**Signal line error (pin 4 line error)**	**Signal line error (valve control line error)**
Error detection settings	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Error operation	Inputs OFF.	Outputs OFF.	Inputs the minimum (absolute) value of the operating range format.	Switches off the analog output power supply.	Triggers an IO-Link COMM error.	Inputs OFF.	Outputs OFF.	Outputs OFF.
Recovery operation settings	No	Yes	No	Yes	No	No	Yes	Yes
Recovery operation	Recovers automatically.	According to the set recovery operation.	Recovers automatically.	According to the set recovery operation.	Recovers automatically.	Recovers automatically.	According to the set recovery operation.	According to the set recovery operation.

Note 1: Recovers OFF when disconnection.

13. WARRANTY PROVISIONS

13.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, when the following items apply, they are excluded from the scope of this warranty.

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or the Instruction Manual.
- Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts. (Note1)
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product
- Failure caused by modifications/alterations or repairs not carried out by CKD
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery
- Failure caused by acts of nature and disasters beyond control of CKD.

Note 1: For details on the durability and consumable parts, contact your nearest CKD sales office.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

13.2 Warranty Period

The product specified herein is warranted for one (1) year from the date of delivery to the location specified by the customer.