CKD

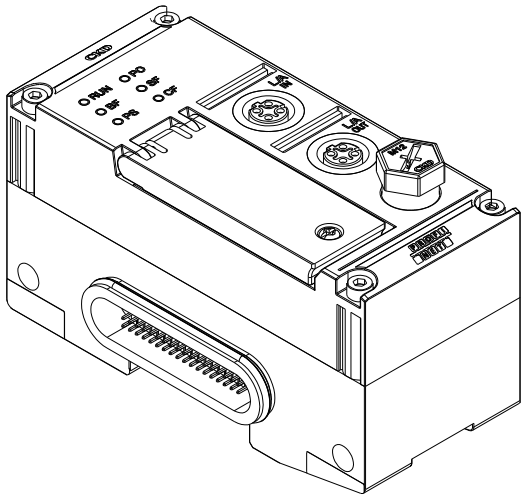
Remote I/O

RT series

PROFINET Compatible Device Unit

INSTRUCTION MANUAL

SM-A87934-A/2



- 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株式会社

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.

PROFINET is an open Industrial Ethernet solution based on international standards proposed by PI (PROFIBUS & PROFINET International).
The names of companies and products in this text are the registered trademarks or trademarks of their respective companies.

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, 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 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, customer's 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 a 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, railroads systems, aviation, ships, vehicles, 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 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 incorporates 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.

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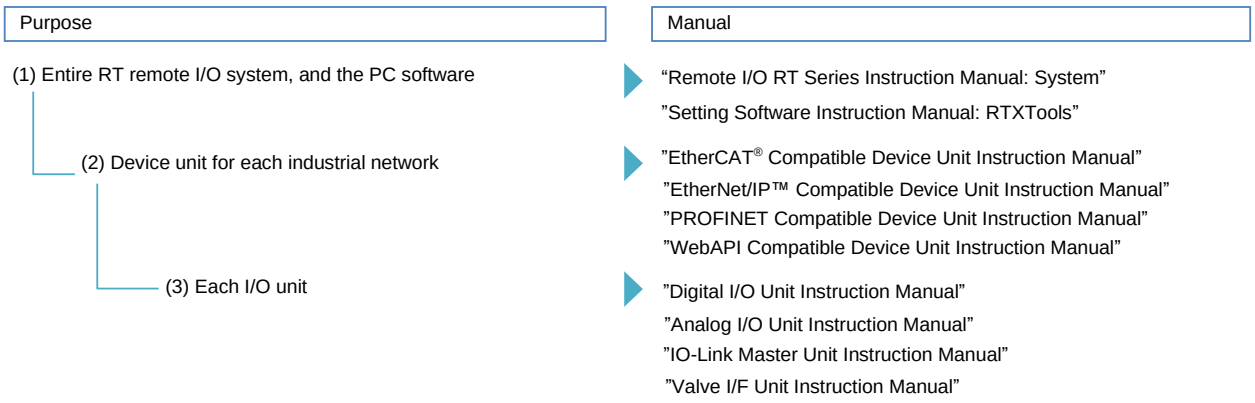
INSTRUCTION MANUAL FOR THIS PRODUCT

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	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 for RT series.
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 (this 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 □ AGA0 2N
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	

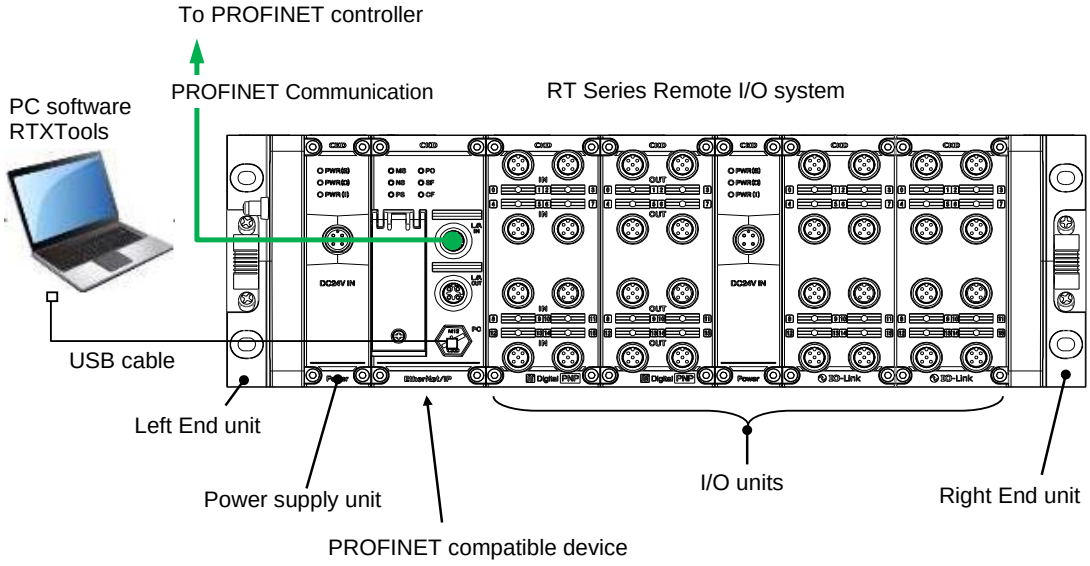
TERMS RELATED TO THE PROFINET COMPATIBLE DEVICE UNIT

Terms	Definition
GSDML file	An XML format file that describes the characteristics and functions of a PROFINET device.
PROFINET	PROFINET is an open Industrial Ethernet solution based on international standards proposed by PI (PROFIBUS & PROFINET International).
PROFINET IO	A PROFINET communication mechanism that exchanges periodic input/output data. There is RT and IRT.
CC-A/B/C	A Class of the conformance. It classifies the function PROFINET IO needs to support.
IO controller	PROFINET equipment that controls IO devices. PLC for example.
IO device	A device that actually performs input and output. One or more devices are connected to the IO controller.
Slot	The place where the IO module within the IO device is located.
Sub slot	The actual input/output interface inside the slot.
Index	Data in the sub slot used for acyclic reading and writing.
DCP	Address identification and setting protocol for PROFINET IO.
Cyclic data communication	Input/output data communication between the IO controller and IO device periodically.
Acyclic parameter communication	Acyclic communication for the purpose of IO device configuration, etc.
WebAPI	A mechanism that provides an interface for manipulating applications over HTTP communication.
LAN	Local Area Network A network constructed in a limited range such as an office.
V	A value or a set value that disappears when the power is turned off.
NV	A value or a set value that is retained even the power is turned off.
json	Format of a text as defined in RFC8259.
SendClock	An element to determine the update time for PROFINET device. SendClock = SendClockFactor x 31.25 µs
SendClockFactor	An element to determine the update time for PROFINET device. The integer multiple of PROFINET base clock 31.25 µs always become SendClock. SendClock = SendClockFactor x 31.25 µs
ReductionRation	An element to determine the update time for PROFINET device. Update time = ReductionRation x SendClock
ctc	Communication cycle time.

1. PRODUCT OVERVIEW

RT Series PROFINET compatible device unit is a device unit in the Remote I/O RT Series systems and compatible to open network PROFINET.
The device unit acts as an interface between the PROFINET controller (upper master) and each I/O units.

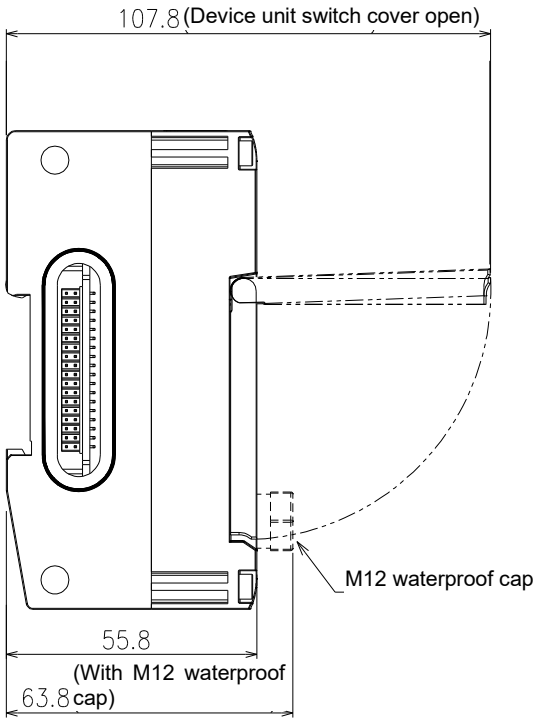
By connecting the PC software (free of charge) to the device unit via USB or LAN, it is possible to check the information and status of the entire Remote I/O RT Series system, as well as the settings/status of each unit.

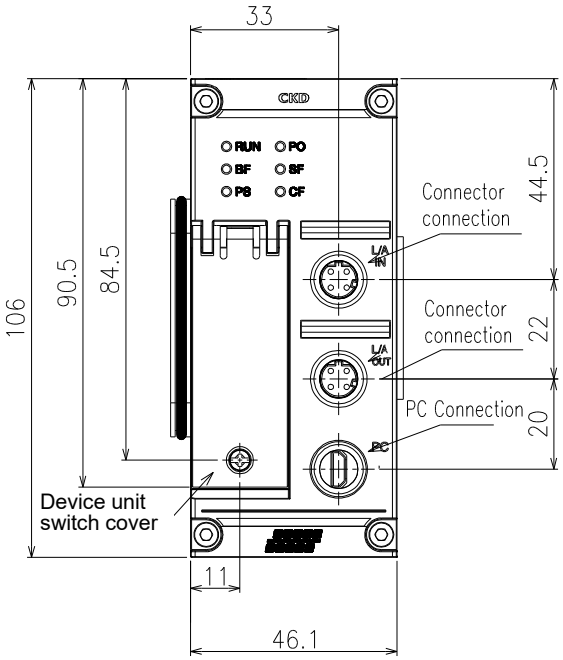


1.1 Features

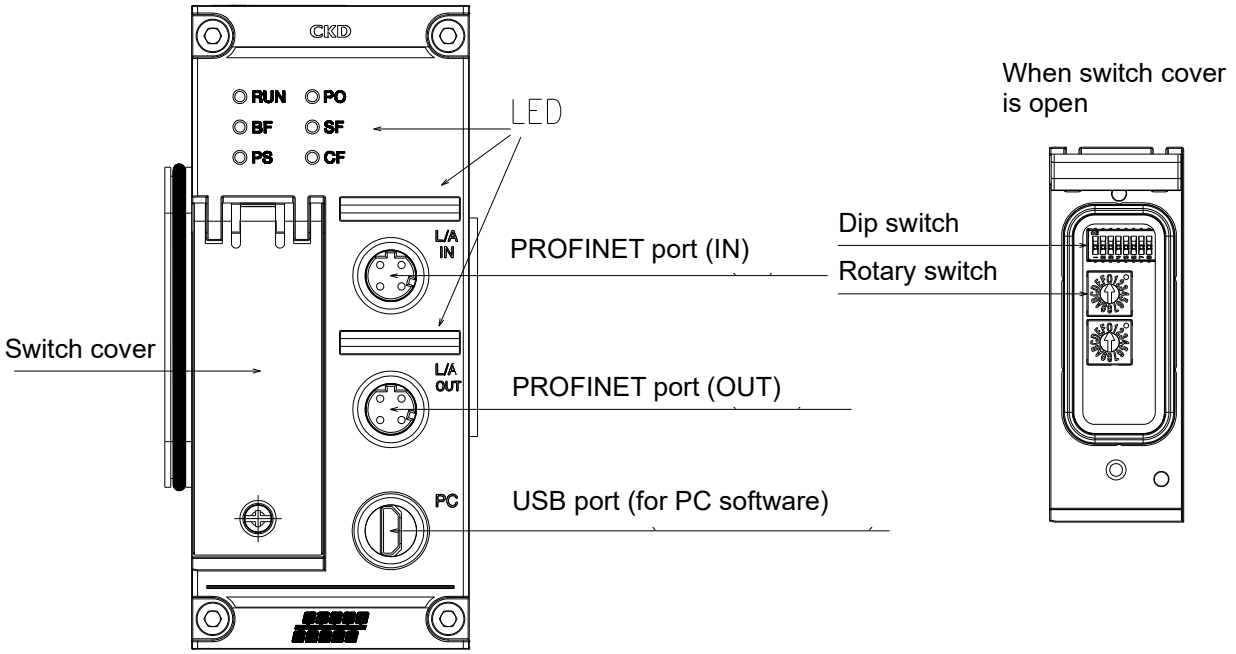
Features include:
- Supports both cyclic data communication and acyclic parameter communication of PROFINET.
- Diagnostic information of the connected unit can be cyclically transmitted to the PROFINET controller.
- Supports the PROFINET MRP (Media Redundancy Protocol) function.
- Monitors the status of the internal power supply from the power supply unit (from among the power supply units on the left side toward the device unit, the closest power supply unit to itself is monitored).
- The output operation in the event of a communication error can be specified for the entire Remote I/O system.
- The 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.
- WebAPI compatible. Acquisition/change of the settings data of each unit and acquisition of the status is possible via LAN.

1.2 External Dimensions





1.3 Names and Functions of Each Part



■ LED

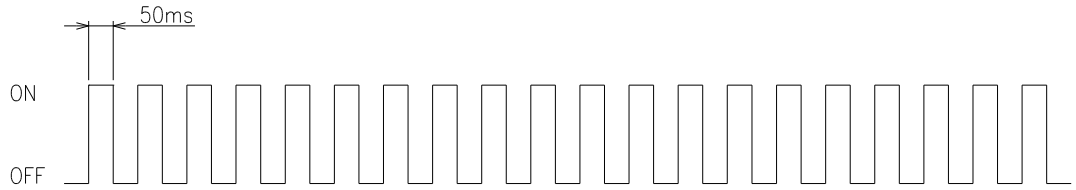
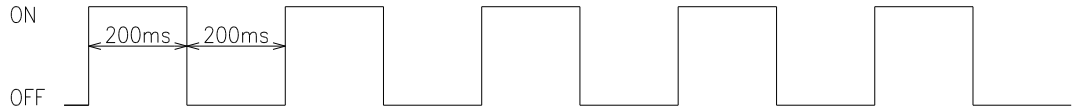
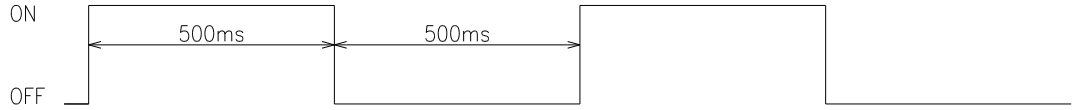
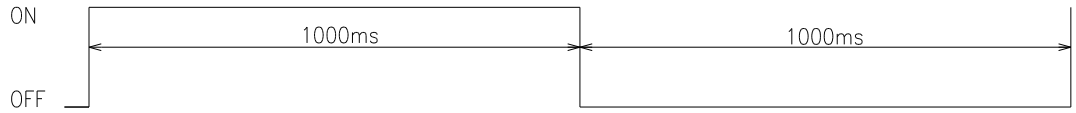
Specifications

LED name	Indication
RUN	Indicates the status of the entire product.
BF	Indicates the PROFINET connect status.
L/A IN	Indicates the link status on the IN side of the connector.
L/A OUT	Indicates the link status on the OUT side of the connector.
PS	Indicates the 24 V power status for the unit/input.
PO	Indicates the 24 V power status for the output.
SF	Indicates the status of the entire Remote I/O system.
CF	Indicates a setting change or forced input/output.

Status list

Part name	Status	Meaning
RUN	Green on	Normal condition
	Green blinking	Preparing for communication At the time receiving the Flash LED command
	Off	Power is not turned on
BF	Red on	・The [Device Name] of the PLC's settings and device unit mismatched ・The power of PLC is off. ・The network cable between PLC and the device unit is not wired. ・Failure of PLC or device unit
	Red blinking (1Hz)	Configuration data with PLC mismatched Or process data size of each unit mismatched
	Green blinking	At the time receiving the Flash LED command
	Off	・The power is off ・Connection established and communicating normally
L/A IN	Green blinking (fast)	LINK, ACTIVITY
	Green on	LINK, NO ACTIVITY
	Off	NO LINK, NO ACTIVITY
L/A OUT	Green blinking (fast)	LINK, ACTIVITY
	Green on	LINK, NO ACTIVITY
	Off	NO LINK, NO ACTIVITY
PS	Red blinking (fast)	Unit/input voltage is outside the range of 24 V ± 25%
	Yellow on	Unit/input voltage restored from voltage error Note: Once it occurs, it will be latched. It must be reset by a power cycle operation or by using PC software.
	Green on	Unit/input voltage is in normal condition.
	Off	Power OFF status
PO	Red blinking (fast)	Output voltage is outside the range of 24 V ± 25%
	Yellow on	Output voltage restored from voltage error. Note: Once it occurs, it will be latched. It must be reset by a power cycle operation or by using PC software.
	Green on	Output voltage is in normal condition.
	Off	Power OFF status
SF	Red blinking (fast)	Internal bus communication error Note: Once it occurs, it will be latched. It must be reset by a power cycle operation or by using PC software.
	Red blinking (slow)	Hardware error
	Red blinking (twice)	Factory setting error (serial number of device unit)
	Yellow on	Operation waiting
	Yellow blinking (fast)	Unit configuration error
	Green blinking (fast)	Initialized set memory (starts in system reset status) Note: Once it occurs, it will be latched. It must be reset by a power cycle operation or by using PC software.
	Green blinking (slow)	Process data overflow
	Green on	Normal condition
	Off	Power OFF status
CF	Red blinking (slow)	WebAPI/PC concurrent access
	Yellow on	Being set to the forced I/O settings
	Green blinking (fast)	Being accessed to WebAPI
	Green blinking (slow)	Being accessed from PC
	Off	Power OFF status or no access status

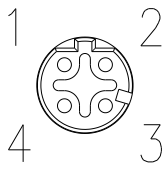
■ LED blinking statuses

Blinking status	Blinking timing
Blinking (fast)	
Blinking (slow)	
Blinking (1 Hz)	
Blinking (0.5 Hz)	

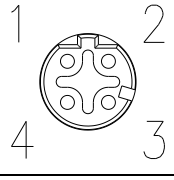
A video is available to show how the LEDs actually blink.
If necessary, refer to the video at the following URL.

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

■ PROFINET port (IN)

M12(A) 4-pin female	Pin number	Description
	1	Transmission data, plus (TD+)
	2	Reception data, plus (RD+)
	3	Transmission data, minus (TD-)
	4	Reception data, minus (RD-)

■ PROFINET port (OUT)

M12(A) 4-pin female	Pin number	Description
	1	Transmission data, plus (TD+)
	2	Reception data, plus (RD+)
	3	Transmission data, minus (TD-)
	4	Reception data, minus (RD-)

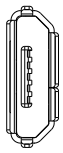
■ Waterproof cap

Always put a waterproof cap on any ports that are not in use.
The tightening torque is 0.1 ± 0.05 N･m.
In addition, proper use of waterproof caps (RT-CM12) is required to achieve protection structure IP65/IP67.
Purchase RT-CM12 separately.

■ USB port (for PC software)

CAUTION

Do not leave the USB port open.
If there are no waterproof caps on the USB port, the degree of protection of the USB port is IP20. Do not allow foreign objects to get inside, and ensure that the ports are free of water, solvents, and oil during use.

Micro USB(B)	Pin number	Description
	1	VBUS
	2	DM
	3	DP
	4	ID
	5	GND

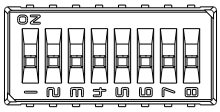
* For the unused USB port, always attach the waterproof cap that comes included as standard accessory (RT-CM12 when sold separately).

■ Dip switch

WARNING

When operating each switch on the device unit, switch OFF the supplied power and set the switches with a precision screwdriver or other tool.
Not doing so can cause a failure as a result of short circuits or damage to components.

When operating a switch, make sure that only the relevant areas are in contact.
Not doing so may result in a failure.

Dip switch 8 points	SW	Part name	Description
	1	WebAPI	Specifies whether the WebAPI function is enabled or disabled OFF: Disable (factory setting) ON: Enable
	2	Reserved	-
	3	Output settings in the event of a communication error/ priority to hardware	Selects whether the operation of all connected I/O units is specified at once by Dip switch SW4 or individually by unit. Read at start-up. OFF: Set individually by unit (factory setting) ON: Specified all units at once (specified by dip switch SW4)
	4	HOLD/CLEAR	If SW4 is on, select whether the output operation (Note 2) in the event of error communication (Note 1) is to be HOLD at the last value or to be OFF (the output value of the process data remains unchanged, and the output power is turned OFF). Read at start-up. OFF: CLEAR (the output value of the process data remains unchanged, and the output power is turned OFF) (factory setting) ON: HOLD at the last value Note 1: It indicates an industrial network communication error or an internal bus communication error. Note 2: It indicates valve I/F unit , digital output, analog output or output in DIO mode of IO-Link unit.
	5	Parameter initialization at startup	If ON at start-up, all units will be restored to the factory setting. OFF: Do not initialize (factory setting) ON: Initialize (restores factory setting for all installed units)
	6	Reserved	-
	7	Reserved	-
	8	Remote I/O system diagnostic information ON/OFF	If ON at start-up, diagnostic information for the entire remote I/O system is added to the data transmitted to the PROFINET controller. OFF: Do not add Remote I/O system diagnostic information (factory setting) ON: Add Remote I/O system diagnostic information Note: The Remote I/O system diagnostic information is in a 16-bit form consisting of the following information: -System error -Hardware error -Operation waiting -Power failure -Unit output error -Unit input error

The set value is read only once at start-up and confirmed.

■ Rotary switch

2 rotary switches	Value	Name	Description
	2 digits from 0 to f	Device name settings	Sets the device name of the PROFINET compatible device unit. Set 00 to ff with combination of x1 and x16 switches. 00: Use the software setting value(DCP) 01 to ff: The device name will be “rt-xx”.(*) *xx is the switch setting value Factory setting: 0 (rt) The value is read only once at start-up and confirmed.

1.4 Unit Specifications

<table>
<tr><th colspan="2">Item</th><th>Description</th></tr>
<tr><td colspan="2">Type</td><td>Device unit</td></tr>
<tr><td rowspan="7">Communication specifications</td><td>Protocol</td><td>PROFINET (PROFINET IO V2.43)</td></tr>
<tr><td>Compliance standard</td><td>IEEE802.3u</td></tr>
<tr><td>Distance between nodes</td><td>Maximum of 100 m</td></tr>
<tr><td>Cable</td><td>Standard Ethernet cable (CAT5 or higher, 100BASE-TX)</td></tr>
<tr><td>Speed</td><td>100 Mbps</td></tr>
<tr><td>System</td><td>Full duplex/half duplex</td></tr>
<tr><td>Supported functions</td><td>Refer to the following table</td></tr>
<tr><td colspan="2">Number of connectable I/O units</td><td>1 to 17 units</td></tr>
<tr><td colspan="2">Number of hard connectable units</td><td>The width of the entire Remote I/O system must not exceed 922.5 mm
- Input: Maximum of 506 bytes (including two bytes for device unit Remote I/O system diagnostic information)
- Output: Maximum of 504 bytes
- Total input/output: Maximum of 514 bytes (including two bytes for device unit Remote I/O system diagnostic information)</td></tr>
<tr><td colspan="2">Process data size limit</td><td>The process data that device unit can input/output to an upper master has the following size limitations. If exceeded, a "Process data overflow" occurs.
<table>
<tr><th>Item</th><th>Minimum size</th><th>Maximum size</th></tr>
<tr><td>input</td><td>0 bytes</td><td>506 bytes (504 bytes for internal bus limit + 2 byte for Remote I/O system diagnostic information)</td></tr>
<tr><td>Output</td><td>0 bytes</td><td>504 bytes</td></tr>
<tr><td>Total</td><td>1 byte</td><td>514 bytes (512 bytes for internal bus limit + 2 byte for Remote I/O system diagnostic information)</td></tr>
</table></td></tr>
<tr><td colspan="2">Protection function</td><td>
<table>
<tr><th rowspan="2">Protection function</th><th colspan="3">Power line</th></tr>
<tr><th>Internal power</th><th>Unit/input</th><th>Output</th></tr>
<tr><td>Low voltage protection (reset function)</td><td>Yes</td><td>No</td><td>No</td></tr>
<tr><td>Overvoltage detection</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Low voltage detection</td><td>No</td><td>Yes</td><td>Yes</td></tr>
</table></td></tr>
<tr><td colspan="2">Connector</td><td>M12(D) 4-pin female x 2 (BUS IN / BUS OUT), Micro USB(B) x 1 (for PC software)</td></tr>
<tr><td colspan="2">Setting switch</td><td>Dip switch x 1: Output settings in the event of a communication error/ priority to hardware, HOLD/CLEAR, Parameter initialization at startup, Remote I/O system diagnostic information ON/OFF, WebAPI ON/OFF, rotary switch x 2: for device name settings</td></tr>
<tr><td colspan="2">LED</td><td>8 (RUN, BF, L/A IN, L/A OUT, PS, PO, SF, CF)</td></tr>
<tr><td colspan="2">Working temperature range</td><td>-10°C to +55°C</td></tr>
<tr><td colspan="2">Relative temperature</td><td>30% to 85% RH</td></tr>
<tr><td colspan="2">Ambient atmosphere</td><td>No corrosive gases or heavy dust</td></tr>
<tr><td colspan="2">Installation location</td><td>Indoor</td></tr>
<tr><td colspan="2">Altitude</td><td>Up to 2000 m</td></tr>
<tr><td colspan="2">Pollution degree</td><td>3</td></tr>
<tr><td colspan="2">Degree of protection</td><td>IP65 / IP67 (when connected) Note 1</td></tr>
</table>

Item	Description
Current consumption	Unit/input power supply: 100 mA or less (24V equivalent) Output power supply 20 mA or less (24V equivalent)
Size (W x H x D)	46.1 × 106 × 55.8 (mm)
Net weight	Approximately 230g (including 2 tie rods for device unit)
Standard accessories	Tie rod for device unit x 2 (RT-TR-1), waterproof cap for USB port x 1 (RT-CM12) Note: Waterproof cap for PROFINET port (RTX-CM12) is sold separately.

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

2. INSTRUCTIONS FOR USE

CAUTION

Thoroughly read and understand the instruction manual for the industrial network communication system used before using the device unit.
The product may operate in an unexpected way, causing injury to people or damage to equipment.

Instructions		Reference
Prior checking	Check the Remote I/O system structure.	“Remote I/O RT Series Instruction Manual: System Construction”
	Check the power supply units' current consumption (related to the number of power supply units used).	
	Determine whether Remote I/O system diagnostic information is used (related to dip switch SW8 of the device unit).	"1.3 Names and Functions of Each Part"
	Check if a variable I/O unit (e.g. IO-Link master unit) is present among the I/O units.	“Remote I/O RT Series Instruction Manual: System Construction”
	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 IO-Link master units, check each output and input size of the IO-Link device that connects ports to be used as IO-Link mode.)	
	- Check the I/O size and assignment information of the Remote I/O system - Design the assignment variables (arrays, structures, etc.) on the PROFINET controller side.	
	Determine what the output operation will be in the event of a communication error. (Related to dip switches SW3 and SW4 on the device unit and the settings of each I/O unit.)	"1.3 Names and Functions of Each Part"
↓	↓	-
Hardware mounting, wiring, and setup	Install the PROFINET controller	PROFINET controller manual
	↓	-
	- Assemble the Remote I/O system. - Mount the Remote I/O system (DIN rail mounting or direct screw mounting).	“Remote I/O RT Series Instruction Manual: System Construction”
	↓	-
	Wire the LAN cable to the device unit.	"3.2 PROFINET Communication Wiring"
	↓	-
	- Wire the 24 V power supply to the power supply unit.	“Remote I/O RT Series Instruction Manual: System Construction”
	↓	-
	Wire each external I/O to the I/O units. Note: For an IO-Link master unit, IO-Link devices must also be connected.	“Remote I/O RT Series Instruction Manual: System Construction”
	↓	
	Set the following switches for the device unit. - Dip switches: Whether there will be diagnostic information; operation in the event of a communication error; etc. - Rotary switches: Specify the device name (Specify the device name using the configuration tool of PROFINET controller when selecting 0)	“Remote I/O RT Series Instruction Manual: System Construction” "1.3 Names and Functions of Each Part"

Instructions		Reference
↓	↓	-
Settings on the PROFINET controller	Install the GSDML file for the product in the configuration tool on the upper PROFINET controller side.	"6.1 Downloading and Installing the GSDML File for This Product"
	↓	-
	Set the followings in the PROFINET controller configuration tool.: - Add the product to the system - Set process data size - Set up communication such as ctc.	“Remote I/O RT Series Instruction Manual: System Construction” "5. FUNCTIONS" "6.SETTINGS TO COMMUNICATE WITH THE PROFINET CONTROLLER" "5. FUNCTIONS" "6.SETTINGS TO COMMUNICATE WITH THE PROFINET CONTROLLER"
	↓	-
	-Cyclic data communication Set the variable in accordance with the process data size and allocate it to the process data in the configuration tool on the upper PROFINET controller side. -Acyclic parameter communication Create a communication program.	"6.8 Assignment of Process Data to the Addresses or Variables for Upper Programs"
↓	↓	-
Checking Remote I/O system settings and status	Supply 24 V power to the power supply unit Note: Make sure if PLC is running prior to RT Note: If there is more than one power supply unit, power them all on within 3 seconds.	“Remote I/O RT Series Instruction Manual: System Construction”
	↓	-
	Device unit settings	“4. “SETTINGS”
	● If setting up from the PC software	“Remote I/O RT Series Instruction Manual: System Construction”
	Connect the PC software to the device unit with a USB cable.	
	↓	
	Check the actual Remote I/O system structure with the PC software.	
	↓	
	Set up the actual Remote I/O system structure with the PC software. Note: If the I/O unit is a variable I/O unit, set the input/output size manually or from the actual unit.	
	● If setting up with acyclic parameter communication from an upper PROFINET controller	PROFINET controller manual "9.LIST of INDEX"
	Create a program to write by specifying the object of each setting via a communication command from the upper PROFINET controller.	
	↓	-
	(If necessary) Check the output wiring, depending on the forced output setting from the PC software.	“Remote I/O RT Series Instruction Manual: System Construction”
	↓	-
	Note: Some settings require it to be powered off and on again. Note: Make sure if PLC is running prior to RT	-
↓	↓	-

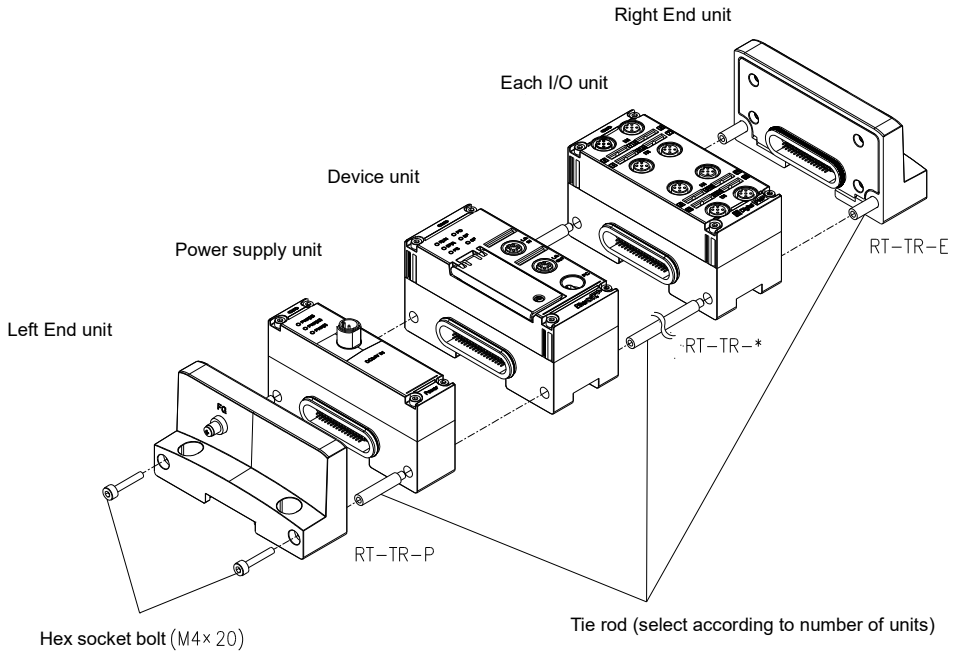
Instructions		Reference
Checking PROFINET communication and start control from the upper PROFINET controller	Check PROFINET communication. (e.g. check LEDs on upper PROFINET controller and the device unit).	PROFINET controller manual "1.3 Names and Functions of Each Part" "5. FUNCTIONS" "6.SETTINGS TO COMMUNICATE WITH THE PROFINET CONTROLLER"
	↓	-
	Check the reading and writing of data to the Remote I/O system from the PROFINET controller via cyclic data communication.	PROFINET controller manual
	↓	-
	(If necessary) Check the reading and writing of data to the Remote I/O system via acyclic parameter communication.	PROFINET controller manual "5. FUNCTIONS" "6.SETTINGS TO COMMUNICATE WITH THE PROFINET CONTROLLER"

3. INSTALLATION AND WIRING

3.1 Device Unit Installation

Connect device unit horizontally with power supply and I/O unit.

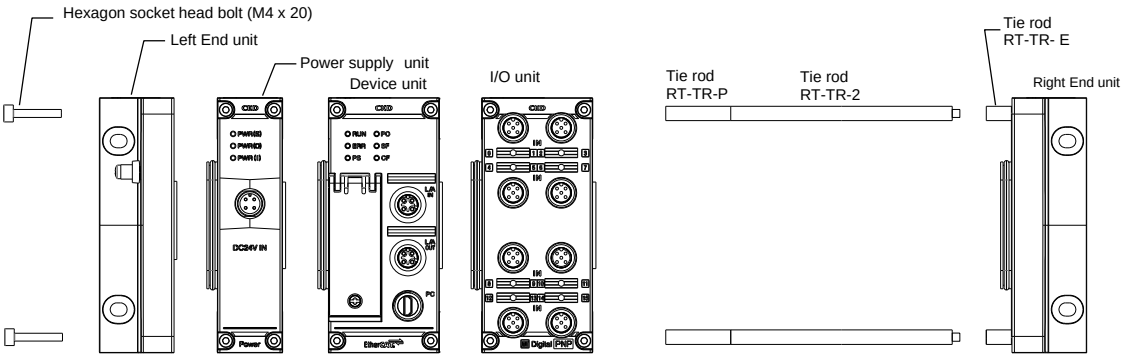
E.g.)



1 Connect the following tie rods in advance.
Select as few tie rods 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.)



2 Connect the units together.

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

4 Tighten the left End unit with hexagon socket head bolts (M4 x 20) (tightening torque 1.2 N·m ± 0.05 N·m).

5 Check that all units are connected without any gaps.

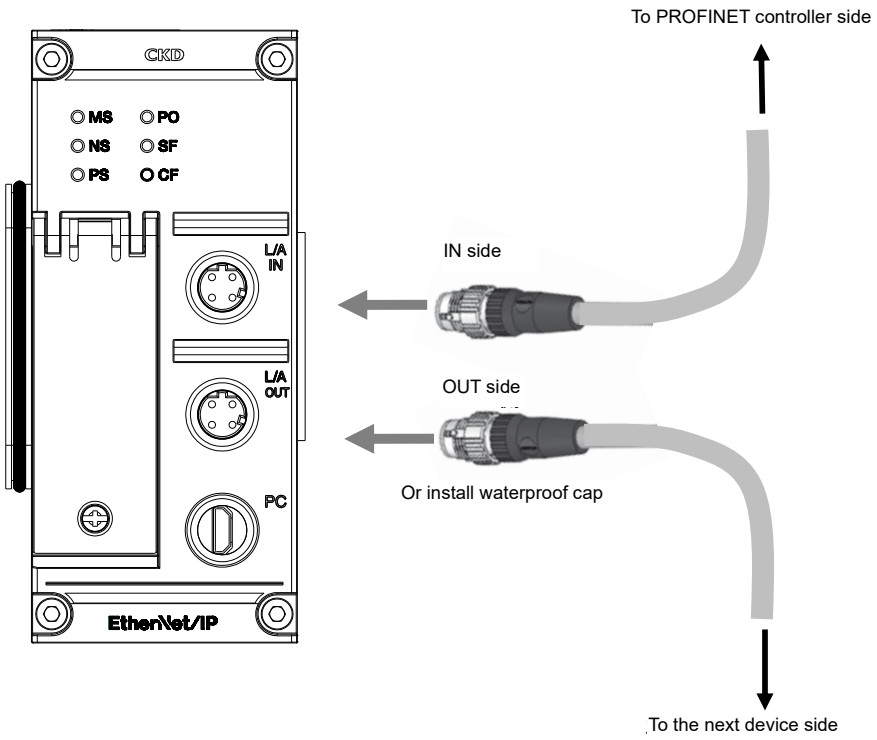
3.2 PROFINET Communication Wiring

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.

Follow the steps below to connect the PROFINET communication cable.

1. After confirming safety, stop PROFINET communication and turn off all the peripheral equipment.
2. Refer to the following figure to wire the PROFINET compliant cable to the IN and OUT sides.
   If no remote device is connected to the OUT side, install a waterproof cap (RT-CM12), sold separately.



For PROFINET communication wiring, purchase a cable or connector that meets the following specifications:
[Specifications] M12 plug (male), D-coding, 4-core

■ Recommended communication cable

- When connecting a PROFINET compatible device unit to a PROFINET controller or remote device with an RJ45 connector type.

Product name	Specifications	Number of cores	Cable extraction method	Length	Manufacturer	OMRON Corp. model No.
XS5W industrial Ethernet plug cable with connectors on both sides (M12 straight to RJ45)	M12 plug (D-coding, male) - RJ45	4 cores	Straight - RJ45	0.5 m	Omron Corporation	XS5W-T421-BMC-SS
				1 m		XS5W-T421-CMC-SS
				2 m		XS5W-T421-DMC-SS
				3 m		XS5W-T421-EMC-SS
				5 m		XS5W-T421-GMC-SS
				10 m		XS5W-T421-JMC-SS

- For a wire with one open-end side

Product name	Specifications	Number of cores	Cable extraction method	Length	Manufacturer	OMRON Corp. model No.
XS5H industrial Ethernet plug cable with a connector on one side (M12 straight to open-end-cable)	M12 plug (D-coding, male) – open-end-cable	4 cores	Straight to open-end-cable	0.5 m	Omron Corporation	XS5H-T421-BM0-K
				1 m		XS5H-T421-CM0-K
				2 m		XS5H-T421-DM0-K
				3 m		XS5H-T421-EM0-K
				5 m		XS5H-T421-GM0-K
				10 m		XS5H-T421-JM0-K
				15 m		XS5H-T421-KM0-K

4. SETTINGS

WARNING

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

4.1 Setting Method

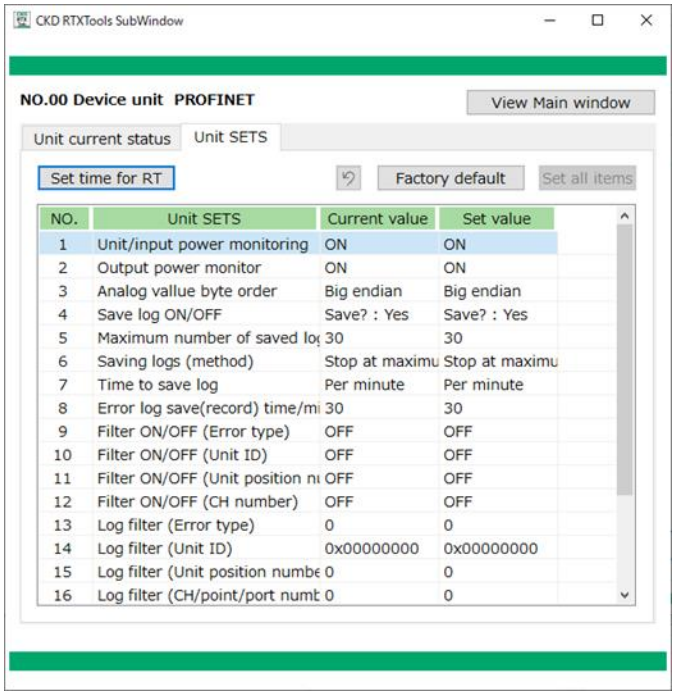
CAUTION

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.

There are three ways to configure a PROFINET compatible device unit: using the PC software, using industrial network communication and using WebAPI.

4.1.1 Using PC software

Select a PROFINET compatible device unit on the "Unit SETS" main tab and click the [Set all items] button.



4.1.2 Using industrial network communication

Set an object for a PROFINET compatible device unit according to the message communication commands from the PROFINET controller. Refer to "9. INDEX LIST" for more information.

4.1.3 Using WebAPI

Specify the IP address instead of the COM port when connecting the PC software. Upon connection, the PC and PROFINET compatible device unit must be connected on the same network.
Accessing the WebAPI using user’s own applications is also possible. Refer to "10 WEBAPI FUNCTION" for more information.

4.2 List of Settings

The items that can be set are as follows.

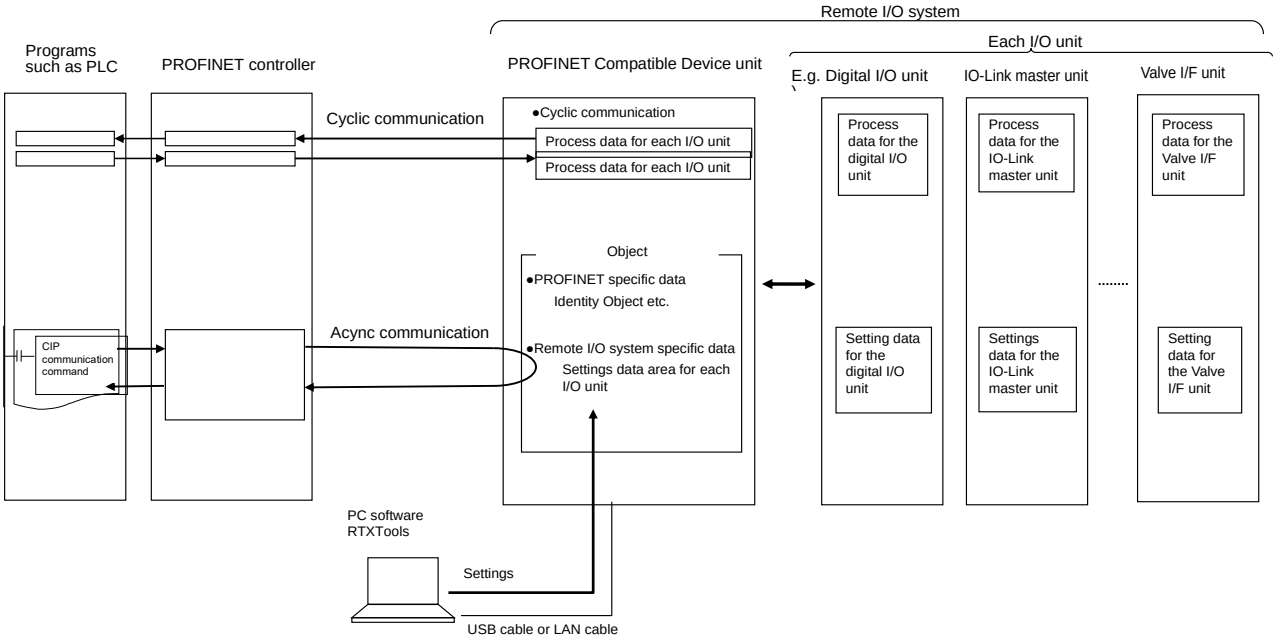
Settings	Description	Value	Factory setting Settings	Settings Setting required
Unit/input power monitoring	Set whether the device unit monitors the unit/input power from the power supply unit closest to itself on the left when facing it. In the event of an error, a "Unit/input power voltage error" will occur.	0: OFF (not monitored) 1: ON (monitored)	1: ON (monitored)	-
Output power supply monitor	Set whether the device unit monitors the power supply for the output from the power supply closest to itself on the left when facing it. In the event of an error, an "Output power voltage error" will occur.	0: OFF (not monitored) 1: ON (monitored)	1: ON (monitored)	-
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.	0: Big endian 1: Little endian	0: Big endian	-
Save log ON/OFF, number of logs saved	Set whether to save logs. Set the maximum number of entries to log.	0: Do not save 1 to 255: Maximum number to save	0: Do not save	-
Saving logs (method)	Select how to save logs from the following. - Repeat (overwrite) - Stop at maximum number	0: Repeat (overwrite) 1: Stop at maximum number	1: Stop at maximum number	-
Log saving time	Select when to save logs from the following. - Save immediately when an error occurs - Save at each set value (minutes)	0: Real-time 1 to 60: Save every 1 to 60 minutes	30: Save every 30 minutes	-
	Set the save interval when the time to save logs is "save at every set value (minutes)."			-
Type of log filter	Set whether error logging filtering (logging only errors with specified conditions) is enabled. Set the type of log filter. Save logs that have passed the filtering target filter with the following bit equal to "1". Bit 7: Enable/disable log filter error type Bit 6: Enable/disable log filter unit ID Bit 5: Enable/disable log filter unit position number Bit 4: Enable/disable log filter CH/point/port number If this setting is 0x00, all logs are saved.	0x00 to 0xFF The meaning of each bit is as follows OFF: Disabled ON: Enabled	0x00: All disabled	-
Filter ON/OFF (Error type)	Only log errors for the specified error type. Set the error type to filter for.	0x00 to 0xFF	0x00	-
Filter ON/OFF (Unit ID)	Only log errors for the specified unit ID. Set the unit ID to filter for. However, the variable I/O unit determines a match in the top 2 bytes.	0x00000000 to 0xFFFFFFFF	0x00000000	-
Filter ON/OFF (Unit position number)	Only log errors for units with a specified unit position number.	0 to 17 (device unit = 0)	0	-
Filter ON/OFF (CH/point/port number)	Only log errors for the specified CH/point/port number. Set the CH/point/port number to filter for.	0 to 31	0	-

Settings	Description	Value	Factory setting Settings	Settings Setting required
WebAPI access authentication	Set the authentication method when accessing WebAPI.	0: Basic authentication 1: Digest authentication 2: No authentication	2: No authentication	
WebAPI login ID	Set the login ID when accessing WebAPI.	Half-width alphanumeric characters and symbols 1 to 16 characters	admin	
WebAPI password	Set the password when accessing WebAPI.	Half-width alphanumeric characters and symbols 1 to 16 characters	pass	

5. FUNCTIONS

5.1 Functions to Communicate with PROFINET Controller

The RT series remote I/O system is capable of the following periodic data (cyclic) communication and non-periodic parameter (acyclic) communication with the PROFINET controller.



5.1.1 Cyclic data communication

CAUTION

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.

The unit's process data is communicated with the controller at set intervals.

5.1.2 Acyclic parameter communication

The PROFINET controller reads and writes the specified data of the unit at any time when necessary. The reading and writing target are all the data placed in the object of the PROFINET compatible device unit. It is primarily used when setting the setting data area for each I/O unit.

Note 1: Refer to "9. INDEX LIST."

For RT series Remote I/O systems, this setting using acyclic parameter communication from the upper PROFINET controller can also be set from the PC software via USB or LAN connection.

■ Example of data assigned with cyclic data communication

Unit type	Example:
Digital I/O unit	Digital input, digital output
Analog I/O unit	Analog input, analog output
IO-Link master unit	IO-Link COMM error flag, IO-Link input data enable flag, digital input/output, Input Data/Output Data, etc.
Valve I/F unit	Valve output

■ Examples of data that can be read and written with acyclic parameter communication

Unit type	Example (Note 1)
Digital I/O unit	Off_On cycle counts, signal line error detection setting, etc.
Analog I/O unit	CH enable/disable setting, max/min range, etc.
IO-Link master unit	IN size, OUT size, device verification, etc. Note: It is also possible to send and receive ISDU communications to connected IO-Link devices.
Valve I/F unit	Off_On cycle counts, signal line error detection setting, etc.

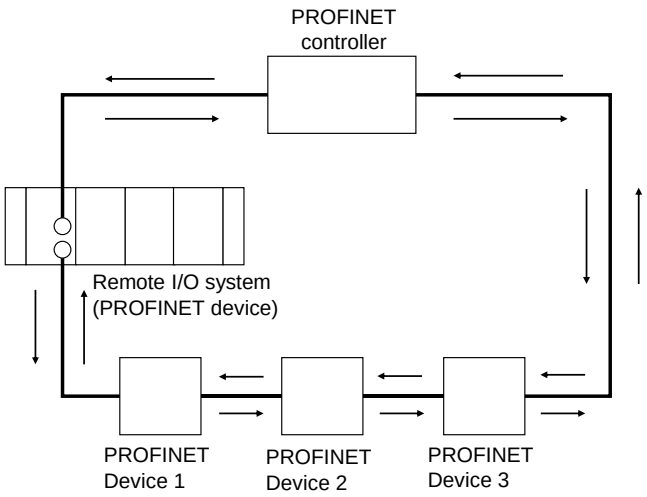
Note 1: For information on the individual functions of each I/O unit, refer to the instruction manual of each I/O unit.

5.2 MRP (Media Redundancy Protocol) Function

CAUTION

Perform appropriate network configuration and wiring according to MRP specifications.
Carefully check the MRP specifications and set the appropriate network configuration.

This product supports the PROFINET MRP (Media Redundancy Protocol) function.
MRP is a function that allows each device to be wired in a ring so that communication can continue even if a disconnection occurs in part of the ring.



5.3 Remote I/O System Diagnostic Information Function

The PROFINET compatible device unit transmits diagnostic information for the entire Remote I/O system to the upper PROFINET 1 controller via cyclic data communication.

If dip switch SW8 (Remote I/O system diagnostic information ON/OFF) for the PROFINET compatible device unit is ON, it is transmitted to the upper PROFINET controller. If OFF, there is no transmission to the upper PROFINET controller.

The process data for the Remote I/O system diagnostic information function is as follows.

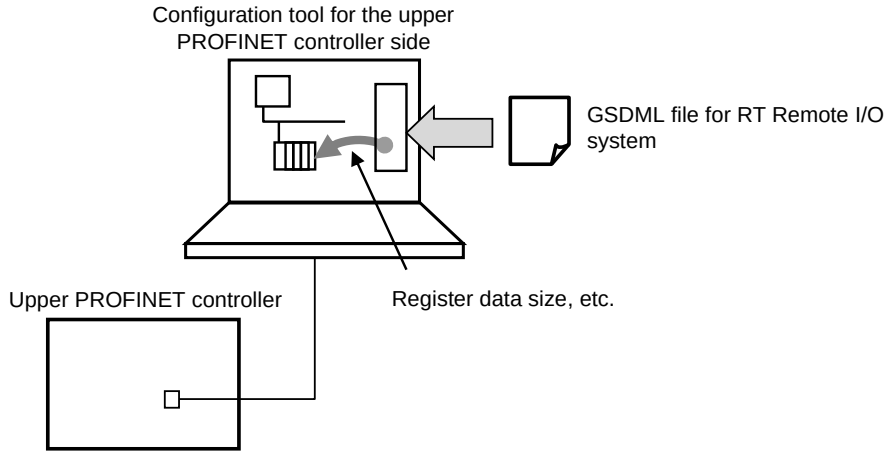
Data Size	Bit	Data
2 bytes	0	Unit input error
	1	Unit output error
	2	Reserved
	3	Power failure
	4	Reserved
	5	Operation waiting
	6	Hardware error
	7	System error
	8 to 15	Unused

For more information about the function for Remote I/O system diagnostic information, refer to "8.1 Function for Remote I/O system Diagnostic Information" in the "Remote I/O RT Series Instruction Manual: System Construction".

6. SETTINGS TO COMMUNICATE WITH THE PROFINET CONTROLLER

This section describes the operations required on the PROFINET controller side for the product to perform PROFINET communication.
For more information, refer to the PROFINET controller manual or the manual for configuration tool on the PROFINET controller side that is used.

The setting procedure when using STEP7 of the SIEMENS PLC, TIA Portal, is shown below as an example.

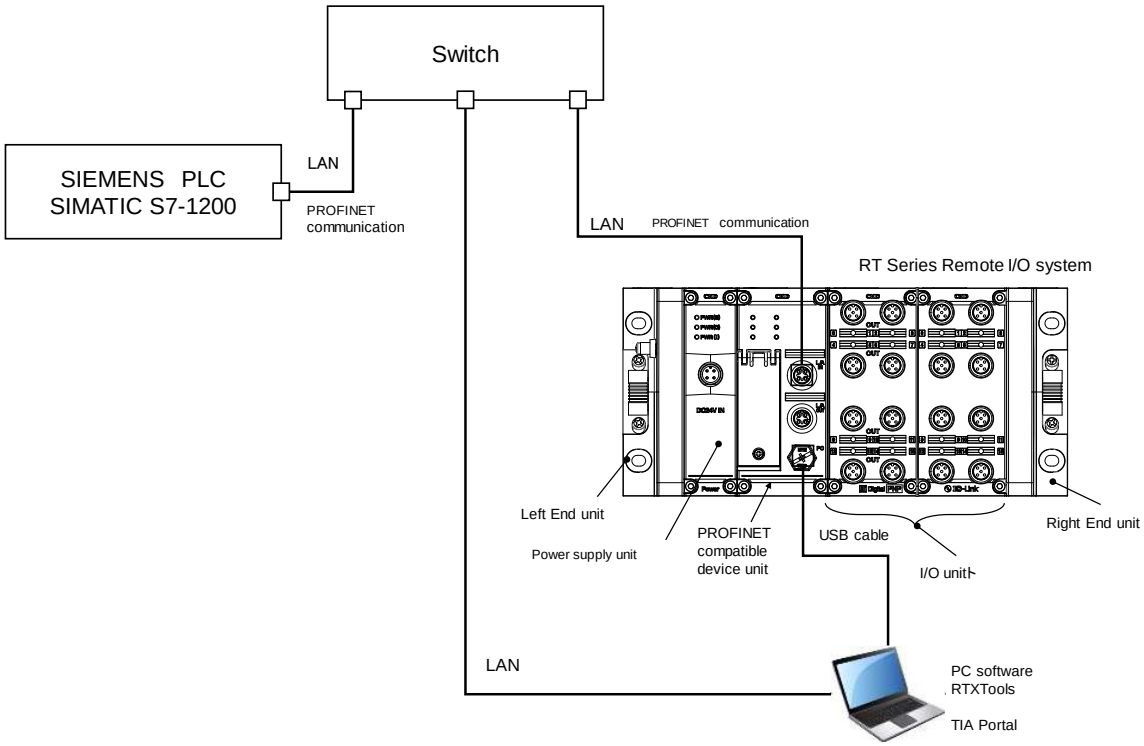


6.1 Downloading and Installing the GSDML File for The Product

Obtain the GSDML file for the product in advance.
GSDML file name for this product (RT series Remote I/O system): GSDML-V2.43-CKD-RT_Series-20220908.xml
The latest GSDML files can be downloaded from CKD's dedicated website.
RT product page:
https://www.ckd.co.jp/kiki/en/product/detail/1064
If not available, contact CKD support at the following link:
https://www.ckd.co.jp/kiki/en/support/index.html

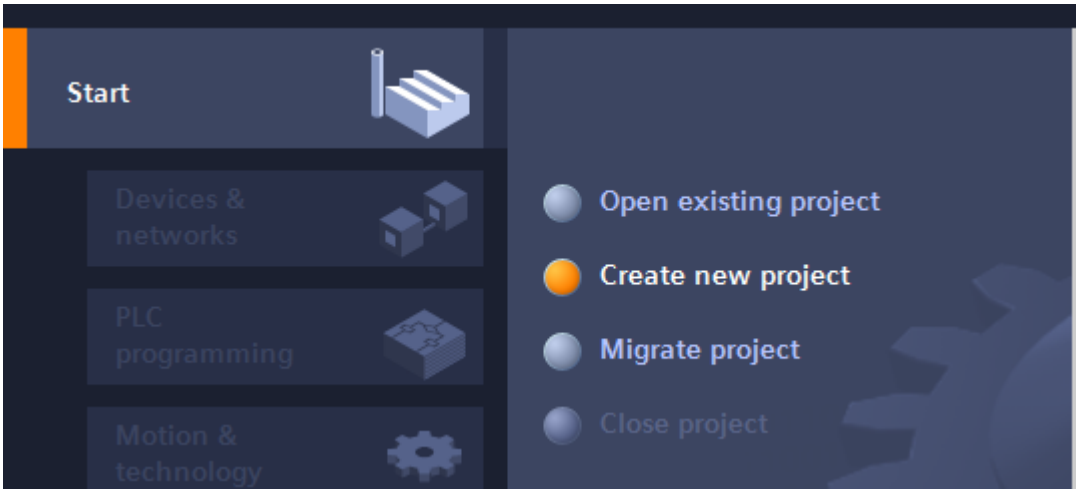
6.2 Wiring

Wire as the diagram below and supply the power to each.
The digital output unit (16 points) and IO-Link master unit are connected to the device unit in this example.



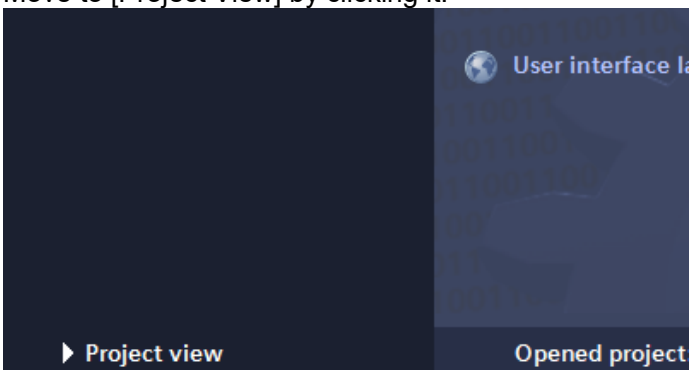
6.3 Create a Project

1 Start TIA Portal and select [Create new project].



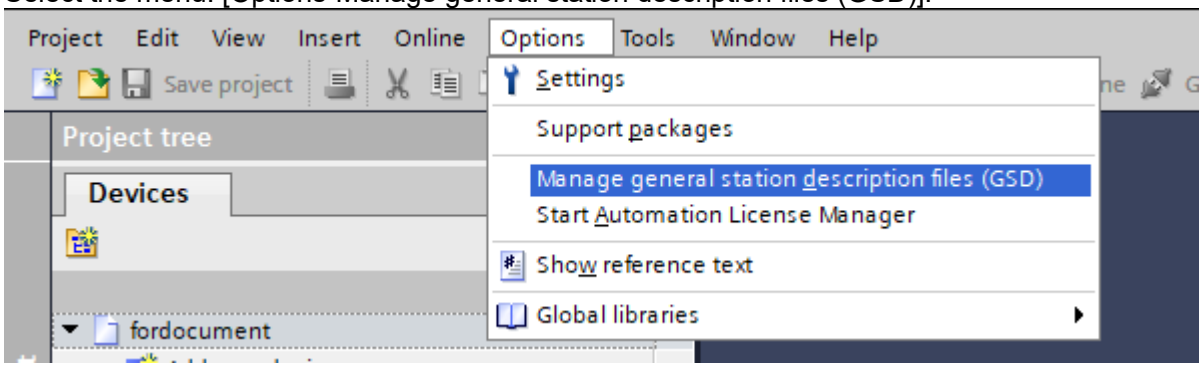
2 Proceed the Create by setting the project name etc.

3 Move to [Project View] by clicking it.

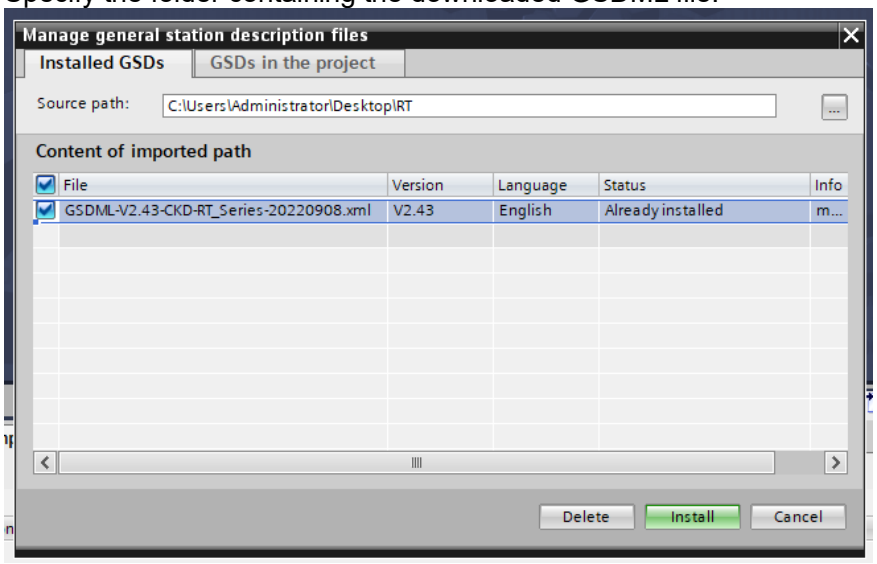


6.4 Adding GSDML Files

1 Select the menu: [Options-Manage general station description files (GSD)].



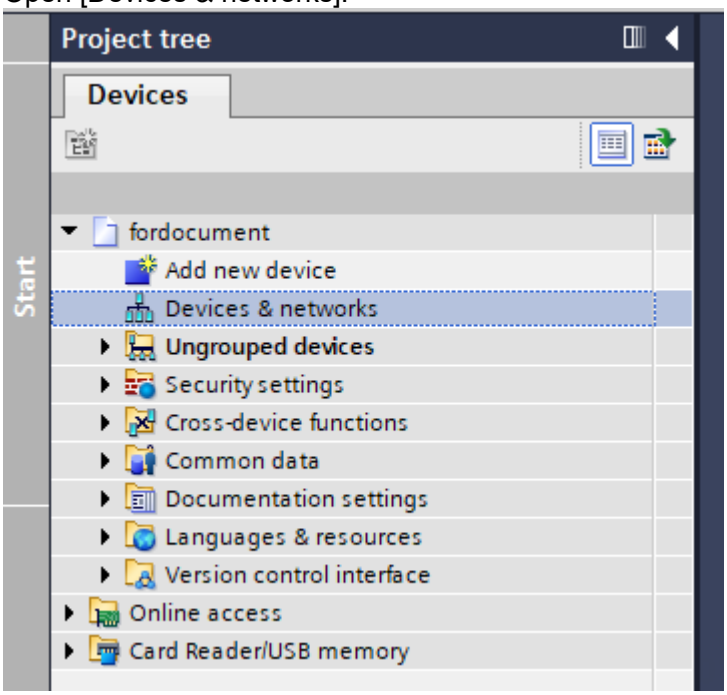
2 Specify the folder containing the downloaded GSDML file.



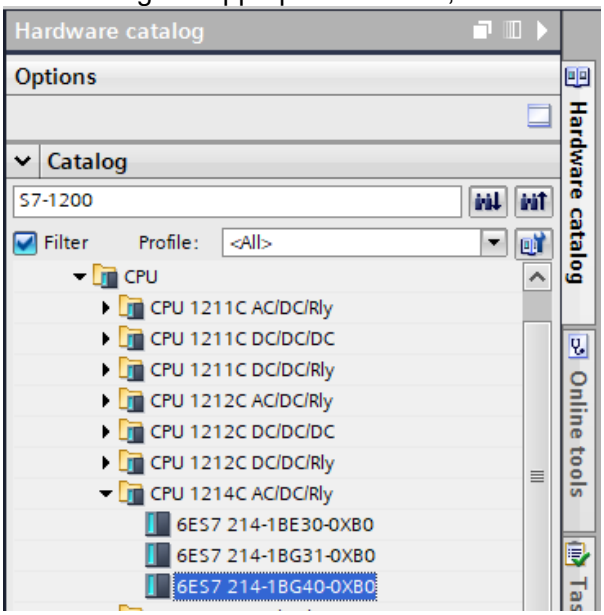
3 Click [Install].

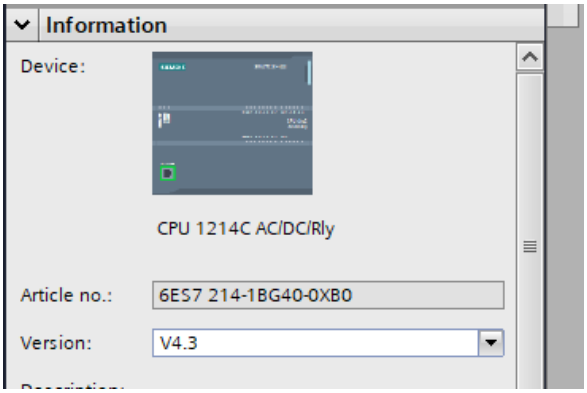
6.5 Adding The Device

1 Open [Devices & networks].

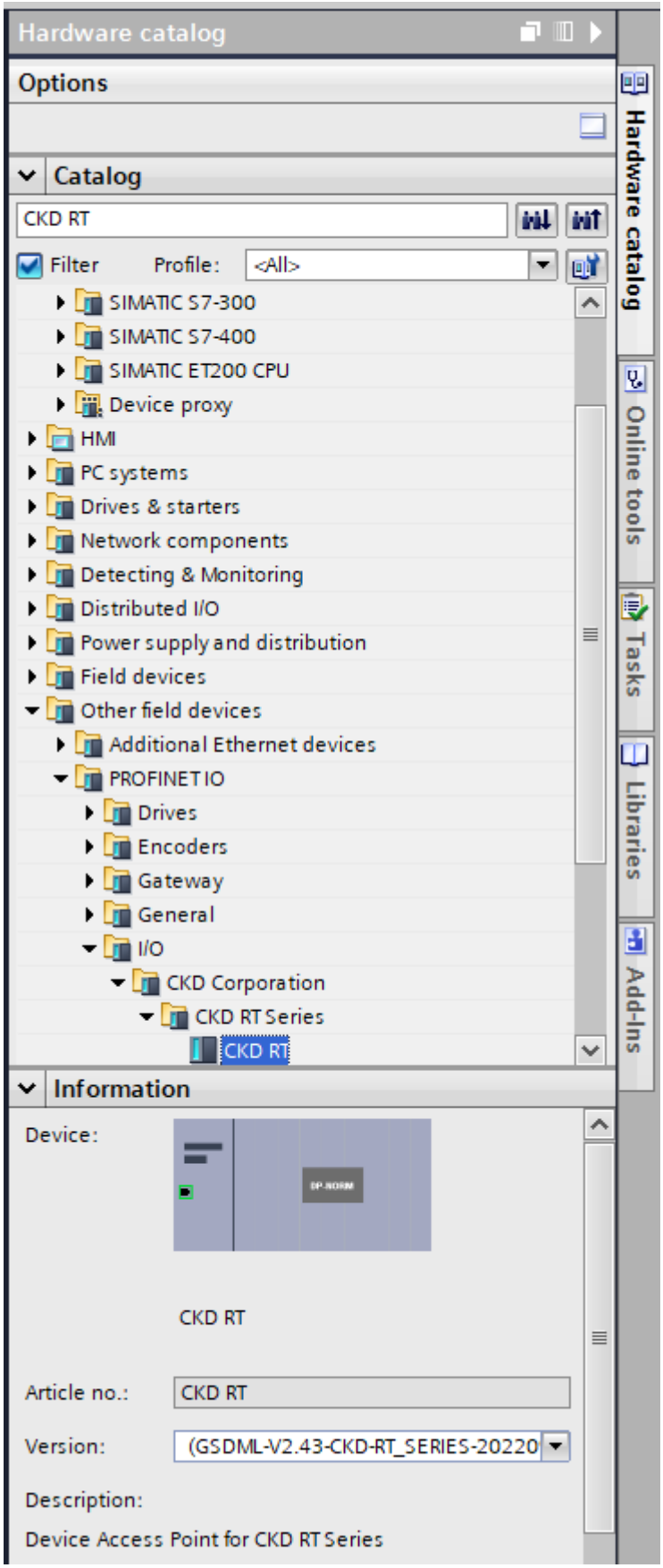


2 Select and add the target PLC in the “Catalog”.
After setting the appropriate version, double-click to add it.

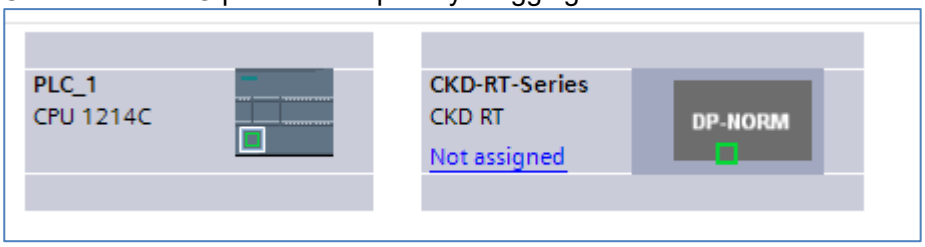




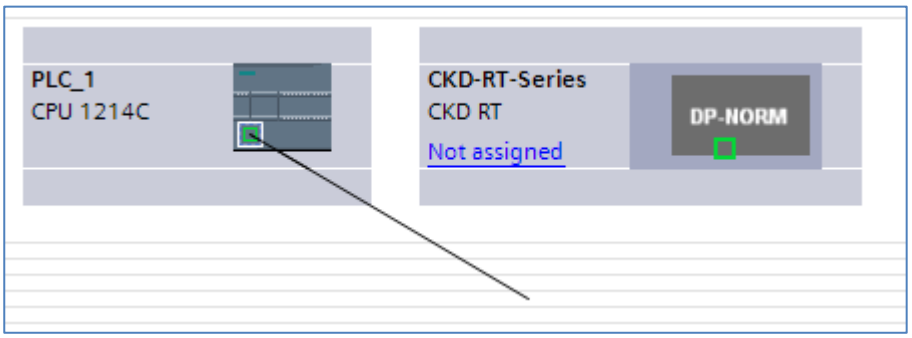
3 Select and add the Remote RT in the “Catalog”.
Double-click "CKD RT" to add it.

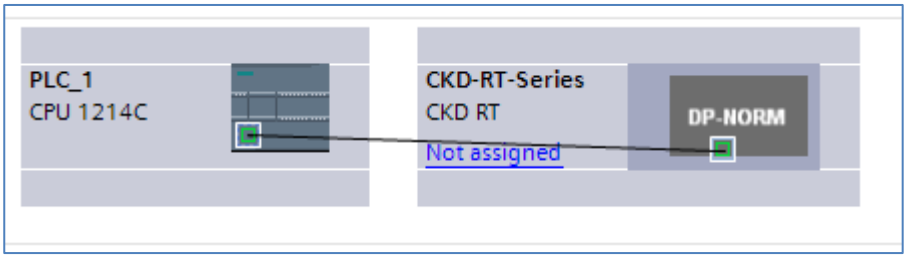


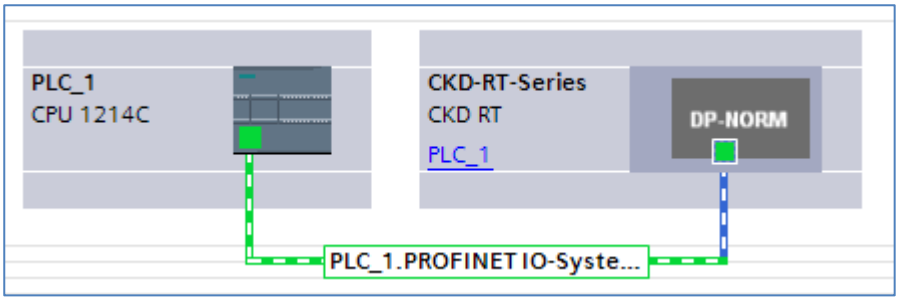
4 Connect the PLC port and RT port by dragging



Drag from the PLC port (green square) to the RT port (green square).



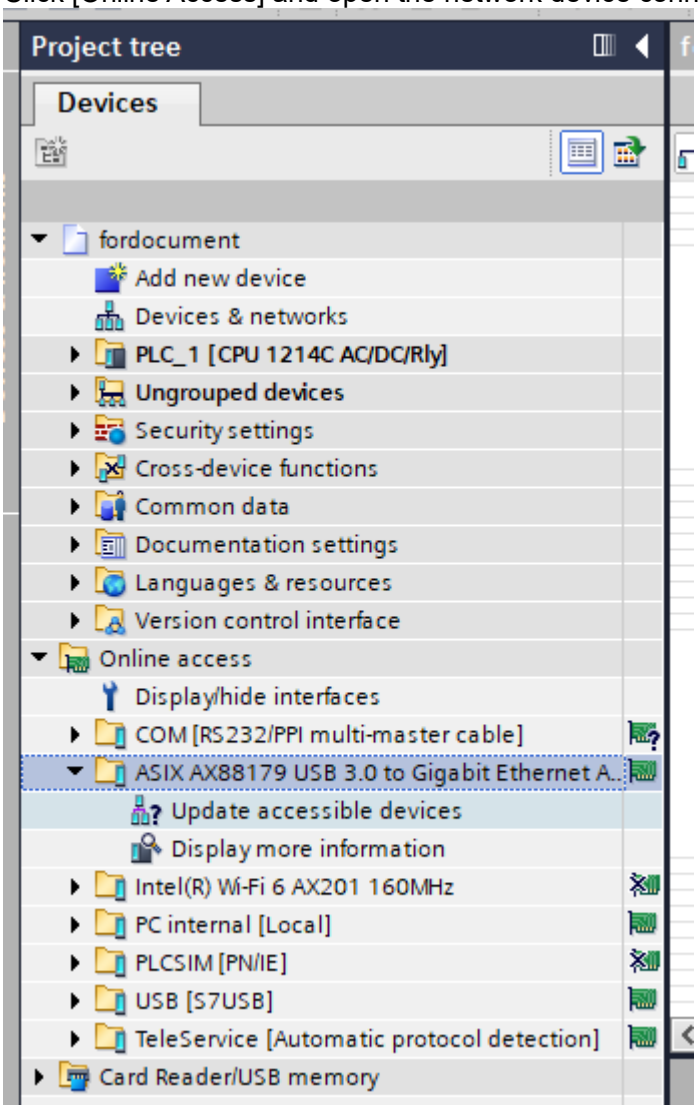




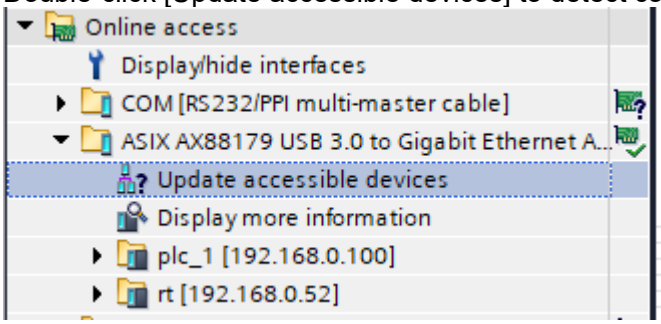
Connection setting is now complete.

6.6 Device Name and IP Address Settings

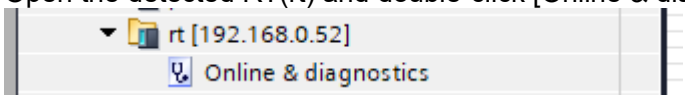
1 Click [Online Access] and open the network device connected to a switch.



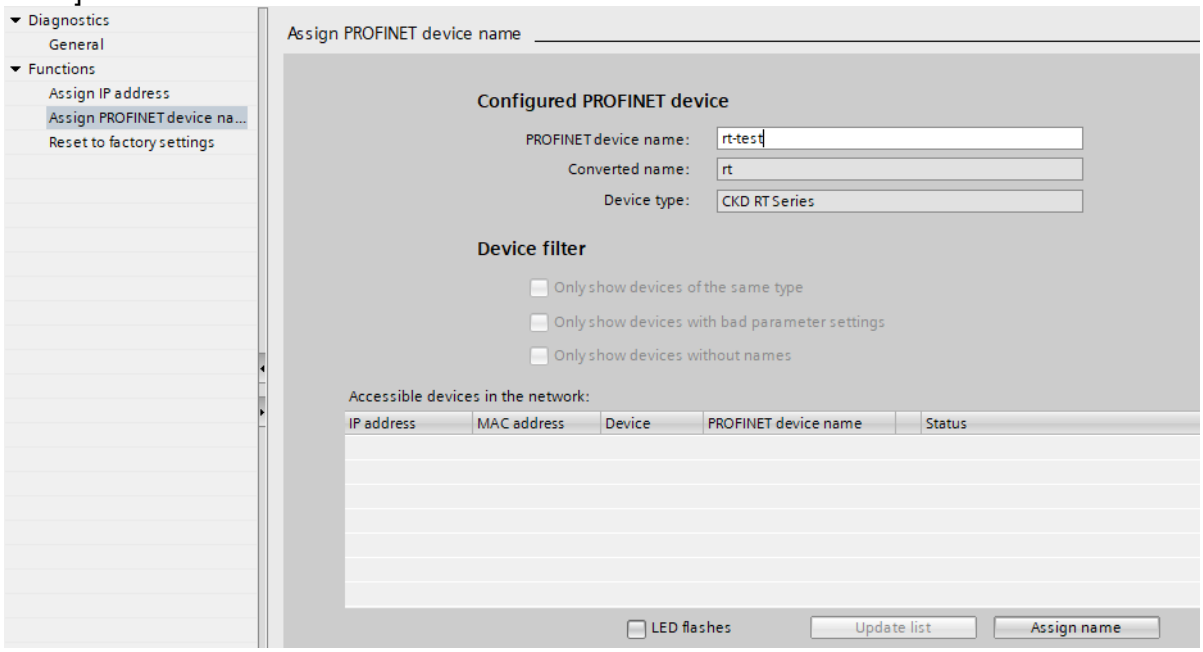
2 Double-click [Update accessible devices] to detect connected PROFINET devices



3 Open the detected RT(rt) and double-click [Online & diagnosis].

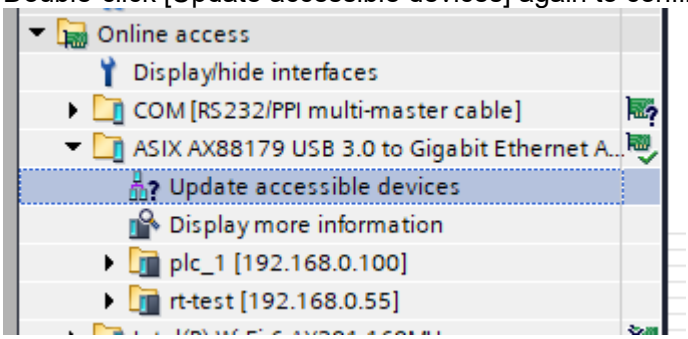


4 Open [Functions] - [Assign PROFINET device name], enter the desired name and click [Assign name].



5 Open [Functions] - [Assign IP address], enter the desired IP address and click [Assign IP Address].

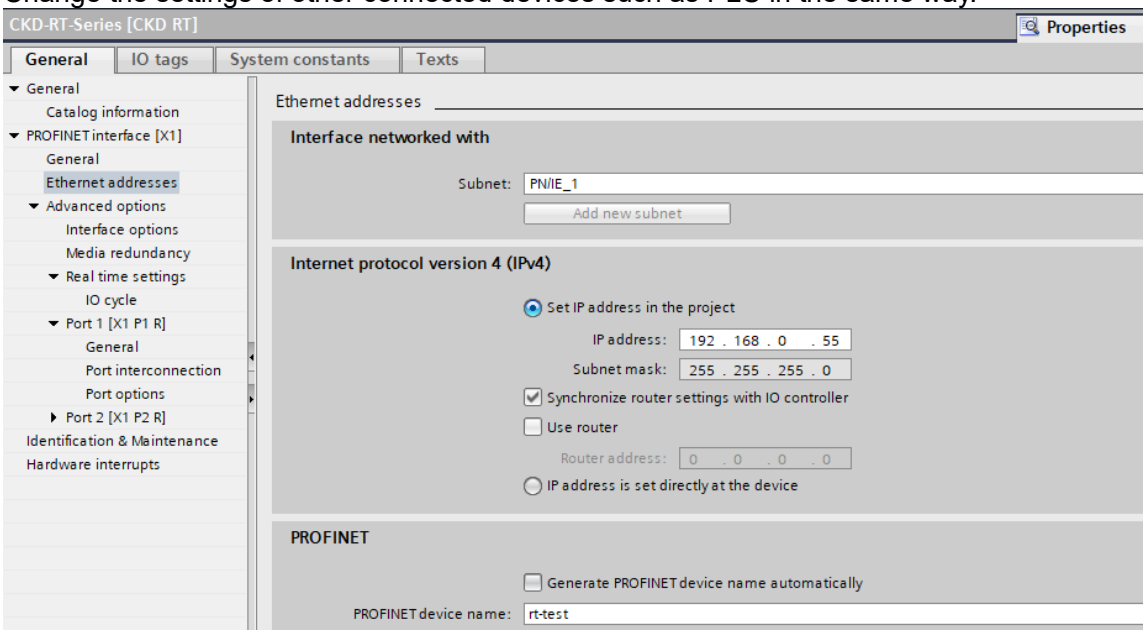
6 Double-click [Update accessible devices] again to confirm that the settings have been reflected.



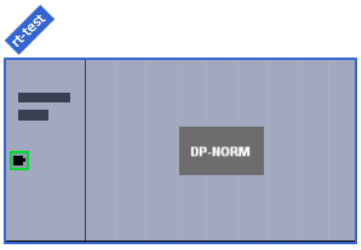
7 Open [Device & networks] and double-click RT. When the display changes, double-click RT again.
→

8 Select [PROFINET interface[x1]] - [Ethernet addresses].

9 Change the IP address and device name to those set above.
Change the settings of other connected devices such as PLC in the same way.



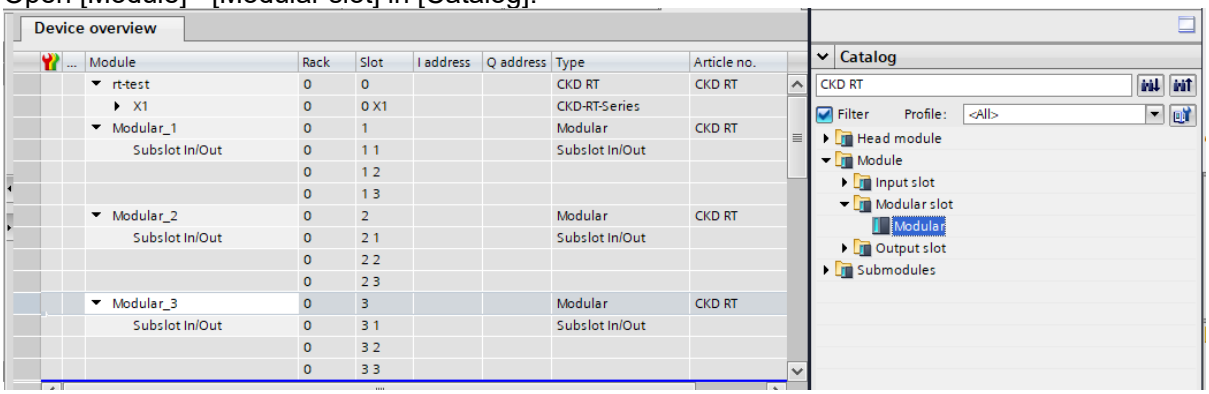
10 Click the name on the [Device View] and change it to a desired name.



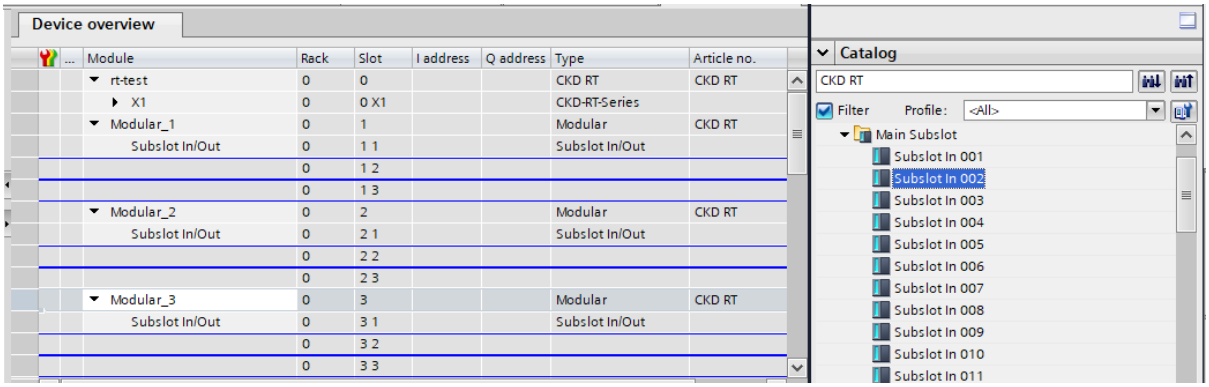
6.7 Module Configuration Settings

1 Select RT(rt) in [Device overview].

2 Open [Module] - [Modular slot] in [Catalog].



3 Add “Modular slot” for the number of units to the [Device overview] list.
Add three “Modular slot” in this example for the device unit, digital output unit and IO-Link master unit.

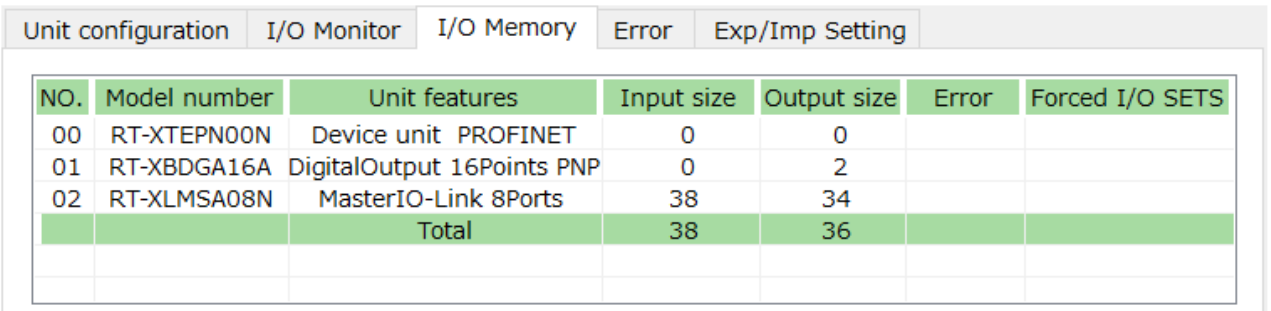


4 Check the process data size for each unit in RTXTools.

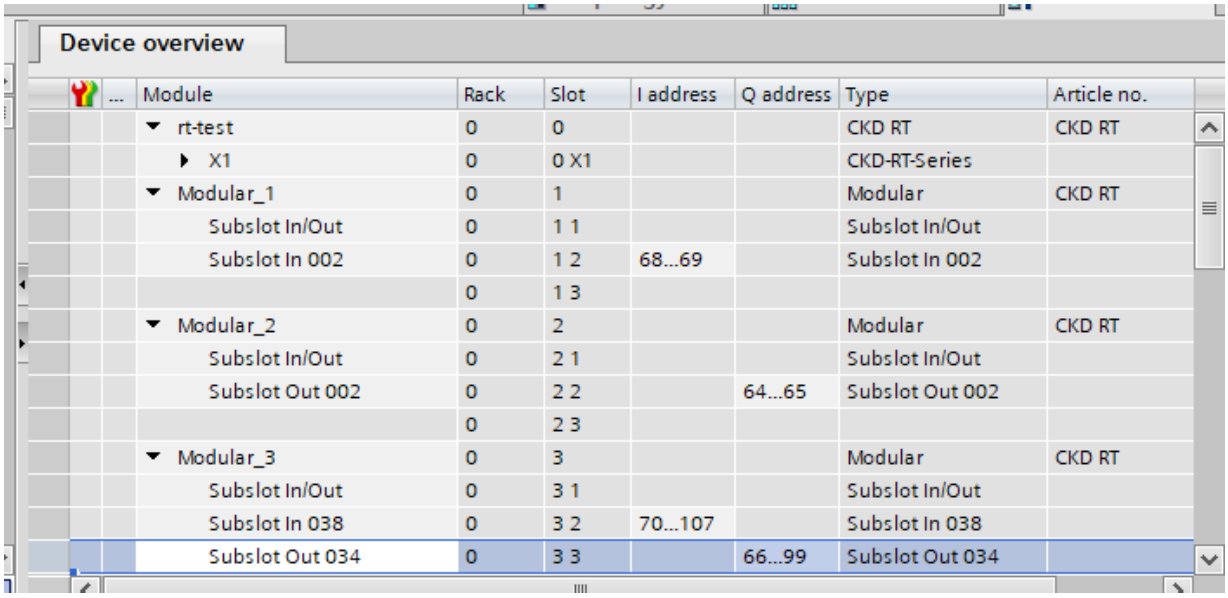
CAUTION

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.



5 Add Input and Output submodules to each unit.
There will be no submodule if the device unit is started with the setting of diagnostic information OFF.



Device overview

Module	Rack	Slot	I address	Q address	Type	Article no.
rt-test	0	0			CKD RT	CKD RT
X1	0	0 X1			CKD-RT-Series	
Modular_1	0	1			Modular	CKD RT
Subslot In/Out	0	1 1			Subslot In/Out	
Subslot In 002	0	1 2	68...69		Subslot In 002	
	0	1 3				
Modular_2	0	2			Modular	CKD RT
Subslot In/Out	0	2 1			Subslot In/Out	
Subslot Out 002	0	2 2		64...65	Subslot Out 002	
	0	2 3				
Modular_3	0	3			Modular	CKD RT
Subslot In/Out	0	3 1			Subslot In/Out	
Subslot In 038	0	3 2	70...107		Subslot In 038	
Subslot Out 034	0	3 3		66...99	Subslot Out 034	

6.8 Assignment of Process Data to Variables or Addresses for Upper Program

CAUTION

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.

The process data of this product is assigned to the input/output of the upper program.
Specifically, it is assigned to a variable or address. For variables, arrays or structures are typically used.
Create a communication program if the cyclic data communication function is to be used.

Described is an example of process data with the unit configuration and settings shown in the table below.
For more information of the process data, refer to the instruction manual for each unit.

No.	**Unit name**	**Model No.**	**Settings**	**Input size**	**Output size**
1	End unit	RT-XEELN00N	-	-	-
2	Power supply unit	RT-XP24A01N	-	-	-
3	Device unit	RT-XTEPN00N	Diagnostic information ON	2	0
4	Digital input unit	RT-XADGA16A/B	-	2	0
5	Digital output unit	RT-XBDGA16A/B	-	0	2
6	Analog input unit	RT-XAAGA02A	-	4	0
7	Analog output unit	RT-XBAGA02A	-	0	4
8	IO-Link master unit	RT-XLMSA08N	Initial value	38	34
9	Valve I/F unit	RT-XVVCN32A/B		0	4
			Total	46 bytes	44 bytes

Example of assigning process data (input)

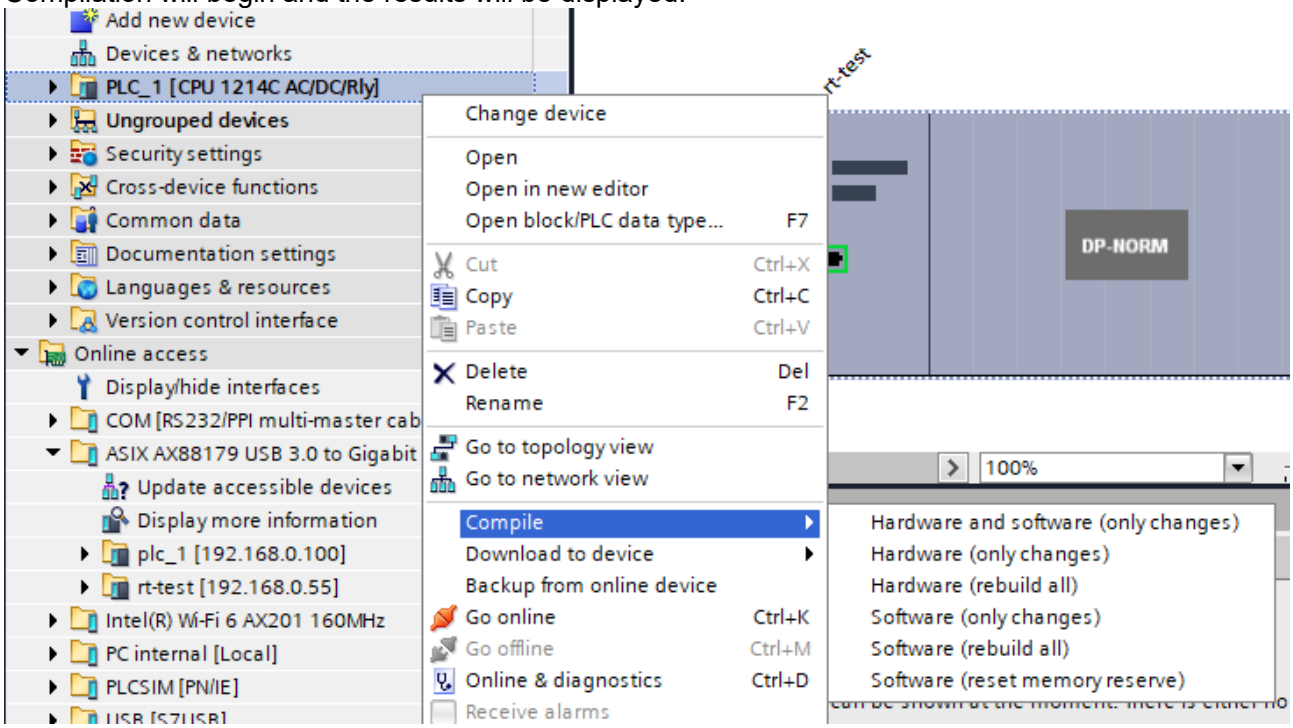
	+0	**+1**	**+2**	**+3**	**+4**	**+5**	**+6**	**+7**	**+8**	**+9**
+0	Diagnosis information		Digital input (16 bit)		Analog input (2 byte×2 CH)				IO-Link Master	
+10	IO-Link Master (continued data)									
+20	IO-Link Master (continued data)									
+30	IO-Link Master (continued data)									
+40	IO-Link Master (continued data)									

Example of assigning process data (output)

	+0	**+1**	**+2**	**+3**	**+4**	**+5**	**+6**	**+7**	**+8**	**+9**
+0	Digital output (16 bit)		Analog output (2 byte × 2 CH)				IO-Link Master			
+10	IO-Link Master (continued data)									
+20	IO-Link Master (continued data)									
+30	IO-Link Master (continued data)									
+40	Valve I/F unit (32 bit)									

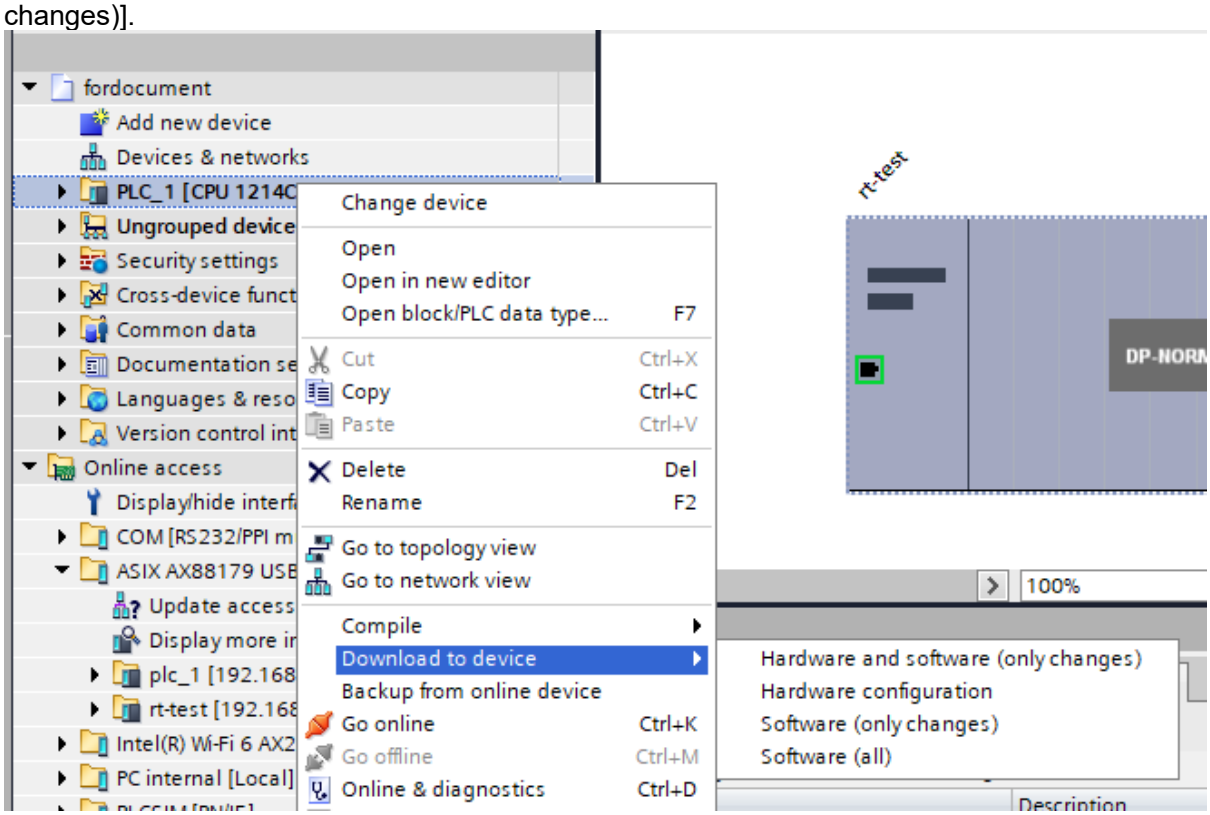
6.9 Reflect the Settings on the PLC

1 Right-click the PLC on the tree and select [Compile] - [Hardware and software (only changes)]. Compilation will begin and the results will be displayed.

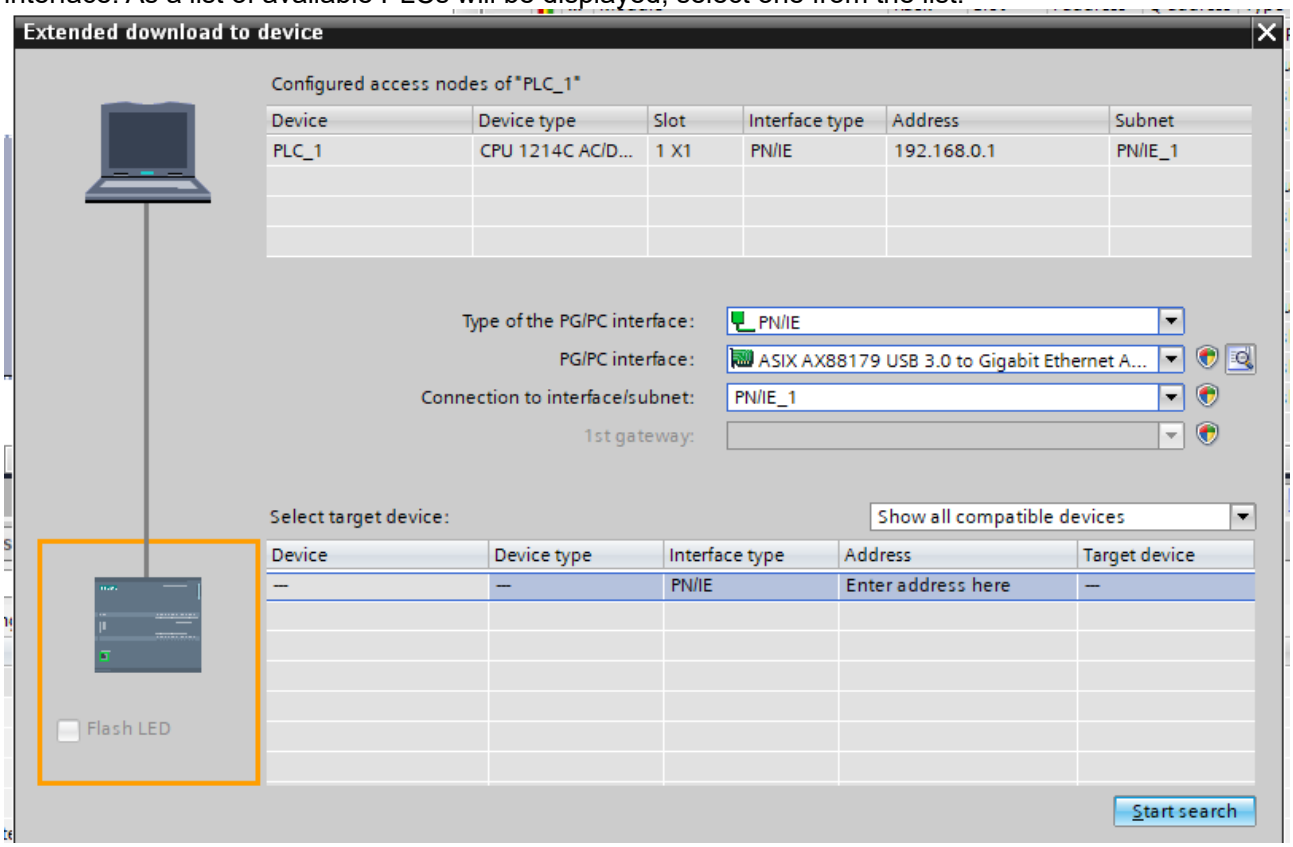


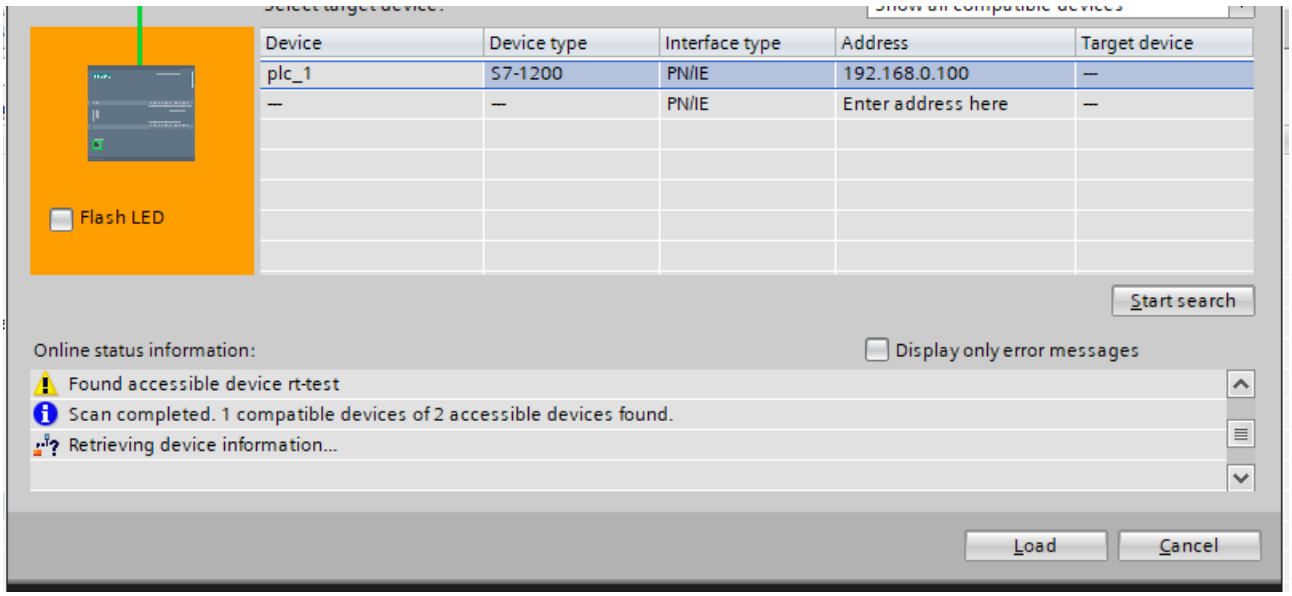
2 Confirm that the compilation completed successfully.

3 Right-click the PLC on the tree and select [Download to device] - [Hardware and software (only changes)].

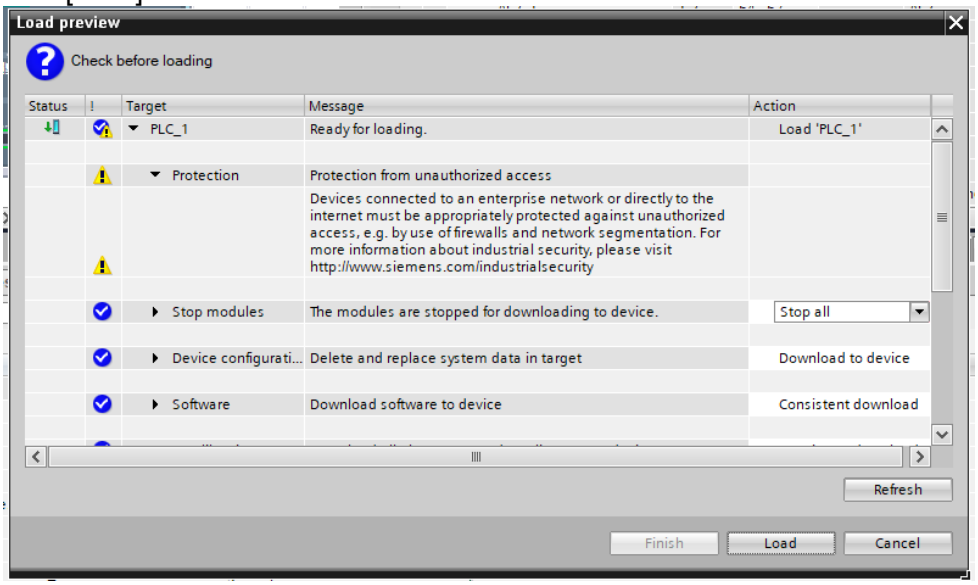


4 If a screen to select the destination PLC is displayed, click [Start search] after setting each interface. As a list of available PLCs will be displayed, select one from the list.

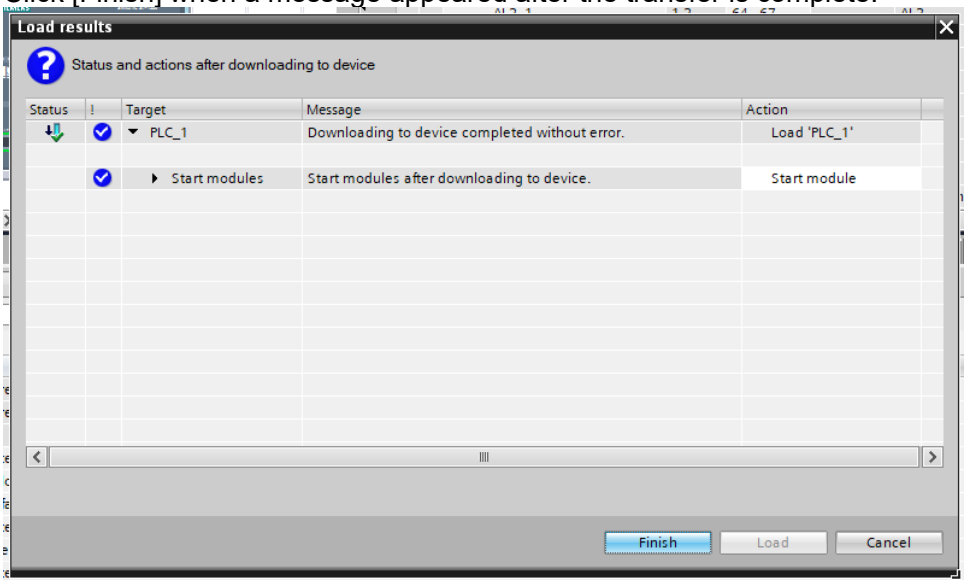




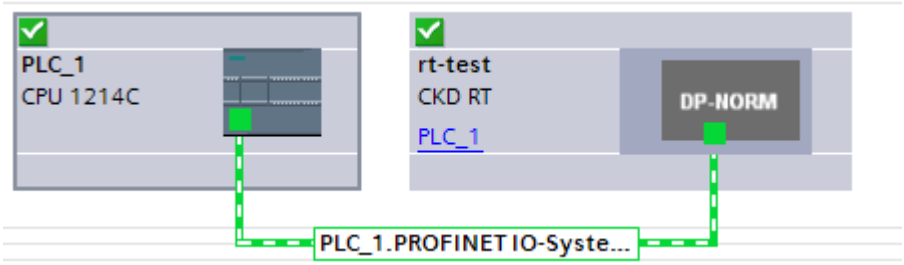
5 Information about the transfer is displayed. Respond appropriately according to the content. Then click [Load] to start the transfer.



6 Click [Finish] when a message appeared after the transfer is complete.



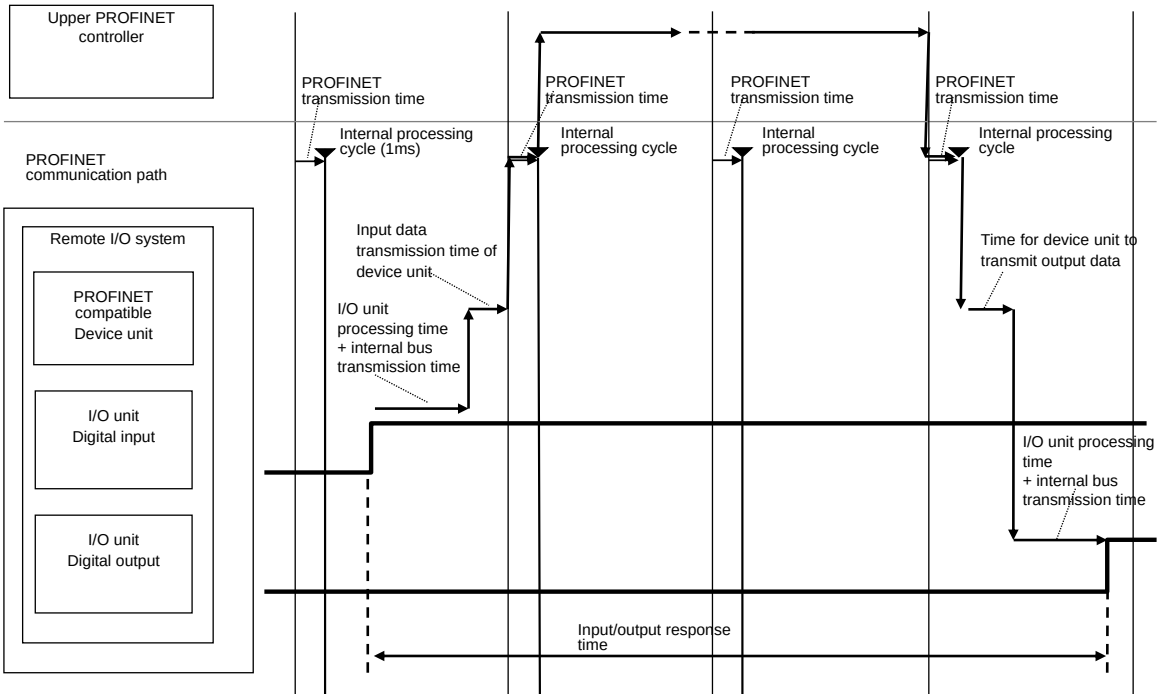
7 Open [Device & networks]. If a green check mark is displayed as shown below, the connection is successful.



7. COMMUNICATION PERFORMANCE

This section describes the input/output response time of the I/O unit in the Remote I/O system for PROFINET device unit connections under the following conditions.

The figure below shows the direction to the right as the chronological order. The digital input and output lines indicate ON/OFF.



7.1 Calculation Method

The maximum values for the input/output response time are as follows:

Maximum input/output response time =	ctc(=SendClockFactor × ReductionRation × 31.25 μs) × 2
	+ upper master (PROFINET controller) transmission delay time
	+ Transmission jitter
	+ Maximum time for input data transmission of device unit
	+ Maximum time for output data transmission of device unit
	+ Maximum time for processing input data specific to each I/O unit
	+ Maximum time for processing output data specific to each I/O unit
	+ Input delay time specific to each I/O unit
	+ Output delay time specific to each I/O unit

Note: The minimum value is when RPI x 1 and the unit has the lowest processing and delay times.

The following are the main maximum reference values for each time element.

● SendClockFactor and ReductionRation

SendClockFactor this product supports is 8,16,32,64,128
ReductionRation this product supports is 1,2,4,8,16,32,64,128,256,512

● PROFINET controller transmission delay time

Depends on the operating environment.

● Transmission jitter

Depends on the operating environment.

● Maximum time for input data transmission of device unit

The total of the update period for the following internal bus and the time for data transmission from the internal bus to PROFINET.

- The update period of the internal bus varies according to the number of connections or the connected I/O unit as follows.
  - When the total number of device units and I/O units is 15 or less: 501 μs
  - When the total number of device units and I/O units is 16 or more: 1037 μs
  - (Regardless of number of units) when the IO-Link master unit is included in the configuration: 2365 μs
- Data transmission time from the internal bus to PROFINET is a maximum of 2000 μs (varies depending on the number of connected I/O units).

● Maximum time for output data transmission of device unit

The total of the update period for the following internal buses and the time for data transmission from PROFINET to the internal bus:

- The update period of the internal bus varies according to the number of connections or the connected I/O unit as follows.
  - When the total number of device units and I/O units is 15 or less: 501 μs
  - When the total number of device units and I/O units is 16 or more: 1037 μs
  - (Regardless of number of units) when the IO-Link master unit is included in the configuration: 2365 μs
- Data transmission time from PROFINET to the internal bus is a maximum of 1000 μs (varies depending on the number of connected I/O units).

● Maximum time for processing input data specific to each I/O unit

The write cycle/time during which input data is written to the internal bus.
Varies depending on the I/O unit, as follows.

- Write cycle:
  - Digital input: maximum of 1000 μs (e.g. when changing settings. Otherwise, typ.300 μs)
  - Analog input: maximum of 3000 μs (almost no variation)
  - IO-Link master: maximum of 4000 μs (Note 1)

  Note 1: The maximum condition for an IO-Link master unit is 64 bytes input and 64 bytes output. For 38 bytes input and 34 bytes output, it is 3000 μs.
- Write time:
  - Digital input: maximum of 200 μs (almost no variation)
  - Analog input: typ.200 μs (almost no variation)
  - IO-Link master: maximum of 1400 μs (Note 2)

  Note 2: The maximum condition for an IO-Link master unit is 64 bytes input and 64 bytes output. For 38 bytes input and 34 bytes output, it is 900 μs.

● **Maximum time for processing output data specific to each I/O unit**

The read cycle/time during which output data is read from the internal bus.
Varies depending on the I/O unit, as follows.

- Read cycle:
  - Digital output: Maximum 1000 μs (when changing settings, etc. Otherwise, typ.300 μs)
  - Analog output: Maximum 3000 μs (almost no change)
  - IO-Link master: maximum of 4000 μ s (Note 3)
  - Valve I/F: maximum of 1200 μ s (Note 4)

  Note 3: The maximum condition for an IO-Link master unit is 64 bytes input and 64 bytes output. For 38 bytes input and 34 bytes output, it is 3000 μ s.

  Note 4: The condition for the maximum value of the Valve I/F unit is when it is 32 points and when the settings are changed, etc.

- Read time:
  - Digital output: Maximum 200 μs (almost no change)
  - Analog output: Typ. 200 μs (almost no change)
  - IO-Link master: maximum of 1400 μ s (Note 5)
  - Valve I/F: typ.240 μ s (Note 6)

  Note 5: The maximum condition for an IO-Link master unit is 64 bytes input and 64 bytes output. For 38 bytes input and 34 bytes output, it is 900 μs.

  Note 6: The condition for the Valve I/F unit typ.value is when it is 32 points.

● **Input delay time specific to each I/O unit**

Varies depending on the I/O unit, as follows. Each item varies depending on the settings.

- Digital input: Sampling cycle 100 μs + filter time 100 μs or above (+ input hold time)
- Analog input: Sampling cycle 1000 μs or above × average number of filters 2 times or more.
- IO-Link master: It depends on typ. 1200 μs (Note 7) or by IO-Link communication cycle time manual settings.

Note 7: When in IO-Link mode, and the communication period is 1 ms, 4 bytes input and 4 bytes output

● **Output delay time specific to each I/O unit**

Varies depending on the I/O unit, as follows.

- Digital output: 500 μs or less when ON, 1000 μs or less when OFF
- Analog output: 150 ms or less
- IO-Link master: typ.1200 μ s (Note 8)
- Valve I/F: 500 μs or less when ON, 1000 μs or less when OFF (Note 9)

Note 8: In IO-Link mode, the communication cycle is 1 ms, 4 bytes input, 4 bytes output.

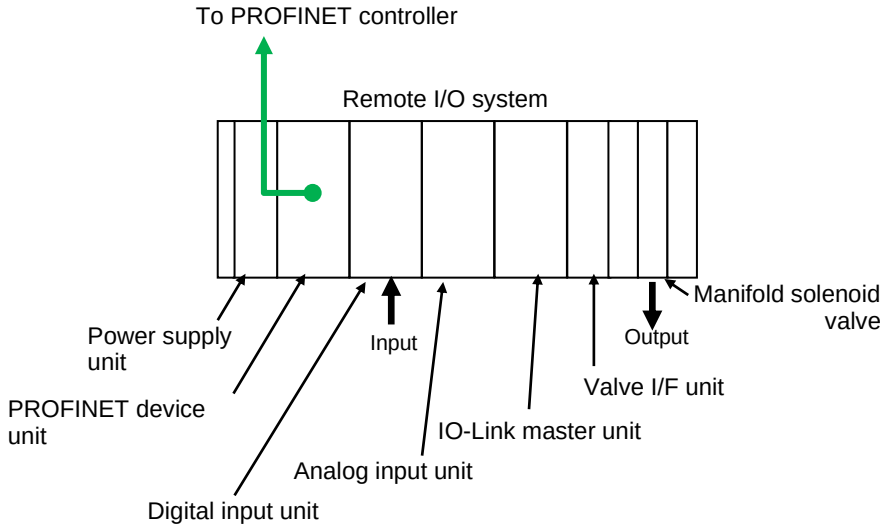
Note 9: The delay of the manifold solenoid valve itself is excluded.

7.2 Example Calculation

The following is an example calculation.

- The communication cycle, PROFINET controller transmission delay time, and transmission jitter depends on the operating environment or settings.
- All of the following I/O unit-specific delay settings are default.
  Input filter time setting for digital input unit: Default 0.1 ms
  Sampling cycle setting for analog input: Default 2 ms
  Averaging sampling count setting for analog input: Default twice (2 ms)

The following is an example of an RT series Remote I/O system structure.



The maximum input/output time from the input of the digital input unit to the output of the valve I/F unit is as follows, assuming the above conditions.

Total)
Maximum of 139590 µs (139.6 ms)

Breakdown:
- ctc x 2 : 64 ms x 2 = 128 ms
- PROFINET controller transmission delay time: 10 µs
- Transmission jitter: 10 µs
- Maximum time for input data transmission of device unit: 4365 µs
- Maximum time for output data transmission of device unit: 3365 µs
- Write cycle for input data processing: 1000 µs for digital input unit only
- Write time for input data processing: 200 µs for digital input unit only
- Read cycle for output data processing: 1200 µs for valve I/F unit only
- Read time for output data processing: 240 µs valve I/F unit only
- Input delay time specific to each I/O unit: 200 µs for digital input only
- Output delay time specific to each I/O unit: 1000 µs for Valve I/F unit

8. TROUBLESHOOTING

8.1 Unit Fault (Device unit diagnostic information)

The information can be read from the PC software, upper master (PROFINET controller) or WebAPI.

■ Error codes displayed in the PC software

The CH diagnostic information can be checked in the following screen of the PC software as a hexadecimal "Error code" with the corresponding bit set to 1 (ON).
- [Codes] on the [Errors] main tab
- [Error code] (in the error log)

■ Reading diagnostic information area from the upper PROFINET controller by cyclic data communication.

The diagnostic information for the device unit is also stored in the diagnostic information area (refer to "9.2.2 Unit specific diagnostic Information") of the object for the PROFINET device unit below. It can be read from the upper PROFINET controller via cyclic data communication.
For the PROFINET compatible device unit, the following errors can be checked:

Bit	Error name	Description	"Error type" of the device unit "Remote I/O system diagnostic information"
15	Memory read/write error	Unable to read and write various memory types, or incorrect checksum.	Hardware error
14	Factory setting error	The serial number or MAC address of the device unit is the initial value.	System error
13	Unit configuration error	The device unit does not automatically recognize the connected I/O units correctly at power-up or has detected a change in the number of connected I/O units during operation.	System error
12	Process data overflow	The total process data size exceeds the maximum size below. - Input: Maximum 506 bytes (Note) - Output: Maximum of 504 bytes - Total I/O: maximum 514 bytes (Note) Note: Two bytes for device unit Remote I/O system diagnostic information is included.	System error
10	Unit/input power voltage error	When the "Unit/input power monitoring" setting is "Monitor", the device unit has detected a voltage of 24 VDC ± 25% or more from the power supply unit closest to itself on the left when facing it.	Power failure
9	Reserved	0 Fixed	-
8	Output power voltage error	When the "Output power supply monitor" setting is "Monitor", the device unit has detected a voltage of 24 VDC ± 25% or more from the power supply unit closest to itself on the left when facing it.	Power failure
7	Internal bus communication error	There is an error in the communication via the Remote I/O system's internal bus.	System error
6	Initialized set memory	Set memory was initialized and started up with the device unit's dip switch SW5 (Parameter initialization at startup) OFF.	System error
5	Reserved	0 Fixed	-
4	WebAPI/PC concurrent access	The device unit is accessed from the web interface and the PC software simultaneously.	System error
3	Hardware error	An error has occurred that is suspected to be a hardware error in the device unit.	Hardware error
2	Reserved	0 Fixed	-
1	Reserved	0 Fixed	-
0	Reserved	0 Fixed	-

8.2 Troubleshooting from LED Display

8.2.1 LED is normal but conduct unintended operation

LED	Problem	Cause	Action
- Device unit RUN, BF: Green on SF: Off - Even number (left) LED of IO-Link master unit: Green on	When the I/O unit configuration includes an IO-Link master unit, the upper master cannot read and write the process data of the IO-Link device correctly when in IO-Link mode. The value of the process data is different from the value checked on the I/O monitor tab of the PC software directly connected to the Remote I/O system, or the value of the PC software is incorrect. E.g.) When the process data (PD) of the IO-Link device on port 1 is 4 bytes, the data of port 2 are stored from halfway in the upper PROFINET controller side, or extra data are stored between them and the data on port 2.	The size or mode settings for each port on the IO-Link master unit is incorrect. Or the IO-Link device is operating at a different from the data size expected. * However, actual process data size matches the process data size of the device registered in the PROFINET controller.	Check the size of the process data (PD) of the IO-Link devices connected in IO-Link mode. Set the process data size settings or mode correctly for each port on the IO-Link master. If necessary, update the process data size settings on the device registered in the PROFINET controller.

8.2.2 Troubleshooting from power supply unit LED Display

■ Power supply unit LED

Power supply unit			Problem	Action
PWR(S)	PWR(O)	PWR(I)		
24 V unit/input status	24 V output status	5 V internal status		
Green on	Green on	Green on	Normal condition	-
Off	Off	Off	24 V unit/input and 24 V output are not supplied correctly.	Supply 24 V unit/input and 24 V outputs correctly.
Off	Green on	Off	24 V unit/input is not correctly supplied or the power supply unit internal fuse is blown.	Check the unit/input 24 V power supply. If the problem persists, replace the power supply unit.
Green on	Off	Green on	24 V output is not correctly supplied. Or, the internal fuse of the power supply unit is blown.	Check the output 24 V power supply. If the problem persists, replace the power supply unit.
Green on	Green on	Off	The internal IC of the power supply unit has failed.	Replace the power supply unit (Note 1).

Note 1: If replacing the power supply unit does not fix it, it may be due to a faulty I/O unit. If such is the case, contact CKD.

8.2.3 Troubleshooting from the LED Display on a PROFINET compatible device unit

■ Power monitoring LED on the device unit

Device unit PS	Problem	Cause	Action
Red blinking (fast)	Unit/input power voltage error	When the "Unit/input power monitoring" setting is "Monitor", the device unit has detected that the 24 VDC unit/input voltage is outside the range of 24 VDC ± 25%.	Verify that the 24 V unit/input voltage to the power supply unit is within the range of ± 10%.
Yellow on	Unit/input voltage restored from voltage error	It is latched after recovering from a voltage error in the unit/input 24 V.	Reset it using power cycle operation or PC software operation.
Off	Power OFF state	24 V for unit/input to the power supply unit is OFF or not correctly supplied.	Verify that there is 24 V for the unit/input to the power supply unit.

Device unit PO	Problem	Cause	Action
Red blinking (fast)	Output power voltage error	When the "Output power supply monitoring" setting is "Monitor", the device unit has detected that the 24 VDC output voltage is outside the range of 24 VDC ± 25%.	Verify that the 24 V output voltage to the power supply unit is within the range of -5 to +10%.
Yellow on	Output voltage restored from voltage error.	It is latched after recovering from a voltage error in the output 24 V.	Reset it using power cycle operation or PC software operation.
Off	Power OFF state	24 V output to the power supply unit is OFF or not correctly supplied.	Verify that there is 24 V output to the power supply unit.

■ Basic LED of the device unit

Normal condition

Device unit								Problem
RUN	BF	SF	CF	PS	PO	L/A IN	L/A OUT	
Status of the PROFINET device	Status of the PROFINET communication	Status of the entire Remote I/O system.	Setting change or forced input/output.	Status of the 24 V power supply for unit/input	Status of the 24 V power supply for output	Link status on the IN side of the connector	Link status on the OUT side of the connector	
Green on	Green on	Green on	Off	Green on	Green on	Green blinking (fast)	Green blinking (fast)	Normal condition

Error condition

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	BF	SF	CF				
Status of the PROFINET device	Status of the PROFINET communication	Status of the entire Remote I/O system	Setting change or forced input/output				
Green blinking	Red on or red blinking (1Hz)	Undefined	Undefined	Cannot connect to IO controller.	-	IP address has not been set. Or the device name is not set properly.	Set the IP address appropriately or check the device name setting.
Green blinking	Red on	Undefined	Undefined		-	Power is on but not in the initialization sequence.	Turn the power off and on again. If the problem persists, contact CKD.
Red on	Red on or red blinking (1Hz)	Yellow blinking (fast)	Undefined	A "Unit configuration error" has occurred.	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.	- If the actual I/O unit configuration is correct, leave the configuration as is and turn the power off and on again. - If the actual I/O unit configuration is not correct, turn OFF the power, change the I/O unit configuration, and then turn on the power. - Check the connection between the units.
						When using multiple power supply units, the power-up timing between the power supply units has shifted by 3 seconds or more.	Cycle the power-up timing to the multiple power supply units at the same time (within 3 seconds).
Off	Off	Off	Off	It does not work at all	-	The power is not supplied properly.	- Check that the 24V is supplied to the Power supply unit. - Check that all LEDs on the Power supply unit are lit.
Green on	Red on or red blinking (1Hz)	Undefined	Undefined	Cannot connect to IO controller.	-	There is an error in the communication path or IO controller.	Check that there is no disconnection or misconnection in the communication path. Check whether the IO controller is set incorrectly and it is operating correctly.

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	BF	SF	CF				
Status of the PROFINET device	Status of the PROFINET communication	Status of the entire Remote I/O system	Setting change or forced input/output				
Undefined	Undefined	Red blinking (fast)	Undefined	An internal bus communication error has occurred.	Internal bus communication error	There is a physical connection problem between the units, or there is a strong noise around the area.	Disconnect, reconnect, and power on the Remote I/O system units. If it still occurs, check the connection, improve the noise condition, or implement a workaround. If the condition still persists even after making improvements, contact CKD.
Undefined	Undefined	Red blinking (slow)	Undefined	A hardware error has occurred in the device unit.	Hardware error	There is a possible hardware error.	Turn the power off and on again. If the problem persists, replace the device unit.
Undefined	Undefined	Red blinking (slow)	Undefined	- Cannot read/write various memories. - Settings are initialized. - Cannot communicate with the IO controller. - Automatic recognition fails. - Cannot read log data from the PC software.	Memory read/write error	There is a possible hardware failure.	Turn the power off and on again after writing new data, or do so while the dip switch SW5 is ON. If the problem persists, contact CKD.
Undefined	Undefined	Red blinking (Twice)	Undefined	Factory setting error has occurred.	Factory setting error	The serial number of the device unit is the initial value (the serial number is always written at manufacturing). There is a possible failure.	Contact CKD.

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	BF	SF	CF				
Status of the PROFINET device	Status of the PROFINET communication	Status of the entire Remote I/O system	Setting change or forced input/output				
Undefined	**Undefined**	**Yellow on**	**Undefined**	**Process data is fixed.**	**-**	- Disconnection detected in digital input unit or analog input unit. - The digital output unit or analog output unit is in “Manual output” status. - Valve I/F unit is in a manual output state. - Changed the settings that changes the process data size on the variable I/O unit.	**Turn the power off and on again.**
Undefined	Undefined	Green blinking (fast)	Undefined	The I/O unit setting is initialized and started. Cannot connect to the upper master.	Initialized set memory	The setting memory was initialized and started up while the device unit's dip switch SW5 (Parameter initialization at startup) was OFF. - Changed connected I/O unit (when the device unit started up, the unit ID and connection position number of the connected I/O unit did not match ones at the last start-up). - The checksum of the setting memory in the analog I/O unit and IO-Link master unit did not match the one stored in the device unit.	Check if the configuration of the I/O unit has changed. And turn the power off and on again. If the problem persists, contact CKD. Note: To clear the error, turn the power off and on again, or a latch reset operation from the PC software.
Undefined	Undefined	Green blinking (slow)	Undefined	The process data size of some I/O units is different than expected. Some I/O units have an internal bus communication error. Cannot connect to the upper	Process data overflow	The process data size with the upper master as a device unit exceeds the maximum size below. - Input: Up to 504 bytes (not including two bytes for the device unit	Make the process data size the maximum size or lower, for example by reducing the number of I/O units or changing the I/O unit type. Following this, turn the power off and on again.

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	BF	SF	CF				
Status of the PROFINET device	Status of the PROFINET communication	Status of the entire Remote I/O system	Setting change or forced input/output				
Undefined	**Undefined**	**Yellow on**	**Undefined**	**Process data is fixed.**	**-**	- Disconnection detected in digital input unit or analog input unit. - The digital output unit or analog output unit is in “Manual output” status. - Valve I/F unit is in a manual output state. - Changed the settings that changes the process data size on the variable I/O unit.	**Turn the power off and on again.**
				master.		Remote I/O system diagnostic information). - Output: Up to 504 bytes. - Total input/output: Up to 512 bytes (not including two bytes for the device unit Remote I/O system diagnostic information).	
Undefined	Undefined	Undefined	Yellow on	Cannot control process data from the IO controller.	-	There is a unit with a forced I/O setting.	Remove the forced I/O setting from the PC software, or turn the power off and on again.
Undefined	Undefined	Undefined	Either of Red blinking (slow), Yellow on	Cannot control process data from the IO controller.	WebAPI/PC concurrent access	At the same time, settings are changed from the LAN-connected PC software or from the WebAPI.	Check whether the settings are also changed from the LAN-connected PC software or from WebAPI.
Undefined	Undefined	Undefined	Either of Red blinking (slow), Green blinking (fast), Green blinking (slow)	Cannot change settings by acyclic parameter communication.	WebAPI/PC concurrent access	At the same time, settings are changed from the LAN-connected PC software, WebAPI, or USB-connected PC software.	Check whether the settings are also changed from the LAN-connected PC software, WebAPI, or USB-connected PC software.
Undefined	Undefined	Undefined	Green blinking (slow)	Cannot change settings by acyclic		At the same time, settings are also changed from the	Check whether the settings are changed from the

Device unit				Problem	Diagnostic information for the device unit	Cause	Action
RUN	BF	SF	CF				
Status of the PROFINET device	Status of the PROFINET communication	Status of the entire Remote I/O system	Setting change or forced input/output				
Undefined	**Undefined**	**Yellow on**	**Undefined**	**Process data is fixed.**	**-**	- Disconnection detected in digital input unit or analog input unit. - The digital output unit or analog output unit is in “Manual output” status. - Valve I/F unit is in a manual output state. - Changed the settings that changes the process data size on the variable I/O unit.	**Turn the power off and on again.**
				parameter communication.		PC software.	PC software as well.
Undefined	Undefined	Undefined	Off	Cannot be controlled from the PC software.	-	There is no access from the PC software (connected to a USB) for 60 seconds or more.	Check that the COM port specified is correct.
Undefined	Undefined	Undefined	Off	Cannot be controlled from the PC software or WebAPI.	-	There is no access from the PC software (connected to LAN) or WebAPI for 60 seconds or more.	Check that the dip switch SW1 of the device unit is ON (Note 1). And check if the IP address and URL specified are correct.

Note 1: Turn the power off and on again when the switch settings have been changed.

■ LED in data transmission/reception status of the device unit

Device unit	Problem	Cause	Action
L/A IN L/A OUT			
Off	No Ethernet communication.	The Ethernet cable is not connected properly.	Check the Ethernet cable connection.

9. INDEX LIST

9.1 Supported index

The following objects are supported by the product.

Index		Name	Description	Item
Decimal	Hexadecimal			
16	0x0010	Manifold Diagnosis	Remote IO system diagnostic information	9.2.1
32 to 50	0x0020 to 0x0032	Unit Diagnosis	Unit diagnostic information	9.2.2
64 to 82	0x0040 to 0x0052	Points CH Port Diagnosis	CH/point/port diagnostic information	9.2.3
96 to 114	0x0060 to 0x0072	Specific Diagnosis	Unit-specific diagnostic information	9.2.4
416	0x01A0	Detected Module Ident List	List of unit IDs detected at startup	9.2.5
512 to 767	0x0200 to 0x02FF	Diagnosis History	Log: Up to 256 logs starting from Index=0x0200	9.2.6
1024 to 1042	0x0400 to 0x0412	Unit Parameters	Unit settings	9.2.7
1120 to 1138	0x0460 to 0x0472	IO-Link Master ISDU Write	ISDU communication (Write)	9.2.8
1152 to 1170	0x0480～0x0492	IO-Link Master ISDU Read	ISDU communication (Read)	9.2.9
1536 to 1554	0x0600 to 0x0612	Process Data	Process data of the target unit	9.2.10

■ About Index

An index with a range specified other than Diagnosis History is relative to the physical location of the unit. +0 is always assigned to the device unit. It is added to the index as the leftmost unit excluding the device units is set as +1, the unit on the right is +2, the unit on the next right is +3, and so on. The maximum value to add is 17.

■ About Length

When accessing to the index, specifying the exact data length is required. Set the correct length by checking the tables for each index.

9.2 Index Details

This section describes the details of index.

9.2.1 Remote IO system diagnostic information

This is diagnostic information for the entire system. It is about data aggregating diagnostic information for each unit.
Note: [Diagnostic information] function needs to be enabled (Dip switch SW needs to be ON).

Index	RW	V/NV	Length (byte)
0x0010	R	V	2

Bit	Name	Data Type	Default
0	Unit input error	Bit	0
1	Unit output error	Bit	0
2	Reserve	Bit	0
3	Power failure	Bit	0
4	Reserve	Bit	0
5	Operation waiting	Bit	0
6	Hardware abnormal	Bit	0
7	System error	Bit	0
8-15	Reserve	Bit	0

9.2.2 Diagnostic information for each unit

This is diagnostic information for each unit.
Specify the index by adding the physical location of the target unit based on 0x0020.

Index	RW	V/NV	Length (byte)
0x0020-0x0032 (*1)	R	V	2

Offset (byte)	Name	NV	Default
0	Unit diagnosis (*2)	V	0x0000

*1: An index is relative to the physical location of the unit. +0 is always assigned to the device unit. It is added to the index as the leftmost unit excluding the device units is set as +1, the unit on the right is +2, the unit on the next right is +3, and so on. The maximum value to add is 17.
*2 The diagnostic information of the unit is the result of performing OR logic on all point-specific diagnostic information of the target unit.

9.2.3 Diagnostic information for each point

This is diagnostic information for each point/CH/port.

Index	RW	V/NV	Length (byte)
0x0040-0x0052	R	V	128 (2byte*64pt)

Offset (byte)	Name	NV	Default
0	Point/ch/port diagnosis 0	V	0x0000
2	Point/ch/port diagnosis 1	V	0x0000
…	…	…	…
126	Point/ch/port diagnosis 63	V	0x0000

*1 The maximum number of valid data is the number of points, CHs, and ports that the target unit has.
*2 For the definition of diagnostic information, refer to the instruction manual for each unit.
*3 Device unit is not supported

9.2.4 Unit-specific diagnostic information (Specific Diagnosis)

Diagnostic information for a specified I/O unit is stored in this area.

Index	RW	V/NV	Length (byte)
0x0060-0x0072	R/RW	V	26 (for IO-Link master unit)

■ Error log of the IO-Link master unit

A maximum of 6 error histories within the IO-Link master unit (history of event codes for IO-Link devices or error responses for ISDU communication) are stored. This data can be read out with acyclic parameter communication from the IO controller or in [Error log] window of the PC software. The error log data is automatically deleted from IO-Link master unit as soon as it is read out.
There are no attributes for the class. For a description of the instances, refer to "About Index".

Offset (byte)	RW	NV	Name	Data type	Initial value	Description
0	RW	V	Read Target Port	BYTE	0x00	Target port to read
1	R	V	Read Complete	BYTE	FALSE	Read complete (Note 1)
2	R	V	IO-Link Device Error1	DWORD	0x00000000	IO-Link error log 1 (Note 2)
6	R	V	IO-Link Device Error2	DWORD	0x00000000	-Link error log 2 (Note 2)
10	R	V	IO-Link Device Error3	DWORD	0x00000000	-Link error log 3 (Note 2)
14	R	V	IO-Link Device Error4	DWORD	0x00000000	-Link error log 4 (Note 2)
18	R	V	IO-Link Device Error5	DWORD	0x00000000	-Link error log 5 (Note 2)
22	R	V	IO-Link Device Error6	DWORD	0x00000000	-Link error log 6 (Note 2)

Note 1: The read complete values are as follows. The device unit writes the termination status when a series of write processing is complete.
0: Reading
1: Read complete. Or, it generates when the wait time for a response has timed out.

Note 2: The bit allocation for IO-Link error log is as follows. The upper row is for IO-Link device events and the lower row is for error responses for ISDU communication. Refer to IO-Link Communication specifications for details. Event Code may contain a unique value for the product.

Bit 31	…	Bit 24	Bit 23	…	Bit 16	Bit 15	…	Bit 8	Bit 7	…	Bit 1	Bit 0
Event Code						Event Qualifier			0		IOLDEP (Note 3)	
Additional Code			Error Code			I-Service			0		IOLDEP (Note 3)	

Note 3: Details of IOLDEP (IO-Link Device Error Pattern) are as follows.
00: No error during IO-Link communication
01: Diagnosis
10: ISDU

Examples of Event Codes that can be generated on IO-Link master units are as follows.

Event Code	Description	Remarks
0xFFF3	Device ID to verify is not registered.	-
0xFFFB	IO-Link device is not connected.	-
0xFFFC	Verification error with serial number occurred.	During this error, IO-Link communication is stopped on PREOPERATE.
0xFFFE	IO-Link devices have different device IDs.	During this error, IO-Link communication is stopped on PREOPERATE.
0xFFFF	Device ID of restore destination is different.	When the storage data ID and the device ID are different at the restore.

* For events that generate on IO-Link devices, refer to the specifications for each IO-Link device in use.

The instruction for read is as follows:

1 Set the number of desired port to [Read Target Port]

2 Wait until [Read Complete] is "1."
This value is typically updated within two seconds of setting the target port to [Read Target Port].

3 When [Read Complete] is "1", check the value and the "IO-Link error log"
* The existence of error log from IO-Link devices can be checked in [Error log update] in the process data.

9.2.5 Unit ID configuration detected by automatic recognition

It is the I/O unit configuration actually detected by the device unit at power-up

Index	RW	V/NV	Length (byte)
0x01A0	R	V	72 (4*18)

Offset (byte)	Name	Data Type	Default
0	Unit 0 Unit ID	DWORD	0x00000000
4	Unit 1 Unit ID	DWORD	0x00000000
…	…	…	…
68	Unit 17 Unit ID	DWORD	0x00000000

Unit ID List

Unit ID	Model No.	Type	Main function	Connector	Points/CH/ports	Polarity
07060000	RT-XTEPN00N	Device unit	PROFINET 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	Terminal	32 points	PNP
2D6C0400	RT-XADGC32B	Input	Digital	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	Terminal	32 points	PNP
2D740004	RT-XBDGC32B	Output	Digital	Terminal	32 points	NPN
51080400	RT-XAAGA02N	Input	Analog	M12	2CH	-
51100004	RT-XBAGA02N	Output	Analog	M12	2CH	-
D300xxyy(Note 1)	RT-XLMSA08N	IO-Link	Master	M12	8 ports	-
6D020004	RT-XVVCN32A(Note 2)	Valve I/F	TVG		32 points	PNP
6D820004	RT-XVVCN32B(Note 2)	Valve I/F	TVG		32 points	NPN

Note 1: The module name for Valve I/F unit are indicated as the model No. on the software only. The actual model No. for valve manifold is TVG☐P-TB-☐-KA1☐.

Note 2: xxyy varies depending on the unit settings. (Initial setting value: 2622)

9.2.6 Remote I/O system log

The error log of the product is saved.
The latest index is 0x0200, and each index contains one log up to 0x02FE.
Enable the error log function ([Save log ON/OFF], [Number of saved log] to 1 or more) to save error log.
Refer to “4.2 List of Settings” for detail.

Index	RW	V/NV	Length (byte)
0x0200-0x02FE	R	N.V.	16

Offset (byte)	Name	Data Type	Default	Remarks
0	Date	WORD	0x0000	Number of days since startup
2	Hour	BYTE	0x00	
3	Minute	BYTE	0x00	
4	Second	BYTE	0x00	
5	Msec	BYTE	0x00	×10
6	Error code	WORD	0x0000	Error code
8	Unit ID	DWORD	0x00000000	Unit ID of target unit
12	Unit Position	BYTE	0x00	Unit position of target unit
13	Point/CH/Port	BYTE	0x00	Target CH/point/port
14	Reserve	WORD	0x0000	

9.2.7 Setting data area

Index	RW	V/NV	Length (byte)
0x0400-0x0412	R/RW	V/NV	Varies depending on each unit

“Setting change failed” notification
All I/O units and device unit will set the [Setting change failed] to 0 when the setting change using acyclic parameter communication is successful. [Setting change failed] is set to 1 when the setting change using acyclic parameter communication is failed.
Therefore, use this [Setting change failed] as a result of successful/failed setting changes using acyclic parameter communication.
The Attr ID for the [Setting change failed] differs depending on the I/O unit as follows.
This value is updated within 2 seconds after requesting a setting change.

■ Settings for the device unit

Length(byte)=19

Offset(byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Input power monitor	BYTE	1	0: OFF (not monitored) 1: ON (monitored)
1	RW	NV	Output power monitor	BYTE	1	0: OFF (not monitored) 1: ON (monitored)
2	RW	NV	Analog byte order	BYTE	0	0: Big endian 1: Little endian
3	RW	NV	Maximum number of saved logs	BYTE	0x00	0x00: Do not save 0x01 to 0xFF: Maximum number to save
4	RW	NV	Saving logs (method)	BYTE	1	0: Repeat (overwrite) 1: Stop at maximum number
5	RW	NV	Time to save log	BYTE	0x1E	0x00: real-time 0x1 to 3C: Save every 1 to 60 minutes
6	RW	NV	Log filter	BYTE	0x00	Refer to "4.2 List of settings".
7	RW	NV	Log filter details (error code specification)	BYTE	0x00	0x00 to 0xFF
8	RW	NV	Log filter details (unit specification)	DWORD	0x00000000	0x00000000 to 0xFFFFFFFF
12	RW	NV	Log filter details (Unit position specification)	BYTE	0	0x00 to 0x11
13	RW	NV	Log filter details (CH specification)	BYTE	0x00	0x00 to 0xFF
14	R	NV	Output power supply ON time	DWORD	-	0x00000000 to 0xFFFFFFFF
18	R	V	Setting change failed	BYTE	0	0: Setting change successful 1: Setting change failed

■ Settings for the analog input 2 CH unit

Length(byte)=57

Offset(byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Power line error detection	BYTE	1	0: Disable 1: Enable
1	RW	NV	Averaging sampling count	BYTE	0x00	0x00: Two times 0x01: Four times 0x02: Eight times 0x03: Sixteen times
2	RW	NV	Sampling period	WORD	0x0001	0x0001(1 ms) to 0xFFFF(65535 ms)
4	RW	NV	Data format	DWORD	0x01	(Note 1)
8	RW	NV	Input range	DWORD	0x00	(Note 2)
12	RW	NV	Max range error	DWORD	1	0: Disable 1: Enable
16	RW	NV	Min range error	DWORD	1	0: Disable 1: Enable
20	RW	NV	User set value upper limit error	DWORD	0	0: Disable 1: Enable
24	RW	NV	User set value lower limit error	DWORD	0	0: Disable 1: Enable
28	RW	NV	User set value upper limit error threshold	QWORD	0x0000	(Note 3)
36	RW	NV	User set value lower limit error threshold	QWORD	0x0000	(Note 3)
44	RW	NV	Sensor power	DWORD	1	0: OFF (Do not supply) 1: ON (Supply)
48	RW	NV	Measured hysteresis	DWORD	0	0: OFF 1: ON
52	RW	NV	Enable/Disable	DWORD	1	0: Disable 1: Enable
56	R	NV	Setting change failed	BYTE	0	0: Setting change successful 1: Setting change failed

Assigning “Power line error detection” data

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	CH1	CH0

Assigning “Data format” data

Offset(byte)	+0	+1	+2	+3
Depends on the target item	0	0	CH1	CH0

* “Input range”, “Max range error“, “Min range error“, “User set value upper limit error“, “User set value lower limit error“, “Sensor power“, “Measured hysteresis“, and “Enable/Disable“ are also assigned in the same way.

Assigning “User set value upper limit error threshold” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	+6	+7
28	CH3 *1		CH2 *1		CH1		CH0	

* Same as “User set value lower limit error threshold”.

Note 1: The values for the data format setting are as follows:

0x00: Offset 12 (12 bit)
0x01: Offset 16 (16 bit)
0x02: Signed magnitude A (12 bit)
0x03: Signed magnitude B (16 bit)
0x04: Signed magnitude C (16bit)
0x05: Signed magnitude D (16bit)
0x06: Signed magnitude E (16bit)
0x07: Signed 2's complement (16 bit)

Note 2: The values for the input range setting are as follows

0x00: DC -10 V to +10 V
0x01: DC -5 V to +5 V
0x02: DC 0 V to 10 V
0x03: DC 0 V to 5 V
0x04: DC 1 V to 5 V
0x0A: DC -20 mA to +20 mA
0x0B: DC 4 mA to 20 mA
0x0C: DC 0 mA to 20 mA

Note 3: Refer to “7.1.1 Analog Input” of “Analog I/O Unit Instruction Manual “ for the valid setting value for the combination of data format and input range.

■ Settings for the digital input unit M 8 x 8 type

Length(byte)=55

Offset (byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Power line error detection	BYTE	TRUE	FALSE: Disabled TRUE: Enabled
1	RW	NV	ON count threshold (Input) point 0	3BYTE	0	0x000000 to 0xFFFFFF No count when 0x000000
…	…	…	…	…	…	…
22	RW	NV	ON count threshold (Input) point 7	3BYTE	Same as above	Same as above
25	R	NV	On Operating Cycle point 0	3BYTE	0	0x000000 to 0xFFFFFF
…	…	…	…	…	…	…
46	R	NV	On Operating Cycle point 7	3BYTE	Same as above	Same as above
49	RW	NV	Input filter time	3BYTE	0	0: 0.1 ms 1: 1 ms 2: 5 ms 3: 10 ms 4: 20 ms
52	RW	NV	Input hold time point	WORD	0	0: 1 ms 1: 15 ms 2: 100 ms 3: 200 ms
54	R	NV	Setting change failed	BYTE	0	0: Setting change successful 1: Setting change failed

Assigning “Power line error detection” bit

Bit 7	Bit 6	…	…	…	…	Bit 1	Bit 0
Connector 7	Connector 6	…	…	…	…	Connector 1	Connector 0

Assigning “ON count threshold (Input)/On Operating Cycle” data

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+21	+22	+23
1 or 49	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 7 counter value/threshold		

Assigning “Input filter time” bit

Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	…	Bit2	Bit1	Bit0
Setting for point 7			Setting for point 6				Setting for point 0		

Assigning “Input hold time” bit

Bit15	Bit14	…	…	…	…	Bit1	Bit0
Setting for point 7		…	…	…	…	Setting for point 0	

■ Settings for the digital input unit M 12 x 8 type

Length(byte)=108

Offset (byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Power line error detection	BYTE	TRUE	FALSE: Disabled TRUE: Enabled
1	RW	NV	ON count threshold (Input) point 0	3 BYTE	0	0x000000 to 0xFFFFFF No count when 0x000000
...	...	...	...	...	...	...
46	RW	NV	ON count threshold (Input) point 15	3 BYTE	Same as above	Same as above
49	R	NV	On Operating Cycle point 0	3 BYTE	0	0x000000 to 0xFFFFFF
...	...	...	...	...	...	...
94	R	NV	On Operating Cycle point 15	3 BYTE	Same as above	Same as above
97	RW	NV	Input filter time point 0	6 BYTE	0	0: 0.1 ms 1: 1 ms 2: 5 ms 3: 10 ms 4: 20 ms
103	RW	NV	Input hold time point 0	DWORD	0	0: 1 ms 1: 15 ms 2: 100 ms 3: 200 ms
107	R	NV	Setting change failed	BYTE	0	0: Setting change successful 1: Setting change failed

Assigning “Power line error detection” bit

Bit 7	Bit 6	…	…	…	…	Bit 1	Bit 0
Connector 7	Connector 6	…	…	…	…	Connector 1	Connector 0

Assigning “ON count threshold (Input)/On Operating Cycle” data

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+45	+46	+47
1 or 49	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 15 counter value/threshold		

Assigning “Input filter time” bit

Bit 47	Bit 46	Bit 45	Bit 44	Bit 43	Bit 42	…	Bit 2	Bit 1	Bit 0
Setting for point 15			Setting for point 14			…	Setting for point 0		

Assigning “Input hold time” bit

Bit 31	Bit 30	…	…	…	…	Bit 1	Bit 0
Setting for point 15		…	…	…	…	Setting for point 0	

■ Settings for the digital input unit Push-in terminal block type

Length(byte)=215

Offset (byte)	RW	NV	Name	Data Type	Initial value	Description	
0	RW	NV	Power line error detection	BYTE	TRUE	FALSE: Disabled TRUE: Enabled	
2	RW	NV	ON count threshold (Input) point 0	3 BYTE	0	0x000000 to 0xFFFFFF No count when 0x000000	
…	…	…	…	…	…	…	
95	RW	NV	ON count threshold (Input) point 31	3 BYTE	Same as above	Same as above	
98	R	NV	On Operating Cycle point 0	3 BYTE	0	0x000000 to 0xFFFFFF	
…	…	…	…	…	…	…	
191	R	NV	On Operating Cycle point 31	3 BYTE	Same as above	Same as above	
194	RW	NV	Input filter time	12 BYTE	0	0: 0.1 ms 1: 1 ms 2: 5 ms 3: 10 ms 4: 20 ms	
206	RW	NV	Input hold time	QWORD	0 to 15 points: 0 16 to 31 points: 2	0 to 15 points 0: 1 ms 1: 15 ms 2: 100 ms 3: 200 ms	16 to 31 points 2: 100 ms 3: 200 ms
107	R	NV	Setting change failed	BYTE	0	0: Setting change successful 1: Setting change failed	

Assigning “Power line error detection” bit

Bit 15	Bit 14	…	…	…	…	Bi t1	Bi t0
Block 7		…	…	…	…	Block 0	

Assigning “ON count threshold (Input)/On Operating Cycle” data

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+94	+95	+96
2 or 98	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 31 counter value/threshold		

Assigning “Input filter time” bit

Bit 95	Bit 94	Bit 93	Bit 92	Bit 91	Bit 90	…	Bi t2	Bi t1	Bi t0
Setting for point 31			Setting for point 30				Setting for point 0		

Assigning “Input hold time” bit

Bit 63	Bit 62	…	…	…	…	Bit 1	Bit 0
Setting for point 31		…	…	…	…	Setting for point 0	

■ Settings for the analog output 2 CH unit

Length(byte)=63

Offset (byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Power line error detection	BYTE	1	0: Disable 1: Enable
1	RW	NV	Signal line error recovery operation	BYTE	0	0 : Auto 1 : Manual
2	RW	NV	Data format	DWORD	0x01	(Note 1)
6	RW	NV	Output range	DWORD	0x02	(Note 2)
10	RW	NV	Max range error	DWORD	1	0: Disable 1: Enable
14	RW	NV	Min range error	DWORD	1	0: Disable 1: Enable
18	RW	NV	User set value upper limit error	DWORD	0	0: Disable 1: Enable
22	RW	NV	User set value lower limit error	DWORD	0	0: Disable 1: Enable
26	RW	NV	User set value upper limit error threshold	QWORD		(Note 3)
34	RW	NV	User set value lower limit error threshold	QWORD		(Note 3)
42	RW	NV	Load power	DWORD	1	0: OFF 1: ON
46	RW	NV	Customized output value at communication error	DWORD	0x0000	0x0000 to 0xFFFF
50	RW	NV	Communication error operation	QWORD	0x02	0x00: OFF 0x01: User 0x02 : HOLD
58	RW	NV	Enable/Disable	DWORD	1	0: Disable 1: Enable
62	R	V	Setting change failed	BYTE	0	0: Setting change successful 1: Setting change failed

Assigning “Power line error detection” data

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	CH1	CH0

Assigning “Data format” data

Offset(byte)	+0	+1	+2	+3
Depends on the target item	0	0	CH1	CH0

* “Output range“, “Max range error“, “Min range error“, “User set value upper limit error“, “User set value lower limit error“, “Load power“, “Communication error operation“, and “Enable/Disable“ are also assigned in the same way.

Assigning “User set value upper limit error threshold” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	+6	+7
28	CH3 *1		CH2 *1		CH1		CH0	

* Same as “User set value lower limit error threshold”.

Note 1: The values for the data format setting are as follows:

0x00: Offset 12 (12 bit)
0x01: Offset 16 (16 bit)
0x02: Signed magnitude A (12 bit)
0x03: Signed magnitude B (16 bit)
0x04: Signed magnitude C (16bit)
0x06: Signed magnitude E (16bit)
0x07: Signed 2's complement (16 bit)

Note 2: The values for the output range setting are as follows.

0x02: DC 0 V to 10 V
0x03: DC 0 V to 5 V
0x04: DC 1 V to 5 V
0x0B: DC 4 mA to 20 mA
0x0C: DC 0 mA to 20 mA

Note 3: Refer to “7.1.2 Analog Output” of “Analog I/O Unit Instruction Manual “ for the valid setting value for the combination of data format and output range.

■ Settings for the digital Output unit M 12 x 8 type

Length(byte)=63

Offset(byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Signal line error detection	WORD	TRUE	FALSE: Disabled TRUE: Enabled
2	RW	NV	Signal line error recovery operation	WORD	0	0 : Auto 1 : Manual
4	RW	NV	ON count threshold (Output) point 0	3 BYTE	0x00000	0x000000 to 0xFFFFFF No count when 0
…	…	…	…	…	…	…
49	RW	NV	ON count threshold (Output) point 15	3 BYTE	Same as above	Same as above
52	R	NV	On Operating Cycle point 0	3 BYTE	0x00000	0x000000 to 0xFFFFFF
…	…	…	…	…	…	…
97	R	NV	On Operating Cycle point 15	3 BYTE	Same as above	Same as above
100	RW	NV	Communication error operation point	DWORD	0x02	0x00: OFF 0x01: ON 0x02: HOLD
104	R	NV	Setting change failed	BOOL	0	0: Setting change successful 1: Setting change failed

Assigning “Signal line error detection” bit

Bit 15	Bit 14	…	Bit 1	Bit 0
Point 15	Point 14	…	Point 1	Point 0

Assigning “Signal line error recovery operation” bit

Bit 15	Bit 14	…	Bit 1	Bit 0
Point 15	Point 14	…	Point 1	Point 0

Assigning “ON count threshold (Output)/On Operating Cycle” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+45	+46	+47
Data	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 15 counter value/threshold		

Assigning “Communication error operation” bit

Bit 31	Bit 30	…	…	…	…	Bit 1	Bit 0
Setting for point 15		…	…	…	…	Setting for point 0	

■ Settings for the digital Output unit Push-in terminal block type

Length(byte)=209

Offset(byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Signal line error detection	DWORD	TRUE	FALSE: Disabled TRUE: Enabled
4	RW	NV	ON count threshold (Output) point 0	3 BYTE	0x00000	0x000000 to 0xFFFFFF No count when 0
...	...	...	...	...	...	...
97	RW	NV	ON count threshold (Output) point 15	3 BYTE	Same as above	Same as above
100	R	NV	On Operating Cycle point 0	3 BYTE	0x00000	0x000000 to 0xFFFFFF
...	...	...	...	...	...	...
193	R	NV	On Operating Cycle point 15	3 BYTE	Same as above	Same as above
196	RW	NV	Signal line error recovery operation	DWORD	0	0：Auto 1：Manual
200	RW	NV	Communication error operation point	QWORD	0x02	0x00: OFF 0x01: ON 0x02: HOLD
208	R	NV	Setting change failed	BOOL	0	0: Setting change successful 1: Setting change failed

Assigning “Signal line error detection” bit

Bit 31	Bit 30	…	Bit 1	Bit 0
Point 31	Point 30	…	Point 1	Point 0

Assigning “Signal line error recovery operation” bit

Bit 31	Bit 30	…	Bit 1	Bit 0
Point 31	Point 30	…	Point 1	Point 0

Assigning “ON count threshold (Output)/On Operating Cycle” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+45	+46	+47
Data	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 15 counter value/threshold		

Assigning “Communication error operation” bit

Bit 63	Bit 62	…	…	…	…	Bit 1	Bit 0
Setting for point 31		…	…	…	…	Setting for point 0	

■ Settings for the valve I/F unit 32-point unit

Length(byte)=209

Offset(byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Signal line error detection	DWORD	TRUE	FALSE: Disabled TRUE: Enabled
4	RW	NV	ON count threshold (Output) point 0	3 BYTE	0x00000	0x000000 to 0xFFFFFF No count when 0
...	...	...	...	...	...	...
97	RW	NV	ON count threshold (Output) point 15	3 BYTE	Same as above	Same as above
100	R	NV	On Operating Cycle point 0	3 BYTE	0x00000	0x000000 to 0xFFFFFF
...	...	...	...	...	...	...
193	R	NV	On Operating Cycle point 15	3 BYTE	Same as above	Same as above
196	RW	NV	Signal line error recovery operation	DWORD	0	0：Auto 1：Manual
200	RW	NV	Communication error operation point	QWORD	0x02	0x00: OFF 0x01: ON 0x02: HOLD
208	R	NV	Setting change failed	BOOL	0	0: Setting change successful 1: Setting change failed

Assigning “Signal line error detection” bit

Bit 31	Bit 30	…	Bit 1	Bit 0
Point 31	Point 30	…	Point 1	Point 0

Assigning “Signal line error recovery operation” bit

Bit 31	Bit 30	…	Bit 1	Bit 0
Point 31	Point 30	…	Point 1	Point 0

Assigning “ON count threshold (Output)/On Operating Cycle” byte

Offset(byte)	+0	+1	+2	+3	+4	+5	…	+45	+46	+47
Data	Point 0 counter value/threshold			Point 1 counter value/threshold			…	Point 15 counter value/threshold		

Assigning “Communication error operation” bit

Bit 63	Bit 62	…	…	…	…	Bit 1	Bit 0
Setting for point 31		…	…	…	…	Setting for point 0	

■ Settings for the IO-Link master unit

Length(byte)=249

Offset (byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	NV	Device ID port 0	3 BYTE	0x000000	0x000000 to 0xFFFFFF
3	RW	NV	Vendor ID port 0	2 BYTE	0x0000	0x000000 to 0xFFFFFF
5	RW	NV	Revision port 0	BYTE	0x00	0x00 to 0xFF
6	RW	NV	Input size port 0	WORD	0x04	0x00 to 0x20
8	RW	NV	Output size port 0	WORD	0x04	0x00 to 0x20
10	RW	NV	Serial number port 0	16 BYTE	0x00 (null)	ASCII code of up to 16 characters
26	RW	NV	Connector 0 operation settings	WORD	0x0F01	0x0000 to 0xFFFF (Note 1)
28	RW	NV	Cycle time port 0	BYTE	0x00	0x00：Auto 0x0A to 0xFF: Manual setting
29	RW	NV	Input filter time port 0	BYTE	0x00	0x00: 0.1 ms 0x01: 1 ms 0x02: 5ms 0x03: 10 ms 0x04: 20 ms
30	RW	N.V.	Input hold time port 0	BYTE	0x00	0x00: 1 ms 0x01: 15 ms 0x02: 100 ms 0x03: 200 ms
31	-	-	Same as port 0	-	-	For port 1
62	-	-	Same as port 0	-	-	For port 2
93	-	-	Same as port 0	-	-	For port 3
124	-	-	Same as port 0	-	-	For port 4
155	-	-	Same as port 0	-	-	For port 5
186	-	-	Same as port 0	-	-	For port 6
217	-	-	Same as port 0	-	-	For port 7
248	R	V	Setting change failed	BOOL	0	0: Setting change successful 1: Setting change failed

Assigning “Revision” bit

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Major Revision (0x0 to 0xF)				Minor Revision (0x0 to 0xF)			

Assigning “Connector 0 operation settings” bit

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved	Reserved	Reserved	Signal line error recovery operation	Signal line error detection	Power line error detection	Communication error operation	

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Port-to-port sync	Backup settings	Restore settings	Device verification		Select operation mode		

The values for the above operation settings by port are as follows.

Operation setting name by port	Value	Factory setting
Select operation mode	0(000): Disable mode, 1(001): IO-Link mode, 2(010): Digital input mode (PNP), 3(011): Digital input mode (NPN), 4(100): Digital force mode (PNP), 5(101): Digital output mode (NPN)	1(001): IO-Link mode
Device verification	0: Do not verify, 1: 3 types verification, 2: 4 types verification	0: Do not verify
Restore settings	0: Do not restore,1: Restore	0: Do not restore
Backup settings	0: Do not back up, 1: Back up	0: Do not back up
Port-to-port sync	0: Do not sync, 1: Sync	0: Do not sync
Communication error operation	0(00): OFF, 1(01): ON, 2(10): HOLD	2：HOLD
Power line error detection	0: Disable, 1: Enable	1: Enable
Signal line error detection	0: Disable, 1: Enable	1: Enable

9.2.8 ISDU communication area (Write)

It is the area for sending and receiving ISDU communication (acyclic communication of IO-Link communication) for IO-Link devices by specifying the index/sub-index of the service data of the IO-Link device via the IO-Link master unit.
The device unit uses this data to send ISDU communication to the target IO-Link master unit.

There are two ways to write the ISDU communication area to this IO-Link device:
- Command from the upper master
- Operation from the [ISDU] tab in the PC software

Index	RW	V/NV	Length (byte)
0x0460 to 0x0472	R	N.V.	242

Offset(byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	V	Write Target Port	BYTE	0	Write target port
1	RW	V	Write Index	WORD	0	Write index number
3	RW	V	Write Subindex	BYTE	0	Write sub-index number
4	RW	V	Write Size	BYTE	0	Write size (bytes)
5	RW	V	Write Data	232 BYTE	0	Write data:
237	RW	V	Write State	BYTE	0	Write status
238	R	V	Write Return Code	4 BYTE	0	Write Return(response) Code

■ Write Data

Binary data from 232 bytes. An array of BYTE type with element numbers from 0 to a maximum of 231.

■ Write State

The user and device unit write the values according to the status.

Value	Meaning, condition, and timing of value
0	Initial value
1	ISDU transmission instruction. User writes. Sends ISDU data to the designated IO-Link master unit when 1 is written to the device unit. When a user writes a value other than 1, it moves to an error termination status (3 below).
2	Sending ISDU. Device unit writes.
3 (Note 1)	Error termination. Status is indicated in the “Write Return Code”. Device unit writes.
4 (Note 1)	Normal termination. Status is indicated in the “Write Return Code”. Device unit writes.

Note 1: When 3 or 4, the user can write 1.

■ Write Return Code

The device unit writes the termination status when a series of processing is complete.

23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
General Error				ISDU Status				ISDU Additional Code								ISDU Error Code							

Name	Role
General Error	Indicates an error other than the ISDU communication response Value: Error details 0: No error 1: Parameter error. Occurs when the value is outside the specification 2: ISDU communication response timeout 3: Abnormal 4 to 15: Undefined
ISDU Status	0: Target port is not in IO-Link mode. Or, an IO-Link COMM error has occurred. 2: Successful (I-Service making an ISDU response is "0101" or "1101") 3: Failed (I-Service making an ISDU response is "0100" or "1100")
ISDU Additional Code	“Same as Additional Code” for ISDU communication
ISDU Error Code	Same as “Error Code” for ISDU communication

■ Write procedures for ISDU communication area

Follow these steps.

1 Set the desired write destination for [Write Target Port], [Write Index], [Write Subindex].

2 Set the size to be written to [Write Size](byte).

3 Set the data to be written to [Write Data].

4 Set [Write State] to "1".

5 Wait until [Write State] is "3" or "4".
This value is typically updated within 2 seconds of setting [Write State] to "1".

6 When [Write State] changes to "3" or "4", check its value and [Write Return Code].

9.2.9 ISDU communication area (Read)

It is the area for sending and receiving ISDU communication (acyclic communication of IO-Link communication) for IO-Link devices by specifying the index/sub-index of the service data of the IO-Link device via the IO-Link master unit.
The device unit uses this data to send ISDU communication to the target IO-Link master unit.

There are two ways to read the ISDU communication area to this IO-Link device:
- Command from the upper master
- Operation from the [ISDU] tab in the PC software

Index	RW	V/NV	Length (byte)
0x0480 to 0x0492	R	N.V.	242

Offset(byte)	RW	NV	Name	Data Type	Initial value	Description
0	RW	V	Read Target Port	BYTE	0	Target port to read
1	RW	V	Read Index	WORD	0	Read index number
3	RW	V	Read Subindex	BYTE	0	Read sub-index number
4	RW	V	Read Size	BYTE	0	Read size (bytes)
5	RW	V	Read Data	232 BYTE	0	Read data
237	RW	V	Read State	BYTE	0	Read status
238	R	V	Read Return Code	4 BYTE	0	Read return(response) code

■ Read Data

Binary data of 232 bytes. An array of BYTE type with element numbers 0 to 231.
If the data length of the read target is less than 232 bytes, the read data is placed on top of it and 0 padding will be made for the rest.

■ Read State

The user and device unit write the values according to the status.

Value	Meaning, condition, and timing of value
0	Initial value
1	ISDU transmission instruction. User writes. Sends ISDU data to the designated IO-Link master unit when 1 is written to the device unit. When a user writes a value other than 1, it moves to an error termination status (3 below).
2	Sending ISDU. Device unit writes.
3 (Note 1)	Error termination. Status is indicated in the “Read Return Code”. Device unit writes.
4 (Note 1)	Normal termination. Status is indicated in the “Read Return Code”. Device unit writes.

Note 1: When 3 or 4, the user can write 1.

■ Read Return Code

The device unit writes the termination status when a series of processing is complete.

23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
General Error				ISDU Status				ISDU Additional Code								ISDU Error Code							

Name	Role
General Error	Indicates an error other than the ISDU communication response Value: Error details 0: No error 1: Parameter error. Occurs when the value is outside the specification 2: ISDU communication response timeout 3: Abnormal 4 to 15: Undefined
ISDU Status	0: Target port is not in IO-Link mode. Or, an IO-Link COMM error has occurred. 2: Successful (I-Service making an ISDU response is "0101" or "1101") 3: Failed (I-Service making an ISDU response is "0100" or "1100")
ISDU Additional Code	“Same as Additional Code” for ISDU communication
ISDU Error Code	Same as “Error Code” for ISDU communication

■ Read procedures for ISDU communication area

Follow these steps.

1 Set the desired read destination for [Read Target Port], [Read Index], [Read SubIndex].

2 Set [Read State] to "1".

3 Wait until [Read State] is "3" or "4".
This value is typically updated within 2 seconds of setting [Read State] to 1.

4 When [Read State] changes to "3" or "4", check its value and [Read Return Code].

5 If [Read State] is "4" and [Read Return Code] indicates no errors, read the data from [Read Data] for the [Read Size].

9.2.10 Process data

Returns process data for the specified unit.

Index	RW	V/NV	Length (byte)
0x0600 to 0x0612	R	V	Refer to Table below

Name	RW	NV	Data Type	Default	Remarks
Device unit	R	V	0 or WORD	0	WORD if diagnostic information is enabled
Digital input unit M8 x 8 type	R	V	BYTE	0	
Digital output unit M12 x 8 type	R	V	WORD	0	
Digital Input unit Push-in terminal block type	R	V	DWORD	0	
Digital Output unit M 12 x 8 type	R	V	WORD	0	
Digital Output unit Push-in terminal block type	R	V	DWORD	0	
Analog input unit (2CH)	R	V	DWORD	0	
Analog output unit (2CH)	R	V	DWORD	0	
Valve IF unit (32 points)	R	V	DWORD	0	
IO-Link Master unit	R	V	8 to 128 BYTE	0	(*1)

*1 Since the process data of the IO-Link master has variable length and input/output, they are placed in the order of input R process data, input I process data, output R process data, and output I process data. It will not be placed if there is no each I process data.

10. WebAPI FUNCTION

This product has WebAPI function. Turn ON dip switch number 1 and power it on to enable the WebAPI function.

WebAPI function is used mainly for the application below.
・LAN connect for RTXTools (Note 1)
・Periodic data collection from system monitoring applications, etc. (Note 2)
・Data collection or setting changes from user-specific applications, etc. (Note 2)

Note 1: RTXTools is intended to be used for confirmation before operation. Connecting with RTXTools during operation may affect communication with the PLC. If it occurs, stop using WebAPI connection using RTXTools.
Note 2: Intensive access via WebAPI during operation may affect communication with the PLC. If it occurs, reduce the load by increasing the communication cycle intervals, etc.

10.1 Setting Method

Although the WebAPI function is initially freely accessible by anyone, access to the WebAPI can be restricted by authentication. It is recommended to set up user ID and password following the instructions below.

1. Connect the product to the PC using a USB cable.
2. Start RTXTools and click the Product Appearance.
3. Set "Authentication Function" to "Digest Authentication".
4. Change the "Login ID (Web access)".
5. Change the "Password (Web access)".
6. Click the Settings Reflect button to reflect the settings to the product.

* This setting will reflect in real-time.

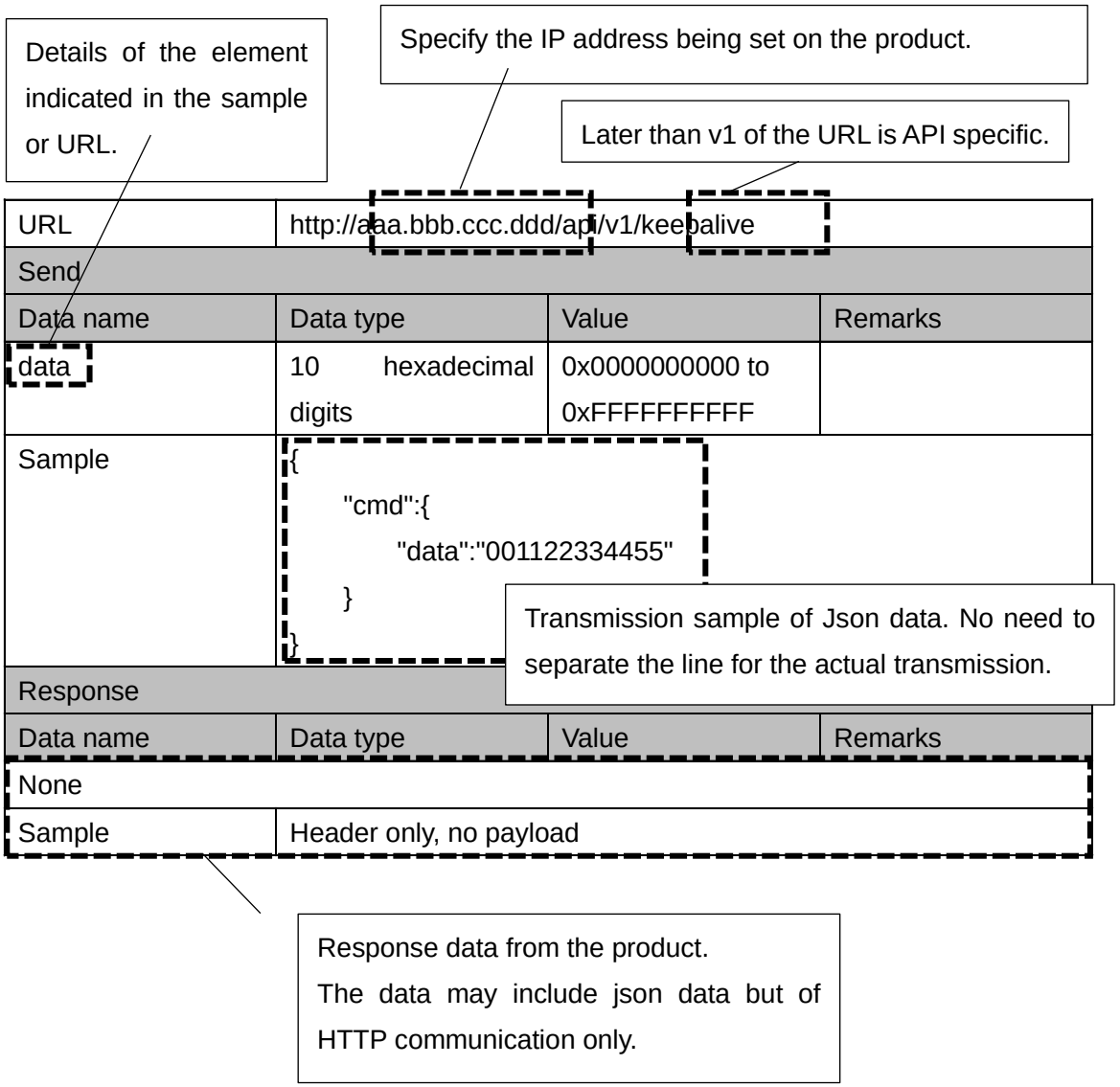
10.2 Access Method

Some WebAPIs can acquire data using general web browsers. Follow the instructions below to acquire the data.

1. Enable the WebAPI function by turning ON the dip switch 1.
2. Change the login ID and password as appropriate.
3. Start a web browser.
4. Check the IP address of the product (the IP address set in “2. INSTRUCTIONS FOR USE”).
5. Access using a web browser with the URL "http://192.168.1.10/api/v1/dipsw". (* Replace "192.168.1.10" with the IP address checked in instruction 4.)
6. Check that the dip switch and rotary switch statuses are responded in the JSON format. (* In case of no response, check that the WebAPI is enabled and that the entered URL is correct.)

10.3 Description of Each API

Each API is described in the following format:



10.3.1 Keepalive

It is used to maintain a connect status with the product. Send once every 30 seconds.

<table>
<tr><td>URL</td><td colspan="3">http://aaa.bbb.ccc.ddd/api/v1/keepalive</td></tr>
<tr><td colspan="4">Send</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>data</td><td>10 Hexadecimal digits</td><td>Send the current time of the PC in the format below.
(1 byte = 2 digits)
<table><tr><td>Byte</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>Description</td><td colspan="2">Date</td><td>Hours</td><td>Minutes</td><td>Seconds</td></tr></table>Date: 0x0000 to 0xFFFF
(January 1, 2000-June 6, 2179)
Hours: 0x00 to 0x17 (0 to 23)
Minutes: 0x00 to 0x3B (0 to 59)
Seconds: 0x00 to 0x3B (0 to 59)</td><td></td></tr>
<tr><td>Sample</td><td colspan="3">{
"cmd":{
"data":"FFFF000000"
}
}</td></tr>
<tr><td colspan="4">Response</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>No</td><td colspan="3"></td></tr>
<tr><td>Sample</td><td colspan="3">Header response only, no payload</td></tr>
</table>

10.3.2 Obtaining device unit switch status

It acquires the status of the settings switches (dip switches, rotary switches) on the device unit.

<table>
<tr><td>URL</td><td colspan="3">http://aaa.bbb.ccc.ddd/api/v1/dipsw</td></tr>
<tr><td colspan="4">Send</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>No</td><td colspan="3"></td></tr>
<tr><td>Sample</td><td colspan="3">Header only, no payload</td></tr>
<tr><td colspan="4">Response</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>data</td><td>8 hexadecimal digits
(4 x 1 byte 2 digits)</td><td>1st byte: Dip switch status.
SW number is 1 in the highest bit and 8 is the lowest bit
2nd byte: Value of rotary switch (x16)
3rd byte: Value of rotary switch (x1)
4th byte: 0x00 fixed</td><td></td></tr>
<tr><td>Sample</td><td colspan="3">{
"cmd":{
"data":"00000000"
}
}</td></tr>
</table>

10.3.3 Obtaining version

It acquires the software and hardware versions of the unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/cmd/version/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
Sample			
Response			
Data name	**Data type**	**Value**	**Remarks**
unit	2 hexadecimal digits	0x00 to 0x11	Same as above unit position
Data	12 hexadecimal digits (4 digits x 3 types)	Refer to sample column and remarks column	When the product is the target AAAA: Hardware version BBBB: Software version CCCC: Option number When the product is not the target AAAA: Microcomputer version 1 BBBB: Microcomputer version 2 CCCC: Microcomputer version 3

Sample	<pre>{
	  "cmd":{
	  "unit":"00",
	  "data":"AAAABBBBCCCC"
	  }
	}</pre>		

10.3.4 Setting date and time

It adjusts the internal time of the product to the specified time. It is only held while the power is ON.

<table>
<tr><td>URL</td><td colspan="3">http://aaa.bbb.ccc.ddd/api/v1/datetime</td></tr>
<tr><td colspan="4">Send</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>data</td><td>12 Hexadecimal digits</td><td>Sends the date and time in the format below. (1 byte = 2 digits)
<table>
<tr><td>byte</td><td colspan="2">5 4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>Description</td><td colspan="2">Date</td><td>Hours</td><td>Minutes</td><td>Seconds</td><td>Milliseconds</td></tr>
</table>
Date: 0x0000 to 0xFFFF
(January 1, 2000-June 6, 2179)
Hours: 0x00 to 0x17 (0 to 23)
Minutes: 0x00 to 0x3B (0 to 59)
Seconds: 0x00 to 0x3B (0 to 59)
Milliseconds: 0x00 to 0x63(0 to 99) *1=10 msec</td><td></td></tr>
<tr><td>Sample</td><td colspan="3">{
"cmd":{
"data":FFFF00000000
}
}</td></tr>
<tr><td colspan="4">Response</td></tr>
<tr><td>Data name</td><td>Data type</td><td>Value</td><td>Remarks</td></tr>
<tr><td>Data</td><td>12 hexadecimal digits</td><td>Returns the date and time that can be set.
The format is the same as described above.</td><td></td></tr>
<tr><td>Sample</td><td colspan="3">{
"cmd":{
"data":" FFFF00000000"
}
}</td></tr>
</table>

10.3.5 Latch reset

It releases the latch of the LED lighting status at the time specified by the user.

URL	http://aaa.bbb.ccc.ddd/api/v1/latchreset		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	None When status code is 200, release is complete		

10.3.6 Obtaining Remote IO system diagnostic data

It obtains diagnostic data for the Remote IO system. This diagnostic data is identical to the diagnostic data contained in the process data.

URL	http://aaa.bbb.ccc.ddd/api/v1/diag		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	2 hexadecimal digits	Diagnostic information	
Sample	{ "cmd":{ "data":"00" } }		

10.3.7 Obtaining unit diagnostic data

It acquires diagnostic information for the specified unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/diag/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
unit	2 hexadecimal digits	0x00 to 0x11	Same as described above
data	4 hexadecimal digits	0x0000-0xFFFF	Diagnostic information for the target unit. Refer to the Instruction Manual for each unit.
Sample	{ "cmd":{ "unit":"00", "data":"0000" } }		

10.3.8 Obtaining point/CH diagnostic data

It acquires diagnostic information by point/CH/port for the specified unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/diag/[unit]/ch		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
unit	2 hexadecimal digits	0x00 to 0x11	Same as described above
data	4 hexadecimal digits X point/CH/ ports	-	Diagnostic information for each point/CH/port. The child elements of data are listed, separated by commas, in descending order.

Sample	<pre>{
	"cmd":{
	"unit":00,
	"data":[
	"0000",
	"0000",
	"0000",
	"0000",
	"0000",
	"0000",
	"0000",
	"0000"
	]
	}
	}</pre>		

10.3.9 Obtaining unit order/number/type

It acquires the order and number/type of units connect to the product.

URL	http://aaa.bbb.ccc.ddd/api/v1/order		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
data	10 hexadecimal digits X number of units	Refer to Remarks column	Numbers and unit IDs containing the product are listed in comma-separated in the order from the left to the right. The first two characters represent the order in 1 byte, and the remaining eight characters represent the unit ID. For unit IDs, refer to “9.2.5 Unit ID configuration detected by automatic recognition”.

Sample	<pre>{
	  "cmd":{
	  "data":[
	  "0007010000",
	  "012C080200",
	  "022C080200",
	  "03D3000000"
	  ]
	  }
	}</pre>		

10.3.10 Obtaining unit setting data

It acquires the settings data for each unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/config/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
Sample	Header only, no payload		
Response			
Data name	**Data type**	**Value**	**Remarks**
unit	2 hexadecimal digits	0x00 to 0x11	Same as described above
len	4 hexadecimal digits	Refer to Remarks column	Expresses the length of the received data in bytes, half of the string length of data below.
pos	4 hexadecimal digits	-	Represents the management position within the product. It is described in the table below.
data	N hexadecimal digits	-	A string representing the settings data. It expresses 1 byte as a 2-character hexadecimal number.
Sample	{ "cmd":{ "unit":"00", "len":"00FF", "pos":"0000", "data":"00000000000000…(omitted)" } }		

The list of the settings data for each unit is shown below. Refer to the Instruction Manual of the unit for details.

The product (device unit)

Position	Length (bytes)	Name	Overview
pos+0x0C	**1**	Unit/input power monitoring	Refer to 4.2 Settings list.
pos+0x0D	**1**	Output power supply monitor	
pos+0x0E	**1**	Analog value byte order	
pos+0x10	**1**	Save log ON/OFF and number of saved logs	
pos+0x11	**1**	Saving logs (method)	
pos+0x12	**1**	Log saving time	
pos+0x13	**1**	Type of log filter	
pos+0x14	**1**	Filter ON/OFF (Error type)	
pos+0x15	**4**	Filter ON/OFF (Unit ID)	
pos+0x19	**1**	Filter ON/OFF (Unit position number)	
pos+0x1A	**1**	Filter ON/OFF (CH/point/port number)	
pos+0x30	**4**	IP address	
pos+0x34	**4**	Subnet mask	
pos+0x38	**4**	Default gateway	
pos+0x40	**16**	WebAPI login ID	
pos+0x50	**16**	WebAPI password	
pos+0x60	**1**	WebAPI access authentication	

Analog input unit

Position	Length (bytes)	Name	Overview
pos+0x01	**1**	Power line error detection	Sets enables/disables of power line error detection.
pos+0x09	**1**	Averaging sampling count	Sets the average number of filters for the analog input.
pos+0x0B	**2**	Sampling period	Sets the sampling period of the analog input.
pos+0x11	**4**	Data format	Sets the conversion method to the process data of analog input.
pos+0x19	**4**	Input range	Selects the analog input signal of the analog input unit from the following. 0:-10 VDC to +10 VDC 1:-5 VDC to +5 VDC 2:0 VDC to 10 VDC 3:0 VDC to 5 VDC 4:1 VDC to 5 VDC 10:-20 mA DC to +20 mA 11:4 mA DC to 20 mA 12:0 mA DC to 20 mA DC
pos+0x31	**4**	Max range error	Sets whether or not to use max range error of analog input.
pos+0x39	**4**	Min range error	Sets whether or not to use min range error of analog input.
pos+0x61	**4**	User set value upper limit error	Sets whether or not to use user set value upper limit error of analog input.
pos+0x69	**4**	User set value lower limit error	Sets whether or not to use user set value lower limit error of analog input.
pos+0x71	**8**	User set value upper limit error threshold	Sets the threshold value of user set value upper limit error of analog input.
pos+0x81	**8**	User set value lower limit error threshold	Sets the threshold value of user set value lower limit error of analog inputs.
pos+0x91	**4**	Input power ON/OFF	Sets whether or not the external device is supplied with power for input when the analog input is used.
pos+0x99	**4**	Measured hysteresis	Sets whether or not measurement values are hysteresis treated.
pos+0xa1	**4**	Enable/Disable CH	It is possible to set without using the target CH.

Digital input unit M8 x 8 / M12 x 8 type

Position	Length (bytes)	Name	Overview
pos+0x01	**1**	Power line error detection	Sets enables/disables of power line error detection. Error detection is set per connector.
pos+0x08+x3n (n = point number of the target)	**3 (Per point)**	[Input Off_On cycle threshold]	Threshold for monitoring the number of cycles of the change from OFF to ON. The actual threshold is used by multiplying the set value by 10.
pos+0xDE	**1**	Input filter time	Sets the input filter time.
pos+0xEC	**1**	Input hold time	Sets the input hold time.

Digital input unit Push-in terminal block type

Position	Length (bytes)	Name	Overview
pos+0x01	**2**	Power line error detection	Sets enables/disables of power line error detection. Error detection is set per connector.
pos+0x08+x3n (n = point number of the target)	**3 (Per point)**	Input Off_On cycle threshold	Threshold for monitoring the number of cycles of the change from OFF to ON. The actual threshold is used by multiplying the set value by 10.
pos+0xDE	**12**	Input filter time	Sets the input filter time.
pos+0xEC	**8**	Input hold time	Sets the input hold time.

Analog output unit

Position	Length (bytes)	Name	Overview
pos+0x01	**1**	Power line error detection	Sets enables/disables of power line error detection.
pos+0x02	**1**	Power line error recovery operation	Sets whether to maintain the same behavior as during the power line error when it has been recovered from, or return to normal from the most recent data update after recovery.
pos+0x11	**4**	Data format	Sets the conversion method to the process data of analog output.
pos+0x19	**4**	Output range	Selects the analog output signal of the analog output unit from the following. 2：0 VDC to 10 VDC 3：0 VDC to 5 VDC 4：1 VDC to 5 VDC 11：4 mA DC to 20 mA 12：0 mA DC to 20 mA DC
pos+0x31	**4**	Max range error	Sets whether or not to use max range error of analog output.
pos+0x39	**4**	Min range error	Sets whether or not to use min range error of analog output.
pos+0x61	**4**	User set value upper limit error	Sets whether or not to use user set value upper limit error of analog output.
pos+0x69	**4**	User set value lower limit error	Sets whether or not to use user set value lower limit error of analog output.
pos+0x71	**8**	User set value upper limit error threshold	Sets the threshold value of user set value upper limit error of analog output.
pos+0x81	**8**	User set value lower limit error threshold	Sets the threshold value of user set value lower limit error of analog output.
pos+0x91	**4**	Output power ON/OFF	Sets whether or not the external device is supplied with output power when the analog output is used.
pos+0xa1	**4**	Enable/Disable CH	It is possible to set without using the target CH as a unit.
pos+0xc1	**8**	Customized output value at communication error	Sets the value to be output when “Communication error operation” is “User settings”.
pos+0xd1	**4**	Communication error operation	If the device unit's dip switch settings SW3 (output settings in the event of a communication error / priority to hardware) is OFF, the output operation in the event of a communication (upper communication or internal bus communication) error is set on the Analog output unit side.

Digital output unit M12 x 8 type

Position	Length (bytes)	Name	Overview
pos+0x01	**2**	Signal line error detection	Sets enables/disables of signal line error detection. Error detection is set per connector.
pos+0x03	**2**	Signal line error recovery operation	Sets whether the behavior at the time of occurrence is maintained or the condition is returned to normal after the last data update, when a signal line error is recovered. Error recovery operation is set for each connector. When the behavior at the time of occurrence.is to be maintained, wait for the user to operate power cycle.
pos+0x08+x3n (n = point number of the target)	**3 (Per point)**	Output Off_On cycle threshold	Threshold for monitoring the number of cycles of the change from OFF to ON. The actual threshold is used by multiplying the set value by 10.
pos+0xD4	**4**	Communication error operation	When the dip switch settings SW3 on the device unit is OFF (set individually), the digital output operation at the communication (upper or internal bus communication) error is set on the digital output unit side.

Digital output unit Push-in terminal block type/ Valve I/F 32-point unit

Position	Length (bytes)	Name	Overview
pos+0x01	**4**	Signal line error detection	Sets enables/disables of signal line error detection. Error detection is set per connector.
pos+0x08+x3n (n = point number of the target)	**3 (Per point)**	Output Off_On cycle threshold	Threshold for monitoring the number of cycles of the change from OFF to ON. The actual threshold is used by multiplying the set value by 10.
pos+0xC9	**4**	Signal line error recovery operation	Sets whether the behavior at the time of occurrence is maintained or the condition is returned to normal after the last data update, when a signal line error is recovered. Error recovery operation is set for each connector. When the behavior at the time of occurrence.is to be maintained, wait for the user to operate power cycle.
pos+0xCD	**8**	Communication error operation	When the dip switch settings SW3 on the device unit is OFF (set individually), the digital output operation at the communication (upper or internal bus communication) error is set on the digital output unit side.

IO-Link master unit

Position	Length (bytes)	Name	Overview
pos+0x01	**31**	**Port 0 settings**	The settings for each port. Refer to the .following table for details
pos+0x20	**31**	**Port 1 settings**	
pos+0x3F	**31**	**Port 2 settings**	
pos+0x5E	**31**	**Port 3 settings**	
pos+0x7D	**31**	**Port 4 settings**	
pos+0x9C	**31**	**Port 5 settings**	
pos+0xBB	**31**	**port 6 settings**	
pos+0xDA	**31**	**Port 7 settings**	

Setting details of each port of the IO-Link master unit (specify the relative position in relation to the "position" in the table above)

Relative position	Length (bytes)	Name	Overview
+0x00	**3**	Device ID	Device type of the connected IO-Link device.
+0x03	**2**	Vendor ID	Vendor ID of the connected IO-Link device.
+0x05	**1**	Revision	Revision of the connected IO-Link device.
+0x06	**2**	Input size settings	Sets the size (bytes) of the input process data of the connected IO-Link device.
+0x08	**2**	Output size settings	Sets the size (bytes) of the output process data of the connected IO-Link device.
+0x0A	**16**	Serial number	Serial number of the connected IO-Link device.
+0x1A	**2**	Select operation mode	Selects which operation mode is to be used for each port on the IO-Link master unit.
+0x1C	**1**	Communication cycle time settings	Set the IO-Link communication cycle.
+0x1D	**1**	Input filter time settings	Sets the input filter time.
+0x1E	**1**	Input hold time settings	Sets the input hold time.

10.3.11 Unit setting data settings

It changes the settings data for each unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/config/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
len	4 hexadecimal digits	Refer to Remarks column	Expresses the length of the data to be sent in bytes, half of the string length of data below. Only those parts that need to be changed can be sent.
pos	4 hexadecimal digits	-	Represents the management position within the product. It is described in "10.3.10 Get unit settings data". Only those parts that need to be changed can be sent.
Data	N hexadecimal digits	-	A string representing the settings data. It expresses 1 byte as a 2-character hexadecimal number. Only those parts that need to be changed can be sent.
Sample	{ "cmd":{ "len":"0000", "pos":"0000", "data":"00000000000000" } }		
Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		

10.3.12 Obtaining log data

It reads the log data stored inside the product.

URL	http://aaa.bbb.ccc.ddd/api/v1/log/[pos]/[req]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[pos]	4 hexadecimal digits	0 and over	The location of the log desire to start acquiring. 0 is the most recent. Specified in the URL. When POS is 1 and REQ is 5, it will result in "5 records are acquired from one log older than the most recent".
[req]	2 hexadecimal digits	0 to 255	The number of logs desire to acquire. 0 to 255. Obtain all results with 0.
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
pos	4 hexadecimal digits	0 and over	Same as described above
req	2 hexadecimal digits	0 to 255	Same as described above
num	2 hexadecimal digits	0 to 255	The number of logs that could be acquired.
Data	32 hexadecimal digits x num	Refer to Remarks column	16 bytes of data per element Refer to the table below for details

Sample	<pre>{
	  "cmd":{
	  "pos":"0000",
	  "req":"0000",
	  "num":"0000",
	  "data":[
	  "00000…00000000000",
	  "00000…00000000000"
	  ]
	  }
	}</pre>		

Name	Size (bytes)	Description
Date	2	Number of days since January 1, 2000, as 0 (up to June 6, 2179)
Hours	1	Hours when the device unit received the error information. The milliseconds are in 10 ms units.
Minutes	1	
Seconds	1	
Milliseconds	1	
Error code	2	16-bit data determined per unit. Refer to the Instruction Manual for each unit.
Unit ID	4	Refer to "9.2.5 Unit ID configuration detected by automatic recognition".
Unit position	1	0x00 is the product. 0x01-0x11 is the position of the other units excluding the product counted from the left to the right.
Point/CH number	1	The number of CH where the error occurred. If the CH is not identified because of a unit level error etc., 255 is used.
Reserve	2	Always 0

10.3.13 Clearing log data

It deletes the log data stored inside the product.

URL	http://aaa.bbb.ccc.ddd/api/v1/log/clear		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		

10.3.14 Obtaining unit during forced input

It acquires the unit using the forced input function.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/enabled/in/		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
Data	Decimal array	The unit number of the unit in forced input is entered.	

Sample	{
	"cmd":{
	"data":[1,2,3]
	}
	}		

10.3.15 Obtaining unit during forced output

It acquires the unit using the forced output function.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/enabled/out/		
Send			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
Data	Decimal array	The unit number of the unit in forced output is entered.	
Sample	{ "cmd":{ "data":[1,2,3] } }		

10.3.16 Obtaining forced input

It acquires information on the forced input instructions for the target unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/monitor/in/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
Data	N hexadecimal digits	Refer to Remarks column	The data that has been overwritten is entered to the process data for the specified unit. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the process data of the specified unit.
data2	N hexadecimal digits	Refer to Remarks column	Indicates the position that is being overwritten for the process data of the specified unit. The bit that is overwritten is 1, and the bit that is not overwritten is 0. The length of the data is the same as the process data of the specified unit.
Sample	{ "cmd":{ "unit":"01", "data":"0000", "data2":"0000" } }		

10.3.17 Obtaining forced output

It acquires information on the forced output instructions for the target unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/monitor/out/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
Data	N hexadecimal digits	Refer to Remarks column	The data that has been overwritten is entered to the process data for the specified unit. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the process data of the specified unit.
data2	N hexadecimal digits	Refer to Remarks column	Indicates the position that is being overwritten for the process data of the specified unit. The bit that is overwritten is 1, and the bit that is not overwritten is 0. The length of the data is the same as the process data of the specified unit.

Sample	<pre>{
	  "cmd":{
	  "unit":"01",
	  "data":"0000",
	  "data2":"0000"
	  }
	}</pre>		

10.3.18 Forced input setting

It indicates whether the forced input function is enabled or disabled for the target unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/control/in/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
res	String	"ON" or "OFF"	If specify "ON", it disables the forced entry instructions for the target unit.
Data	N hexadecimal digits	Refer to Remarks column	Instructs the data to be overwritten on the process data of the specified unit. The data is specified as two hexadecimal characters per 1 byte. The length of the data is matched to the process data of the specified unit.
data2	N hexadecimal digits	Refer to Remarks column	Instructs the bit of the data to be overwritten on the process data of the specified unit. Specify 1 for the bit to overwrite and 0 for the bit not to overwrite. The length of the data is matched to the process data of the specified unit.
Sample	{ "cmd":{ "res":"ON", "data":"0000", "data2":"0000" } }		
Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		

10.3.19 Forced output settings

It indicates whether the forced output function is enabled or disabled for the target unit.

URL	http://aaa.bbb.ccc.ddd/api/v1/force/control/out/[unit]		
Send			
Data name	**Data type**	**Value**	**Remarks**
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
res	String	“ON” or “OFF”	If specify "ON", it disables the forced entry instructions for the target unit.
Data	N hexadecimal digits	Refer to Remarks column	Instructs the data to be overwritten on the process data of the specified unit. The data is specified as two hexadecimal characters per 1 byte. The length of the data is matched to the process data of the specified unit.
data2	N hexadecimal digits	Refer to Remarks column	Instructs the bit of the data to be overwritten on the process data of the specified unit. Specify 1 for the bit to overwrite and 0 for the bit not to overwrite. The length of the data is matched to the process data of the specified unit.

Sample	<pre>{
	"cmd":{
	"res":"ON",
	"data":"0000",
	"data2":"0000"
	}
	}</pre>		

Response			
Data name	**Data type**	**Value**	**Remarks**
No			
Sample	Header only, no payload		

10.3.20 Obtaining process data

It acquires the process data covered by the product.

URL	http://aaa.bbb.ccc.ddd/api/v1/procdata/		
Send			
Data name	**Data type**	**Value**	**Remarks**
No data to send			
Sample	No		
Response			
Data name	**Data type**	**Value**	**Remarks**
Data	N hexadecimal digits	Refer to Remarks column	It is the data being transmitted from the PLC to the device unit. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the length of the process data.
data2	N hexadecimal digits	Refer to Remarks column	It is the data being transmitted from the device unit to the PLC. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the length of the process data.
Sample	{ "cmd":{ "data":"00000000", "data2":"0000" } }		

10.3.21 Obtaining unit current value

It acquires the data that each unit is handling via its internal bus.

URL	http://aaa.bbb.ccc.ddd/api/v1/procdata/[unit]		
Transmission specifications			
Data name	Data type	Value	Remarks
[unit]	2 hexadecimal digits	0x00 to 0x11	Specifies the unit position. 0x00 is the position of the product and 0x01-0x11 is the position of the other units excluding the product, counted from the left to the right. Indicated by URL.
Sample	No		
Response specifications			
Data name	Data type	Value	Remarks
Data	Hexadecimal	Refer to Remarks column	It is the data that each unit is handling via its internal bus. When a device unit (unit=0x00) is specified, it represents the output data to instruct each unit. When any other unit is specified, it represents the input data sent from each unit to the device unit. The data is represented as two hexadecimal characters per 1 byte. The length of the data is the same as the length of the process data.
Sample	{ "cmd":{ "data":"00000000" } }		

10.4 HTTP Response Status Code

The product supports the following status codes.

Number	Meaning	Conditions
200	OK	when the request is successful
400	Bad Request	When the syntax of the request is disabled
401	Unauthorized	When the request requires authentication
404	Not Found	When the requested resource (URL) does not exist
405	Method Not Allowed	When a request is made with an unauthorized method
408	Request Timeout	When response cannot be made within a predefined time
413	Payload too large	When the payload of the request is long
414	URI too Large	When the URI is long
500	Internal server error	When any operation that is not defined by the product has occurred
501	Not Implemented	When accessed by anything other than GET, HEAD, or POST
505	HTTP Version Not Supported	When a request is made with an unsupported HTTP version

When the response is made with the above status code, it responds including json data as follows.

Response Sample	{
	"status": {
	"code":401,
	"title": "401 Not Authorized"
	}
	}

11. APPENDIX DIAGNOSTIC INFORMATION LIST FOR THE PRODUCT

This section lists the operations performed by the PROFINET compatible device unit in the event of an error and when recovering from one.

11.1 Device Unit Diagnostic Information

The lists of diagnostic information are as follows.

Error name	When	LED	LED status	State and countermeasures
Memory read/write error	On occurrence	SF (Device)	Red blinking (slow)	No PROFINET communication. No automatic recognition.
Memory read/write error	On recovery	SF (Device)	Green on	May recover by turning the power off and on again. If the problem persists, contact CKD.
Factory setting error	On occurrence	SF (Device)	Red blinking (twice)	(No specific behavior.)
Factory setting error	On recovery	SF (Device)	Green on	Factory setting is written and restored after powering it off and on again. Contact CKD.
Unit configuration error	On occurrence	LED of all unit	Red on	Automatic recognition failed. If the LEDs do not light up red, the assignment size of the variable I/O unit is recognized as 0. The SFLED on the device unit blinks yellow (fast).
		SF (Device)	Yellow blinking (fast)	Does not start PROFINET communication if it occurs at power-up. Stops PROFINET communication if it occurs during PROFINET communication.
Unit configuration error	On recovery	SF (Device)	Green on	May recover by reviewing the unit configuration and connections between units.
Process data overflow	On occurrence	SF (Device)	Green blinking (slow)	PROFINET communication does not start.
Process data overflow	On recovery	SF (Device)	Green on	Will recover by reviewing the unit configuration and making the process data size 512 bytes or less in the total IN/OUT.
Unit/input power voltage error	On occurrence	PS (Device)	Red blinking (fast)	The behavior of each unit becomes unstable or the power turns OFF. It will recover when the supply voltage is within normal range.
Unit/input power voltage error	On recovery	PS (Device)	Yellow on	After "latch reset" using the PC software, the PS LED on the device unit will be Green on (normal status).
Output power voltage error	On occurrence	PO (Device)	Red blinking (fast)	It will recover when the supply voltage is within normal range.
Output power voltage error	On occurrence	Output unit, except IO-Link master unit	Yellow on	It will recover when the supply voltage is within normal range.
Output power voltage error	On recovery	PO (Device)	Yellow on	After "latch reset" using the PC software, the PO LED on the device unit will be Green on (normal status).

Internal bus communicati on error	On occurrence	SF (Device)	Red blinking (fast)	(No specific behavior.) Communication is unstable due to electromagnetic waves or other influences.
Internal bus communicati on error	On recovery	SF (Device)	Green on	May recover by reviewing the connections between the units or eliminating external influences.
Initialized set memory	On occurrence	SF (Device)	Green blinking (fast)	PROFINET communication does not start. Each I/O unit may operate unintentionally.
Initialized set memory	On recovery	SF (Device)	Green on	Will recover by turning the power off and on again. It starts with the settings initialized status.
Hardware error	On occurrence	SF (Device)	Red blinking (slow)	(No specific behavior.) Contact CKD.
Hardware error	On recovery	SF (Device)	Red blinking (slow)	If there are no other errors, the SF LED on the device unit will be Green on

12. WARRANTY PROVISIONS

12.1 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, following failures are excluded from 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 this 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 equipment 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.

12.2 Warranty Period

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