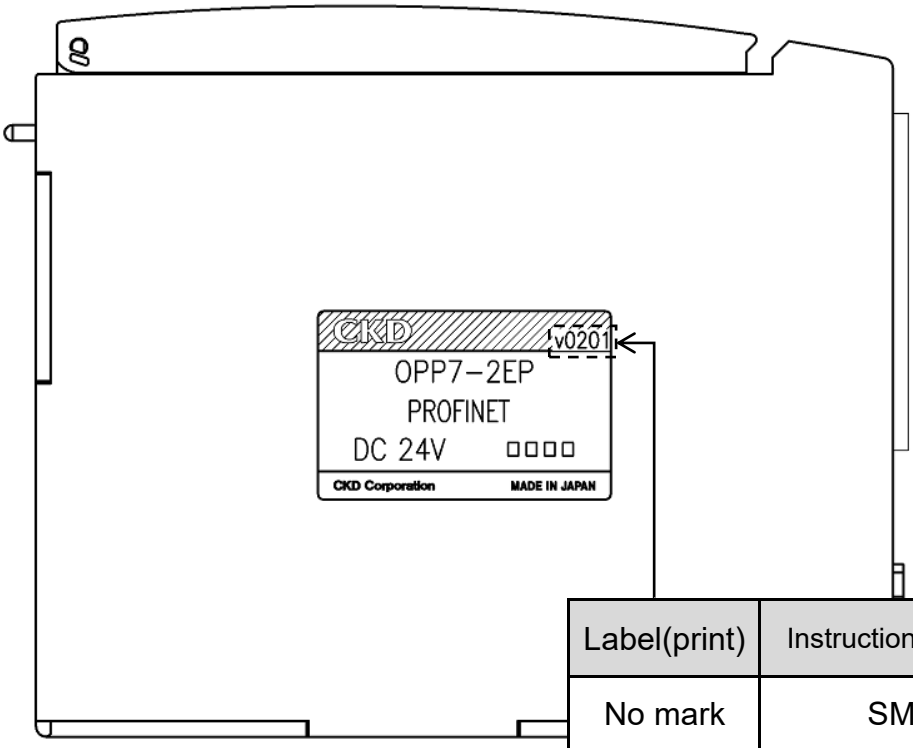
How to check the Instruction Manual to be read

Check the product label on the device and read the Instruction Manual corresponding to the device version.



Label(print)	Instruction Manual to be read
No mark	SM-P00133-A
v0201	SM-A75435-A

CKD

Serial Transmission Device

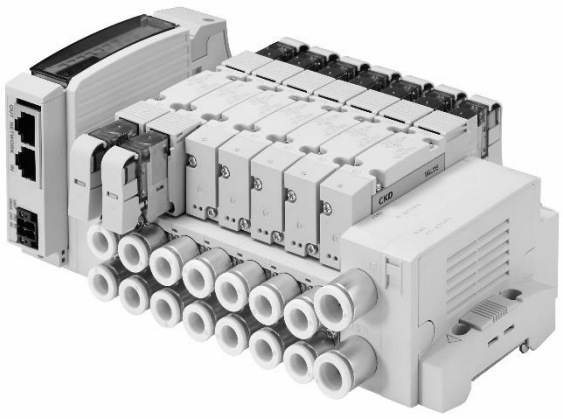
4GR series T8EP
(4GR-OPP7-*EP)

Device Rev 2.1

PROFINET Compatible

INSTRUCTION MANUAL

SM-A75435-A



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

CKD Corporation

PREFACE

Thank you for purchasing CKD's serial transmission device. 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.

- The product, which uses control valves such as solenoid valves, motor valves, and air operated valves, is intended for users who have basic knowledge about materials, fluids, piping, and electricity. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training with respect to control valves.
- 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 due to fluid, piping, or other conditions. 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.

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 fluid 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

⚠ 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. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

(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.)

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

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

- 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.

CONTENTS

1. PRODUCT OVERVIEW

1.1 System Overview

1.1.1 System features

Make sure to read the instruction manual for each product.
This Instruction Manual describes the device T8EP (4GR-OPP7-□EP) for 4GR.
For the controller unit and other device units that are connected in the same system, refer to the instruction manuals issued by each manufacturer.
For manifold solenoid valves, make sure to read both this Instruction Manual and the solenoid valve's instruction manual to fully understand the functions and performance in order to use them correctly.

■ T8EP (4GR-OPP7-□EP)

This is a device for 4GR which can be connected to the open industrial Ethernet network PROFINET.
Features include the following:

- The device is connected to PLC with only an Ethernet cable (Category 5 or higher), allowing significant reduction in wiring man-hours.
- The unit power and the valve power are separated, ensuring easy maintenance.
- The device is available in +COM or -COM specification and 16-point or 32-point output, allowing wide variety of applications.
- The device is a slot-in structure and is fixed with just one screw, allowing reduction in maintenance man-hours.

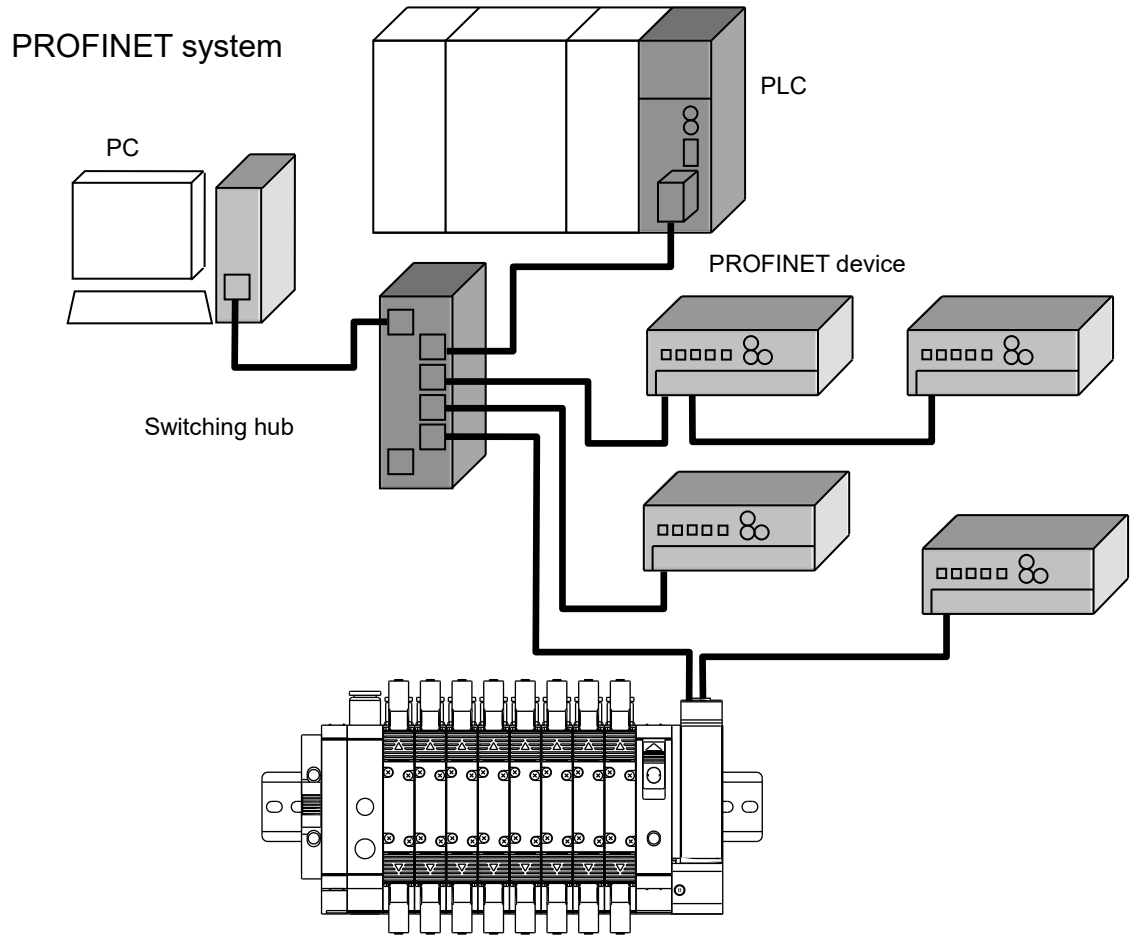
1.1.2 System structure

This system mainly consists of a PLC, T8EP(4GR-OPP7-□EP) mounted manifold solenoid valve, and peripheral equipment.

■ Example of PLC

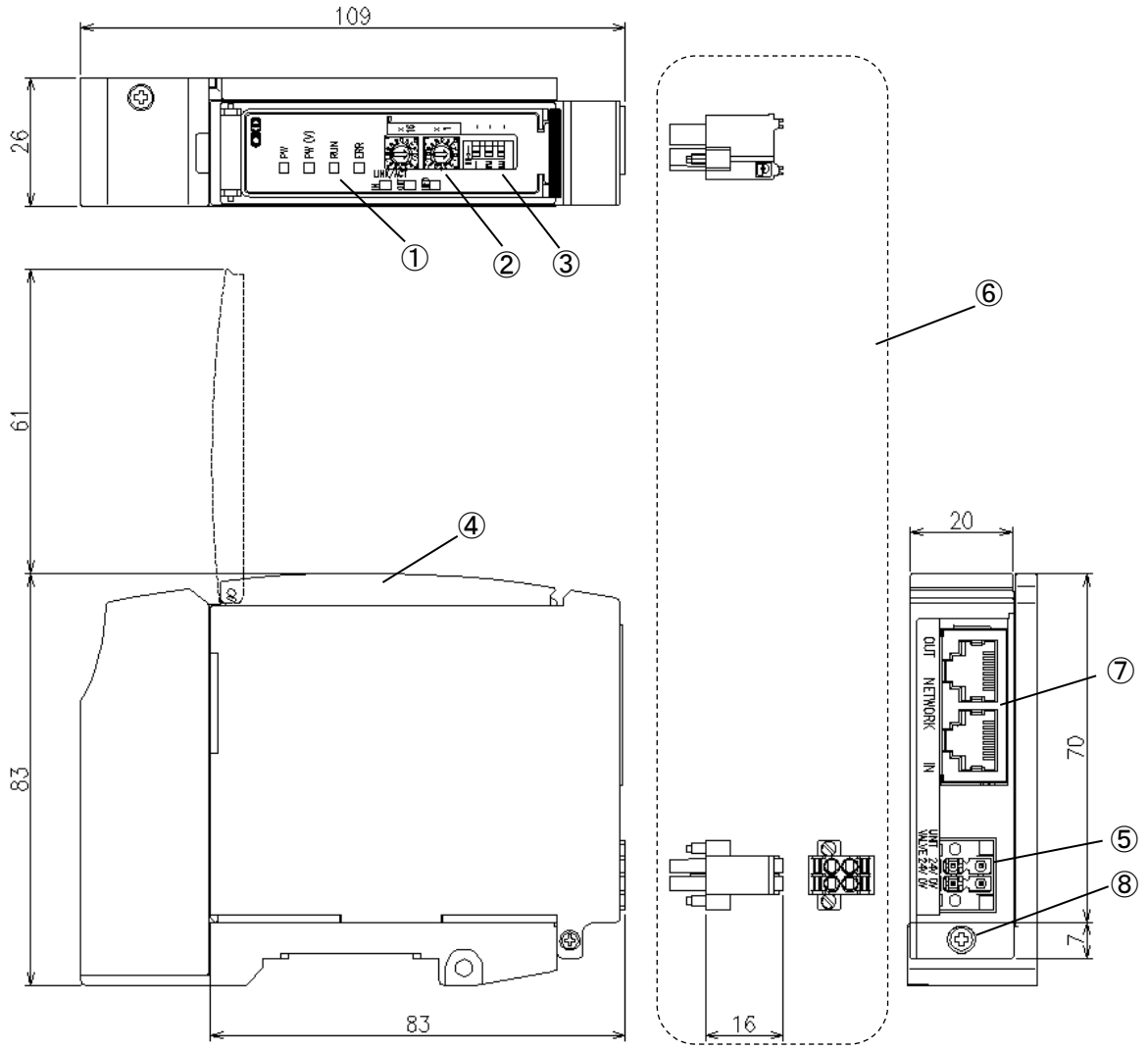
PLC manufacturer	Compatible PLC
Siemens AG	S7-1200
	S7-1500

■ Example of basic structure of the system



1.2 Part Name

1.2.1 Parts of the device



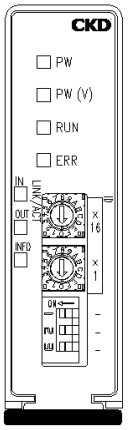
No.	Part name	Description
①	LED indicators	Indicates the status of the device and network with RUN, ERR, LINK ACT (IN, OUT), PW, and PW(V).
②	Rotary switch	Sets the device name of the serial transmission device.
③	DIP switch	Not used in this product.
④	Cover	Protects the LED Indicators and setting switches. It is hinged and can be flipped open and closed.
⑤	Unit/valve power socket	Connects the unit/valve power plug.
⑥	Unit/valve power plug (included item)	Connect the unit/valve power cables (24 V).
⑦	Network connector socket [RJ45×2 ports【IN, OUT】] (Network plug is not included)	IN: Port transmits and receives PROFINET communication. OUT: Port transmits and receives PROFINET communication. * There is no functional difference between the IN and OUT port.
⑧	Device fixing screw (M2.5 tapping screw)	Secures the device to the device connecting block.

1.2.2 Switches and LED indicators

⚠ CAUTION

Discharge static electricity from your body before touching the product.
Static electricity may cause damage to the product.

■ Switches



The rotary switch sets the device name of this device.
The device operates according to the switch settings when the power is turned on.

Switch	Settings
ID x16, x1 (Rotary switch)	Sets the device name of the serial transmission device. For the setting details, refer to "3.2.1 Switch settings".

■ LED indicators

The LEDs indicate the status of the product and network.
Refer to the following table for the description of LED indicators.

Part name	Function	Status	
RUN	Communication status of the device	Green on Green blinking Green triple flash *1	In communication Preparing for communication Forced output settings in process
ERR	Device error status	Off Red blinking Red double flash *1	Normal condition Cyclic data receive timeout Preparing for communication
LINK / ACT IN	Ethernet port status: IN side	Off Green on Green blinking	No link, no data transfer Link detected, but no data transfer Link detected, and data transferring
LINK / ACT OUT	Ethernet port status: OUT side	Off Green on Green blinking	No link, no data transfer Link detected, but no data transfer Link detected, and data transferring
INFO	Product(device) status	Off Red on Red blinking Red slow blinking Red triple flash *1 Other than the above.	Normal condition EEPROM error Participation test signal received Switch operating Maintenance notice Internal circuit board error
PW	Unit power status	Off Green on	Unit power OFF Unit power ON
PW(V)*2	Valve power status	Off Green on	Valve power OFF Valve power ON

*1: The following table describes the flashing pattern.
*2: PW (V) is enable when the unit power is ON.

Item	Blinking pattern (ON: OFF:)
Double flash	Repeat flashing 2 times
Triple flash	Repeat flashing 3 times

1.3 Specifications

1.3.1 Communication specifications

Item	Specifications
Communication protocol	PROFINET IO compliant
Baud rate	100 Mbps
Communication method	Full duplex
Communication media	Ethernet cable (Category 5 or higher)

1.3.2 Device specifications

The product must be used within the following specifications.

Item		Specifications			
Model		T8EP1 (4GR-OPP7-1EP)	T8EP2 (4GR-OPP7-2EP)	T8EPP1 (4GR-OPP7-1EP-P)	T8EPP2 (4GR-OPP7-2EP-P)
Unit power voltage		21.6 VDC to 26.4 VDC (24 VDC ±10%)			
Unit power current consumption		90 mA or less (at 24.0 VDC with all points ON)			
Valve power voltage		22.8 VDC to 26.4 VDC (24 VDC +10%, -5%)			
Valve power current consumption		10 mA or less (with all points OFF) 15 mA or less (under no load with all points ON)			
Output type		+COM (NPN)		-COM (PNP)	
Number of output points		16 points	32 points	16 points	32 points
Insulation resistance		Between external terminals and case: 30 MΩ or more with 500 VDC			
Withstand voltage		Between external terminals and case: 500 VAC for 1 minute			
Shock resistance		294.0 m/s^2 for 3 times in 3 directions			
Storage ambient temperature		-20°C to 70°C			
Storage humidity		30% to 85% RH (no dew condensation)			
Ambient temperature		-5°C to 55°C			
Ambient humidity		30% to 85% RH (no dew condensation)			
Atmosphere		No corrosive gas			
Output insulation		Photo coupler insulation			
Max. load current		40 mA/1 point			
Leakage current		0.1 mA or less			
Residual voltage		0.5 V or less			
Fuse		Valve power: 24V, 3A /Unit power 24V, 2A (both fuses are non-replaceable)			
Operation indicator		LED (communication status, unit power and valve power status)			
Degree of protection		IP30			
Vibration resistance	Durability	10 Hz to 55 Hz to 10 Hz, 1 octave/min., 15 sweeps each in X, Y, Z directions with 0.75 mm half-amplitude or 98.0 m/s2, whichever smaller.			
	Malfunction	10 Hz to 55 Hz to 10 Hz, 1 octave/min., 4 sweeps each in X, Y, Z directions with 0.5 mm half-amplitude or 68.6 m/s^2, whichever smaller.			

* For the delay time, refer to the instruction manual issued by the PLC manufacturer. Transmission delay as a system varies depending on the PLC scan time and other devices connected to the same network.
* For the response time of the solenoid valve, check the solenoid valve specifications.
* Solenoid valve Off time is delayed by approximately 20 msec due to the surge absorbing circuit integrated in the device.

2. INSTALLATION

2.1 Mounting

⚠CAUTION

Before handling a PROFINET device, touch a grounded metal part to discharge static electricity from your body.
Static electricity may cause damage to the product.

Do not apply tension or shocks to the power cable or network cable.
If the wiring is long, the cable weight or shocks may cause an unexpected force and result in damage to the connector or device.
Take appropriate measures; for example, secure the wiring to the machine or device midway.

When wiring, be careful of the following points to prevent problems caused by noise.

- If noise could have an effect, prepare power for each manifold solenoid valve and wire independently.
- Wire the power cable as short as possible.
- Wire the power cables for the product separately from the power cables for noise-generating devices such as inverter motors.
- Wire the power cable and network cable away from other power lines as much as possible.

Wire the power cable and network cable properly within its specifications.
Incorrect wiring may cause the device to malfunction or break.

Check that cables and connectors are securely connected before turning on the power.

1 Connect the network cable and power cable.
Check both this Instruction Manual and instruction manuals for PLC and each unit in the system and connect them properly.
Incorrect connection may cause not only a system failure but also serious fault to the other devices.

2 Keep 200 mm or more away from high-voltage lines and power lines, or wire the high-voltage lines and power lines in metal tubing and ground it before mounting this device.

2.2 Wiring

2.2.1 Connecting and wiring to the network connector socket

⚠ WARNING

Turn off the power before wiring.
An electric shock may occur by touching the electrical wiring connection (bare live part).

Do not touch live parts with bare hands.
An electric shock may occur.

Thoroughly read and understand this Instruction Manual before working on electrical wiring.

⚠ CAUTION

Check the working voltage and polarity before wiring and energizing.

Take measures against lightning surges on the device side.
The product has no resistance to lightning surges.

Use a dedicated network cable that complies with PROFINET specifications.

Provide sufficient bending radius for the network cable and do not bend it forcibly.

Separate the network cable from power lines and high-voltage lines.

Although the PROFINET network uses a standard Ethernet cable and has flexible wiring methods, there are limits depending on the wiring material and equipment (controller unit, hub, and other devices) used. Always understand their specifications thoroughly before wiring. For more information, refer to the instruction manuals issued by the controller unit manufacturer or PI (PROFIBUS & PROFINET International.
The network plug is not supplied with the product. Separately purchase a network plug that satisfies the specifications.
By wiring the network cable to a network plug, that plug can be connected to the network connector socket on the device.

Recommended cable with plug: Cat.5e

Manufacturer	Cable	Model
JMACS Japan Co., Ltd.	Industrial Ethernet cable (double shielded)	IETP-SB-S***□
		***: Length, □: M = meter or C = centimeter

Recommended assembly type RJ45 connector: Cat 6

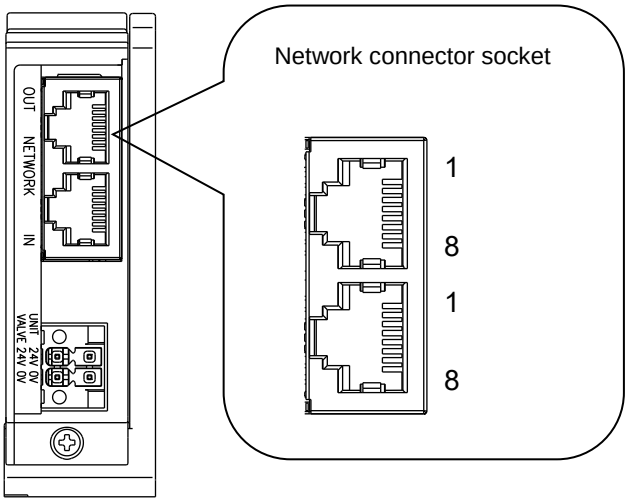
Manufacturer	Connector	Model
HARTING Co., Ltd.	Assembly type RJ45 connector	09 45 151 1560
HARTING Co., Ltd.	Assembly type RJ45 connector (45° angled)	09 45 151 1561

■ Connecting the network cable

Follow the steps below to connect the network cables to the network plug.

1 After confirming safety, stop network communication and turn off all the peripheral equipment.

2 Refer to the following figure to wire the PROFINET cables to the RJ45 plug (PROFINET compliant).



Port	Pin	Signal	Function
IN/ OUT	1	TD+	Transmission data, plus
	2	TD-	Transmission data, minus
	3	RD+	Reception data, plus
	4	Unused	Unused
	5	Unused	Unused
	6	RD-	Reception data, minus
	7	Unused	Unused
	8	Unused	Unused

2.2.2 Connecting and wiring to the unit/valve power socket

⚠ CAUTION

Always check the polarity and rated voltage thoroughly before connecting cables.

Calculate the current consumption to select the power cable.

Consider the voltage drop due to cables when selecting and wiring the cables if power is supplied to more than one device from one power supply.

Take measures to secure the specified power supply voltage if voltage drop cannot be avoided.

For example, wire the power cables in multiple systems or install other power supplies to secure the specified power supply voltage.

Install a terminal block if multi-drop wiring of the power cables is needed.

Install the terminal block so that it comes before the power plug.

The power plug is supplied with the product.
The unit/valve power cables are wired to the supplied power plug and that the plug is connected to the power socket on the device.

Unit power
This electrical power is for operating the device. Use 21.6 VDC to 26.4 VDC power with the least noise.

Valve power
This electrical power is for operating the solenoid valve. Use 22.8 VDC to 26.4 VDC power with the least noise.

Supplied power plug

Part name	Model	Manufacturer
4-pin connector	DFMC1,5/2-STF-3,5 (1790292)	PHOENIX CONTACT

Recommended ferrules and crimp tools

Part name	Model	Manufacturer
Ferrule (without sleeve)	A 0,5-10 to 1,5-10	PHOENIX CONTACT
Ferrule (with sleeve)	AI 0,25-10 to 0,75-10	PHOENIX CONTACT
Crimping tool (in common)	CRIMPFOX6(1212034)	PHOENIX CONTACT

■ Connecting the power cables

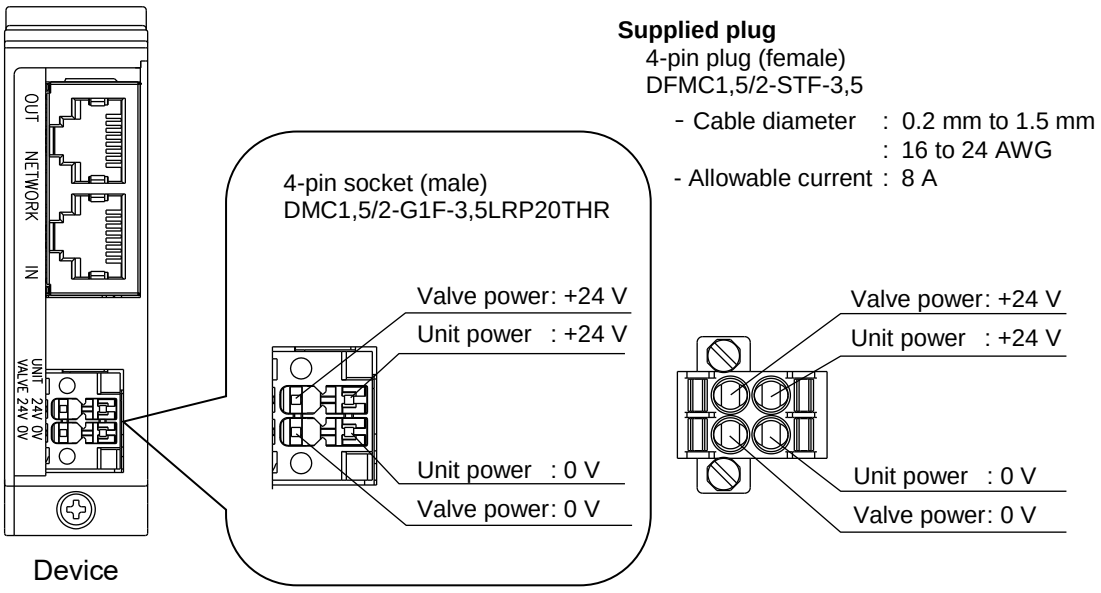
Follow the steps below to connect the unit/valve power cables to the power plug.

1 After confirming safety, turn off the power to be connected to the device.

2 Attach a terminal such as a ferrule to the cable to be connected as necessary.

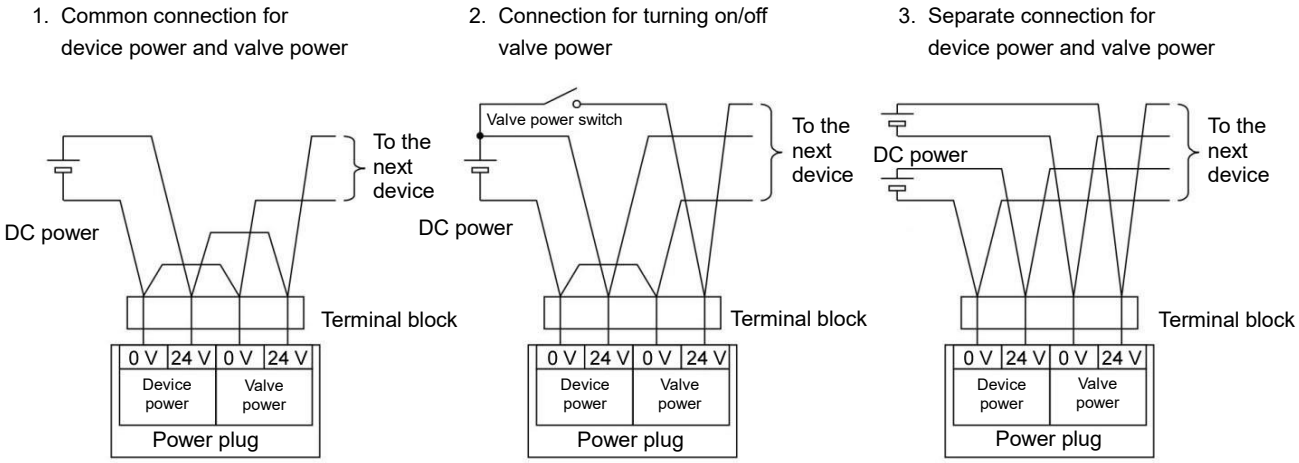
3 Refer to the figure below and wire the cables to the correct terminals on the power plug (24 V to 24 V, 0 V to 0 V).

4 Connect the power plug to the power socket and secure the plug flange with the appropriate tightening torque (0.25 N·m).



■ Wiring the power cable

Figures 1 to 3 are examples of the wiring for the power plug.
Change the circuit configuration as necessary.



3. USAGE

⚠WARNING

Consult CKD about the specifications before using the product outside the designated specifications or for special applications.

⚠CAUTION

Thoroughly read and understand the instruction manual for the network system to be used before using the serial transmission device.

Check the address setting value of serial transmission device carefully before use.
Improper address setting value may cause valves or cylinders to malfunction.

Be careful of the surroundings and ensure safety before turning on or off the power.
The system or solenoid valve (cylinder) may operate suddenly.

3.1 Registering GSDML files

In order for an PROFINET device to participate in a network, a GSDML file containing the device's communication specifications must be installed in the setting tool. For details on installing the GSDML file, refer to the instruction manual issued by the controller unit manufacturer. Use the latest GSDML file complying with the device version to ensure a suitable network configuration.

Correspondence between device version and GSDML file

Device ver.	GSDML file
1.0	GSDML-V2.32-CKD-OPP7_W4G-OPP8-20171123
2.1	GSDML-V2.42-CKD-OPP7_OPP8-20230427

Specifications and the model names in the GSDML file

Item		Specifications			
Manifold model No.		T8EP1	T8EP2	T8EPP1	T8EPP2
Single unit model		OPP7-1EP	OPP7-2EP	OPP7-1EP-P	OPP7-2EP-P
Output type		+COM (NPN)		-COM (PNP)	
Number of output points		16-point output	32-point output	16-point output	32-point output
GSDML File	Head Module	OPP7			
	Module	-1EP	-2EP	-1EP	-2EP

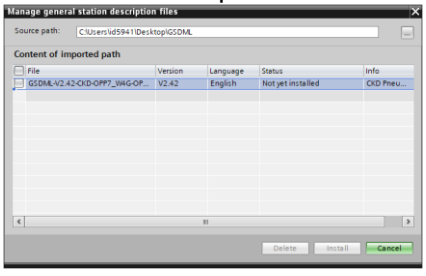
* There is no distinction between model names in the GSDML file for +COM and -COM.

3.1.1 Installing the GSDML file

GSDML file installation by the configuration tool STEP7 made by Siemens AG is described as follows.

1 Select [Options-Manage general station description files (GSDML)].

2 Check the check box and execute [Install] after specifying the folder where the GSDML file is stored in Source path and confirming that the displayed GSDML file is correct.



3.2 Setting the Device name

Each device needs to be configured with a unique name for PROFINET connection.
The device name is set by switch setting or software setting.

3.2.1 Switch settings

⚠ CAUTION

Discharge static electricity from your body before touching the product.
Static electricity may cause damage to the product.

Set switches while the unit power is turned off.
Since switch settings are read when the power is turned on, changes made to the settings after turning on the power are not recognized.

Keep the cover of serial transmission device closed except when setting the switches.
The cover may become damaged or foreign matters may enter inside and cause unexpected failure.

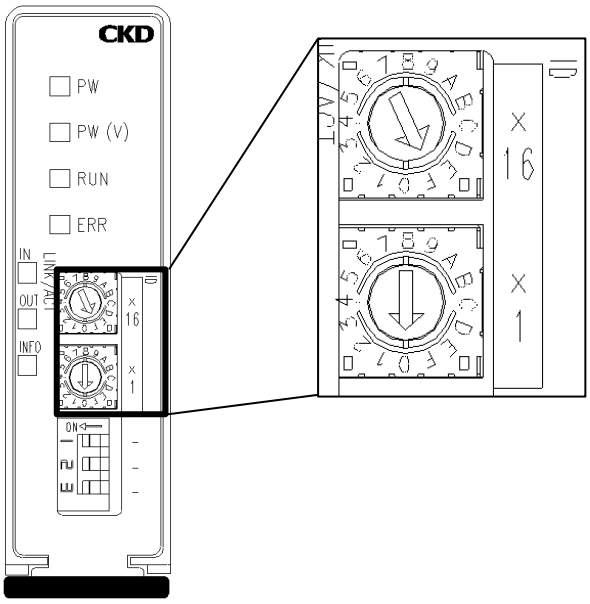
Be careful not to allow any foreign matter to enter inside when setting the switches.
Unexpected failure may result.

Do not handle switches roughly.
Switches are precision devices and can be easily damaged.

Do not touch the internal circuit board when setting the switches.
The internal circuit board can be easily damaged.

Set the device name of the serial transmission device. The device name is OPP7-[NA setting value].
The device name setting is read when the power is turned on. The device name cannot be set in duplicate.
*If the NA setting value is "00", the device name will be the value written from the PLC.
If the device name is not written (initial value), the value will be "OPP7".

Example:
If the rotary switch is set to "F0" (figure below), the device name will be "OPP7-F0".



3.2.2 Software setting

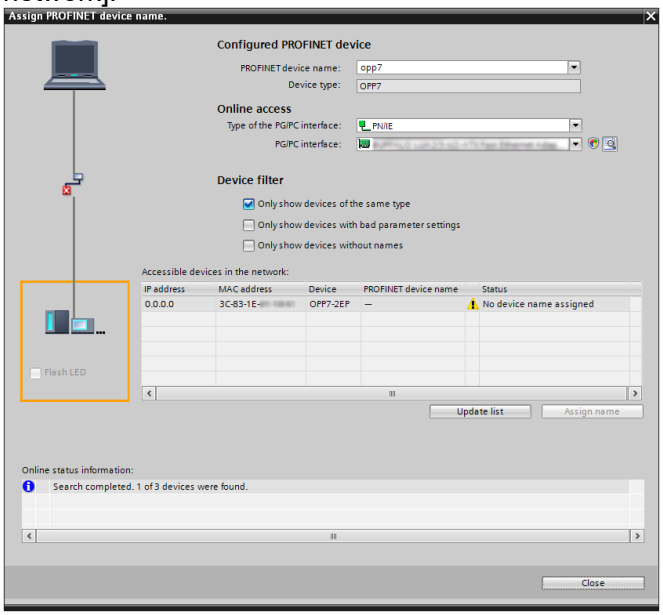
Described as follows is the setting when registering the S7-1214C made by Siemens AG in the project and connecting with this device.
Note that the set device name uses the default value automatically assigned by the configuration tool. Refer to the configuration tool manual for setting the device name by user.

1 Set the rotary switch to the software setting (00) with the unit power OFF.

2 After confirming safety, turn on the unit power.

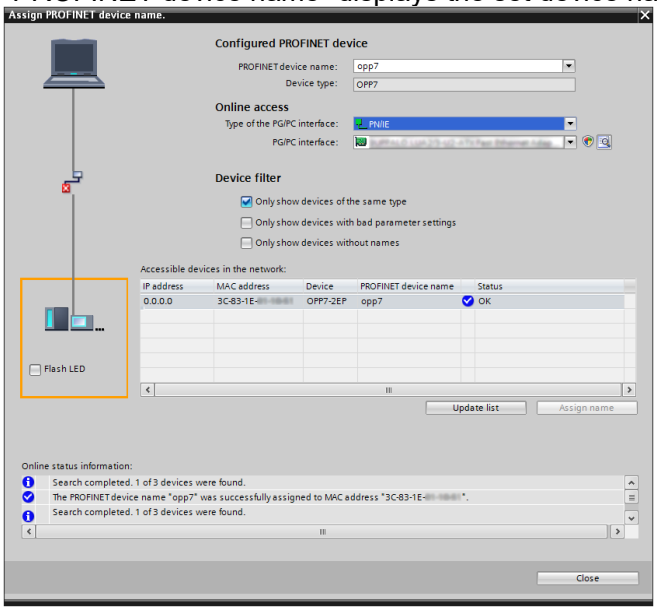
3 Set the device name using the configuration tool.

Select the device displayed in [Network view], right click and select [Assign device name].
Find the target product from MAC address, Device, etc. displayed in [Accessible devices in the network].



* In case the target device could not be found, check that the network is configured correctly.

Select the target device and execute [Assign name]. The setting is complete when [Status] becomes [OK].
“PROFINET device name” displays the set device name.

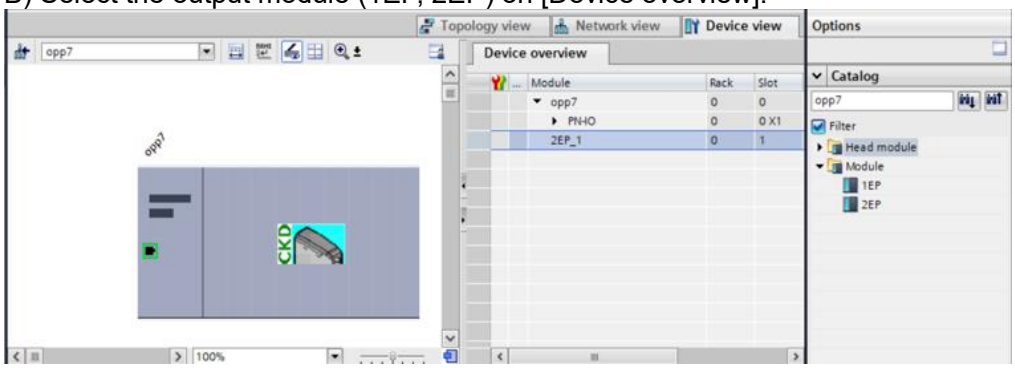


3.3 Output module parameter setting

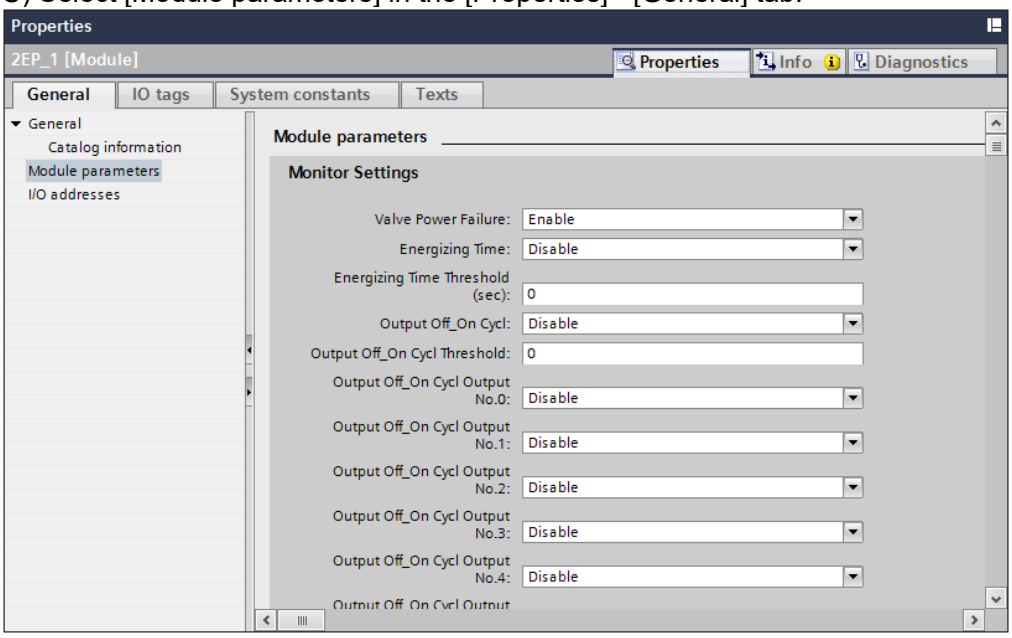
Sets Enable/ Disable the monitoring function and the output value processing at communication error.

3.3.1 Registering the device

A) Double-click the device displayed on [Network view] to display the [Device view].
B) Select the output module (1EP, 2EP) on [Device overview].



C) Select [Module parameters] in the [Properties] - [General] tab.



D) Set the necessary parameters.
Parameters are saved in the PLC. The device is set when it is connected to the PLC and communication started.
Refer to the configuration tool manual for how to save (download) parameters to the PLC.
* Refer to “3.3.2 Parameters“ for parameter details.

3.3.2 Parameters

Several parameters are available for monitoring and setting the device. Set the parameters according to the intended use.

■ Monitor (Monitor Setting)

This monitors the device status and notifies the PLC of an alarm when an error occurs.

A) Valve Power (Valve Power Failure)

Description	Monitors the valve power. Notifies the PLC of an alarm when the valve power voltage drops.
Setting	Selects Enable/ Disable. Value: Enable — Meaning: Executes monitor. (initial value) Value: Disable — Meaning: Does not monitor.
Subject of notice	Undervoltage

B) Energizing time

Description	Monitors the energizing time of the device. Notifies the PLC of an alarm when the energizing time exceeds the threshold.
Setting	Selects Enable/ Disable. Value: Enable — Meaning: Executes monitor. Value: Disable — Meaning: Does not monitor. (initial value) Threshold (Energizing Time Threshold) Setting range: 0 to 4,294,967,295 — unit: seconds
Subject of notice	Threshold-exceeded energizing time (Over Threshold Energizing Time)
Remarks	The energizing time stops counting at the maximum count (4,294,967,295 seconds).

C) Output ON count (Output Off_On Cycl)

<table>
<tr><td>Description</td><td>Monitors the output ON count for each output number.
Notifies the PLC of an alarm when output ON count exceeds the threshold with any output number.</td></tr>
<tr><td>Setting</td><td>Selects Individual setting / Disable
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>Individual settings</td><td>According to the settings.</td></tr>
<tr><td>Disable</td><td>Does not monitor all points.
(initial value)</td></tr>
</table>
Individual setting (Output Off_On Cycl Output No.0 to No.x)
(16 output points: x=15, 32 output points: x=31)
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>Enable</td><td>Executes monitor.</td></tr>
<tr><td>Disable</td><td>Does not monitor. (initial value)</td></tr>
</table>
Threshold (Output Off_On Cycl Threshold)
<table>
<tr><th>Setting range</th><th>unit</th></tr>
<tr><td>0 to 4,294,967,295</td><td>Counts</td></tr>
</table></td></tr>
<tr><td>Subject of notice</td><td>Threshold-exceeded output ON count (Over threshold Output Off_On Cycles)</td></tr>
<tr><td>Remarks</td><td>The output ON count stops counting at the maximum count (4,294,967,295 seconds).</td></tr>
</table>

* The output ON count can be rewritten to any value. Refer to "3.6.2 Acyclic data access" for the settings.

■ Output

This can set the action taken on the output in the event of a communication error.

Note that a communication error refers to the physical disconnection such as a LAN cable disconnection, or when the PLC is not in a normal state such as STOP status.

Output setting at communication error (Communication Error Output No.0 to No.x) (Output 16 points: x = 15, Output 32 points: x = 31)

<table>
<tr><td>Meaning</td><td>Sets the action taken on the output in the event of a communication error.</td></tr>
<tr><td>Setting</td><td>Selects output value
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>Forced Off</td><td>Turn off the output. (initial value)</td></tr>
<tr><td>Forced On</td><td>Turn on the output.</td></tr>
<tr><td>Hold output value (Last Valid Value)</td><td>Holds the output value before a communication error occurred.</td></tr>
</table></td></tr>
</table>

3.4 MRP (Media Redundancy Protocol) function

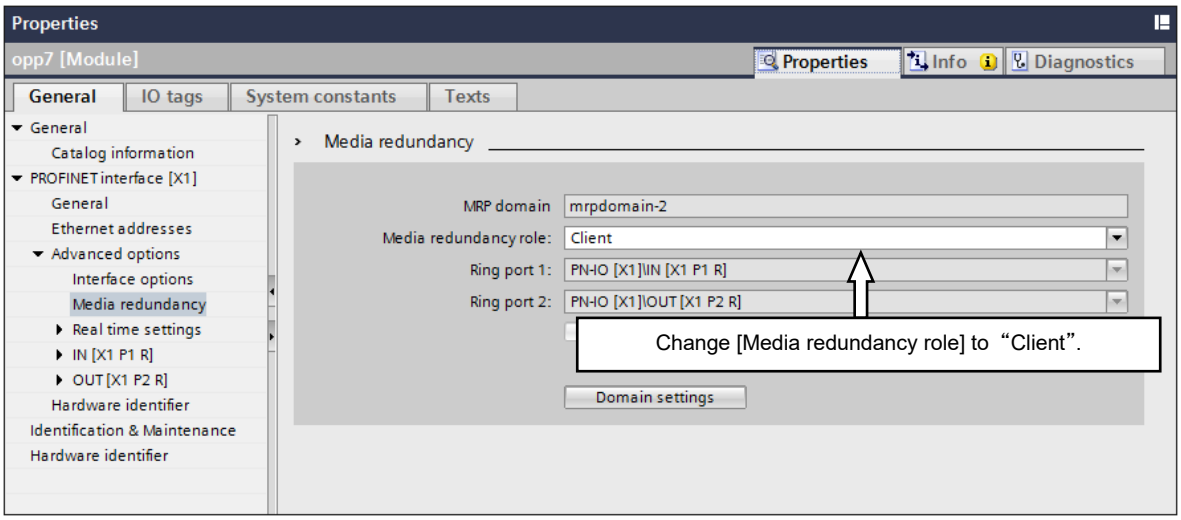
This device supports the MRP function (client).

A device with MRP manager function and an appropriate network construction are necessary to use the MRP function.

Refer to the manual of the device with MRP manager function for details.

(Reference) MRP client settings for this device in STEP7 made by Siemens AG

Set [the Media redundancy role] on the [Properties] - [General] tab.



3.5 Correspondence between Device Output Number and PLC Address Number

3.5.1 PLC address correspondence table

This correspondence table uses the PLC of Siemens AG as an example.

<T8EP□1(OPP7-1EP-□) (16-point output)>

PLC address No.	Output Bit 00 to 15															
	QB□.0	QB□.1	QB□.2	QB□.3	QB□.4	QB□.5	QB□.6	QB□.7	QB (□+1) .0	QB (□+1) .1	QB (□+1) .2	QB (□+1) .3	QB (□+1) .4	QB (□+1) .5	QB (□+1) .6	QB (□+1) .7
Serial Transmission Device Output No.	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Solenoid output No.	**s1**	**s2**	**s3**	**s4**	**s5**	**s6**	**s7**	**s8**	**s9**	**s10**	**s11**	**s12**	**s13**	**s14**	**s15**	**s16**

Output data

<T8EP□2 (OPP7-2EP-□) (32-point output)>

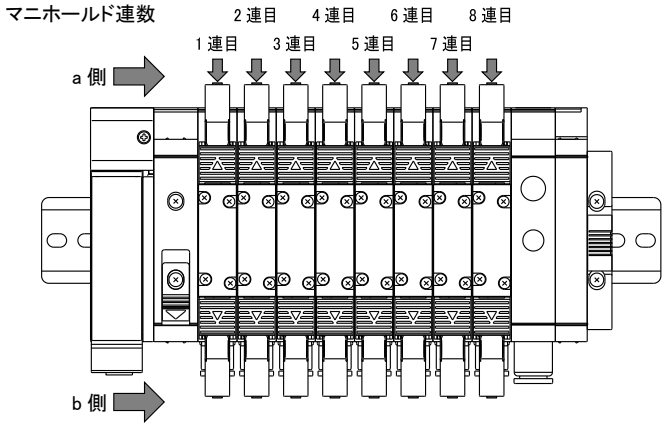
PLC address No.	Output Bit 00 to 15																Output Bit 16 to 31															
	QB□.0	QB□.1	QB□.2	QB□.3	QB□.4	QB□.5	QB□.6	QB□.7	QB (□+1) .0	QB (□+1) .1	QB (□+1) .2	QB (□+1) .3	QB (□+1) .4	QB (□+1) .5	QB (□+1) .6	QB (□+1) .7	QB (□+2) .0	QB (□+2) .1	QB (□+2) .2	QB (□+2) .3	QB (□+2) .4	QB (□+2) .5	QB (□+2) .6	QB (□+2) .7	QB (□+3) .0	QB (□+3) .1	QB (□+3) .2	QB (□+3) .3	QB (□+3) .4	QB (□+3) .5	QB (□+3) .6	QB (□+3) .7
Serial Transmission Device Output No.	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28/**	**29**	**30**	**31**
Solenoid output No.	**s1**	**s2**	**s3**	**s4**	**s5**	**s6**	**s7**	**s8**	**s9**	**s10**	**s11**	**s12**	**s13**	**s14**	**s15**	**s16**	**s17**	**s18**	**s19**	**s20**	**s21**	**s22**	**s23**	**s24**	**s25**	**s26**	**s27**	**s28**	**s29**	**s30**	**s31**	**s32**

Output data Output data

3.5.2 Example of valve number array corresponding to solenoid output number

In the table below, each valve number (Valve No.) consists of a number (the station number) and an alphabet (a for a-side solenoid and b for b-side solenoid). For example, “1a” refers to 1st station a-side solenoid. Also, “V” stands for “Vacant”.
Manifold stations are numbered in order from left to right with the piping port towards the user (refer to the figure below).
As appearance and maximum number of stations differ depending on the solenoid valve model, check individual specifications.

< T8EP1, T8EPP1 (16-point output)>



The figure on the left is an example of mounting eight stations of double-solenoid type manifold valves.
There is no solenoid on the b-side for single-solenoid types.

Standard wiring

- Single solenoid valve

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	13a	14a	15a	16a

- Double solenoid valve

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b

- Mixed (both single and double solenoid valves are mounted) [example]

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	2a	3a	3b	4a	4b	5a	6a	7a	7b	8a	(V)	(V)	(V)	(V)	(V)

Double wiring

- Single solenoid valve

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	(V)	2a	(V)	3a	(V)	4a	(V)	5a	(V)	6a	(V)	7a	(V)	8a	(V)

- Double solenoid valve

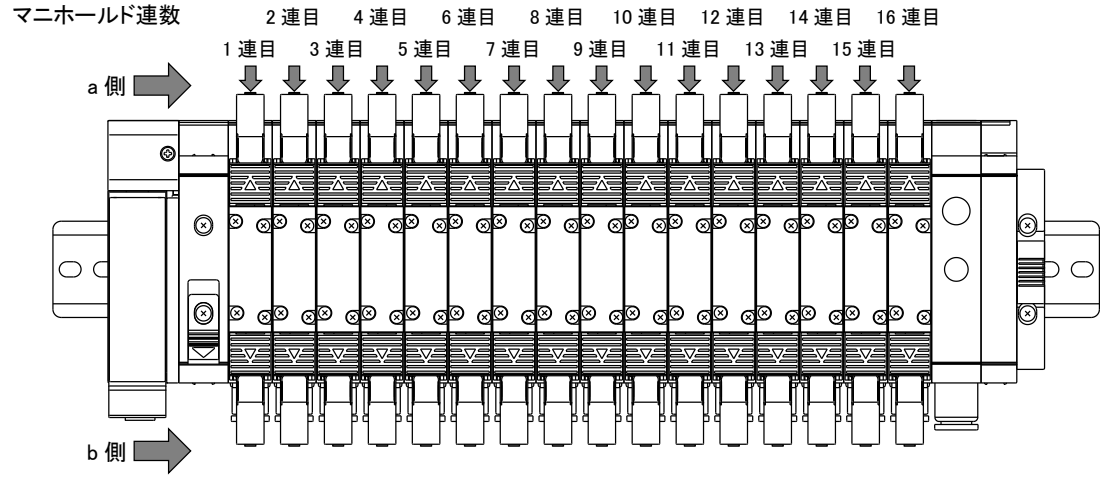
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b

- Mixed (both single and double solenoid valves are mounted) [example]

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	(V)	2a	(V)	3a	3b	4a	4b	5a	(V)	6a	(V)	7a	7b	8a	(V)

< T8EP2, T8EPP2 (32-point output)>

The figure below is an example of mounting sixteen stations of double-solenoid type manifold valves. There is no solenoid on the b-side for single-solenoid types.



Standard wiring

- Single solenoid valve

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	13a	14a	15a	16a	17a	18a	19a	20a	21a	22a	23a	24a	25a	26a	27a	28a	29a	30a	31a	32a

- Double solenoid valve

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b	9a	9b	10a	10b	11a	11b	12a	12b	13a	13b	14a	14b	15a	15b	16a	16b

- Mixed (both single and double solenoid valves are mounted) [example]

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	1a	2a	3a	3b	4a	4b	5a	6a	7a	7b	8a	9a	10a	10b	11a	11b	12a	13a	14a	14b	15a	15b	16a	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)

Double wiring

- Single solenoid valve

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	1a	(V)	2a	(V)	3a	(V)	4a	(V)	5a	(V)	6a	(V)	7a	(V)	8a	(V)	9a	(V)	10a	(V)	11a	(V)	12a	(V)	13a	(V)	14a	(V)	15a	(V)	16a	(V)

- Double solenoid valve

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b	9a	9b	10a	10b	11a	11b	12a	12b	13a	13b	14a	14b	15a	15b	16a	16b

- Mixed (both single and double solenoid valves are mounted) [example]

Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	1a	(V)	2a	(V)	3a	3b	4a	4b	5a	(V)	6a	(V)	7a	7b	8a	(V)	9a	(V)	10a	10b	11a	11b	12a	(V)	13a	(V)	14a	14b	15a	15b	16a	(V)

3.6 Programming

3.6.1 I/O mapping

The controller unit handles this product as a device (T8EP□1 for 16-point output, T8EP□2 for 32-point output).

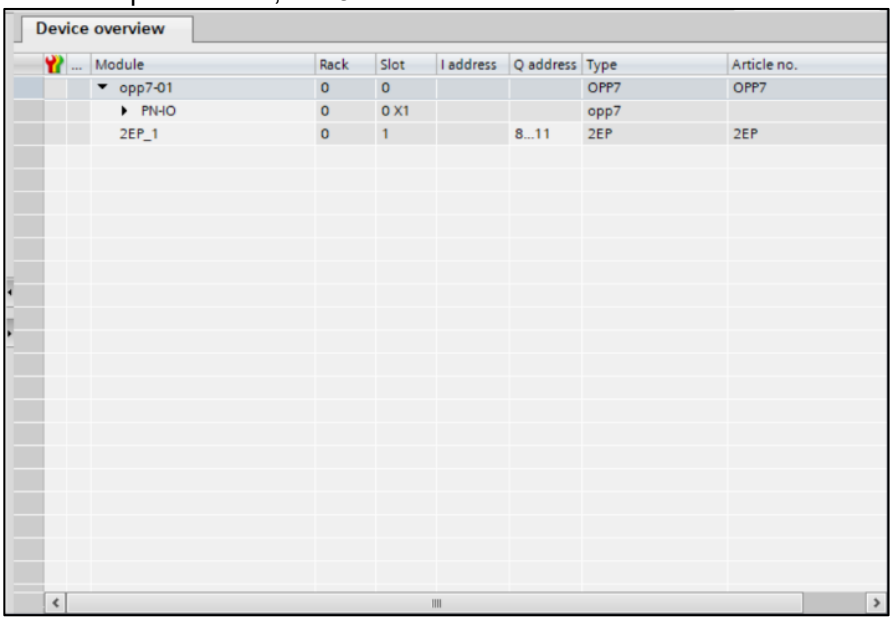
There are two types of data: output data sent from the controller unit to the device and input data sent from the device to the controller unit. This product is an output device that receives output data from the controller unit and output to the valve.

Refer to the instruction manual issued by the PLC manufacturer when programming.
Refer to the following table to program the I/O mapping.

(Reference) I/O mapping in STEP7 made by Siemens AG

	output No.																													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28/	29	30	31
1 byte	QB a								QB a+1								QB a+2								QB a+3							
2 bytes	QW a																QW a+2															
4 bytes	QD a																															

*a is the starting numbers of the Q address set in STEP7.
For the capture below, a = 8.



3.6.2 Acyclic data access

Various types of data are stored in this device. Acyclic data access from the PLC enables to refer (read) the data. Also, value can be set (write) for some data.
Do not set (write) value to the indexes which setting is not available. The operation will not be guaranteed in case of such setting.

■ Index

Each data is assigned a number called an index, and it is accessed by specifying the index.

A) The entire index

Index	Size (byte)	Item	Config.*1	Meaning
1001	4	Vendor name	N	Returns 'CKD' (character string).
1002	2	Vendor ID	N	Returns 0x0357.
1003	15	Product Name	N	Returns product name (character string).
1004	2	Hardware version	N	Returns the hardware version.
1005	4	Software version	N	Returns the software version.
1006	4	Model name code	N	Returns the model name code.
1007	4	Serial no.	N	Returns the serial number.
1008	1	IP address setting status	N	Return the condition how the IP address currently used was set. 0x00: Use the value stored in the device 0x01: Use the value notified from PLC
1009	4	IP address	N	Returns the currently used IP address, subnet mask, or gateway.
1010	4	Subnet mask	N	
1011	4	Gateway	N	
1012	4	SW IP address	N	Returns the IP address, subnet mask, or gateway stored in the device.
1013	4	SW subnet mask	N	
1014	4	SW gateway	N	
1015	1	(For other models)	N	Returns 0x00.
1016	1	(For other models)	N	Returns 0x00.
1017	6	MAC address	N	Returns the MAC address.
1018	6	MAC address IN	N	
1019	6	MAC address OUT	N	
1020	4	Energizing time*2	N	Returns the energizing time (seconds).
1021	1	Number of output points	N	Returns the number of output points.
1022	1	-	N	Reserve
1023	1	Output type	N	Returns the output type. 0x00: +COM 0x01: -COM
1024	240	Device name	N	Returns the device name (character string).
1025	1	Maintenance notice	N	Returns the monitoring status. (0x00: No notification g, 0x01: Notifying to PLC) Bit0: Valve power Bit1: Unit power Bit2: (No definition) Bit3: Energizing time Bit4: (No definition) Bit5: (No definition) Bit6: (No definition) Bit7: Output ON count
1026	1	Maintenance settings	N	Returns the monitoring settings. (0x00: not monitored, 0x01: monitoring) Bit0: Valve power Bit1: Unit power Bit2: (No definition) Bit3: Energizing time Bit4: (No definition) Bit5: (No definition) Bit6: (No definition) Bit7: Output ON count
1027	4	Energizing time maintenance threshold	N	Returns the threshold of energizing time.
1028	4	Output ON count maintenance threshold	N	Returns the threshold of the output ON count.

Index	Size (byte)	Item	Config.*1	Meaning
1029	-	-	N	Reserve
1030	1	Valve power	N	Returns the valve power status. 0x00: Valve power OFF 0x01: Valve power ON

*1: ”Y” stands for “Yes” and “N” stands for “No”
*2: The energization time stops counting at the maximum count (4,294,967,295 seconds).

B) For each output number

Internal data can be referenced for each output number. Each index is as follows.

Index *1	Size (byte)	Item	Config.*2	Meaning
2001	1	Cyclic output value	N	Cyclic output value received from PLC. 0x00: OFF 0x01: ON
2002	1	Forced output value	Y	Value to output when forced output is enabled. 0x00: OFF (initial value) 0x01: ON
2003	1	Forced output (enable/disable)	Y	Forced output enable/disable selecting status. 0x00: Disabled, cyclic output (initial value) 0x01: Enabled, forced output
2004	1	Output setting at communication error (hold/user-set value)	N	Selecting status of the output at communication error. 0x00: User-set value, set value for output value at communication error 0x01: Hold, the output value before a communication error occurred.
2005	1	Output value at communication error	N	Value to output when the forced output is selected for the value at communication error. 0x00: OFF 0x01: ON
2006	-	(Unused)	N	* An access error will occur.
2007	1	Output ON count excess notification	N	Returns the monitoring state of the output ON count. 0x00: No notification 0x01: Notifying to PLC
2008	1	Output ON count excess notification (enable/disable)	N	Returns the monitoring settings of the output ON count. 0x00: Disable, not monitored 0x01: Enable, monitoring
2009	4	Output ON count	Y	Returns the output ON count.

*1: The above index is for output No.0.

*2: ”Y” stands for “Yes” and “N” stands for “No”

The correspondence table between output No. and the index is as follows.

Item	Output No.							
	0	1	-	15	16	-	30	31
Cyclic output value	2001	2011	-	2151	2161	-	2301	2311
Forced output value	2002	2012	-	2152	2162	-	2302	2312
Forced output (enable/disable)	2003	2013	-	2153	2163	-	2303	2313
Output settings in the event of a communication error (hold/user-set value)	2004	2014	-	2154	2164	-	2304	2314
Output value at communication error	2005	2015	-	2155	2165	-	2305	2315
(Unused)	2006	2016	-	2156	2166	-	2306	2316
Output ON count excess notification	2007	2017	-	2157	2167	-	2307	2317
Output ON count excess notification (enable/disable)	2008	2018	-	2158	2168	-	2308	2318
Output ON count	2009	2019	-	2159	2169	-	2309	2319

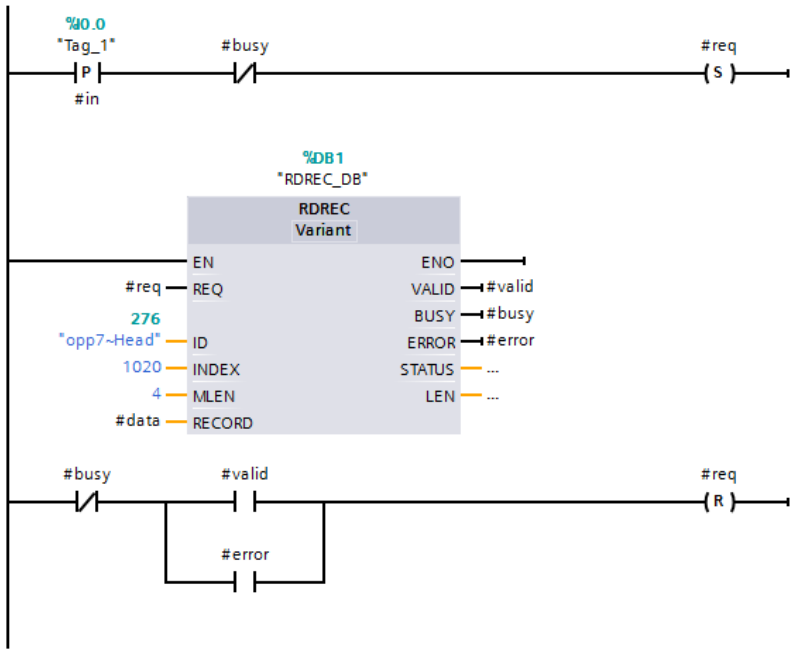
* Output No.0 to No.15 for 16-point output, and output No.0 to No.31 for 32-point output can be set.

■ Reference program

This program performs acyclic data access with ladder logic.

The following value is referred:

Index	Size (byte)	Item
1020	4	Energizing time



<Circuit Detail>
1. [SET] the [#req] when input 0.0 turns ON.
2. Acquire the [INDEX:1020] information for [ID:276] with [RDREC].
3. Acquisition is complete if either [VALID] or [ERROR] is [SET].
4. The acquired contents are stored in [#data] when [VALID] is [SET].

* The [ID] of [RDREC] varies depending on the project. Change the [ID] to the target device's.
* As input chattering is not considered, add mask time if needed.

* Correct parameters by changing [RDREC] to [WRREC] for setting (writing).

Refer to the manual of PLC for details.

⚠ CAUTION

Forced output setting will be canceled when the product is powered off or communication with the controller unit is disconnected. The cyclic data will be output when the power is turned on again or communication is restored.

■ **Forced output**

Forced output setting enables to change the output data without changing the main program of the PLC.
Forced output setting can be set for each output number.
Forced output setting cannot be enabled if the connection with the PLC is abnormal.
(It outputs according to the [Output settings in the event of a communication error].))
Enabling the forced output setting makes the RUN LED indicate green triple flash.
Refer to “1.2.2 Switches and LED Indicators”.

<Settings>
Forced output value and forced output (enable/disable) can be set with acyclic data access (writing) to the needed output number.
* Refer to “the correspondence table between output No. and the index” of page 25 for accessing index.

The table below describes the output when the cyclic output value, forced output value, and forced output (enable/disable) are set.

Cyclic output value	Forced output value	Forced output (enable/disable)	output
0	0	0	OFF
0	0	1	OFF
0	1	0	OFF
0	1	1	ON
1	0	0	ON
1	0	1	OFF
1	1	0	ON
1	1	1	ON

4. MAINTENANCE AND INSPECTION

⚠WARNING

Turn off the power, stop the supply of compressed air and make sure that there is no residual pressure before conducting maintenance.

Do not disassemble, modify, or repair the product.
These may cause failure or malfunction.

⚠CAUTION

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

Do not drop or apply excessive vibrations or shocks to the product.
These may cause damage because parts inside the product are made to precise specifications.

4.1 Periodic Inspection

This section describes the cleaning and inspection of the device for daily maintenance and what to do when replacing the device. In order to use the product under optimum conditions, clean and inspect the product periodically.

■ Cleaning

1. For daily cleaning, wipe the product with a soft dry cloth.
2. When stains cannot be removed by wiping with a dry cloth, moisten the cloth with diluted neutral detergent (2%), wring it out well, and wipe off the stains.
3. Objects such as rubber, vinyl, or tape may stain the device if they are left in contact with the device for a long period. Remove such objects when cleaning if they are leaving stain on the product.

■ Inspection

Perform inspection once or twice a year.
Conduct inspections at a shorter interval if using the product in an environment where temperature or humidity is extremely high or in a dusty environment.

<Inspection item>
Inspect the following items to make sure that each item satisfies the criteria.
If any item does not meet the criteria, improve the surrounding environment or adjust the device.

Inspection item	Description	Criteria	Inspection method
Environment	Is the surrounding and in-panel temperature appropriate?	Refer to "1.3.2 Device specifications".	Thermometer
	Is the surrounding and in-panel humidity appropriate?	Refer to "1.3.2 Device specifications".	Hygrometer
	Is there any dust on the device?	There should be no dust.	Visual inspection
Installation	Is the device fixed securely?	No looseness	Phillips screwdriver
	Is the power cable connector fully inserted?	No looseness	Flat blade screwdriver
	Is the network cable connector fully inserted?	No looseness	Visual inspection
	Is the connection cable not broken?	No abnormality in appearance	Visual inspection

■ Checking the device before/after replacing

Each unit (controller and device) is a component that constitutes a part of a network.
If any unit fails, immediately perform recovery work to prevent the entire network from being affected. To restore the network function as fast as possible, it is recommended to prepare spare devices.

<Inspection item>
If a fault is detected and the device is replaced with a new one, check if the new device has no abnormality. Also, confirm the device settings.

<Settings for replacement device>
For the switches on the replacement device, confirm the specifications and set the same settings as the previous one.

4.2 Removing and Mounting

⚠WARNING

Turn off the power and completely release the pressure before removing or adding a manifold solenoid valve.

Thoroughly read and understand this Instruction Manual before removing and adding the manifold solenoid valve.

Do not touch the electrical wiring connection (bare live part).
An electric shock may occur.

Do not touch live parts with bare hands.
An electric shock may occur.

⚠CAUTION

Check the device IP address and the setting at communication error, before turning on the unit power.

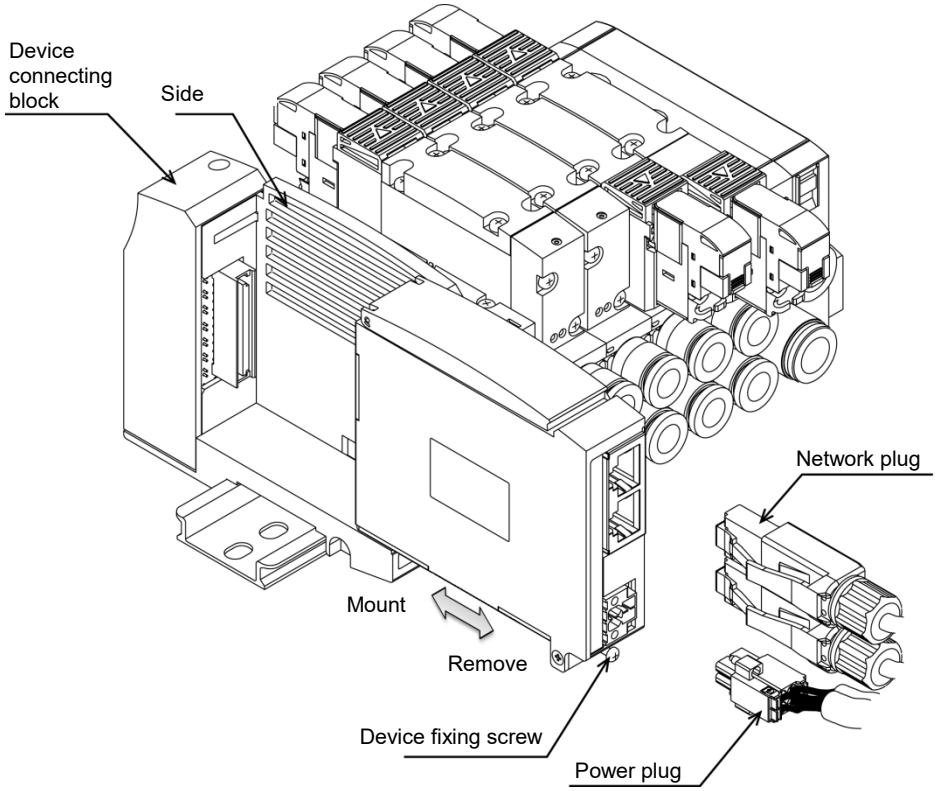
Do not attach or detach the plug while the power is turned on.
These may cause failure or malfunction.

Do not pull out the device by pulling the cable or connector.
A cable disconnection or damage may occur.

Fully loosen the plug fixing screws before removing the plug.
After inserting the plug, tighten the plug fixing screws securely.

4.2.1 Removing the product (device)

1. After confirming safety, stop network communication as necessary and turn off all peripheral equipment.
2. After confirming safety, turn off the unit power and valve power as necessary.
3. Remove the network plug and power plug.
4. Loosen the device fixing screw.
   * Be careful not to lose the fixing screw.
5. Hold and pull out the product slowly in the direction of the arrow.



4.2.2 Mounting the product (device)

1. Set the device name of the product.
2. Turn off the power (for unit/valve) and connect the network plug and power plug.
   The system may start operating suddenly if the plug is connected while the power is turned on.
   Be careful of the surroundings and secure safety before connecting the plugs.
   Power plug: Appropriate tightening torque: 0.25 N·m
3. Hold the product and insert it slowly in the direction of the arrow.
4. Check that the product and device connecting block are properly connected and tighten the device fixing screw firmly.
   (Appropriate tightening torque: 0.5 N·m)
5. Confirm safety and turn on each power.

5. Troubleshooting

5.1 Problems, Causes, and Solutions

Troubleshooting for this device must be performed not only for the single unit but for the entire system. The system may start operating suddenly depending on the communication state. Use extreme care and ensure safety during maintenance.

■ Fault 1: PW, PW(V) does not light up.

- Check that the power cable is properly connected and in good condition.
- Check that the supplied power voltage is used within the specified range.
- Check the system and restart (turn off the power and turn on again) the product. If it does not recover, replace the device as it is damaged by a blown fuse inside or such.

■ Fault 2: LINK/ACT IN, LINK/ACT OUT LED does not light up.

- Check that the network cable is properly connected and in good condition.
- Check that the network cable is compatible with PROFINET.
- Check that the power to the PLC is turned on.

■ Fault 3: RUN LED does not light up/ is blinking.

- Check the PLC configuration and restart the product.
- Check that the IP address and device name are not duplicated.
- Check that the settings for each device are correct when using MRP.
  (Refer to the manual of each device for MRP settings.)

■ Fault 4: ERR LED is blinking.

- Check the PLC configuration and restart the product.
- Check that the IP address and device name are not duplicated.

■ Fault 5: ERR LED is double flashing and RUN LED lights on.

- The output data received from the PLC is disabled. Check the status of the PLC.

■ Fault 6: INFO LED lights up.

- The EEPROM error may have occurred. If the product does not recover after restarting, replace the unit.

■ Fault 7: INFO LED is blinking.

- An internal circuit board error may have occurred. If the product does not recover after restarting, replace the unit.

6. WARRANTY PROVISIONS

6.1 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.
- 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 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.
- Failure caused by incorrect use such as careless handling or improper management.
- 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.

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.

6.2 Warranty period

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