

Serial Transmission Device

TVG series JA6*

(OPP8-A2EP / OPP8-A2EP-P)

PROFINET Compatible

INSTRUCTION MANUAL

SM-A76003-A/1



- 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.

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.

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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 OPP8-A2EP-*(JA6*) for TVG.
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.

■ OPP8-A2EP-*(JA6*)

This is a device for TVG 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.

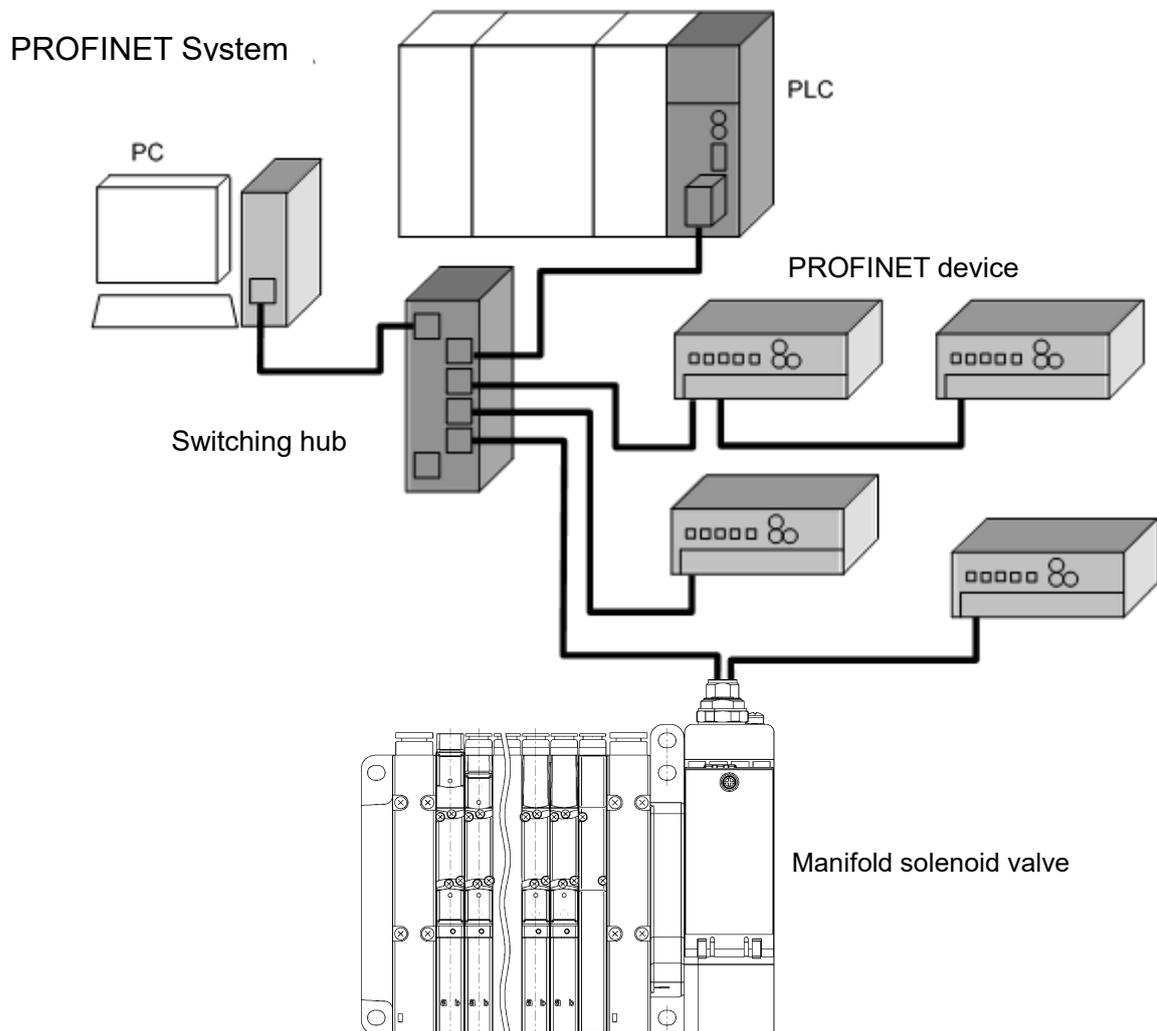
1.1.2 System structure

This system mainly consists of a PLC, OPP8-A2EP-* mounted manifold solenoid valve, and peripheral equipment.

Example of PLC

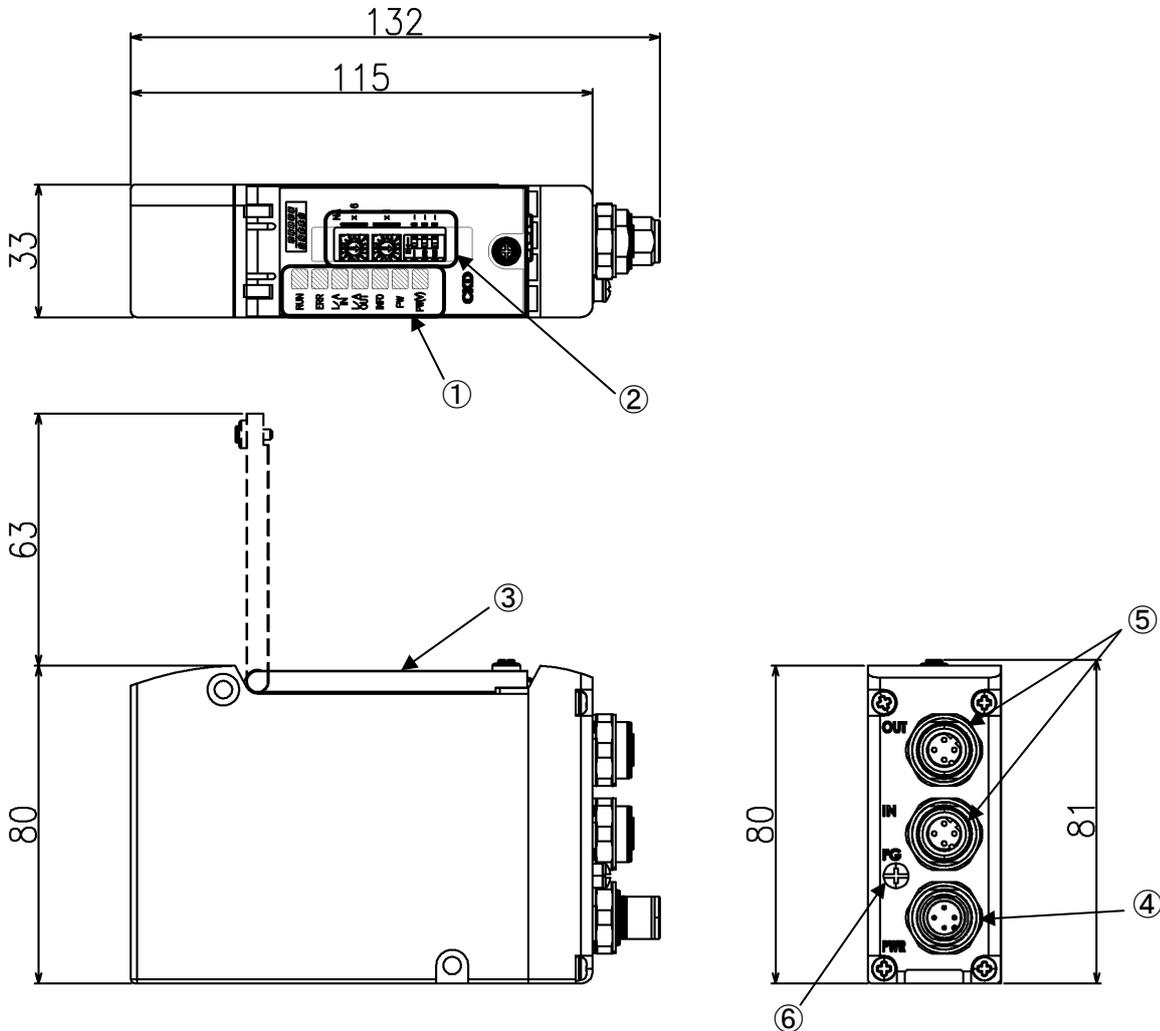
PLC manufacturer	Compatible PLC
Siemens AG	S7-1200
	S7-1500

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, L/A IN, L/A OUT, INFO, PW, and PW(V).
②	Switches	Rotary switch: Sets the device name of the serial transmission device. DIP switch : Not used in this product.
③	Cover	Protects the LEDs and setting switches.
④	Unit/valve power plug	Connects the unit/valve power socket.
⑤	Network connector socket (M12 × 2 ports [IN, OUT] D-cord: 4 pins)	IN: Transmits and receives PROFINET communication. OUT: Transmits and receives PROFINET communication. Note: There is no functional difference between the IN and OUT port.
⑥	FG terminal	Connects FG (frame grounding) to the terminal.

1.3 Specifications

1.3.1 Communication specifications

Item	Specifications
Communication protocol	PROFINET IO compliant
Baud rate	100Mbps
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	OPP8-A2EP (JA6C)	OPP8-A2EP-P (JA6D)
Unit power voltage	21.6 VDC to 26.4 VDC (24 VDC \pm 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 (all points OFF) 15 mA or less (under no load with all points ON)	
Output type	+COM (NPN)	-COM (PNP)
Number of output points	32 points	
Insulation resistance	Between external terminals and case: 30 M Ω 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 ambient 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	
PROFINET connector	M12, D-code: 4 pins	
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: 24 V, 3 A/ Unit power: 24 V, 2 A (both fuses are non-replaceable)	
Operation indicator	LED (communication status, unit power and valve power status)	
Degree of protection	IP65/ IP67	
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/s ² , 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 a separate power supply for each manifold solenoid valve wherever possible, wire them individually, and install a noise filter on the power cable.
- Wire the power cable as short as possible.
- 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.
- Make sure to connect the shielding of the network cable to equipotential bonding close to the device.
- If communication could become unstable, install a ferrite core on the network cable near the device as a countermeasure.
- In environments at altitudes exceeding 2,000 m, reduced air pressure may affect the withstand voltage performance and noise immunity (such as lightning surge noise and static electricity). Use the product with caution under such conditions.

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.

When the network plug is not used, make sure to cover it with water-resistant cap.

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 manual 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

<Recommended M12-RJ45 cable [Cat.5e]>

Manufacturer	Model
HARTING Co., Ltd.	09 45 700 50**
Omron Corporation	XS5W-T421-*MC-K

* differs depending on the cable specifications.

<Recommended assembly type M12 connector>

Manufacturer	Model
HARTING Co., Ltd.	21 03 281 1405

<Recommended assembly type RJ45 connector>

Manufacturer	Model
HARTING Co., Ltd.	09 45 151 1100

<Recommended cable [Cat.5e]>

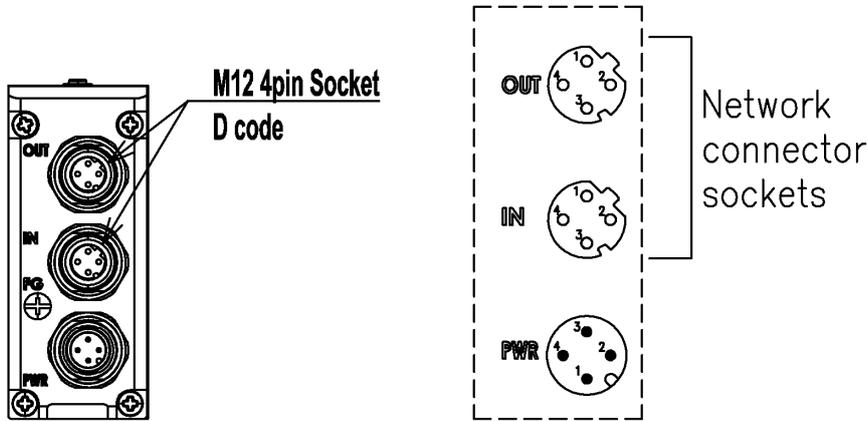
Manufacturer	Model
HARTING Co., Ltd.	09 45 600 01**

* □ differs depending on the cable specifications.

■ Connecting the network cable

Follow the steps below to connect the network cables to the network connector socket.

- 1** After confirming safety, stop network communication and turn off all peripheral equipment.
- 2** Refer to the figure below to wire the PROFINET compliant cable to the M12 connector.



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

2.2.2 Connecting and wiring to the unit/valve power plug

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.

In this product, the unit power and the valve power supply are separated. In addition, each power supply is connected by an M12 connector (socket).

* Power connector is not supplied with the product. Separately purchase a power connector that satisfies the specifications.

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.

Recommended power socket

<Recommended M12 power cable-loose wire type>

Manufacturer	Model
Omron Corporation	XS2F-D421-*8*-*

* differs depending on the cable specifications.

<Recommended M12 connector (socket)>

Manufacturer	Model
HARTING Co., Ltd.	21 03 212 2305

Cable size : AWG22 to 18, outside diameter of compatible cable : 6 to 8 dia.

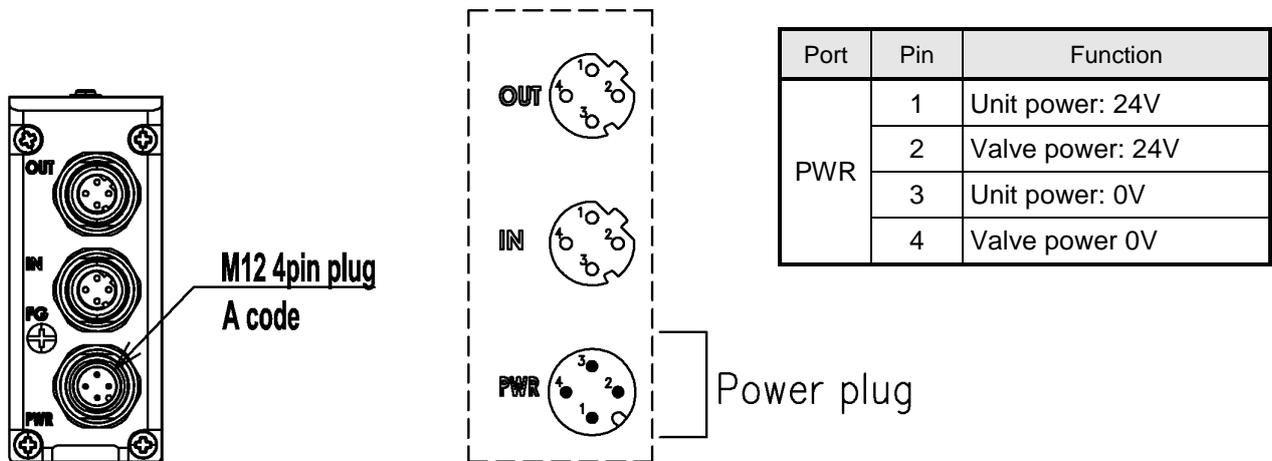
■ Connecting the power cables

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** 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).

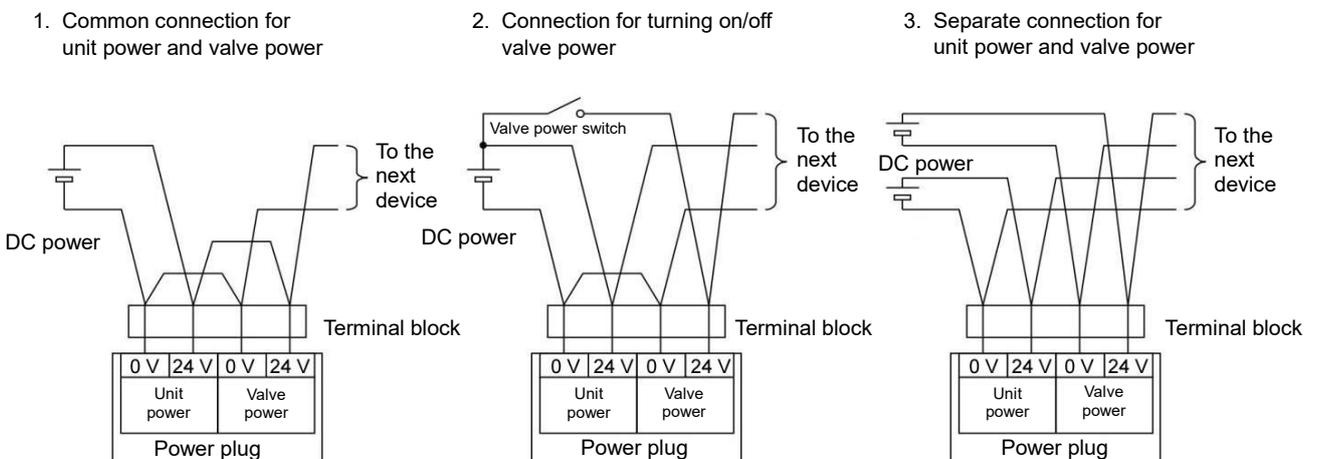
■ Wiring the power cable

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



■ Wiring the power cable

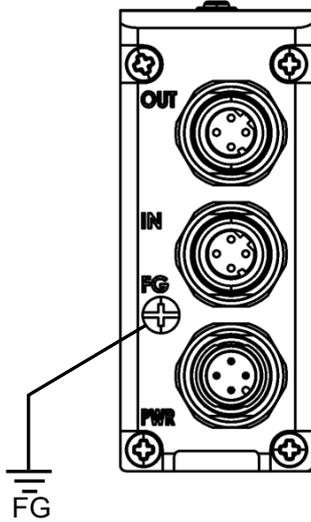
Figures 1 to 3 are examples of the wiring for the power plug. Change the circuit configuration as necessary.



2.2.3 FG terminal

If the noise from the communication or power line could have an effect, providing the product with ground may improve the condition.

Ground the frame ground (F.G.) terminal so that the grounding resistance is 100 Ω or less, as necessary.



<Recommended crimp terminal>

Use the crimp terminal for M3 and fix with the tightening torque 0.3 to 0.5 N·m when grounding FG terminal.

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
2.1	GSDML-V2.42-CKD-OPP7_OPP8-20230427

Specifications and the model names in the GSDML file

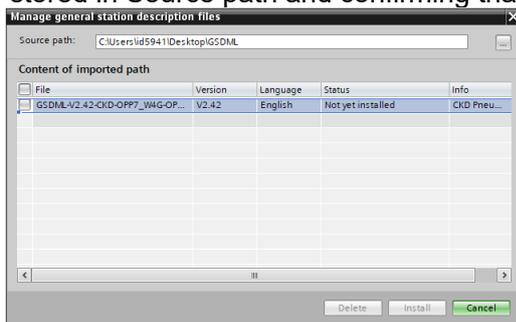
Item		Specifications	
Model No.		OPP8-A2EP	OPP8-A2EP-P
Output type		+COM (NPN)	-COM (PNP)
Number of output point		32 points	
GSDML file	Head Module	OPP8	
	Module	-2EP	

* 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.

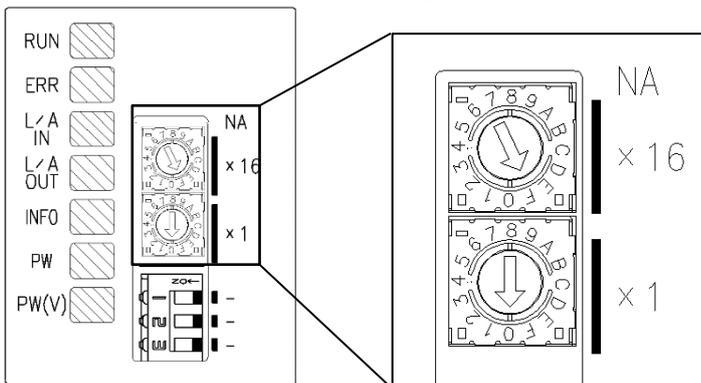
Set the device name of the serial transmission device. The device name is OPP8-[NA setting value]. The device name setting is read when the power is turned on. The device name cannot be set in duplicate.

*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 "OPP8".

Example:

If the rotary switch is set to "F0" (figure below), the device name will be "OPP8-F0".



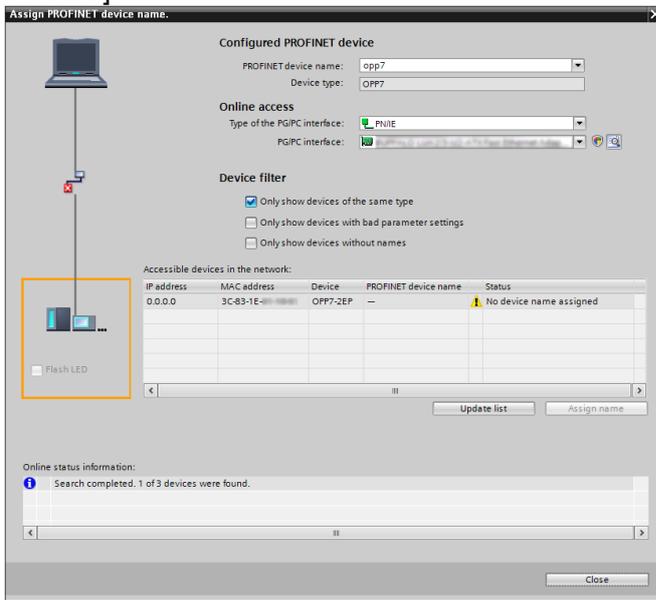
3.2.2 Software setting

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.

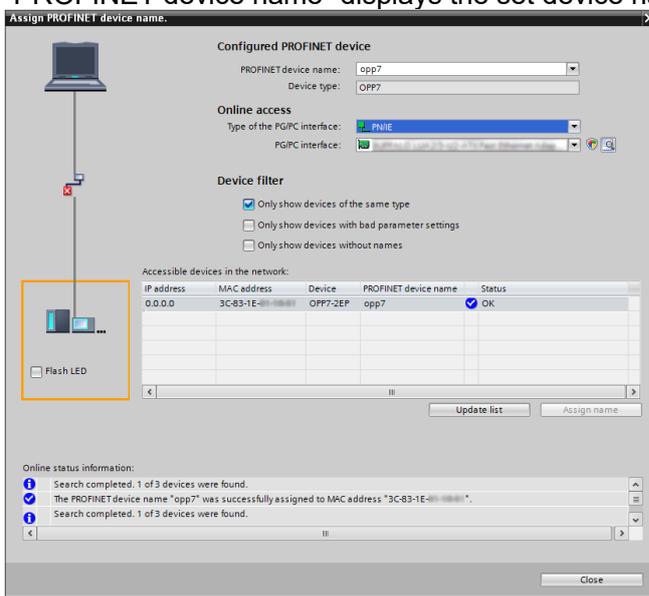
Select the device displayed in [Network view], right click and select [Assign device name]. Find the target product from MAC address, Device, etc. displayed in [Accessible devices in the network].



* 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.

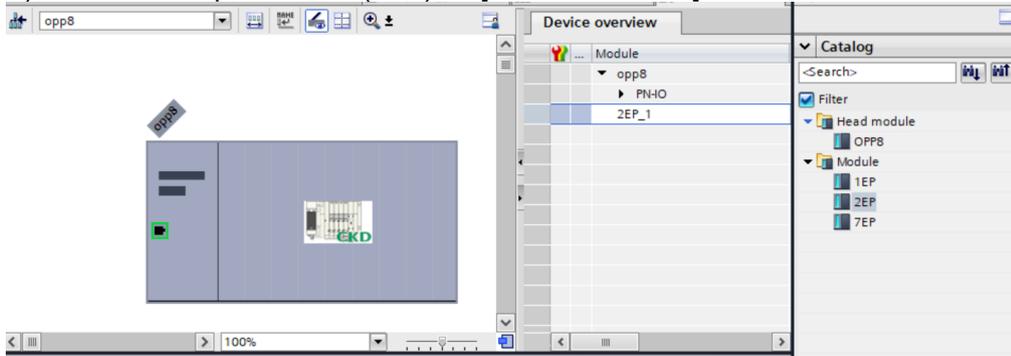


3.3 Output module parameter setting

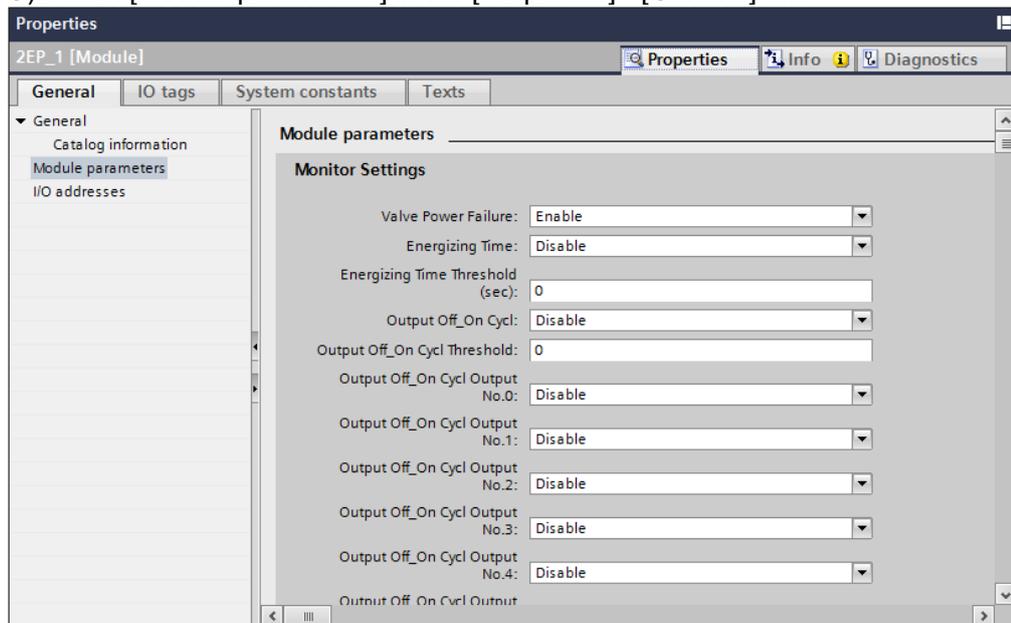
Sets Enable/ Disable the monitoring function and the output value processing at communication error.

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 (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	Meaning
	Enable	Executes monitor. (initial value)
	Disable	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	Meaning
	Enable	Executes monitor.
	Disable	Does not monitor. (initial value)
	Threshold (Energizing Time Threshold)	
	Setting range	unit
	0 to 4,294,967,295	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)

Description	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.	
Setting	Selects Individual setting / Disable	
	Value	Meaning
	Individual settings	According to the settings.
	Disable	Does not monitor all output points. (initial value)
	Individual setting (Output Off_On Cycl Output No.0 to No.x) (16 output points: x=15, 32 output points: x=31)	
	Value	Meaning
	Enable	Executes monitor.
	Disable	Does not monitor. (initial value)
	Threshold (Output Off_On Cycl Threshold)	
	Setting range	unit
	0 to 4,294,967,295	Counts
Subject of notice	Threshold-exceeded output ON count (Over threshold Output Off_On Cycles)	
Remarks	The output ON count stops counting at the maximum count (4,294,967,295 seconds).	

* 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)

(32 output points: x=31)

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

3.4 MRP (Media Redundancy Protocol) function

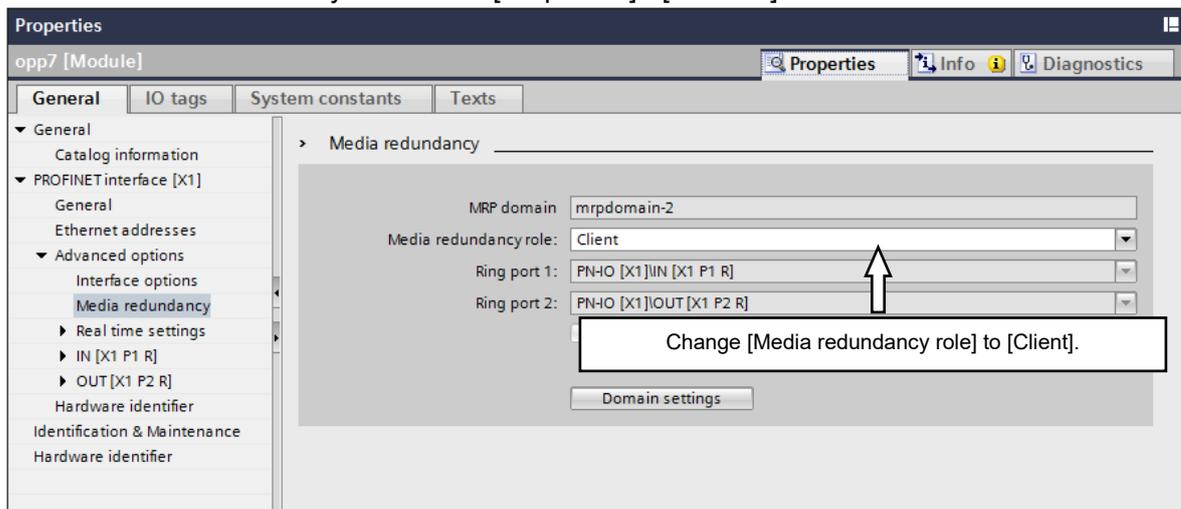
This device supports the MRP function (client).

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.

< OPP8-A2EP / OPP8-A2EP-P (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
ST 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

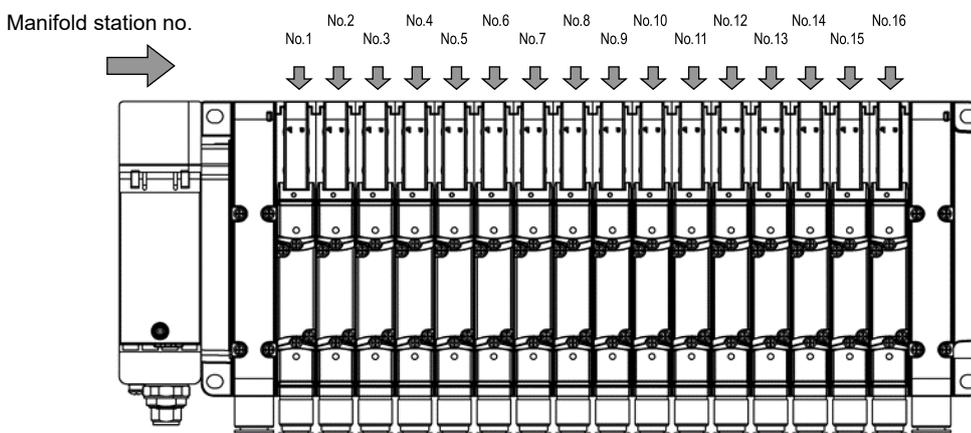
In the table below, each valve number (Valve no.) consists of a number (the station number) and an alphabet (a for a-side solenoid and b for b-side solenoid). For example, “1a” refers to 1st station a-side solenoid. Also, “V” stands for “Vacant”.

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.

< OPP8-A2EP / OPP8-A2EP-P >

The figure below is an example of mounting sixteen stations of double-solenoid type manifold valves.



Standard wiring (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	12b	13a	(V)	14a	14b	15a	15b	16a	(V)

Single solenoid, Double solenoid layout specification

- 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	(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	2a	3a	3b	4a	4b	5a	6a	7a	7b	8a	9a	10a	10b	11a	11b	12a	13a	14a	14b	15a	15b	16a	(V)								

3.6 Programming

3.6.1 I/O mapping

The controller unit handles this product as a device (OPP8-A2EP-* 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 are the starting numbers of the Q address and I address set in STEP7

For the capture below, a = 2

Module	Rack	Slot	I address	Q address	Type	Article no.
opp8	0	0			OPP8	OPP8
PN-IO	0	0 X1			opp8	
IN	0	0 X1 P1			IN	
OUT	0	0 X1 P2			OUT	
2EP_1	0	1		2...5	2EP	2EP

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	-	Returns 'CKD' (character string).
1002	2	Vendor ID	-	Returns 0x0357.
1003	15	Product Name	-	Returns product name (character string).
1004	2	Hardware version	-	Returns the hardware version.
1005	4	Software version	-	Returns the software version.
1006	4	Model name code	-	Returns the model name code.
1007	4	Serial no.	-	Returns the serial number.
1008	1	IP address setting status	-	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	-	Returns the currently used IP address, subnet mask, or gateway.
1010	4	Subnet mask	-	
1011	4	Gateway	-	
1012	4	SW IP address	-	Returns the IP address, subnet mask, or gateway stored in the device.
1013	4	SW subnet mask	-	
1014	4	SW gateway	-	
1015	1	(For other models)	-	
1016	1	(For other models)	-	Returns 0x00.
1017	6	MAC address	-	Returns the MAC address.
1018	6	MAC address IN	-	
1019	6	MAC address OUT	-	
1020	4	Energizing time	-	Returns the energizing time (seconds).
1021	1	Number of output points	-	Returns the number of output points.
1022	1	-	-	Reserve
1023	1	Output type	-	Returns the output type. 0x00: +COM 0x01: -COM
1024	240	Device name	-	Returns the device name (character string).
1025	1	Maintenance notice	-	Returns the monitoring status. (0x00: No notification 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	-	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	-	Returns the threshold of energizing time.

Index	Size (byte)	Item	Config. *1:	Meaning
1028	4	Output ON count maintenance threshold	-	Returns the threshold of the output ON count.
1029	4	-	-	Reserve
1030	1	Valve power	-	Returns the valve power status. 0x00: Valve power OFF 0x01: Valve power ON

* The energization time stops counting at the maximum count (4,294,967,295 seconds).

Note 1: "Y" stands for "Yes" and "N" stands for "No"

B) For each output number

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

Index *	Size (byte)	Item	Config. *1:	Meaning
2001	1	Cyclic output value	-	Returns the 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 valid/invalid selecting status. 0x00: Disabled, Cyclic output (initial value) 0x01: Enabled, Forced output
2004	1	Output settings in the event of a communication error (hold/user-set value)	-	Returns the 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	-	Returns the output value when the output value at communication error is set to the forced output. 0x00: OFF 0x01: ON
2006	-	Unused	-	* An access error will occur.
2007	1	Output ON count excess notification	-	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)	-	Returns the monitoring settings of the output ON count. 0x00: Disable, Not monitored 0x01: Enable, Monitoring
2009	4	Output ON count	Y	Output ON count.

* The above index is for output No.0.

Note 1: "Y" stands for "Yes" and "N" stands for "No"

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

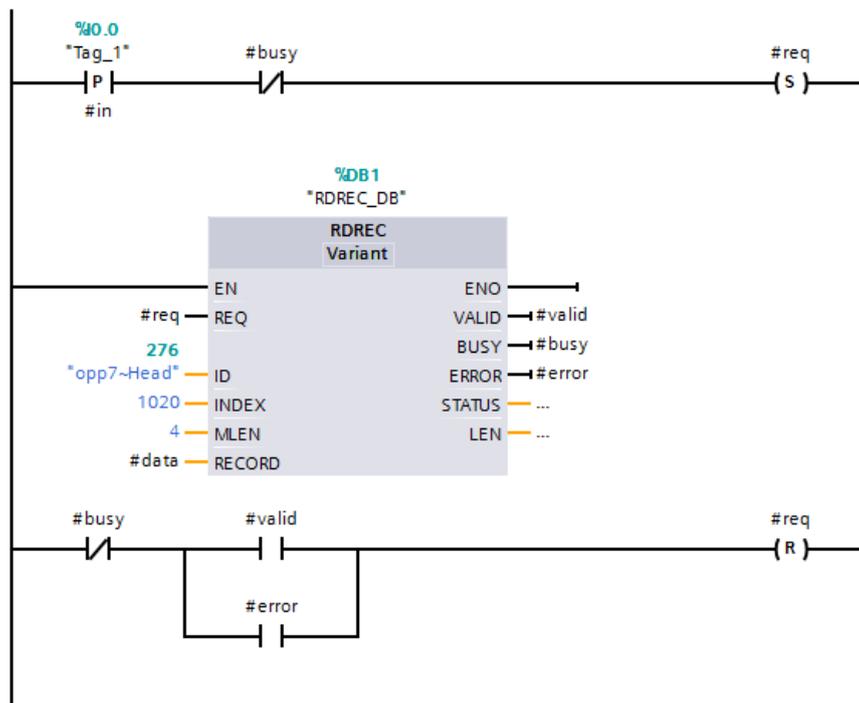
Item	Output no.							
	0	1	-	15	16	-	30	31
Cyclic output value	2001	2011	-	2151	2161	-	2301	2311
Forced output value	2002	2012	-	2152	2162	-	2302	2312
Forced output (enable/disable)	2003	2013	-	2153	2163	-	2303	2313
Output settings in the event of a communication error (hold/user-set value)	2004	2014	-	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

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 [ID].
 - * 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 and simulated input settings will be canceled when the product is powered off or communication with the controller unit is disconnected. When the power is turned on again or communication is restored, cyclic data is output and the signal from the input module will be notified to the controller unit.

■ 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 indicating 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 27 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 unit 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	Hexagonal wrench
	Is the power cable connector fully inserted?	No looseness	Visual inspection
	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 made to specify which action to take on the output in the event of 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.

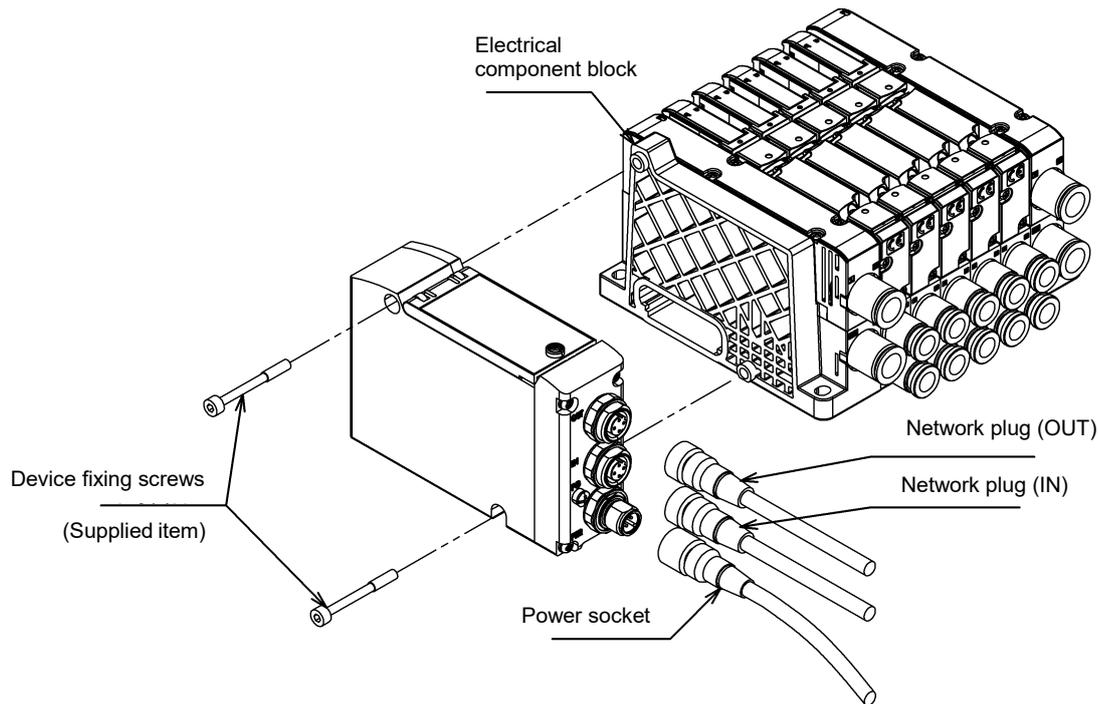
A cable disconnection or damage may occur.

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 the power socket.
- 4 Remove the device fixing screws.
- 5 Hold and pull out the product slowly.



4.2.2 Mounting the product (device)

- 1 Set the device name of the product.
- 2 Hold the product and insert it slowly by matching the connectors on the electrical component block and the side of the device.
- 3 Check that the product and the electrical component block are properly connected, and tighten the device fixing screws firmly.
(Appropriate tightening torque: 1.2 N·m)
- 4 Turn off the power (for unit/valve) and connect the network plug and power socket.
The system may start operating suddenly if the plug and socket are connected while the power is turned on.
Be careful of the surroundings and secure safety before connecting the connectors.
Network plug: Reference tightening torque 0.6 N·m
(Since the torque varies depending on the plug, confirm the plug manufacturer for appropriate torque.)
Power socket: Reference tightening torque 0.45 N·m
(Since the torque varies depending on the socket, confirm the socket manufacturer for appropriate torque.)
- 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) LED 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: L/A IN, L/A 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 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.