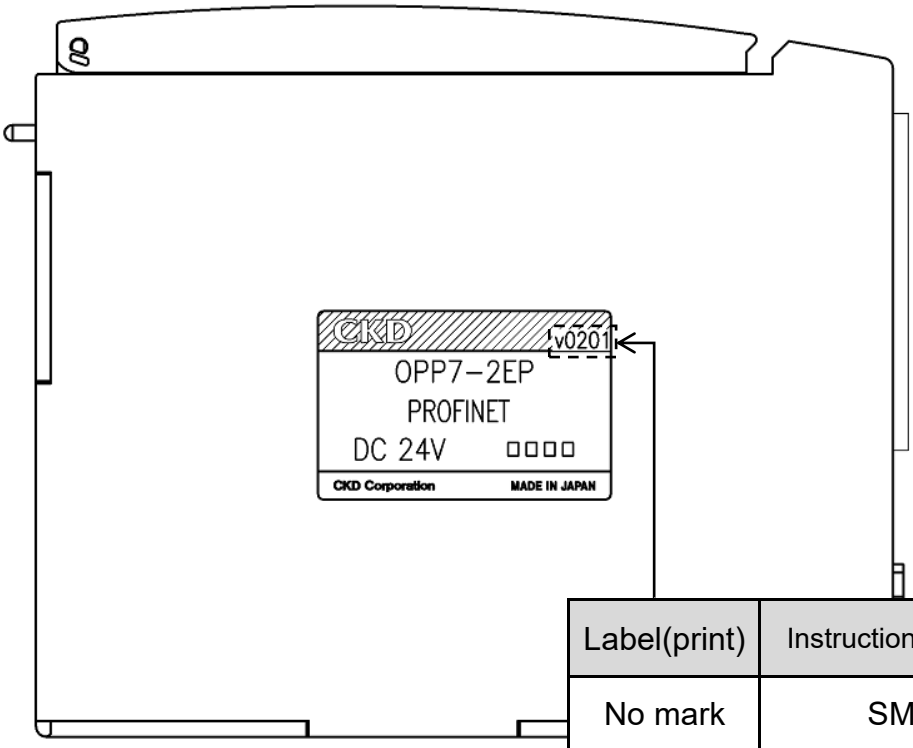
How to check the Instruction Manual to be read

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

SM-P00133-A

Instruction Manual

Block Manifold
MW4G Series

Serial Transmission Type
N4G*R-T8EP**
(4GR-OPP7-*EP-*)

【PROFINET Compatible】

- Please read this instruction manual thoroughly before using the product.
- In particular, carefully read the contents related to safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

CKD Corporation

Safety precautions

When designing and manufacturing devices using CKD products, the manufacturer is obligated to ensure that the safety of the mechanism, pneumatic control circuit and/or fluid control circuit and the system that runs the electrical controls are secured.

It is important to select, use, handle and maintain CKD products appropriately to ensure their safe usage.

Observe warnings and precautions to ensure device safety.

Check that device safety is ensured, and manufacture a safe device.

⚠ WARNING

1. This product is designed and manufactured as a general industrial machine part.
   It must be handled by an operator having sufficient knowledge and experience.

2. Use this product in accordance with specifications.
   This product must be used within its stated specifications.
   In addition, do not modify or additionally machine this product.
   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.
   (Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid dangers in the event of problems.)

   (1) Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
   (2) Use for applications where life or assets could be significantly affected, and special safety measures are required.

3. Observe organization standards and regulations, etc., related to the safety of the device design and control, and such.
   ISO4414, JIS B 8370 (General rules for pneumatic systems)
   JFPS2008 (Principles for pneumatic cylinder selection and use)
   Including the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.

4. Do not handle, pipe, or remove devices before confirming safety.
   (1) Inspect and service the machine and devices after confirming safety of the entire system related to this product.
   (2) Note that there may be hot or charged sections even after operation is stopped.
   (3) Turn off the energy source (air supply or fluid supply), and turn off power to the facility, when inspecting or servicing the device. Discharge any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
   (4) Make sure to secure system safety, such as pop-out prevention measures, when starting or restarting a machine or device that incorporates pneumatic components,.

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

Precautions are ranked as “DANGER”, “WARNING”, and “CAUTION” in this section.

DANGER: In the case where the product operation is mishandled and/or when the urgency of a dangerous situation is high, it may lead to fatalities or serious injuries.

WARNING: A dangerous situation may occur if handling is mistaken, leading to fatal or serious injuries.

CAUTION: A dangerous situation may occur if handling is mistaken, leading to minor injuries or property damage.

Note that some items indicated with "CAUTION" may lead to serious results depending on the conditions.
All items contain important information and must be observed.

Limited warranty and disclaimer

- Warranty period
  This warranty is valid for one (1) year after delivery to the customer’s designated site.

- Scope of warranty
  In case any defect clearly attributable to CKD is found during the warranty period, CKD shall, at its own discretion, repair the defect or replace the relevant product in whole or in part and at no cost, according to its own judgment.
  Note that the following failures are excluded from the warranty scope:

  (1) Failures due to use outside the conditions and environments set forth in the catalog or these specifications.
  (2) Failures resulting from factors other than this product
  (3) Failures caused by improper use of the product.
  (4) Failures resulting from modifications or repairs made without CKD consent.
  (5) Failures caused by matters that could not be predicted with the technologies in practice when the product was delivered.
  (6) Failures resulting from natural disasters or accidents for which CKD is not liable.

  The warranty covers the actual delivered product, as a single unit, and does not cover any damages resulting from losses induced by malfunctions in the delivered product.

- Compatibility check
  The customer is responsible for confirming the compatibility of CKD products with the customer’s systems, machines and equipment.

⚠ WARNING

- If the product is used under conditions that are different from the specified conditions or for a special application, consult CKD before utilizing the product.
- Before performing maintenance, turn off the power, cut off the compressed air supply, and make sure there is no residual pressure.
- Before increasing or decreasing the number of stations (valves) on the manifold, turn off the power and release pressure.
- Before disassembling or assembling the manifold, read this instruction manual carefully with full understanding of its content.
- Before performing electrical wiring, read this manual carefully and with full understanding of its content.

⚠ CAUTION

- Regularly perform daily and periodic inspections to correctly maintain product performance.
- Confirm working voltage and polarity before wiring and turning on the power.
- Do not touch the electrical wiring connections (exposed live parts); as there is a risk of electric shock. During wiring, keep the power off. Also, do not touch these live parts with wet hands.
- Before using the serial transmission slave unit, read the manual for the applicable communication system carefully with full understanding of its content.
- System components such as valves and cylinders could malfunction if the serial transmission slave unit address setting is incorrect. Always check the address setting before starting use.
- This product does not meet the surge immunity requirements specified in EN61000-4-5 for CE marking. Please provide appropriate protective measures on the device side.
- The valve status light may flicker momentarily when the valve power of the slave unit is turned on (i.e., when the power voltage starts to rise). However, this will not cause the valve itself to turn ON or OFF.

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N4G*R-T8EP**

Serial Transmission Type

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Issued on Sep.2019

1. PRODUCT

1.1 General outline of the system

1.1.1 N4G*R-T8EP**

This is a PROFINET device for N4G connecting to PROFINET which is one of the industrial Ethernet standards. The N4G*R-T8EP** slave unit has the following features:

(1) It is connected to the PLC with only an Ethernet cable, allowing a significant reduction of man-hours in wiring.

(2) The built-in 2-port switch makes it easy to configure line topology.

(3) Unit power and Valve power of the slave unit are separated, ensuring easy maintenance work.

(4) The slave unit is a slot-in structure and is fixed with just one screw, allowing reduction in maintenance man-hours.

(5) The slave unit is available in +COM or -COM specification and 16 or 32 output points, allowing for use in a wide variety of applications.

1.1.2 PROFINET

PROFINET is an open industrial Ethernet standard for industrial automation advocated by PROFIBUS & PROFINET International (PI). PROFINET is based on industrial Ethernet and uses TCP/IP and IT related standards.

PROFINET enables engineering over different vendors and integrates seamlessly with existing fieldbus applications.

For more information on PROFINET, please refer the website run by PI (www.profinet.com).

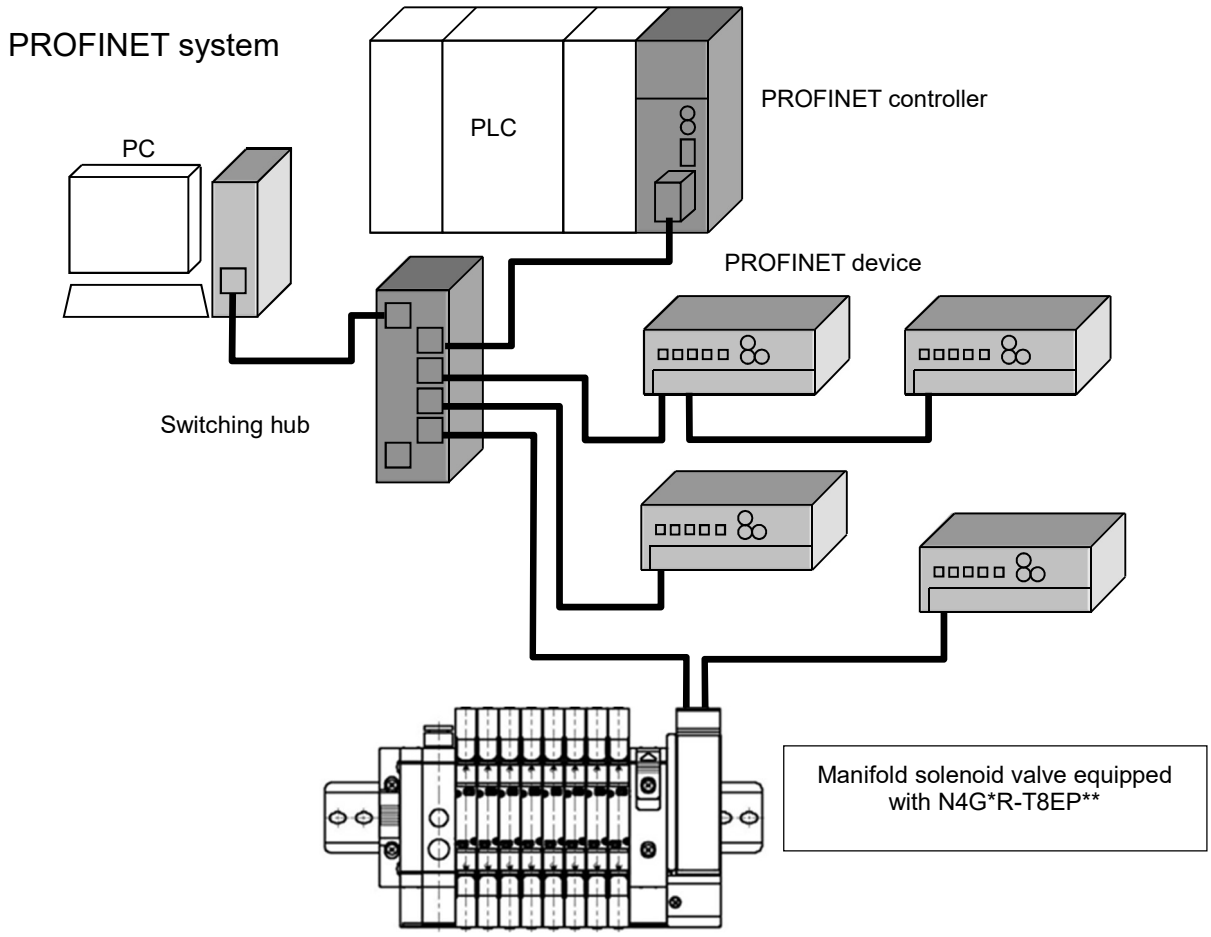
1.2 System structure

This system mainly consists of PLC (PROFINET controller), N4G*R-T8EP** solenoid valve and peripheral devices.

1.2.1 Example of PLC

Manufacturer	Product series
Siemens AG	S7-1200
	S7-1500

1.2.2 Example of basic structure of the system



1.3 Specifications

1.3.1 Communication specifications

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

CAUTION

- Upon selecting the network cable, consider the ambient conditions such as noise and temperature. Also, note that the maximum length of the cable between devices varies depending on the cable used.

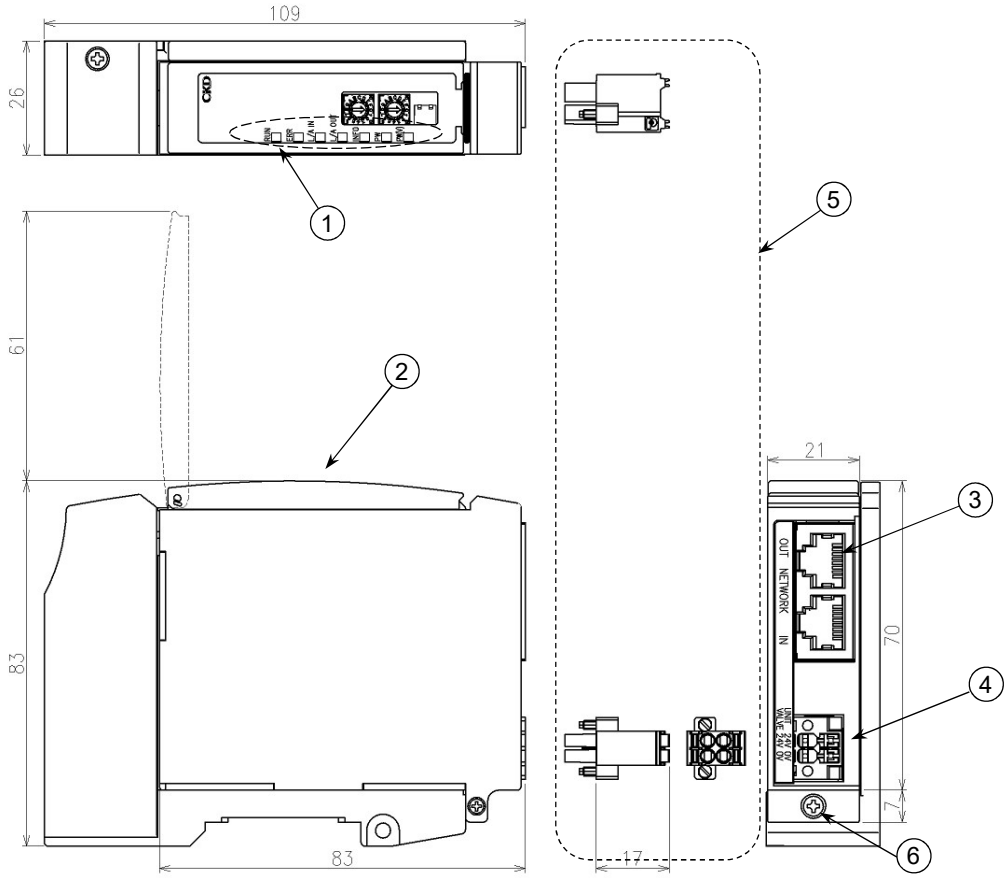
1.3.2 Slave unit specifications

Always operate this slave unit within its product specifications.

Item		Specifications			
Manifold Model No.		-T8EP1	-T8EP2	-T8EPP1	-T8EPP2
Slave unit		OPP7-1EP	OPP7-2EP	OPP7-1EP-P	OPP7-2EP-P
Unit power supply voltage		21.6 VDC to 26.4 VDC (24 VDC±10%)			
Unit power current consumption		130 mA or less (at 24.0 VDC with all points ON)			
Valve power supply voltage		22.8 VDC to 26.4 VDC (24 VDC+10%, -5%)			
Valve power current consumption		15 mA or less (all points OFF) 40 mA or less (with no load and all points ON)			
Output type		+COM（NPN）		-COM (PNP)	
Number of output points		16 points	32 points	16 points	32 points
Insulation resistance		30 MΩ or more with 500 VDC between external terminals and case			
Withstand voltage		500 VAC for 1 minute between external terminals and case			
Noise immunity		500 Vp-p pulse duration 1μsec			
Shock resistance		294.0 m/s^2 in 3 directions, 3 times each			
Storage 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）			
Ambient atmosphere		No corrosive gas			
Communication protocol		PROFINET			
Baud rate		100 Mbps			
Communication method		Full duplex			
PROFINET connector		RJ45 8-pin modular connector			
Output insulation type		Photocoupler insulation			
Maximum load current		40 mA/ 1 point			
Leakage current		0.1 mA or less			
Residual voltage		0.5 V or less			
Fuse rating		Valve power: 24 V, 3 A/ Unit power: 24 V, 2 A （both fuses are not replaceable）			
Status indicator		LED (communication status, unit power and valve power statuses*1)			
Degree of protection		IP20			
Vibration resistance	Durability	10 Hz to 150 Hz to 10 Hz, 1 octave/min., 15 sweeps each in X, Y, Z directions at half-amplitude of 0.75 mm or 98.0 m/s^2, whichever is smaller.			
	Malfunction	10 Hz to 150 Hz to 10 Hz, 1 octave/min., 4 sweeps each in X, Y, Z directions at half-amplitude of 0.5 mm or 68.6 m/s^2, whichever is smaller.			

*1. Status can be monitored when Unit power is supplied with specified voltage.

1.4 Parts of the Slave Unit



① Status monitoring lights
Indicate slave unit status and network status by LEDs.

② Cover
Protects the status monitoring lights(LEDs) and the switches.

③ Network connector socket (RJ45 × 2 ports [IN, OUT]) (Network connector plug is not supplied.)
IN: I/O port for PROFINET communication
OUT: I/O port for PROFINET communication
(There is no functional difference between IN and OUT ports.)

④ Unit/valve power socket
Connects the unit/valve power plug (included in the unit).

⑤ Unit/valve power plug (included in the unit).
Connects the unit/valve power cables (24 V).

⑥ Slave unit mounting screw (M2.5 Taptite)
Secures the slave unit to the slave unit connecting block.

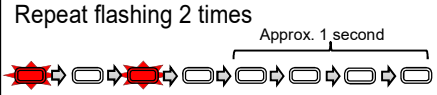
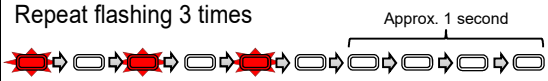
1.5 LED indicators

CAUTION ● Discharge static electricity that has built up on your body before touching the slave unit. Otherwise, static electricity may damage this product.

These LEDs indicate slave unit status and network status.
See table below for their descriptions.

Switch	Function	Status	
PW	Indicates slave unit power status	Off	Unit power OFF
		Green on	Unit power ON
PW (V)	Indicates valve power status	Off	Valve power OFF
		Green on	Valve power ON
RUN	Indicates slave unit operating status	Off	Not communicating
		Green on	In communication
		Green flashing	Preparing for communication
		Green flashing special 2	Forced output setting in progress
ERR	Indicates slave unit communication status	Off	Normal
		Red flashing	Cyclic data receive timeout
		Red flashing special 1	Received data disable
INFO	Indicates slave unit status	Off	Normal
		Red on	EEPROM error
		Red flashing	Receives participation test signal
		The other	Internal circuit board error
L/A IN	Indicates Ethernet port status IN side	Off	No link, no data transfer
		Green on	Link established, no data transfer
		Green flashing	Link established, in transferring data
L/A OUT	Indicates Ethernet port status OUT side	Off	No link, no data transfer
		Green on	Link established, no data transfer
		Green flashing	Link established, in transferring data

Special flashing pattern (repeats the pattern described)

Item	Flashing pattern (ON: ■ OFF: □)
Special 1	Repeat flashing 2 times 
Special 2	Repeat flashing 3 times 

2. PRECAUTIONS

- To correspond with the requirements of the relevant EC Directive, use AC/DC adapter (e.g., switching power supplies) complying with EMC standards for the valve and slave unit power supplies.
- Before turning the power on or off, ensure the safety of the surroundings as the components in the system, including the valve (cylinder), may move unexpectedly.
- Refer to the user's manual provided for the PROFINET controller concerning the communication delay time. The transmission delay within the entire system depends on the scan time achieved by the PLC and on other devices included in the system.
- Refer to the valve specification for the response time as it varies by the model of solenoid valve.
- Solenoid valve off time is delayed by approximately 20 msec due to the surge absorbing circuit integrated in the slave unit.
- Make sure the power cables and network cables are connected according to the specifications to avoid any incorrect wiring.
- Do not subject the power cables and network cables to tension and impact.
- Make sure that all cables and connectors are connected firmly before turning the power on.
- Never attempt to disassemble, modify, or repair the slave unit. Doing so may result in failure or malfunction of the slave unit.
- Many precision devices are mounted inside the slave unit. Do not drop the slave unit nor apply vibration or impact to the unit.
- Do not connect or disconnect any connector while the power is being supplied. Doing so may result in failure or malfunction.
- Mold and rust may develop on the product if it is exposed to high humidity during transportation. Include moisture absorbers and tightly seal the package.
- Install the slave unit at least 200 mm away from high-voltage cables and power lines, or lay the high-voltage cables and power lines in metal tubing and ground it.

3. OPERATION

3.1 Configuration

The functions of PROFINET devices are described in the GSD file. The configuration tool understands the device functions and provides the necessary settings by installing GSD file.

This section describes the configuration using STEP7 V13 manufactured by Siemens AG as a configuration tool.

3.1.1 GSD file

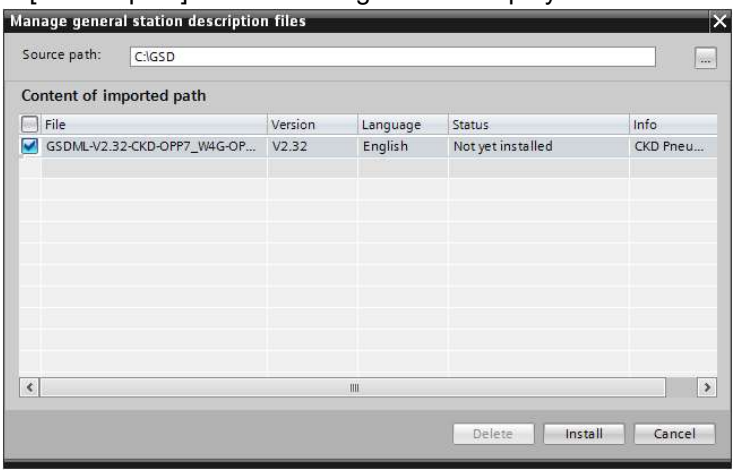
Please contact us for information on obtaining GSD files.

3.1.2 GSD file installation

Install the GSD file in the configuration tool.

a) Select [Options-Manage general station description files (GSD)].

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

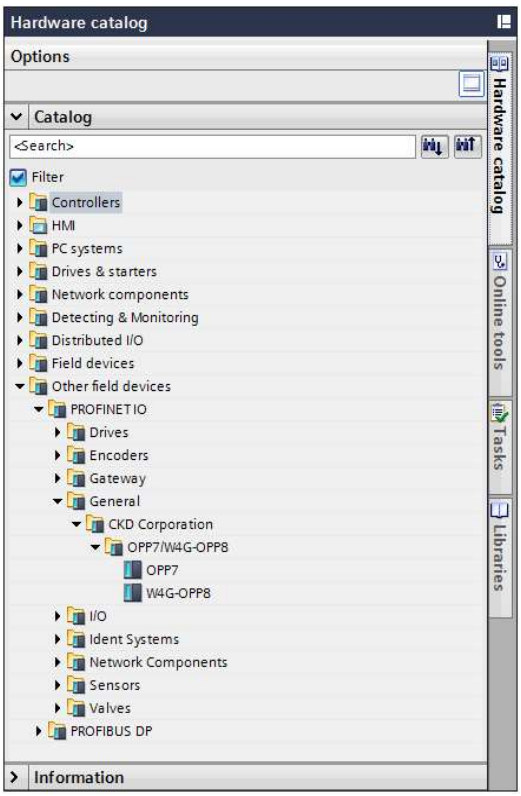


3.1.3 Device registration

Register this slave unit in the project. On registering, please prepare what describes model number of the slave unit. The label on the side of the unit also describes the model number.

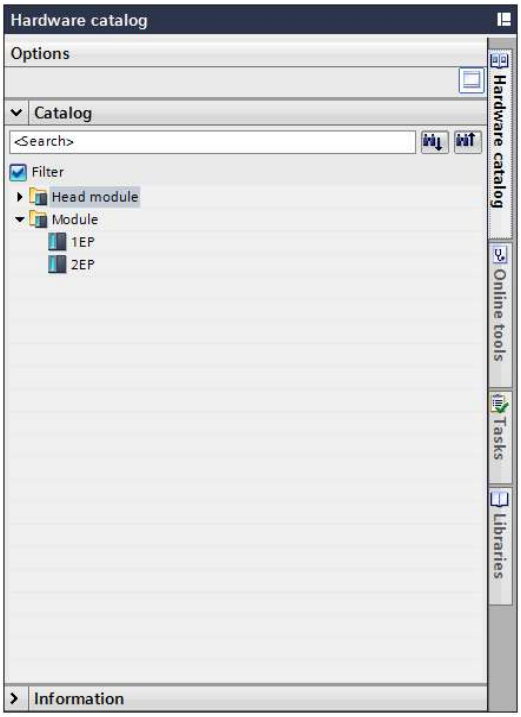
a) Double-click [OPP7] in the [Hardware catalog].

Select [Other field devices] - [PROFINET IO] - [General] - [CKD Corporation] - [OPP7/W4G-OPP8]



b) Double-click [OPP7] displayed on [Network view] to display the [Device view].

c) Select the output module from [Hardware catalog] again.



Select the same output module as the actual slave unit. Selecting different output module from the actual slave unit will prevent the unit from communicating with other devices properly.

3.1.4 Device name setting

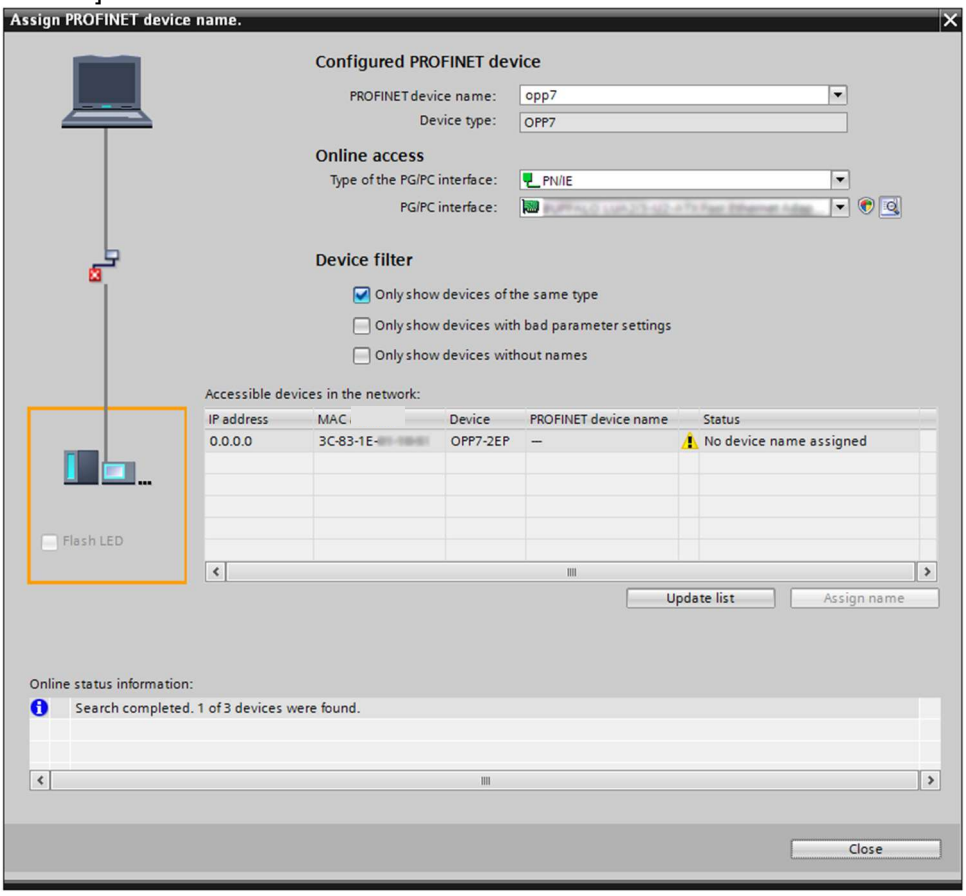
Each device needs to be configured with a unique name for PROFINET connection.

Example shows S7-1214C manufactured by Siemens AG being registered in the project and connected with the slave unit as a PROFINET controller.

Note that the set device name uses the default value automatically assigned by the configuration tool. Check the configuration tool manual for setting the device name by yourself.

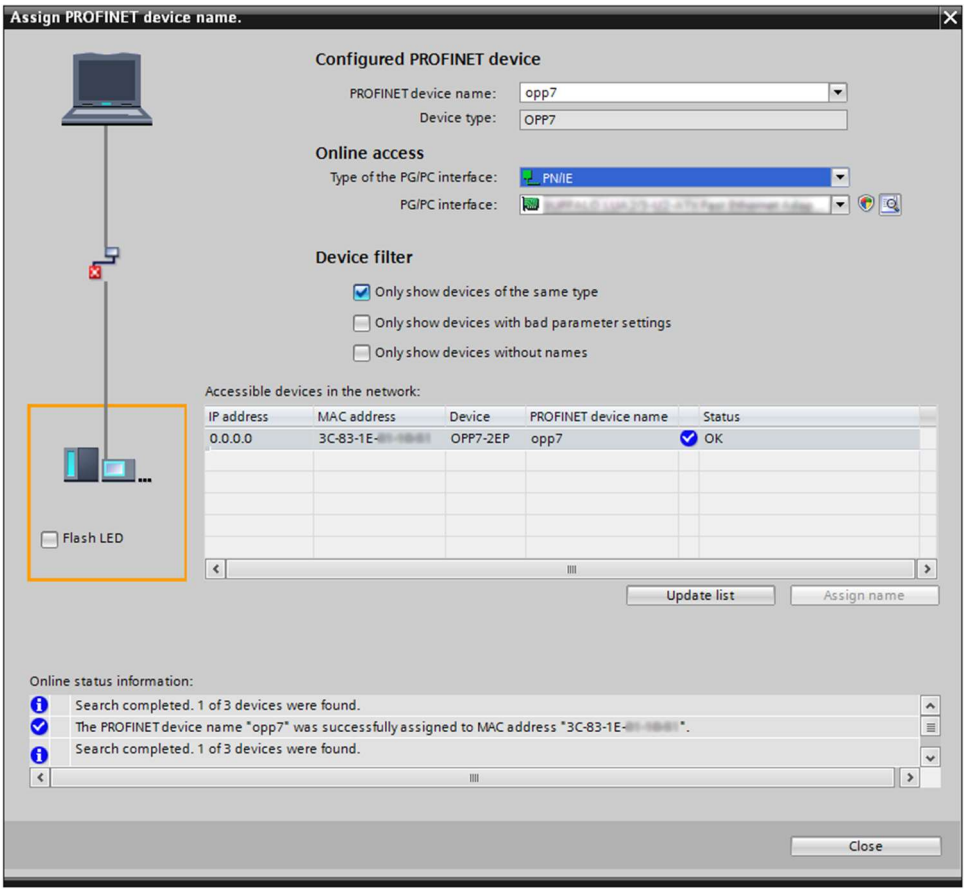
a) Select OPP7 displayed in [Network view], right click and select [Assign device name].

b) Find the target product from MAC address, Device, etc. displayed in [Accessible devices in the network].



Note: In case the target unit was not found, check that the network is configured correctly.

c) Select the target slave unit and execute [Assign name].
The setting is complete when [Status] becomes [OK]. [PROFINET device name] displays the set device name.

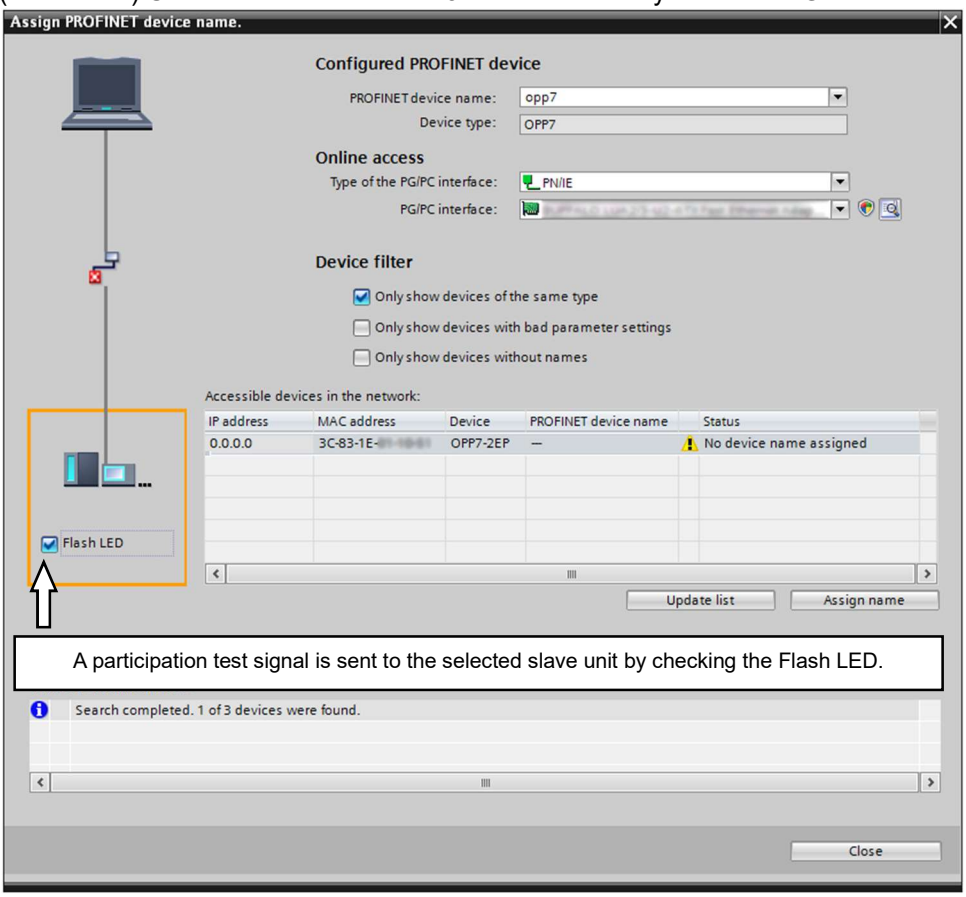


・Flash LED

The INFO LED flashes several times when a participation test signal is received from the configuration tool and such. This function enables to find the desired slave unit.

Refer to the configuration tool manual for the transmission method of participation test signal.

(Reference) Use case with STEP7 V13 manufactured by Siemens AG

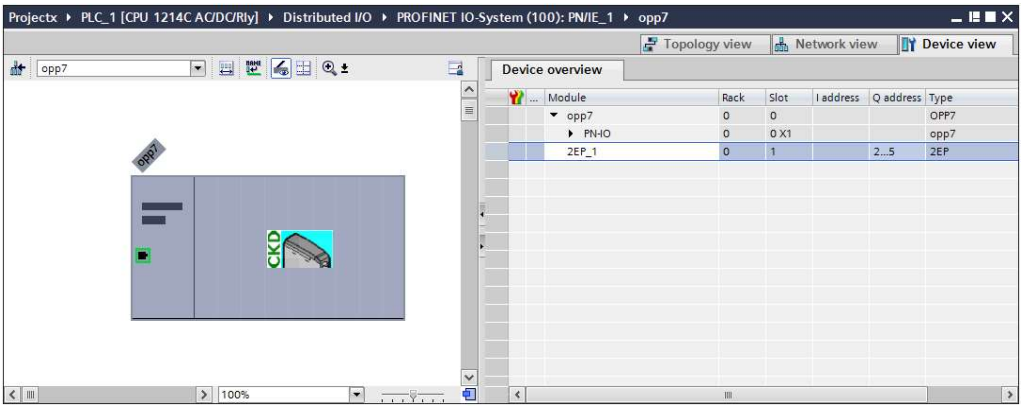


3.1.5 Output module parameter setting

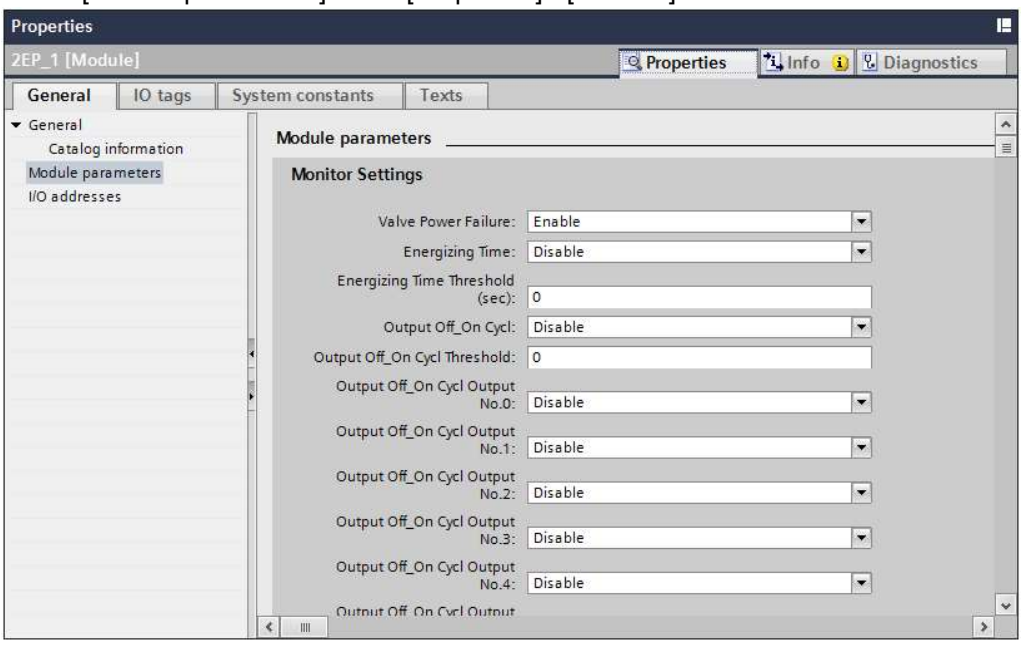
Sets Enable/Disable the monitoring function and the output value processing at communication error.

a) Double-click OPP7 displayed on [Network view] to display the [Device view].

b) Select the output module (1EP, 2EP) in [Device overview].



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



d) Set the necessary parameters.

The parameters are stored in the PROFINET controller.

Refer to the configuration tool manual for how to save (download) parameters to the PROFINET controller.

Note: Refer to the chapter 3.2 3.2 Parameters for parameter details.

3.2 Parameters

Several parameters are available for monitoring and setting this slave unit. Set according to the intended use.

3.2.1 Monitor (Monitor settings)

Monitors the slave unit status and notifies an alarm to the PROFINET controller when an error occurs.

a) Valve Power (Valve Power Failure)

Function	Monitors the valve power. Notifies an alarm to the PROFINET controller when the valve voltage drops.
Settings	Selects Enable/ Disable. Value: Enable — Contents: Executes monitoring. (initial value) Value: Disable — Contents: Does not monitor.
Subject of notice	Undervoltage

b) Energizing time

Function	Monitors the slave unit energizing time. Notifies an alarm to the PROFINET controller when the energizing time exceeds the threshold.
Settings	Selects Enable/ Disable. Value: Enable — Contents: Executes monitoring. Value: Disable — Contents: Does not monitor. (initial value) Threshold (Energizing Time Threshold) Setting range: 0 to 4,294,967,295 — unit: Second
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 count (Output Off_On Cycl)

Function	Monitors the output count for each output number. Notifies an alarm to the PROFINET controller when output count exceeds the threshold with any output number.
Settings	Selects Individual setting / Disable Value: Individual settings — According to the settings. Value: Disable — Does not monitor any output point. (initial value) Individual setting (Output Off_On Cycl Output No.0 to No.x) (Output 16 points: x = 15, Output 32 points: x = 31) Value: Enable — Executes monitoring. Value: Disable — Does not monitor. (initial value) Threshold (Output Off_On Cycl Threshold) Setting range: 0 to 4,294,967,295 — unit: Counts
Subject of notice	Threshold-exceeded output count (Over threshold output Off_On Cycles)
Remarks	The output count stops counting at the maximum count (4,294,967,295 seconds).

Note: The output count can be rewritten to any value. Refer to chapter 3.6.

3.2.2 Output

Sets output in the event of communication error.

Note that a communication error describes the physical disconnection, such as a LAN cable disconnection, or when the PROFINET controller is not in a normal state, such as STOP state.

a) Output setting in the event of communication error (Communication Error Output No.0 to No.x) (Output 16 points: x = 15, Output 32 points: x = 31)

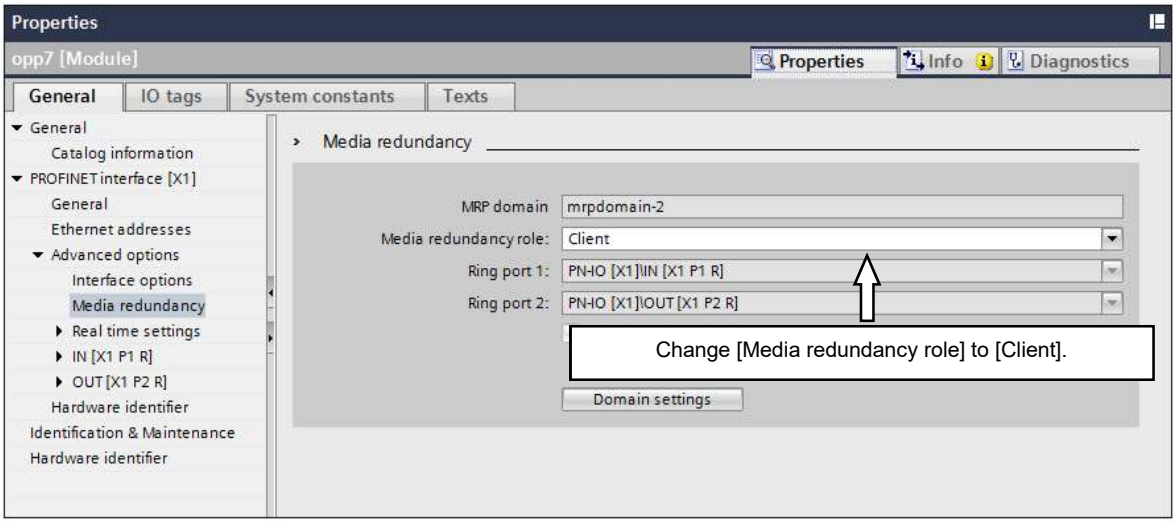
Function	Sets output in the event of communication error.
Settings	Selects output value Value: Forced Off — Turn off the output. (initial value) Value: Forced On — Turn on the output. Value: Holding output value (Last Valid Value) — Holds the previous output value before the error occured.

3.3 MRP (Media Redundancy Protocol) function

This slave unit 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 such device for detail.

(Reference) MRP client setting of this unit in STEP7 V13 manufactured by Siemens AG



3.4 Correspondence between the slave unit output No. and PLC address No.

3.4.1 PLC address correspondence table

Tables below describe the correspondence using PLC manufactured by Siemens AG as a representative example.

◆ N4G*R-T8EP*1 (16 output points)

PLC address No.	Output Bit 00 to 15															
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Slave unit 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

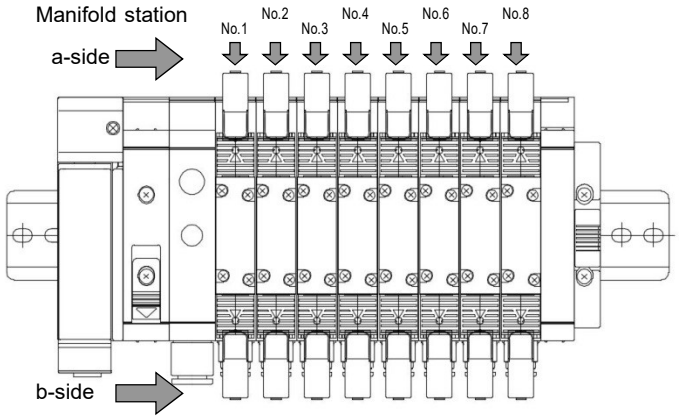
◆ N4G*R-T8EP*2 (32 output points)

PLC address No.	Output Bit 00 to 15																Output Bit 16 to 31															
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Slave unit 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

3.4.2 Examples of valve No. assignments corresponding to the slave unit T8EP* solenoid output No.

In the table below, the valve No. consists of a number and an alphabetic character indicate the station number and the side (a or b side) of solenoid. For example, “1a” refers to 1st station a-side solenoid. Also, “V” stands for “vacant”. Manifold stations are numbered from left side facing toward piping port. Appearance and maximum station number depends on solenoid model.

◆ ◆ N4G*R-T8EP*1 (16 output points)



The figure on the left is an example of manifold when 8 stations of double-solenoid type valve are mounted.
There is no solenoid on the b-side for single-solenoid type.

[Standard wiring]

· When all valves mounted on the manifold are single solenoids:

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

·When all valves mounted on the manifold are double solenoids:

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

·When both single and double solenoid valves are mounted on the manifold (an example is shown above)

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	9a	10a	10b	11a	11b

[Double wiring]

· When all valves mounted on the manifold are single solenoids:

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)

·When all valves mounted on the manifold are double solenoids:

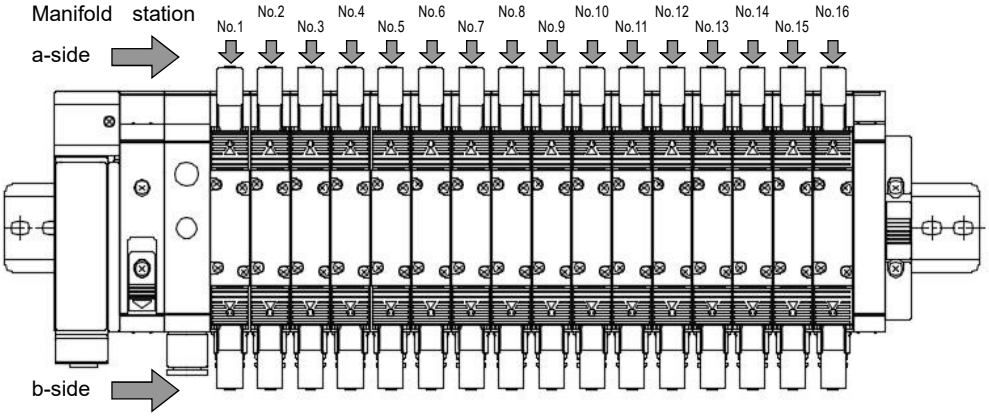
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve no.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b

·When both single and double solenoid valves are mounted on the manifold (an example is shown above)

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)

◆ ◆ N4G*R-T8EP*2 (32 output points)

The figure below is an example of manifold when 16 stations of double-solenoid type valve are mounted. For single-solenoid types, there is no solenoid on the b-side.



[Standard wiring]

· When all valves mounted on the manifold are single solenoids:

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

·When all valves mounted on the manifold are double solenoids:

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

·When both single and double solenoid valves are mounted on the manifold (an example is shown above)

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									

[Double wiring]

· When all valves mounted on the manifold are single solenoids:

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)

·When all valves mounted on the manifold are double solenoids:

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

·When both single and double solenoid valves are mounted on the manifold (an example is shown above)

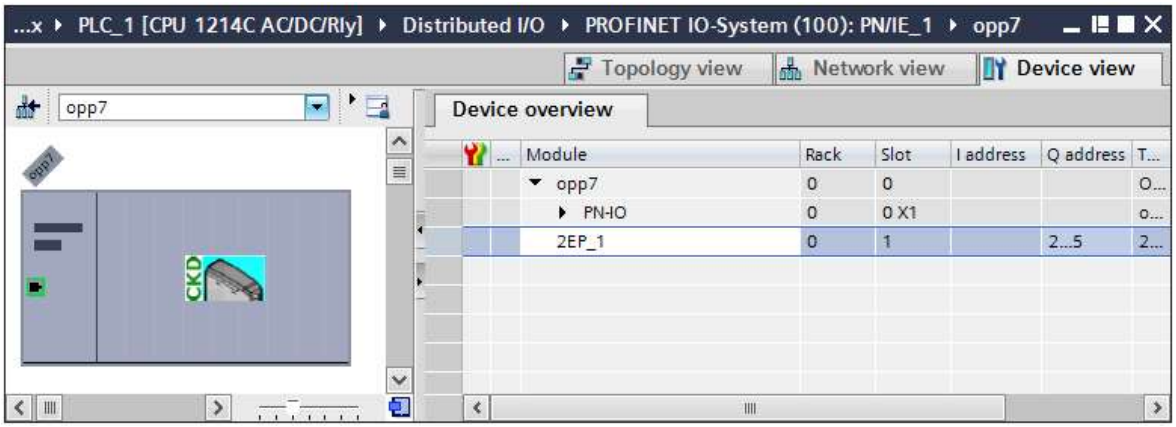
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve no.	1a	(V)	2a	(V)	3a	3b	4a	4b	5a	(V)	6a	(V)	7a	7b	8a	(V)	9a	(V)	10a	(V)	11a	11b	12a	12b	13a	(V)	14a	(V)	15a	15b	16a	(V)

3.5 Programming

This slave unit is treated as a PROFINET device and receives the output signal from the PROFINET controller to operate the valve.

Refer to the PROFINET controller manual when designing a program.

(Reference) I/O mapping in STEP7 V13 manufactured by Siemens AG



The mapping is as follows for the above case:

I/O mapping

	Output No.							
	31	30	29	28	27	26	25	24
Bit	Q5.7	Q5.6	Q5.5	Q5.4	Q5.3	Q5.2	Q5.1	Q5.0
1byte	QB5							

	Output No.							
	23	22	21	20	19	18	17	16
Bit	Q4.7	Q4.6	Q4.5	Q4.4	Q4.3	Q4.2	Q4.1	Q4.0
1 byte	QB4							

	Output No.							
	15	14	13	12	11	10	9	8
Bit	Q3.7	Q3.6	Q3.5	Q3.4	Q3.3	Q3.2	Q3.1	Q3.0
1 byte	QB3							

	Output No.							
	7	6	5	4	3	2	1	0
Bit	Q2.7	Q2.6	Q2.5	Q2.4	Q2.3	Q2.2	Q2.1	Q2.0
1 byte	QB2							

	Output No.																													
	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8	23	22	21	20	19	18	17	16	31	30	29	28	27	26	25	24
1 byte	QB2								QB3								QB4								QB5							
2 bytes	QW2																QW4															
4 bytes	QD2																															

3.6 Acyclic data access

Various types of data is stored in this slave unit. Acyclic data access from the PROFINET controller enables to refer (read) the data. Also, value setting (write) is available for some data. Do not operate value setting (write) to the indexes with which setting is not available. The operation will not be guaranteed in case of such setting.

3.6.1 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	Configurability *1	Contents
1001	4	Vendor name	D	Returns 'CKD' (character string).
1002	2	Vendor ID	D	Returns 0x0357.
1003	15	Product name	D	Returns product name (character string).
1004	2	Hardware version	D	Returns hard ware version.
1005	4	Software version	D	Returns software version.
1006	4	Item Code	D	Indicates item code.
1007	4	Serial No.	D	Returns the serial number.
1008	1	IP address setting status	D	Return the setting status of currently used IP address. 0x00: Use the value stored in the slave unit. 0x01: Use the value notified from the PROFINET controller.
1009	4	IP address	D	Returns the current IP address, subnet mask, and gateway.
1010	4	Subnet mask	D	
1011	4	Gateway	D	
1012	4	SW IP address	D	Returns the IP address, subnet mask, and gateway stored in the slave unit.
1013	4	SW subnet mask	D	
1014	4	SW gateway	D	
1015	1	(For other models)	D	Returns 0x00.
1016	1	(For other models)	D	Returns 0x00.
1017	6	MAC address	D	Returns the MAC address.
1018	6	MAC address IN	D	
1019	6	MAC address OUT	D	
1020	4	Energizing time	D	Returns the energizing time (seconds).
1021	1	Number of output points	D	Returns the number of output points.
1022	1	(For other models)	D	Returns 0x00.
1023	1	Output type	D	Returns the output type. 0x00: +COM 0x01: -COM
1024	240	Device name	D	Returns the device name (character string).
1025	1	Maintenance monitor	D	Returns the monitoring status. (1: Notifying the PROFINET controller, 0: None) Bit0: Valve power Bit1: (No definition) Bit2: (No definition) Bit3: Energizing time Bit4: (No definition) Bit5: (No definition) Bit6: (No definition) Bit7: Output count

Index	Size (byte)	Item	Configurability *1	Contents
1026	1	Maintenance settings	D	Returns the monitoring status. (1: Monitoring, 0: None) Bit0: Valve power Bit1: (No definition) Bit2: (No definition) Bit3: Energizing time Bit4: (No definition) Bit5: (No definition) Bit6: (No definition) Bit7: Output count
1027	4	Energizing time maintenance threshold	D	Returns the threshold of energizing time.
1028	4	Output count maintenance threshold	D	Returns the threshold of the output count.
1029	4	(For other models)	D	* An access error will occur.
1030	1	Valve power	D	Returns the valve power status. 0x00: Valve power OFF 0x01: Valve power ON
1031	1	(For other models)	D	* An access error will occur.
1032	1	(For other models)	D	* An access error will occur.

Note: The energizing time stops counting at the maximum count (4,294,967,295 seconds).

*1: "D" stands for Disable and "E" stands for Enable

b) For each output number

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

Index offset	Item	Output No.							
		0	1	to	15	16	to	30	31
1	Cyclic output data	2001	2011	to	2151	2161	to	2301	2311
2	Forced output data	2002	2012	to	2152	2162	to	2302	2312
3	Forced output setting	2003	2013	to	2153	2163	to	2303	2313
4	Output setting in the event of communication error	2004	2014	to	2154	2164	to	2304	2314
5	Value setting in the event of communication error.	2005	2015	to	2155	2165	to	2305	2315
6	(For other models)	2006	2016	to	2156	2166	to	2306	2316
7	Output count maintenance monitor	2007	2017	to	2157	2167	to	2307	2317
8	Output count maintenance setting	2008	2018	to	2158	2168	to	2308	2318
9	Output count	2009	2019	to	2159	2169	to	2309	2319
10	(For other models)	2010	2020	to	2160	2170	to	2310	2320

Note1: Available setting is output No. 0 to No. 15 for output 16 points, and output No. 0 to No. 31 for output 32 points.

Note2: The output count stops counting at the maximum count (4,294,967,295 seconds).

Index offset	Size (byte)	Item	Configurability *1	Contents
1	1	Cyclic output data	D	Returns the output data received from the PROFINET controller. 0x00: OFF 0x01: ON
2	1	Forced output data	E	Returns the output data when the output setting is configured as forced output. 0x00: OFF (initial value) 0x01: ON
3	1	Forced output setting	E	Returns the selected state of the output. 0x00: Cyclic output (initial value) 0x01: Forced output
4	1	Output setting in the event of communication error	D	Returns the selected state of the output in the event of communication error. 0x00: Value setting in the event of communication error. 0x01: Holding the previous output value before the error.
5	1	Value setting in the event of communication error.	D	Returns the output value when the value setting is selected for output in the event of communication error. 0x00: OFF 0x01: ON
6	1	(For other models)	D	An access error will occur.
7	1	Output count maintenance monitor	D	Returns the monitoring state of output count. 0x00: No notification 0x01: Notifying the PROFINET controller
8	1	Output count maintenance setting	D	Returns the monitoring setting of output count. 0x00: No monitoring 0x01: Monitoring
9	4	Output count	E	Returns the output count.
10	4	(For other models)	D	An access error will occur.

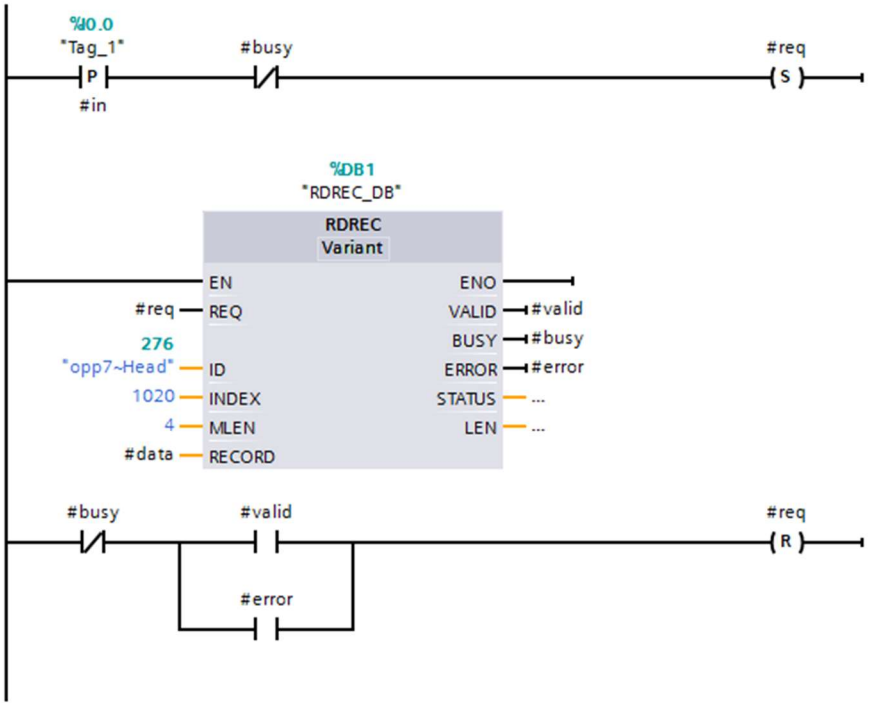
*1: "D" stands for Disable and "E" stands for Enable

3.6.2 Reference program

This program performs acyclic data access with ladder logic.

Refer to the following values:

Index	Size(byte)	Item
1020	4	Energizing time



<Circuit Detail>
1. Executing input 0.0 makes [req] effective.
2. Acquire the data [INDEX: 1020] for [ID: 276] with [RDREC].
3. Process is complete if either [VALID] or [ERROR] is returned.
4. The acquired contents are stored in [data] when [VALID] is returned.

Note 1: [ID] of [RDREC] varies depending on the project. Change the [ID] to the target device.
Note 2: As input chattering is not considered, add mask time if needed.

Note 3: Correct parameters by changing [RDREC] to [WRREC] for setting (write).

Refer to the PROFINET controller manual for details.

3.7 Forced output

Forced output setting enables to change the output data without changing the main program of the PROFINET controller. Forced output setting can be set for each output number.

The forced output setting is disabled when the connection with the PROFINET controller is erroneous. (It outputs according to the [Communication Error Output] setting in the event of communication error.)

CAUTION
- The forced output setting is cleared then the forced output is canceled when this unit is powered off or communication with the PROFINET controller is disconnected. The output data from PROFINET controller is output as is if the communication restored or the unit is powered on for the next time.

Changing the setting to forced output setting makes the RUN LED indicate the green flashing special 2. Refer to chapter 1.5 LED Indicators.

3.7.1 Settings

Writing acyclic data to the needed output No. enables to set the forced output.
Refer to the chapter 3.6 Acyclic data access for writing acyclic data and other setting details.

The value set in the forced output data becomes the output data to the valve when the output setting is configured to forced output.

No.	Index		Remarks
	Forced output data (OFF/ON)	Output setting (Cyclic output / Forced output)	
Output No.0	2002	2003	
Output No.1	2012	2013	
Output No.2	2022	2023	
Output No.3	2032	2033	
Output No.4	2042	2043	
Output No.5	2052	2053	
Output No.6	2062	2063	
Output No.7	2072	2073	
Output No.8	2082	2083	
Output No.9	2092	2093	
Output No.10	2102	2103	
Output No.11	2112	2113	
Output No.12	2122	2123	
Output No.13	2132	2133	
Output No.14	2142	2143	
Output No.15	2152	2153	
Output No.16	2162	2163	
Output No.17	2172	2173	
Output No.18	2182	2183	
Output No.19	2192	2193	
Output No.20	2202	2203	
Output No.21	2212	2213	
Output No.22	2222	2223	
Output No.23	2232	2233	
Output No.24	2242	2243	
Output No.25	2252	2253	
Output No.26	2262	2263	
Output No.27	2272	2273	
Output No.28	2282	2283	
Output No.29	2292	2293	
Output No.30	2302	2303	

No.	Index		Remarks
	Forced output data (OFF/ON)	Output setting (Cyclic output / Forced output)	
Output No.31	2312	2313	

Available access is No.0 to No.15 for 16 outputs, and No.0 to No.31 for 32 outputs.
An access error will occur for the other.

3.8 I & M data

This slave unit supports I & M 0 to 3.

Refer to the PROFINET controller manual for details on how to review and set from the PROFINET controller.

4. INSTALLATION

The network cables and power cables must be connected to the N4G*R-T8EP** to function.
Incorrect connection causes not only malfunctions but in some cases, critical transmission damage to this slave unit as well as other related devices.
Read this instruction manual and the user's manuals of the PLC and other devices for correct connections before use.

CAUTION

- Discharge static electricity that has built up on your body by touching a grounded metal object before handling the PROFINET device. Otherwise, static electricity may damage this product.
- Do not touch the electrical wiring connections (exposed live parts); as there is a risk of electric shock. During wiring, keep the power off. Also, do not touch these live parts with wet hands.
- Do not subject the power cables and network cables to tension and impact. Long cables can exert unexpected momentum and impact due to its weight, and this can consequently damage the connectors and devices. Take preventative measures such as securing the cables part way along its length to reduce inertia.
- To prevent noise problems, keep the following in mind when wiring:
  (1) If noise is likely to have an influence, make efforts to provide a separate power supply for each manifold solenoid valve and wire them independently.
  (2) Do not make the power cables needlessly long, but wire them with the shortest possible lengths.
  (3) Do not share power with noise generating devices such as inverters and motors.
  (4) Do not lay the power cables, network cables, and other power lines parallel to each other.
  (5) Be sure to connect the shielding of the network cable to equipotential bonding close to the slave unit.
- Make sure the power cables and network cables are connected according to the specifications to avoid any incorrect wiring. Incorrect wiring can cause the slave unit to malfunction or to be damaged.
- Make sure that all cables and connectors are connected firmly before turning the power on.

4.1 Connecting and wiring to the network connector socket

Network connector plug is not included in this unit. Purchase a network connector plug separately that meets the specifications.Network cable can be wired by connecting it to the network connector plug then the plug to the network connector socket on the slave unit.

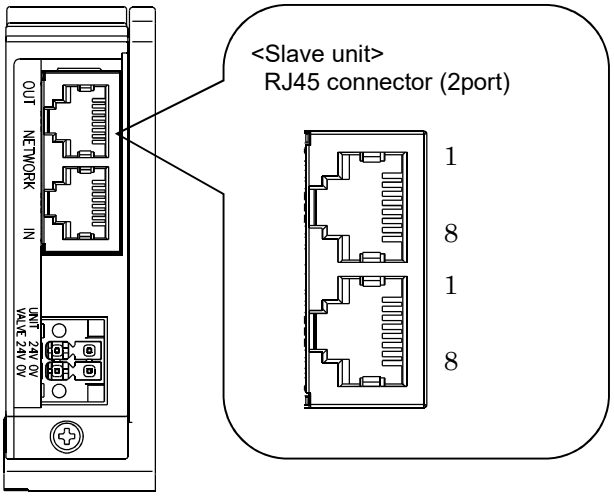
<Recommended cable with plug [Cat.5e]>
PNET/B-S-*** □ Industrial Ethernet cable (double shielded) Manufactured by JMACS
***: strip length, □: unit, M = meter, C = centimeter

<Recommended assembly type RJ45 connector [Cat.6]>
09 45 151 1560 (RJ45 assembly type connector) Manufactured by HARTING
09 45 151 1561 (RJ45 assembly type connector (45 ° angled) Manufactured by HARTING

Connecting the network cable

Connect the network cable to the network connector plug according to the following instructions.

(1) After confirming safety, stop network communication and turn off all peripheral equipment.
(2) Refer to the figure below and wire the cable to the RJ45 plug.



Port	Pin	Signal	Function
IN/ OUT	1	TD+	Transmission data, plus
	2	TD-	Transmission data, minus
	3	RD+	Reception data, plus
	4	Not used	Not used
	5	Not used	Not used
	6	RD-	Reception data, minus
	7	Not used	Not used
	8	Not used	Not used

CAUTION
- Be sure to use PROFINET compliant cables for the network cable.
- Make sure that the network cable have a sufficient bending radius, and do not bend it forcibly.
- Keep the network cables away from the power cables and high-voltage lines.

4.2 Connecting and wiring to the Unit/Valve power plug

Valve power plug is included with this slave unit. Power can be wired by connecting the power cables for the valve as well as for the unit to the power plug then connecting them to the power socket on the slave unit.

<Unit power>
Power to operate the slave unit.
Prepare a 21.6 VDC to 26.4 VDC power with the least noise.

<Valve power>
Power to operate the solenoid valve which is a load on the system.
Prepare a 22.8 VDC to 26.4 VDC power with the least noise.

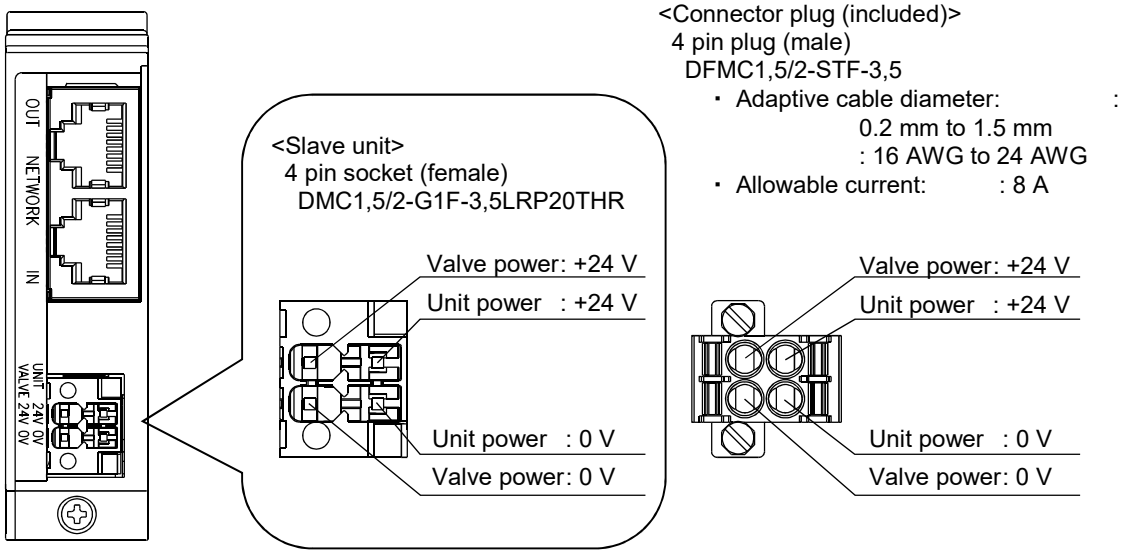
<Power plug (included)>
DFMC1,5/2-STF-3,5 (1790292) 4-pin connector Manufactured by Phoenix Contact

<Recommended ferrules and crimping tool>
Ferrule (without sleeve) : A0.5-10 to 1.5-10 Manufactured by Phoenix Contact
Ferrule (with sleeve) : AI0.25-10 to 0.75-10 Manufactured by Phoenix Contact
Crimping tool (in common) :CRIMPFOX6（1212034） Manufactured by Phoenix Contact

4.2.1 Connecting the power cables

Connect the Unit/Valve power cables to the power plug according to the following instructions.

(1) After confirming safety, power off the power supply connected to the slave unit.
(2) Attach a terminal such as a ferrule to the cables to be connected when needed.
(3) Connect the power cable's 24 V power line to the power plug's 24 V terminal and the 0 V power line to the 0 V terminal referring to the following figure.
(4) After connecting the power plug to the power socket, secure the flanges on the plug with adequate torque (0.25 N•m).



CAUTION

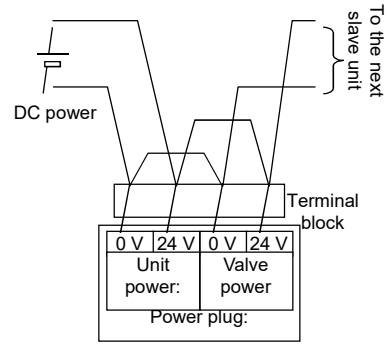
- Carefully check the polarity and rated voltage before making any connections.
- Calculate the current consumption before selecting the power cable.
- Keep in mind that a voltage drop may occur from powering multiple slave units from one power supply when selecting and wiring the cables.
- Secure the specified power supply voltage by taking countermeasures, such as wiring the power cables in multiple systems or installing other power supplies if a voltage drop cannot be avoided.
- Place the terminal block in front of the power plug and wire the power cables at the block, when daisy chain.

4.2.2 Wiring the power cable

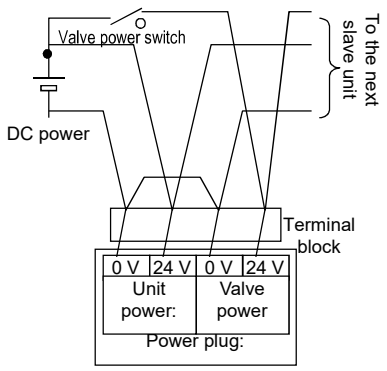
The following figures 1 to 3 are examples of the wiring to the power plug.

Configure any other circuit as needed.

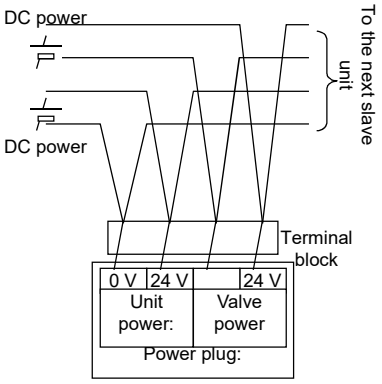
1. When the connection for unit and valve power are in common.



2. When turning on/off the valve power in addition to the example 1



3. When the valve and unit power are separated



5. MAINTENANCE

5.1 Removing the product (slave unit)

(1) After confirming safety, stop network communication and turn off all the peripheral devices as needed.

(2) After confirming safety, turn off the unit power and valve power as needed.
Note that powering off this unit will make all the downstream devices stop communicating due to no communication, if the communication is in daisy chain wiring and this product is an intermediate unit. (Except MPR equipment)

(3) Remove the slave unit's mounting screw. As a fall-prevention screw, stop loosening the screw as soon as it detaches from the slave unit connecting block.

(4) Hold the slave unit and remove by applying a lateral force.

(5) Remove the network connector plug and the power plug.

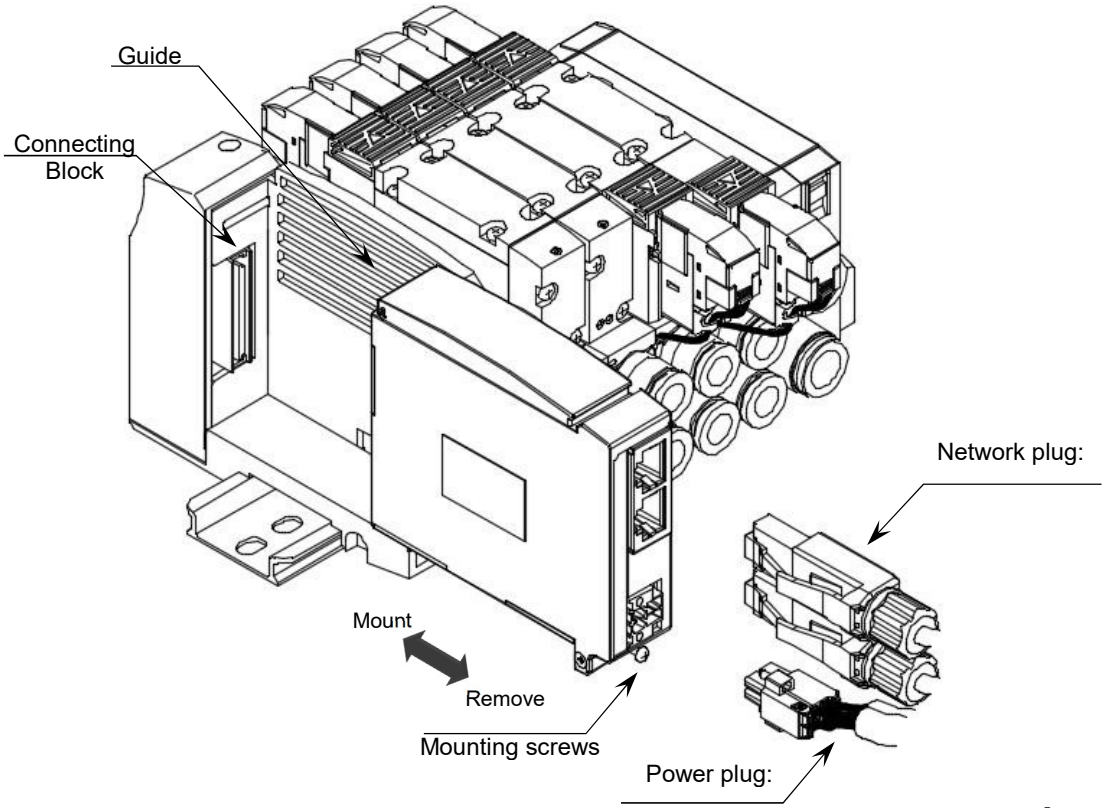
5.2 Mounting the product (slave unit)

(1) Connect the network connector plug and power plug with the power (of the unit/valve) being off.
Connecting the plugs while the power is turned on may cause the components in the system operate unexpectedly. Ensure the safety of the surroundings before starting.
Power plug: reference tightening torque 0.25 N·m

(2) Hold the slave unit and mount it along the guide of the connecting block slowly from the near side.

(3) Make sure that the slave unit and the connecting block are connected and tighten together with the mounting screw firmly.
(Proper tightening torque: 0.5 N·m)

(4) After confirming safety, turn on each power supply.
Note that powering on this product may cause the downstream devices sudden move by communicating to the network, if the communication is in daisy chain wiring.



[SM-P00133-A]

CAUTION

- Before turning the power on or off, ensure the safety of the surroundings as the components in the system, including the valve (cylinder), may move unexpectedly. Ensure the safety of the surroundings before starting.
- Check the device name of slave unit, IP address, the output setting at communication error, and such when power on the unit.
- Do not touch the electrical wiring connections (exposed live parts) as there is a risk of electric shock.
- Many precision devices are mounted inside the slave unit. Do not drop the slave unit nor apply vibration or impact to the unit.
- Do not connect or disconnect any connector plugs while the power is being supplied. Doing so may result in failure or malfunction.
- Do not remove the slave unit by pulling cable or connector that may result in device's damage or wire breakage.
- When removing the plug, make sure to loosen the plug mounting screw sufficiently. When inserting the plug, make sure to tighten the plug mounting screw firmly.

5.3 Troubleshooting

Troubleshooting needs to be conducted on the entire system and not just on a single unit. As the system may move unexpectedly depending on the communication status, be sure to exercise ample caution and ensure safety when conducting maintenance.

[Problem1] PW and PW (V): does not light up

- Unit power and valve power may not be turned on. Check the power cable status, if the cable is disconnected, and if the power supply voltage is within the specified range.
- A fuse blowout may have occurred in the unit. If the system does not recover after checking the system and restarting the product, replace the unit.

[Problem2] L/A IN, L/A OUT: does not light up

- The network cable may not be connected. Check if the network cable is securely inserted all the way, the network cable is not broken, a CAT.5 or higher network cable is used, the network is configured correctly, and if there is no source device or high-voltage/high-current cable is around this unit and the network cable.
- If the system does not recover after checking the system and restarting the product, replace the unit.

[Problem3] RUN LED: does not light up

- Communication with the PROFINET controller may not be started, or it may be disconnected after starting communication. Check if this product and the PROFINET controller are on the same network, whether a device using the same IP address is additionally connected, whether a device with the same device name is additionally connected, or setting value is correct when the setting of PROFINET controller was changed. Power off once and power on again after checking.

[Problem4] RUN LED: flashes

- Communication with the PROFINET controller may not be started. Check if this product and the PROFINET controller are on the same network, the PROFINET controller is set correctly, network is configured correctly, each devices are set correctly when using MRP. (Refer to the manual of each device for how to set MRP.)

(Configuration to be checked)

- ✧ Is the device name set in this product the same as that set in the PROFINET controller configuration?
- ✧ Is the same output module selected as the actual configuration of this product?
- ✧ Is the correct GSD file used?

[Problem5] ERR LED: flashes

- Communication with the PROFINET controller may be disconnected after starting communication. Check if this product and the PROFINET controller are on the same network, whether a device using the same IP address is additionally connected, whether a device with the same device name is additionally connected, or setting value is correct when the setting of PROFINET controller was changed.

[Problem6] ERR LED: flashes special 2 and RUN LED: flashes

- The output data received from the PROFINET controller is disabled. Check the PROFINET controller status.

  Note: With the output data sent from the PROFINET controller, the information which confirms if the output data is “enable” or not is sent together. If the information is “disable”, this will be indicated.

[Problem7] INFO LED: lights up

- The EEPROM error may have occurred.
  - If the product does not recover after restarting, replace the unit.
  - Despite of the following restrictions, operation is possible even If an EEPROM error occurs. However, use the product only for emergency operation until replacement as an unexpected error may have occurred with it.

    ① Setting the device name is needed each time the power is turned on.

    ② All the integrated values such as energizing time, output count, and input count are reset to “0” each time the power is turned on.

    ③ The I & M information is cleared each time the power is turned on.

    ④ Communication cannot be performed normally If there are multiple devices with an EEPROM error on the same network.

[Problem8] INFO LED: flashes

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

5.4 Maintenance of components

This section describes the daily maintenance of devices; such as methods of cleaning, inspection, and replacing the slave unit.

5.4.1 Cleaning

Clean the device periodically in the following manner to ensure its optimum state.

(1) For daily cleaning, wipe the device with a dry, soft cloth.
(2) If dirt remains even after wiping with a dry cloth, use a damp cloth with 2% diluted detergent that has been firmly wrung out.
(3) Rubber, vinyl, and tape products may stain the slave unit if they are left on for long periods of time. Remove such items during regular cleaning.

5.4.2 Inspection

Always perform periodic inspections to ensure that everything is in an optimum state.
Periodic inspections should be carried out at least once every 6 to 12 months.
However, for a slave unit used in environments subject to high temperatures, humidity and/or excessive dust, inspections should be carried out more frequently.

■ Inspection items

Inspect the following items to make sure that each item satisfies the criteria.
If the items deviate from the criteria, improve the ambient environment to fall within the criteria or adjust the slave unit itself.

Inspection items	Inspection details	Criteria	Inspection method
Environment	Are the ambient and in-panel temperatures suitable?	Refer to the specifications of the slave unit.	Thermometer
	Are the ambient and in-panel humidity suitable?	Refer to the specifications of the slave unit.	Hygrometer
	Is there any accumulated dust?	There should be no dust.	Visual inspection
Condition of installation	Is the slave unit fixed firmly?	There should be no looseness.	Hexagonal wrench
	Is the network cable connector fully inserted?	There should be no looseness.	Visual inspection
	Are there any damages to the connection cables?	There should be no external abnormalities.	Visual inspection

5.4.3 Replacing the slave unit

If any unit fails, immediately perform recovery work to prevent the entire network from being affected.
To restore Network function as soon as possible, it is recommended to keep spare units on hand for the replacement.

■ Inspection items

When replacing the unit after a periodic inspection has detected a problem, check if the new unit does not have any errors.