

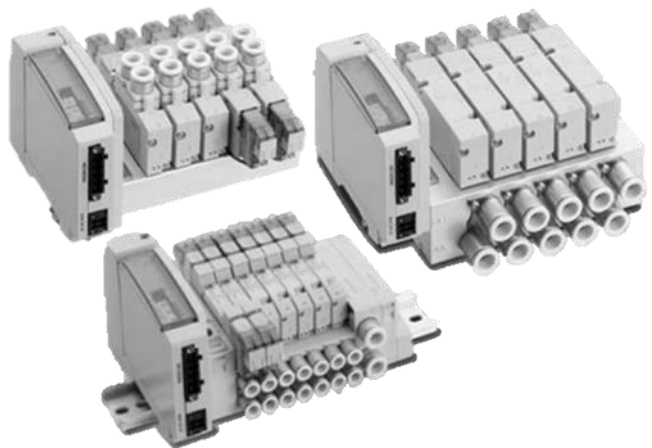
## Serial Transmission Slave Unit

4GR-OPP7-□EC-□  
(N4G□R-T8EC□□)

EtherCAT Compatible

## INSTRUCTION MANUAL

SM-P00073-A/2



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

# PREFACE

Thank you for purchasing CKD's **serial transmission slave unit**.

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 pneumatic or water control circuit, and the electric system that controls such mechanism is ensured.

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

ISO 4414, JIS B 8370, JFPS 2008 (the latest edition of each standard), the High Pressure Gas Safety Act, the 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".

 <b>DANGER</b>	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
 <b>WARNING</b>	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
 <b>CAUTION</b>	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.
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## 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.

- 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.

(Exception is 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.)

**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 mainly describes the slave unit (N4G□R-T8EC□□).

For master units and other slave units that are connected in the same system as the product, read the instruction manuals issued by each manufacturer.

For manifold solenoid valves, make sure to read both this Instruction Manual and the instruction manual for the solenoid valve to fully understand the functions and performance in order to use the valves correctly.

#### ■ N4G□R-T8EC□□

N4G□R-T8EC□□ is a slave unit for 4GR that can be connected to EtherCAT, an Ethernet open network system. Features include the following:

- The slave unit is connected to PLC with only a network 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 slave unit address can either be set by using a switch or by writing from the PLC.
- The slave unit is available in +COM or -COM specification and 16 or 32 output points, allowing it to be used in a wide variety of applications.
- The slave unit is a slot-in structure and is fixed with just one screw, allowing reduction in maintenance man-hours.

#### ■ EtherCAT

EtherCAT is a network that uses EtherCAT Slave Controller to send and receive data at a high speed. This network enables super-high speed communication that differs from conventional Ethernet communication.

EtherCAT specifications have been standardized in several international standards (IEC 61158, IEC 61784, IEC 61800, and ISO 15745) and in a SEMI standard (E54.20). The EtherCAT Technology Group keeps EtherCAT technology open, allowing all users to use the EtherCAT technology.

EtherCAT is a patented technology and registered trademark licensed by Beckhoff Automation GmbH & Co. KG, Germany.

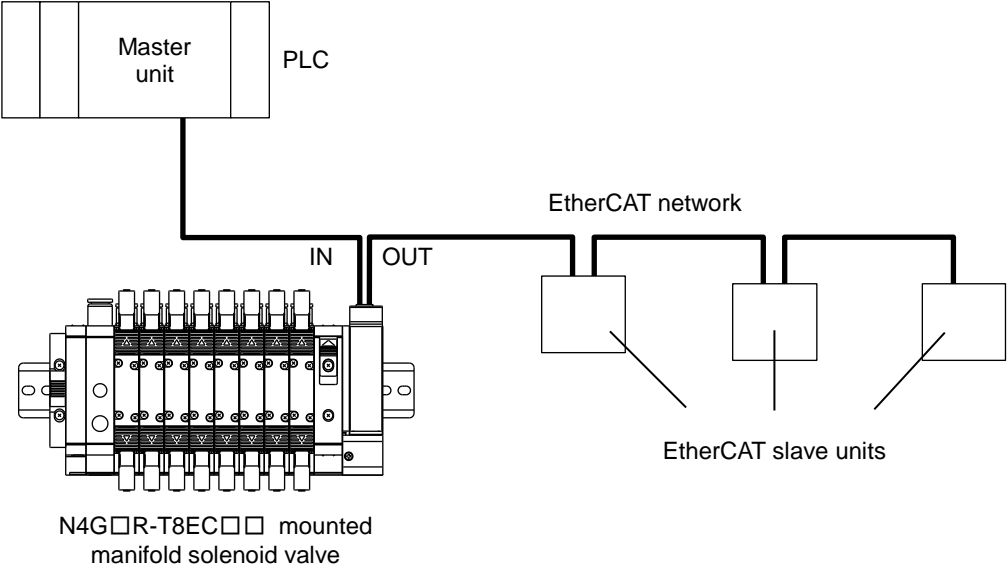
1.1.2 System structure

This system mainly consists of a PLC, master unit, N4G□R-T8EC□□ mounted manifold solenoid valve, and peripheral equipment (EtherCAT slave units).

Examples of PLC and master unit combination

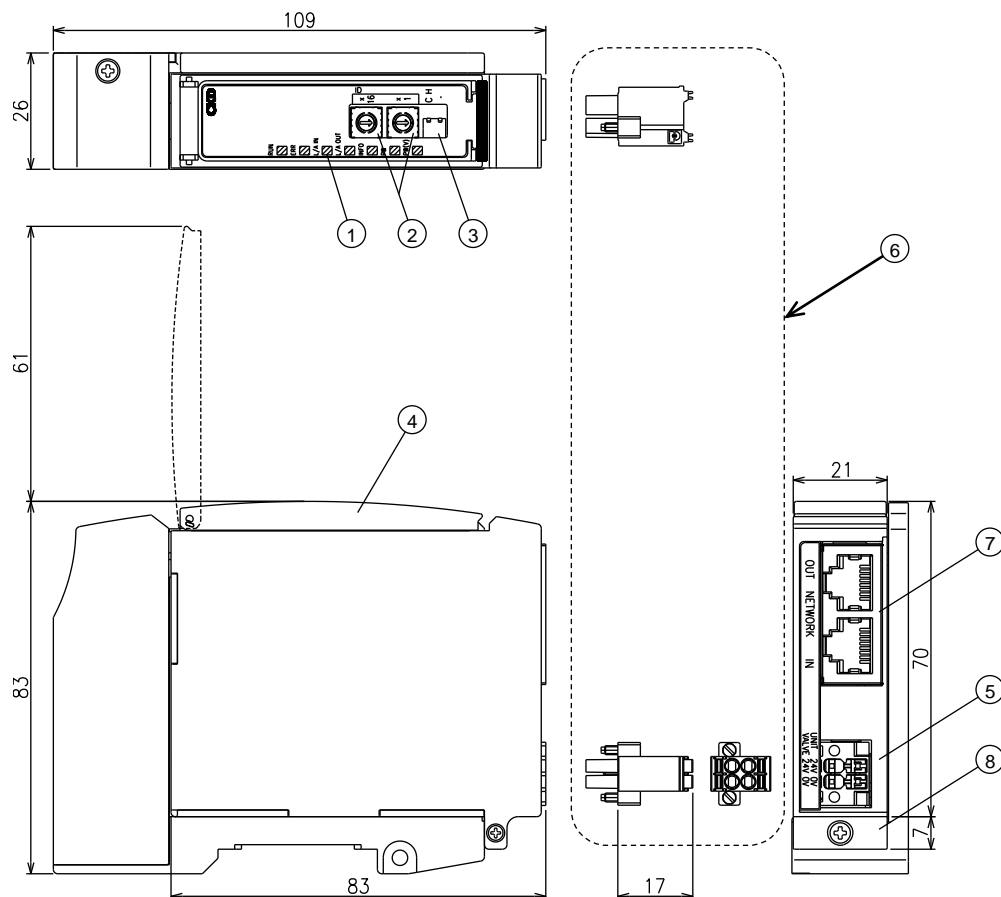
PLC manufacturer	Compatible PLC	Master unit model
Omron Corporation	NJ Series	NJ301/NJ501
Beckhoff Automation GmbH & Co. KG	TwinCAT PLC	
Other master units compatible with EtherCAT		

Example of basic structure of the system



## 1.2 Part Name

### 1.2.1 Slave unit parts



No.	Part name	Description
1	Monitoring lamp	Indicates the status of the slave unit and network with RUN, ERR, L/A IN, L/A OUT, INFO, PW, and PW(V).
2	Rotary switch	Sets the slave unit node address.
3	Slide switch	Sets the action taken in the event of a communication error.
4	Cover	Protects the monitoring lamps and setting switches. This cover is hinged and can be flipped open and closed.
5	Unit/valve power socket	Connects the unit/valve power plug.
6	Unit/valve power plug (supplied item)	Connects the unit/valve power cables (24 V).
7	Network connector socket (RJ45 × 2 ports [IN, OUT]) (Network connector plug is not supplied.)	IN: Receives EtherCAT communication from the previous slave unit. OUT: Sends EtherCAT communication to the next slave unit. * If the product is the end unit of the EtherCAT network, a network plug is not connected to OUT.
8	Slave unit fixing screw (M2.5 Taptite)	Secures the slave unit to the slave unit connecting block.



## 1.2.2 Switches and LED indicators

### ⚠ CAUTION

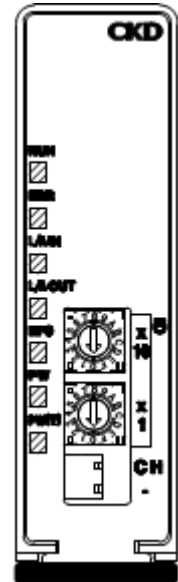
**Discharge static electricity from your body before touching the product.**  
Static electricity may cause damage to the product.

#### ■ Switches

The switches are used to set the slave unit node address and the action taken on the output in the event of a communication error.

This slave unit operates according to the switch settings when the power is on.

Switch	Settings
Rotary switch	Set the slave unit node address between 01 to FF (Hex) [1 to 255 (Dec)]. Set the upper digit with x16, and the lower digit with x1.  The factory setting of the rotary switch is "00". To set the node address from the master unit, set the rotary switch to "00".
Slide switch	Select whether to hold (H) or clear (C) the output status when a communication error occurs.



#### ■ LED indicators

The LED indicators show the status of the network.

Refer to the following table for the description of LED indicators.

LED	Function	Status	
RUN	EtherCAT state	Off	INIT
		Green blinking	PRE-OPERATIONAL
		Green single flash	SAFE-OPERATIONAL
		Green flickering	BOOTSTRAP
		Green light	OPERATIONAL
ERR	Communication state	Off	Normal communication
		Red double flash	Communication error (WD time-out)
		Red blinking	Communication error
L/A IN	EtherCAT IN link state	Off	No link
		Green light	Link detected but no activity
		Green flickering	Link and activity detected
L/A OUT	EtherCAT OUT link state	Off	No link
		Green light	Link detected but no activity
		Green flickering	Link and activity detected
INFO	Model discrepancy	Red double flash	Discrepant
PW	Unit power state	Off	Unit power OFF
		Green light	Unit power ON
PW(V)	Valve power state	Off	Valve power OFF
		Green light	Valve power ON

## 1.3 Specifications

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### 1.3.1 Communication specifications

Descriptions	Specifications
Communication protocol	EtherCAT (asynchronous)
Baud rate	Full-duplex 100 Mbps
Communication media	Ethernet cable (Category 5 or higher) Shielded twist pair cable
Number of connecting nodes	Maximum of 65,535 nodes
Network topology	Daisy chain
Distance between nodes	Maximum of 100 m

## 1.3.2 Slave unit specifications

The product must be used within the following specifications.

Descriptions		Specifications			
Model		N4G□R-T8EC1	N4G□R-T8EC2	N4G□R-T8ECP1	N4G□R-T8ECP2
Unit power voltage		21.6 VDC to 26.4 VDC (24 VDC $\pm 10\%$ )			
Unit power current consumption		110 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		15 mA or less (all points OFF) 40 mA or less (under no load with all points ON)			
Output type		NPN output (+COM)		PNP output (-COM)	
Number of output points		16 points	32 points	16 points	32 points
Node address setting		With switch: 01 to FF (Hex) [1 to 255 (Dec)] <sup>Note 1</sup> With master: 01 to FFFF (Hex) [1 to 65535 (Dec)]			
Output setting when communication error occurs		Hold (all outputs are maintained)/Clear (all outputs are cleared)			
Insulation resistance		Between external terminals and case: 30 M $\Omega$ or more with 500 VDC			
Withstand voltage		Between external terminals and case: 500 VAC for 1 minute			
Shock resistance		294.0 m/s <sup>2</sup> for 3 times in 3 directions			
Storage ambient temperature		$-20^{\circ}\text{C}$ to $70^{\circ}\text{C}$			
Storage humidity		30% to 85% RH (no dew condensation)			
Ambient temperature		$-5^{\circ}\text{C}$ to $55^{\circ}\text{C}$			
Ambient humidity		30% to 85% RH (no dew condensation)			
Atmosphere		No corrosive gas			
Communication protocol		EtherCAT (asynchronous) <sup>Note 2</sup>			
Baud rate		Full-duplex 100 Mbps			
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 state, unit power, valve power) <sup>Note 3</sup>			
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 with 0.75 mm half-amplitude or 98.0 m/s <sup>2</sup> , whichever smaller.			
	Malfunction	10 Hz to 150 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 <sup>2</sup> , whichever smaller.			

Note 1: Slave units follow address restriction from the master unit. The factory setting of the rotary switch is "00". To set the node address from the master unit, set the rotary switch to "00".

Note 2: Synchronization with other slave units is not supported. It is not recommended to use the product in an environment that requires precise time management (This slave unit does not support DC mode and SM mode).

Note 3: Monitoring is available when the voltage within the specified range is supplied to the unit power.

\* For the delay time, refer to the instruction manual for the master unit. Transmission delay in the 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 slave unit.

## 2. INSTALLATION

### 2.1 Mounting

#### CAUTION

**Before handling an EtherCAT device, touch a grounded metal part to discharge static electricity from your body.**

Static electricity may cause damage to the product.

**Do not apply tension or shocks to the power cable or network cable.**

If the wiring is long, the cable weight or shocks may cause an unexpected force and result in damage to the connector or device.

Take appropriate measures; for example, secure the wiring to the machine or device midway.

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

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

**Wire the power cable and network cable properly within its specifications.**

Incorrect wiring may cause the slave unit to malfunction or break.

**Check that cables and plugs 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 the metal tubing before mounting this slave unit.

## 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 AC voltage models in an installation category II environment.

**Use a dedicated network cable that complies with EtherCAT specifications.**

**Provide sufficient bending radius for the network cable. Do not bend it forcibly.**

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

Although the EtherCAT network uses a standard Ethernet cable and has flexible wiring methods, there are limits depending on the wiring material and equipment (master, hub, and other devices) used. Always understand their specifications thoroughly before wiring. For more information, refer to the instruction manuals issued by the master unit manufacturer or ETG (EtherCAT Technology Group).

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 slave unit.

#### Cable with recommended plug: Category 5e

Part name	Model	Manufacturer
Industrial Ethernet cable (double shield)	ETP-SB-S***□	JMACS Japan Co., Ltd.
***: Length, □: M = meter or C = centimeter		

#### Recommended assembly type RJ45 connector: Category 6

Part name	Model	Manufacturer
Assembly type RJ45 connector	09 45 151 1560	Harting K.K.
Assembly type RJ45 connector (45° angled)	09 45 151 1561	Harting K.K.

■ Connecting the network cable

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

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

The diagram shows a side view of a 'Slave unit' with a network port labeled 'OUT NETWORK IN'. A callout provides a detailed view of the 'RJ45 connector Harting 09455511122'. The pinout is as follows:

Pin	Signal	Function
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

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

Slave unit

## 2.2.2 Connecting and wiring to the unit/valve power socket

### CAUTION

**Always check the polarity and rated voltage thoroughly before connecting cables.**  
**Calculate the current consumption to select the power cable.**  
**Consider the voltage drop due to cables when selecting and wiring the cables if power is supplied to more than one slave unit (remote I/O unit) from one power supply.**  
**Take measures to secure the specified power supply voltage if voltage drop cannot be avoided.**  
 For example, wire the power cables in multiple systems or install other power supplies to secure the specified power supply voltage.  
**Install a terminal block if multi-drop wiring of the power cables is needed.**  
 Install the terminal block so that it comes before the power plug.

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

#### Unit power

This electrical power is for operating the slave unit. Use 21.6 VDC to 26.4 VDC power with minimum noise.

#### Valve power

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

- \* Although the lamp on the valve may light up instantaneously when the valve power is turned on, the valve itself will not be turned on or off.

#### Supplied power plug

Part name	Model	Manufacturer
4-pin connector	DFMC1,5/2-STF-3,5 (1790292)	Phoenix Contact GmbH & Co. KG

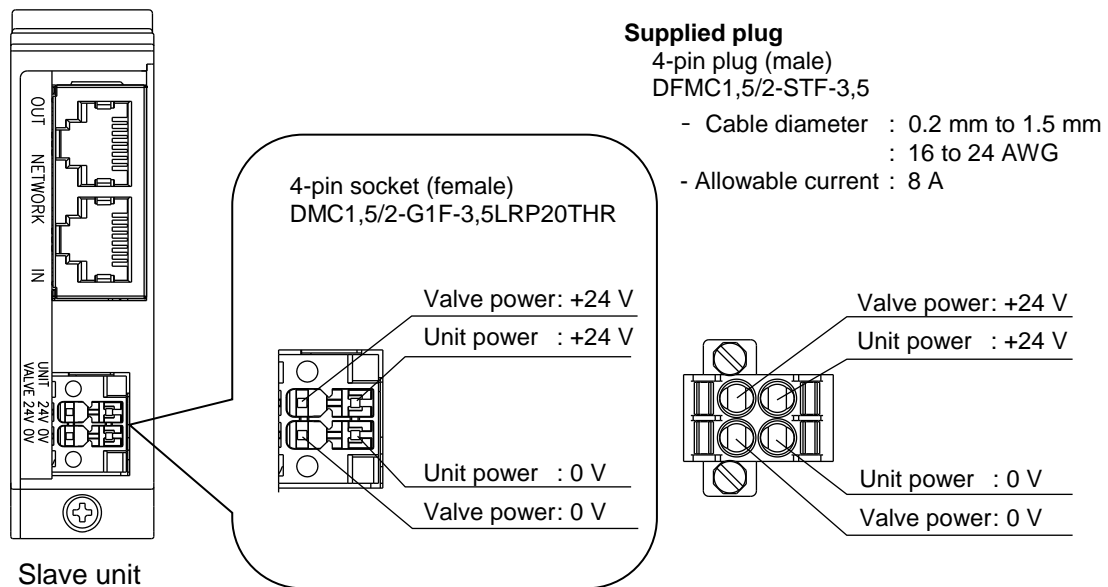
#### Recommended ferrules and crimp tool

Part name	Model	Manufacturer
Ferrule (without sleeve)	A0.5-10 to 1.5-10	Phoenix Contact GmbH & Co. KG
Ferrule (with sleeve)	AI0.25-10 to 0.75-10	Phoenix Contact GmbH & Co. KG
Crimp tool (common)	CRIMPFOX6 (1212034)	Phoenix Contact GmbH & Co. KG

## ■ Connecting the power cables

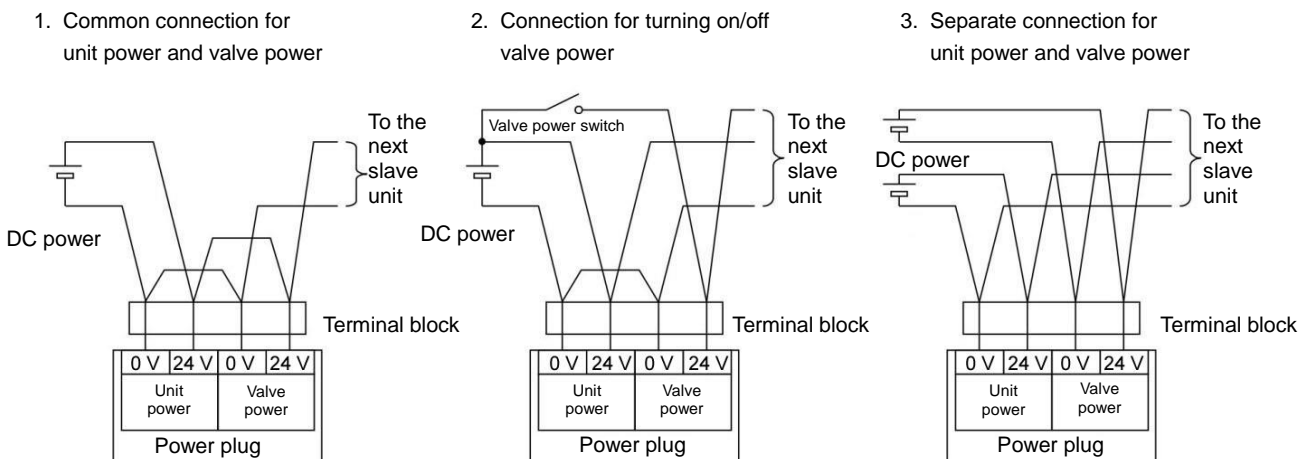
Follow the steps below to connect the unit/valve power cables to the power plug.

- 1** After confirming safety, turn off the power to connect to the slave unit.
- 2** Attach a terminal such as a ferrule to the cable to be connected as necessary.
- 3** Refer to the figure below and wire the cables to the correct terminals on the power plug (24 V to 24 V, 0 V to 0 V).
- 4** Connect the power plug to the power socket and secure the plug flange with the appropriate tightening torque (0.25 N·m).



## ■ Wiring the power cable

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





## 3. USAGE

### WARNING

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

### CAUTION

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

**Check the address setting value of serial transmission slave unit 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 start operating suddenly.

## 3.1 Setting the Switches

### CAUTION

**Discharge static electricity from your body before touching the product.**

Static electricity may cause damage to the product.

**Set switches while 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 slave unit 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.

### 3.1.1 Setting the node address

Set the slave unit node address (ID).

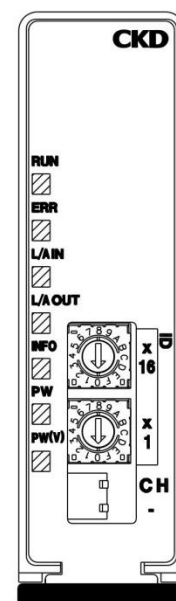
The factory setting of the rotary switch is "00". To set the node address from the master unit, set the rotary switch to "00".

The node address setting is read when the power is turned on. The node address cannot be set in duplicate.

Switch	ID. [node address] x16, x1
Setting range	01 to FF (Hex) [1 to 255 (Dec)]

x16: Upper digit		
Setting (hexadecimal)	<=>	Decimal
0	<=>	0
1	<=>	16
2	<=>	32
3	<=>	48
4	<=>	64
5	<=>	80
6	<=>	96
7	<=>	112
8	<=>	128
9	<=>	144
A	<=>	160
B	<=>	176
C	<=>	192
D	<=>	208
E	<=>	224
F	<=>	240

x1: Lower digit		
Setting (hexadecimal)	<=>	Decimal
0	<=>	0
1	<=>	1
2	<=>	2
3	<=>	3
4	<=>	4
5	<=>	5
6	<=>	6
7	<=>	7
8	<=>	8
9	<=>	9
A	<=>	10
B	<=>	11
C	<=>	12
D	<=>	13
E	<=>	14
F	<=>	15



Example: Setting the node address to 71 (decimal)

Since  $71 = 64 + 7$  and 64 is 4 and 7 is 7 according to the table above, set the upper digit to 4 and lower digit to 7 (47 in hexadecimal).

### 3.1.2 Setting other switches

Set the action taken on the output when there is a communication error.

Switch	Settings
CH (output mode setting)	Set the action taken on the output when there is a communication error (such as disconnection error and time over). OFF: Hold mode ON: Clear mode

## 3.2 Setting with ESI (EtherCAT Slave Information) File

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

ESI file name (for OPP7-□EC-□): CKD\_OPP7.xml

\* The ESI file above contains data for four models.

\* The following INDEXes are for future expansion and cannot be used.  
 0x1010, 0x1011, 0x10F1, 0x1A00, 0x1A01, 0x1C12, 0x1C13, 0x1C32, 0x1C33, 0x3000,  
 0x3001, 0x3010, 0x3011, 0x3020, 0x3021, 0x3030, 0x3031, 0x3032, 0x6000

### 3.2.1 Registering the device

Before starting, check the node address and specifications (model name) of the device to be used and install the corresponding ESI file.

Refer to the following table for device specifications and ESI file and set accordingly.

#### Specifications and the model name in the ESI file

Item	Specifications			
Model	T8EC1	T8EC2	T8ECP1	T8ECP2
Single unit model	OPP7-1EC	OPP7-2EC	OPP7-1EC-P	OPP7-2EC-P
Output type	+COM (NPN)		-COM (PNP)	
I/O point	16-point output	32-point output	16-point output	32-point output
Model name in the ESI file	OPP7-1EC	OPP7-2EC	OPP7-1EC-P	OPP7-2EC-P

## 3.3 Correspondence between Slave Unit Output Number and PLC Address Number

### 3.3.1 PLC address correspondence table

This correspondence table uses Omron's PLC as an example.  
The serial transmission slave unit address is set to "node address 1".

#### <N4G□R-T8EC□1 (16-point output)>

Assigned address in the PLC memory	Output Bit 00 to 15															
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Serial transmission 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

1-word output data

#### <N4G□R-T8EC□2 (32-point output)>

Assigned address in the PLC memory	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
Serial transmission 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

1-word output data

2-word output data

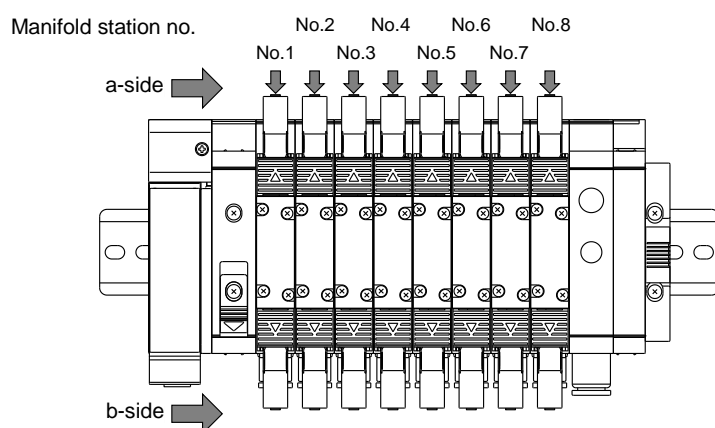
### 3.3.2 Example of valve number array corresponding to T8EC□ solenoid output number

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.

Manifold stations are numbered in order from left to right with the piping port towards the user (refer to the figure below).

Appearance and maximum number of stations differ depending on the solenoid valve model. Check individual specifications.

#### <N4G□R-T8EC□1 (16-point output)>



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

#### Standard wiring

##### • Single solenoid valve

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

##### • Double solenoid valve

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

##### • Mixed (both single and double solenoid valves are mounted) (example)

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

**Double wiring**

- Single solenoid valve

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

- Double solenoid valve

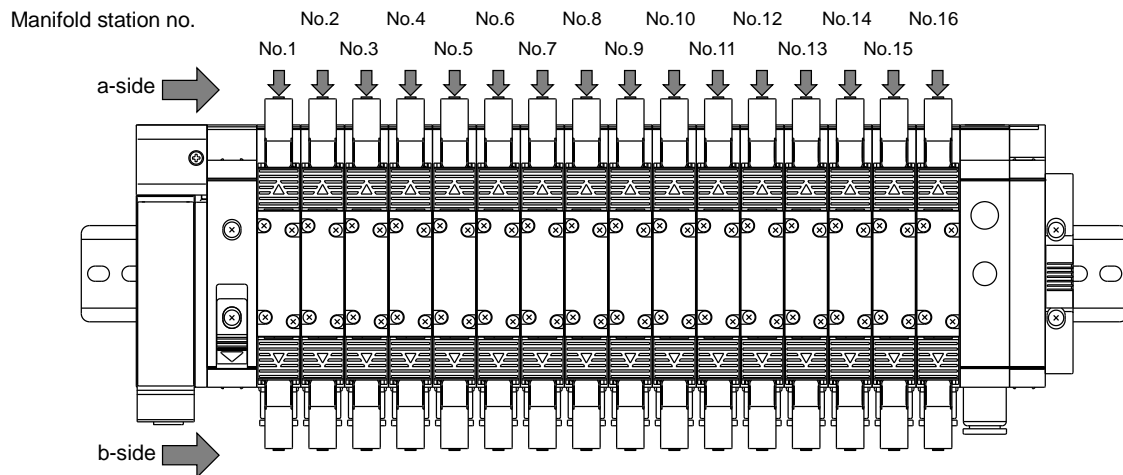
Solenoid output no.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve no.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b

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

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

## &lt;N4G□R-T8EC□2 (32-point output)&gt;

The figure below is an example of mounting 16 stations of double-solenoid type solenoid valves. For single-solenoid types, there is no solenoid on the b-side.

**Standard wiring**

## • Single solenoid valve

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

## • Double solenoid valve

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

**Double wiring**

## • Single solenoid valve

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

## • Double solenoid valve

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



## 3.4 Programming

The master unit handles this unit as a slave device (T8EC□1 for 16-point output, T8EC□2 for 32-point output).

There are two types of data: The PDO (Process Data Objects) output data sent from the master unit to a slave device (in case of this product; T8EC□1 for 16-point output, T8EC□2 for 32-point output) and the input data sent from the slave device to the master unit. This product is an output device that receives output data from the master unit and outputs to the valve (no input data).

Refer to the instruction manual issued by the PLC manufacturer when programming.

Refer to the following table to program the I/O mapping.

The setting made to specify which action to take on the output in the event of an error, which is a unique function of this slave unit. This output status setting does not affect the program.

### Output data mapping

I/O point		Output data	Bit															
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
32-point	16-point	1-word	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
	-	2-word	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

## 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 performing 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 slave unit for daily maintenance and what to do when replacing the slave unit. 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, soak 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 slave unit 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.

If using the product in an environment where temperature or humidity is extremely high or in a dusty environment, perform inspections at a shorter interval.

**<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 unit.

Inspection item	Description	Criteria	Inspection method
Environment	Is the surrounding and in-panel temperature appropriate?	Refer to "1.3.2 Slave unit specifications".	Thermometer
	Is there any dust on the unit?	No dust	Visual inspection
Installation	Is the slave unit fixed securely?	No looseness	Philips screwdriver
	Is the power cable connector fully inserted?	No looseness	Flat blade screwdriver
	Is the network cable connector fully inserted?	No looseness	Visual inspection
	Is the connection cable not broken?	No abnormality in appearance	Visual inspection

**■ Checking the slave unit before/after replacing**

Each unit (master and slave) is a device 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 units.

**<Inspection item>**

If a fault is detected and the unit is replaced with a new one, check if the new unit has no abnormality. Also, confirm the slave unit settings.

**<Settings for replacement slave unit>**

For the switches on the replacement slave unit, confirm the specifications and set the same settings as the previous slave unit.

## 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 or adding a manifold solenoid valve.**

**Do not touch the electrical wiring (bare live part).**

An electric shock may occur.

**Do not touch live parts with bare hands.**

An electric shock may occur.

### CAUTION

**Check the slave unit node 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.**

A failure or malfunction may occur.

**Do not pull out the slave unit by pulling the cable or connector.**

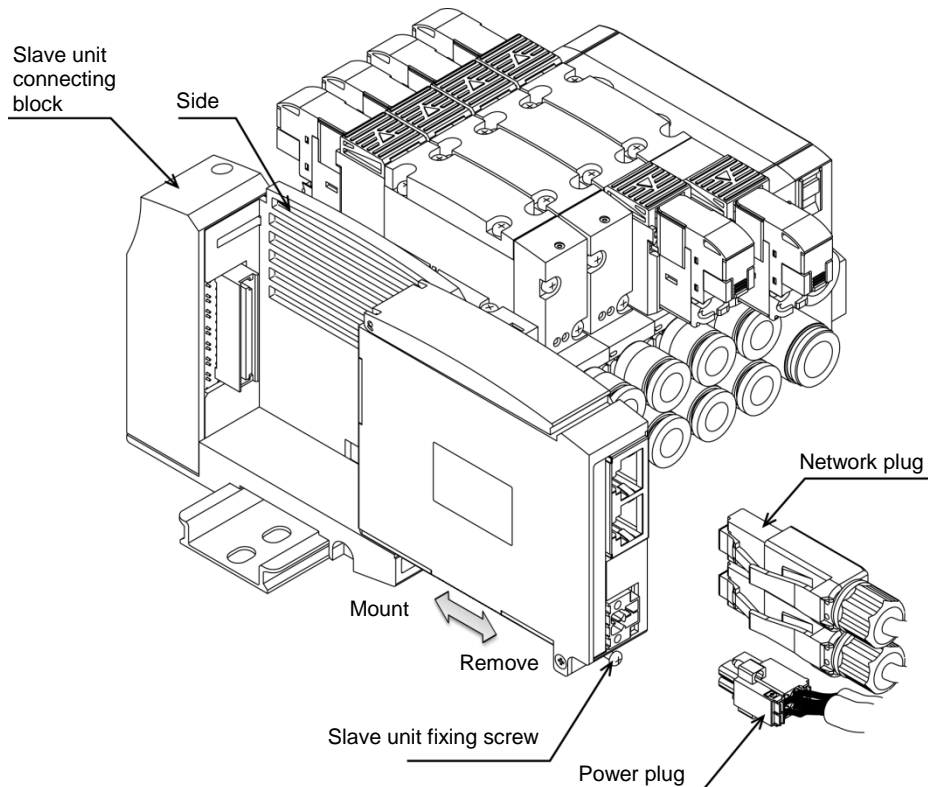
A cable disconnection or damage may occur.

**Fully loosen the plug fixing screw before removing the plug.**

After inserting the plug, tighten the plug fixing screw securely.

### 4.2.1 Removing the product (slave unit)

- 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** Loosen the slave unit fixing screw. Since it is a fall prevention screw, stop loosening when it detaches from the slave unit connecting block.
- 4** Hold and pull out the product slowly in the direction of the arrow.
- 5** Remove the network plug and power plug.



### 4.2.2 Mounting the product (slave unit)

- 1** Set the node address of the product.
- 2** Turn off the power (for unit/valve) and connect the network plug and power plug.  
The system may start operating suddenly if the plugs are connected while the power is turned on.  
Be careful of the surroundings and secure safety before connecting the plugs.  
Network plug: Reference tightening torque: 0.4 N·m (Since it varies depending on the plug, consult the plug manufacturer.)  
Power plug: Appropriate tightening torque: 0.25 N·m
- 3** Hold the product and insert it slowly in the direction of the arrow.
- 4** Check that the product and slave unit connecting block are connected properly and tighten the slave unit fixing screw firmly.  
(Appropriate tightening torque: 0.5 N·m)
- 5** Confirm safety and turn on each power.

## 5. TROUBLESHOOTING

### 5.1 Problems, Causes, and Solutions

Troubleshooting for this slave unit must be performed not only for the single unit but for the entire system.

The system may start operating suddenly depending on the communication state. Use extreme care and ensure safety during maintenance.

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

- Check that the power cable is properly connected and in good condition.
- Check that the supplied power voltage is used within the specified range.

#### ■ Fault 2: ERR LED is blinking.

- Check that the power to PLC is turned on.
- Check that there are no problems (such as damage or disconnection) with the network cable or connector connection.
- Check that the network cable is compatible with EtherCAT.
- Check that transmission distance is compatible with EtherCAT.
- Check that there are no noise-generating devices or high-voltage lines near the communication line.
- Check that the SII data (ESI file) written into the product using TwinCAT PLC is correct.

#### ■ Fault 3: INFO LED is blinking.

- Check that the SII data (ESI file) written into the product using TwinCAT PLC is correct.

#### ■ Fault 4: RUN LED does not light up.

- Check that the product name in the configuration matches the product's name (polarity).
- Check that the IN and OUT cable connections are correct. Do not connect between INs or OUTs.
- Check the node address setting state (incorrect or duplicate). If the setting has been changed, turn off the power and turn on again.

#### ■ Fault 5: The slave unit does not perform according to the specified output mode setting when a communication error occurs.

- Set the switch and turn off the power and turn on again.

## 6. WARRANTY PROVISIONS

### 6.1 Warranty Conditions

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#### ■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.

However, following failures are excluded from this warranty:

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

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

#### ■ Confirmation of product compatibility

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

#### ■ Others

The terms and conditions of this warranty stipulate basic matters.

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

### 6.2 Warranty Period

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