CKD

SM-P00081-A/1

INSTRUCTION MANUAL

Block Manifold
MW4G Series

Serial Transmission Type
NW4G*-T7EC***
（W4G-OPP8-*EC-**）

Compatible with EtherCAT

- 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 a device using CKD products, the manufacturer is obligated to manufacture a safe product by confirming safety of the system comprising the following items:

- Device mechanism
- Pneumatic or water control circuit
- Electric control that controls the above

It is important to select, use, handle, and maintain the product appropriately to ensure that the CKD product is used safely.
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 someone having sufficient knowledge and experience.

2. Use this product within its specifications.

This product cannot be used beyond its specifications. Additionally, the product must not be modified or machined.
This product is intended for use in general industrial devices and parts. Use beyond such conditions is not considered. Consult with CKD for details when using the product beyond the unique specification range, outdoors, or in the following conditions or environments. In any case, measures for safety shall be provided when the vavle malfunctions.

① Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
② Use for applications where life or assets could be adversely affected, and special safety measures are required.

3. Observe corporate standards and regulations, etc., related to the safety of device design and control, etc.

ISO4414, JIS B 8370 (pneumatic system rules)
JFPS2008 (principles for pneumatic cylinder selection and use)
Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, 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 When inspecting or servicing the device, turn off the energy source (air supply or water supply), and turn off power to the facility. Release any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
④ When starting or restarting a machine or device that incorporates pneumatic components, make sure that system safety, such as pop-out prevention measures, is secured.

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

■**The safety cautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.**

DANGER : When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, or when there is a high degree of emergency to a warning.

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

CAUTION : When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. In any case, important information that must be observed is explained.

Precautions with regard to guarantee

● Guarantee period

The guarantee period of our product shall be one (1) year after it is delivered to the place specified by the customer.

● Guarantee coverage

If any failure for which CKD CORPORATION is recognized to be responsible occurs within the above warranty period, a substitute or necessary replacement parts shall be provided free of charge, or the product shall be repaired free of charge at the plant of CKD CORPORATION.

However, the guarantee excludes following cases:

① Defects resulting from operation under conditions beyond those stated in the catalogue or specifications.
② Failure resulting from malfunction of the equipment and/or machine manufactured by other companies.
③ Failure resulting from wrong use of the product.
④ Failure resulting from modification or repairing that CKD CORPORATION is not involved in.
⑤ Failure resulting from causes that could not be foreseen by the technology available at the time of delivery.
⑥ Failure resulting from disaster that CKD is not responsible of.

Guarantee stated here covers only the delivered products. Any other damage resulting from failure of the delivered products is not covered by this guarantee.

● Confirmation of product compatibility

Our customer shall be responsible of confirming compatibility of our product used in our customer's system, machinery or device.

⚠ WARNING

- If you have to use the product under conditions that are different from the specified conditions or if you intend to use the product for a special application, be sure to consult us about the product specifications before using 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 manual carefully and with full understanding of its contents.
- Before performing electrical wiring, read this manual carefully and with full understanding of its contents.

⚠ CAUTION

- Regularly perform the daily and periodic inspections to correctly maintain product performance.
- Confirm working voltage and polarity before wiring and turning on the power.
- Do not touch electric wiring connections (exposed live parts); this will cause an electric shock. During wiring, keep the power off. Also, do not touch these live parts with wet hands.
- This product does not meet the surge immunity requirements specified in EN61000-4-5 for CE marking. Please provide appropriate protective measures against lightning surges on the device side.
- The valve and cylinders, etc., could malfunction if the serial transmission slave station address setting is incorrectly set. Always check the address setting before starting use.
- This product is not resistant to the CE Marking surge immunity (EN61000-4-5). Always provide measures on the system side before starting use.
- The valve light may flicker momentarily when the valve power is turned ON (when the power starts). This will not cause the valve to turn ON and OFF.

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NW4G※-T7EC※※※

Serial Transmission Type

Instruction Manual No. SM-P00081-A/1

1. PRODUCT

1.1 General outline of the system

1) NW4G*-T7EC***

NW4G*-T7EC*** is a MW4G slave station that can be connected to the Ethernet-based open network EtherCAT. It has the following characteristics.

(1) Since the system is connected to the PLC with only a communication cable (Category 5 or higher), the wiring work-hours can be greatly reduced.
(2) Maintenance is easier as the unit power and valve power are separated.
(3) The slave station address can be selected from a hard switch setting or setting written in from the PLC.
(4) The output has +COM/-COM specifications, and can be selected from a 16-point output, 32-point output, or 16-point input/output. This allows the slave station to be used for a variety of applications.
(5) The slave station can be connected to both W4G2 and W4G4.

2) EtherCAT

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

The EtherCAT specifications have been standardized with several international standards (IEC61158, IEC61784, IEC61800, ISO15745), and is also a SEMI Standard (E54.20). The EtherCAT Technology Group has maintained that the EtherCAT technology will be open for various users.

Note: Always read the User's Manual.
This instruction manual explains mainly the slave station (NW4G*-T7EC***).
Read the manuals issued by each manufacturer for details on the master station and other slave stations connected to this system.
For the manifold solenoid valve, always read this manual and the solenoid valve instruction manual, and fully understand the functions and performance to ensure correct use.

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

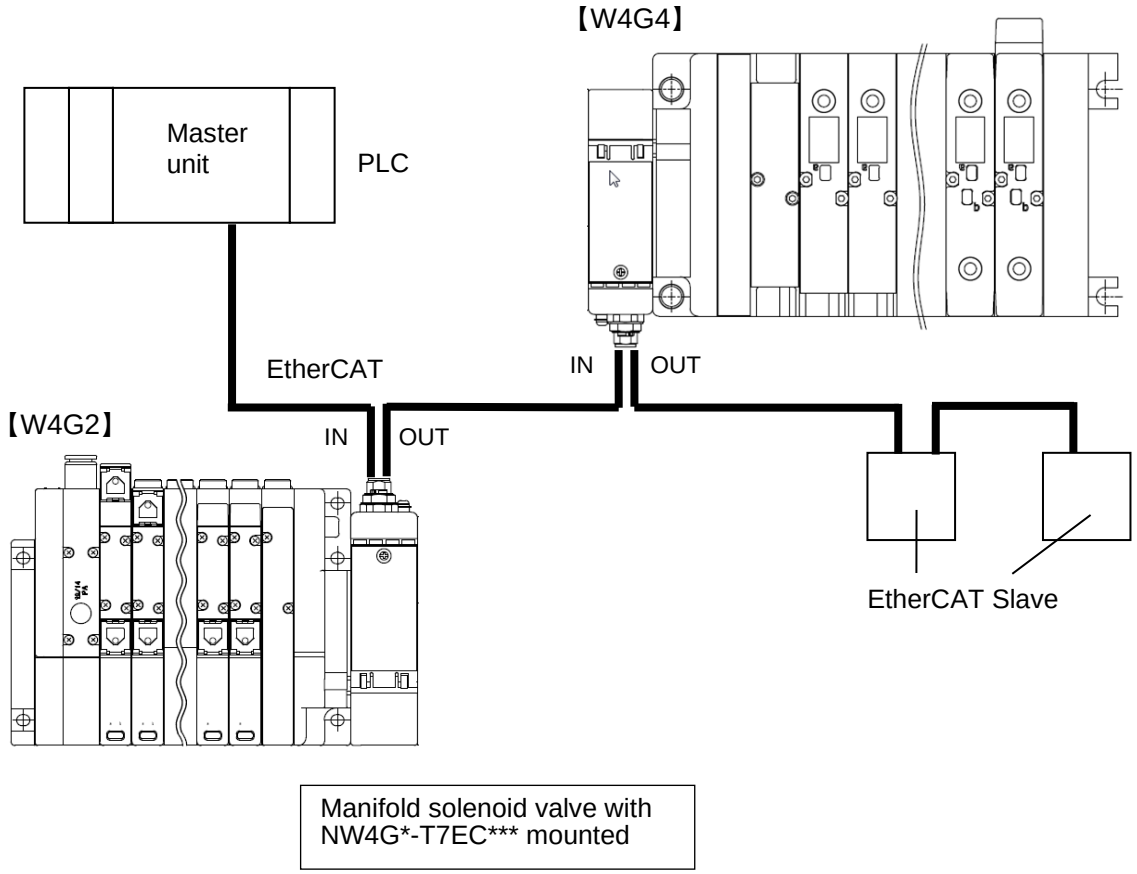
1.2 Network structure

This network mainly consists of a PLC, a master unit, a manifold solenoid valve with N4G*-T8P** mounted, other slave units, and any other peripheral equipment.

1) Examples of PLC and master unit combination

Manufacturer	Compatible PLC	Master unit model
OMRON	NJ series	NJ301/NJ501
Beckhoff Corporation	TWINCAT PLC	
Other equipment compatible with EtherCAT		

2) Fundamental structure of the system



1.3 Specifications

1) Communication specifications

Item	Specification
Communication Protocol	EtherCAT （Unsynchronization）
Baud rate	Full-duplex 100Mbps
Communications media	Ethernet cable（Category 5 or higher） Shielded twist pair cable
Node address range	Switch is set to “00” : 65,535 nodes (max) (Node address is set from the master.） Switch is set as all except for "00" : 255 nodes (max)
Topology	Daisy chain
Communications distance	Distance between nodes : 100m (max)

2) Specification of slave

Always operate this product within its product specifications.

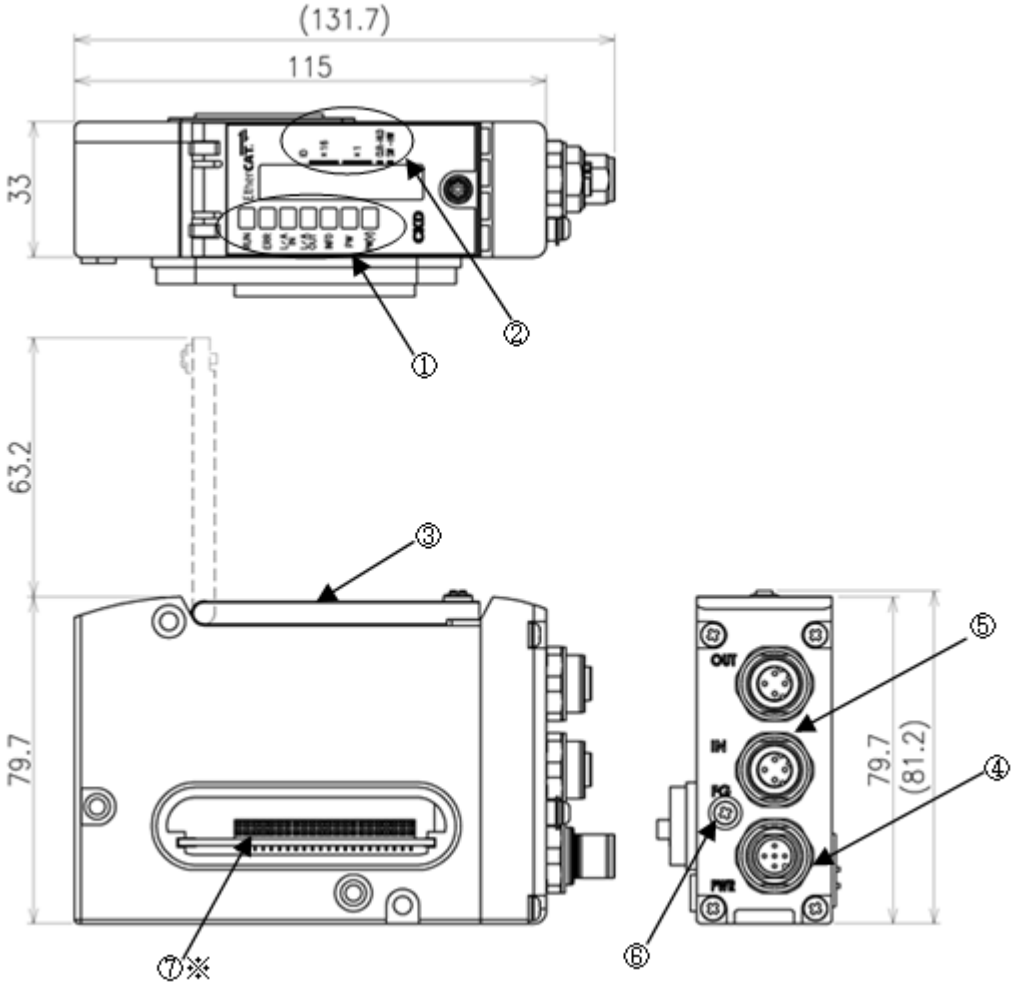
Item		Specification					
Model number		NW4G* -T7EC1	NW4G* -T7EC2	NW4G* -T7ECB7	NW4G* -T7ECP1	NW4G* -T7ECP2	NW4G* -T7ECPB7
Unit power supply voltage		21.6VDC to 26.4VDC (24VDC±10%)					
Unit power current consumption		60mA or less (at 24.0VDC with all points ON)					
Valve power supply voltage		22.8VDC to 26.4VDC (24VDC+10%, -5%)					
Valve power current consumption		10mA or less (all points OFF) 15mA or less under no load conditions (all points ON)					
Output type (polarity)		NPN (+common output)			PNP (-common output)		
Number of input points ／ output points		（0／16）	（0／32）	（16／16）	（0／16）	（0／32）	（16／16）
Node Address setting		By switch 01~FF (Hex)【1~255 (Dec)】 ※1 By master 01～FFFF(Hex)【1～65535（Dec）】					
Switch used for specifying the state of output after error		Hold（All outputs are maintained.）/ Clear（All outputs are turned off.）					
Insulation resistance		30MΩ or more at 500VDC between external terminals and body.					
Withstand voltage		500VAC applied between external terminals and body for 1 minute.					
Shock resistance		294.0m/S^2 for 3 times in each direction of X, Y, Z					
Storage temperature		-20 to 70°C					
Storage humidity		30 to 85%RH (no dew condensation)					
Ambient temperature		-5 to 55°C					
Ambient humidity		30 to 85%RH (no dew condensation)					
Ambient atmosphere		No corrosive gas					
Communications object		EtherCAT （Unsynchronization ※2）					
Baud rate (bit/s)		Full-duplex 100Mbps					
Output insulation type		Photo coupler insulation					
Maximum load current		40mA / output					
Leakage current		0.1mA or less					
Residual voltage		0.5V or less					
Fuse rating		Valve power: 24V, 3A Unit power: 24V, 2A (Both fuses not replaceable)					
Display		LED(communication status, unit and valve power supply status ※3)					
Protective structure		IP65					
Vibration proof	Durability	10Hz to 150Hz to 10Hz, 1 octave/min., 15 sweeps each in X, Y, Z directions with 0.75mm half-amplitude or 98.0m/ S^2, whichever smaller					
	Malfunction	10Hz to 150Hz to 10Hz, 1 octave/min., 4 sweeps each in X, Y, Z directions with 0.5mm half-amplitude or 68.6m/ S^2, whichever smaller					

※1. Slave follows address restriction from a master. Switch is "00", when node address is set from the master.

※2. Slave doesn't have a synchronous mode. (Slave doesn't have a DC mode and SM mode）

※3. The prescriptive voltage is necessary to a unit power supply for slave's display.

1.4 Parts of the Slave Unit



① Monitor light
The slave station and network statuses are displayed with the RUN, ERR, L/A IN, L/A OUT, INFO, PW and PW(V) lights.

② Setting switches
The slave station's node address is set with a rotary switch.
The action to be taken when a communication error occurs is set with the slide switch.

③ Cover
This cover protects the monitor light and setting switches.

④ Unit/valve power plug (M12x1 port [PWR] A cord)
The unit/valve power cord socket is connected to this plug.

⑤ Communication socket (M12x2 ports [IN, OUT] D cord)
IN: The EtherCAT communication from the pervious station is input to this port.
OUT: The EtherCAT communication is output to the next station from this port.
* If this slave is the EtherCAT terminal station, a communication cord plug is not connected to OUT.

⑥ FG terminal
This terminal is connected to the FG.

⑦ I/O block connector
This can be connected to an I/O block. (※ Supported only with W4G-OPP8-7EC-□B).

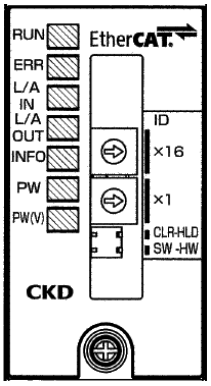
1.5 Switches and LED indicators

CAUTION :

- Discharge static electricity that has built up on your body before touching the Slave Unit. Otherwise, static electricity can cause damages to the Slave Unit.

1) Switches
The switches are used to set this slave station's node address and the output when a communication error occurs.

This slave station operates with the node address set when the power is turned ON and with the output mode setting conditions.



Switch name	Setting details
[Node address] ID x16, x1	The slave station's node address is set in the range of 01 to FF (Hex) [1 to 255 (Dec)]. The high-order address is set with x16, and the low-order address is set with x1. When the node address is set to "00" (default state), the node address is set from the master.
[Output mode] CLR - HLD	Select whether to hold (HLD) the output state or clear (CLR) the output when a communication error occurs.

2) LED indicators
The state of the product and the network is indicated.
Please refer to the following table for LED indication.

LED	Function	State	
RUN	EtherCAT State	OFF	: INIT
		Green blinking	: PRE-OPERATIONAL
		Green single flash	: SAFE-OPEATIONAL
		Green flickering	: BOOTSTRAP
		Green on	: OPERATIONAL
ERR	Communication state	OFF	: Normal communication
		Red double flash	: Problem in communication (WD Time-out)
		Red blinking	: Problem in communication
L/A IN	EthetCAT IN link state	OFF	: NO LINK, NO ACTIVITY
		Green on	: LINK, NO ACTIVITY
		Green flickering	: LINK, ACTIVITY
L/A OUT	EthetCAT OUT link state	OFF	: NO LINK, NO ACTIVITY
		Green on	: LINK, NO ACTIVITY
		Green flickering	: LINK, ACTIVITY
INFO	Model difference	Red double flash	: Model difference
PW	Unit power supply state	OFF	: Power OFF
		Green on	: Power ON
PW(V)	Valve power supply state	OFF	: Power OFF
		Green on	: Power ON

2. CAUTION

- The system and solenoid valve (cylinder) could move suddenly when the power is turned ON or OFF. Pay special attention to the surrounding safety before turning the power ON or OFF.
- Refer to the User Manual for the master unit for details on the delay time.
  The transmission delay for the system will vary according to the PLC scan time and the other devices connected to the same network.
- The solenoid valve's response delay will vary according to the model so confirm with the solenoid valve specifications.
- The solenoid valve OFF time is delayed by about 20msec because a surge absorbing circuit is built into the slave station.
- Wire the power cable and communication cable within the specified range so that there is no incorrect wiring.
- Make sure that no tension or impact is applied on the power cable or communication cable.
- Before turning the power ON, confirm that each connection cable and connector is correctly mounted.
- Do not disassemble, modify or repair the unit. There is a risk of fault or malfunction.
- The internal components are precision parts. Do not drop the unit or apply abnormal vibration or impact.
- Do not connect or disconnect the connector while the power is ON. There is a risk of fault or malfunction.
- Mold or rust could form if the shipping environment reaches high temperatures.
  Always place the product in a sealed package along with desiccant.
- When installing this slave station, separate it at least 200mm from high voltage cables or power cables, or pass the high voltage cables or power cables in a grounded metal conduit.

3. OPERATION

3.1 Switch setting

CAUTION :

- Discharge static electricity that has built up on your body before touching the Slave Unit. Otherwise, static electricity can cause damages to the Slave Unit.
- Make sure the power is turned off when setting the switches.
- The cover on the Slave Unit can be opened.
  Keep the cover closed at all times except when setting the switches. Otherwise, foreign matter may enter into the internal circuit from the cover and cause unexpected failure, or the cover itself may get damaged. Be extremely careful not to allow any foreign matter to enter the Slave Unit when setting the switches.
- Switches are precisely built and can be damaged if mishandled. Make sure not to touch the internal circuit board when setting the switches.

1) Node address setting
Sets this slave station's node address (ID).

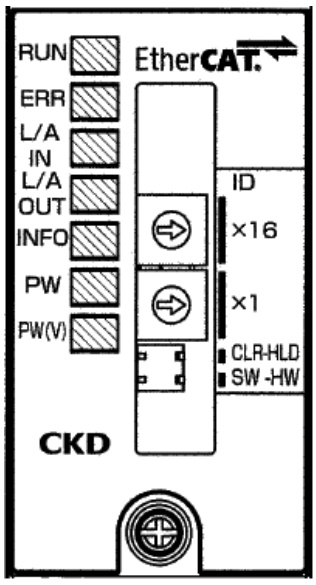
When the node address is set to "00" (default state), the node address is set from the master.

Switches	ID.【Node address】 ×16, ×1
Setting Method	01~FF (Hex) 【1～255(Dec)】

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

×16 : high-order		
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

×1 : low-order		
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) To set address to 71 (decimal)
71 = 64+7 (according to table above): Set high-order to 4 and low-order to 7 [47 (hexadecimal)].

2) other switch setting
Using this switch, specify the output when an error occurs.

Switches	Setting Method
CLR－HLD (output mode setting)	Specifies whether to hold or clear the output when an error (bus line error time-over, etc.) occurs. OFF : Hold mode ON : Clear mode

3) SW－HW switch setting
It isn't used.

3.2 Setting with ESI (EtherCAT Slave Information) File

In order for an EtherCAT device to participate in the network, the network must be registered using an ESI file containing the device's communication specifications. Refer to the User's Manual issued by the master unit manufacturer for details on registering the ESI file. Use the latest ESI file to ensure a suitable network configuration.

ESI file name (W4G-OPP8-□EC-□): CKD_OPP8.xml
(This ESI file contains the data for six models.)

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

Registering the device
Before starting, the node address and specifications (model name) of the device being used must be checked and the matching device and EDSI file must be registered.
Refer to the following table for the device specifications and ESI file, and set accordingly.

The specification and the model name in the ESI file.

Item	Specification					
Model	T7EC1	T7EC2	T7ECB7	T7ECP1	T7ECP2	T7ECPB7
Slave model	W4G-OPP8 -1EC	W4G-OPP8 -2EC	W4G-OPP8 -7EC-B	W4G-OPP8 -1EC-P	W4G-OPP8 -2EC-P	W4G-OPP8 -7EC-PB
Output type (polarity)	+COM（NPN）			－COM（PNP）		
Number of input points ／ output points	（0／16）	（0／32）	（16／16）	（0／16）	（0／32）	（16／16）
The model name in the ESI file	W4G-OPP8 -1EC	W4G-OPP8 -2EC	W4G-OPP8 -7EC-B	W4G-OPP8 -1EC-P	W4G-OPP8 -2EC-P	W4G-OPP8 -7EC-PB

3.3 Correspondence of the Slave Unit output No. and PLC address No.

1) Correspondence table showing the correspondence between the channels in PLC internal memory and the output points.

> The explanation for this correspondence table is based on the OMRON PLC as an example.
> The case when the serial transmission slave address is set to “node address 1” is shown.

NW4G※-T7EC※1 （16 points output ）

Occupied channel in the PLCinternal memory	Output Bit 00-15															
	Output data 1 word															
	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

NW4G※-T7EC※2 （32 points output ）

Occupied channel in the PLCinternal memory	Output Bit 00-15																Output Bit 16-32															
	Output data 1 word																Output data 1 word (The 2nd word)															
	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.	s 1	s 2	s 3	s 4	s 5	s 6	s 7	s 8	s 9	s 10	s 11	s 12	s 13	s 14	s 15	s 16	s 17	s 18	s 19	s 20	s 21	s 22	s 23	s 24	s 25	s 26	s 27	s 28	s 29	s 30	s 31	s 32

NW4G※-T7EC※B7 （16 points input / 16 points output ）
In this case : 8 solenoid points, 4 input blocks , 2 output blocks

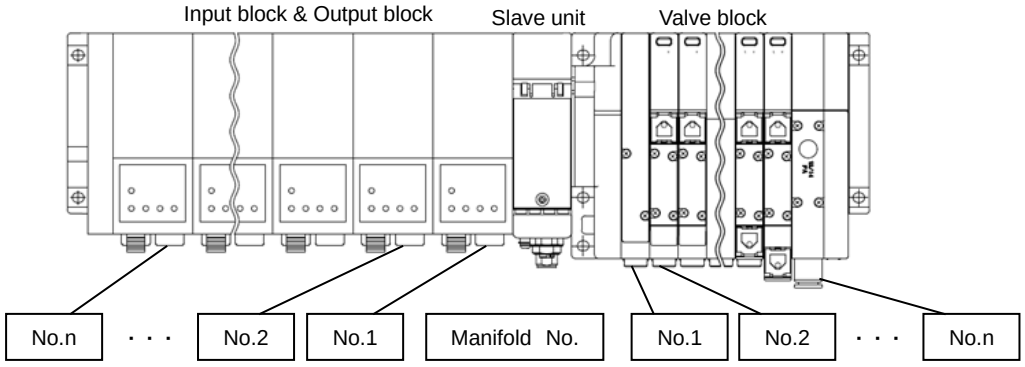
Occupied channel in the PLCinternal memory	Output Bit 00-15																Input Bit 00-15															
	Output data 1 word																Input data 1 word															
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Slave Unit I/O No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Solenoid Output No.	s 1	s 2	s 3	s 4	s 5	s 6	s 7	s 8																								
Input block No.																	1-0	1-1	1-2	1-3	2-0	2-1	2-2	2-3	3-0	3-1	3-2	3-3	4-0	4-1	4-2	4-3
Output block No									1-0	1-1	1-2	1-3	2-0	2-1	2-2	2-3																

* Connect to the slave station in the order of the input block and output block.
* For the output block, set the rotary switch to 1 and 2 from the slave station side.

NW4G※-T7EC※B7 （16 points input / 16 points output ）
In this case : 12 solenoid points, 4 input blocks , 1 output block

Occupied channel in the PLCinternal memory	Output Bit 00-15																Input Bit 00-15															
	Output data 1 word																Input data 1 word															
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Slave Unit I/O No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Solenoid Output No.	s 1	s 2	s 3	s 4	s 5	s 6	s 7	s 8	s 9	s 10	s 11	s 12																				
Input block No.																	1-0	1-1	1-2	1-3	2-0	2-1	2-2	2-3	3-0	3-1	3-2	3-3	4-0	4-1	4-2	4-3
Output block No													2-0	2-1	2-2	2-3																

* Connect to the slave station in the order of the input block and output block.
* For the output block, set the rotary switch to 2 from the slave station side.



2) Example of Valve No. assignments corresponding to Slave Unit Solenoid Output No
Valve Nos. 1a, 1b, 2a, 2b, etc., Number indicate the first and second stations. Letters a and b refer to solenoid a or solenoid b.
Note that the appearance and maximum number of valve will vary according to the model.

< Standard wiring>

● When all valves mounted on the manifold are single-solenoid types:

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 solenoid 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-solenoid types:

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 solenoid 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 type valves are mounted on the manifold (one such example is shown below):

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 solenoid 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-solenoid types:

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 solenoid No.	1a	No use	2a	No use	3a	No use	4a	No use	5a	No use	6a	No use	7a	No use	8a	No use	9a	No use	10a	No use	11a	No use	12a	No use	13a	No use	14a	No use	15a	No use	16a	No use

● When all valves mounted on the manifold are double-solenoid types:

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 solenoid 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 type valves are mounted on the manifold (one such example is shown below):

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 solenoid No.	1a	No use	2a	No use	3a	3b	4a	4b	5a	No use	6a	No use	7a	7b	8a	No use	9a	No use	10a	No use	11a	11b	12a	12b	13a	No use	14a	No use	15a	15b	16a	No use

3.4 Programming

The master station handles this slave station as a slave device (16-point output … T7EC*1, 32-point output … T7EC*2, 16-point input/output … T7EC*B7).

There are two types of data: the PDO (process Data Objects) output data sent from the master station to the slave device, and the input data sent from the slave device to the master station.

Refer to the manual issued by the PLC manufacturer when designing the program.
Refer to the following table and program the I/O mapping.
Setting of the output status at an error, a function unique to this slave station, is not related to the program.

Output data mapping

Points		Output data	bit															
			0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
32	16	**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

Input data mapping

Points	Intput data	bit															
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
16	**1 word**	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15

4. INSTALLATION

The communication cable and power cable must be connected for the MW4G*-T7EC*** to function.
If these cables are incorrectly connected, the product might not function, or this product and the devices used simultaneously could be seriously damaged in some cases.
Always read this manual and User's Manuals enclosed with the PLC and other connected units, and confirm that the cables are correctly connected.

CAUTION :

- Before handling the EtherCAT device, the worker must always touch a piece of grounded metal to release any static electricity charged in his body.
  Static electricity could damage this product.
- There is a risk of electric shock if the electric wiring connections (exposed live sections) are touched.
  Always turn the power OFF before starting wiring work.
  Do not touch the live sections with wet hands.
- Make sure that no tension or impact is applied on the power cable or communication cable.
  If the wiring is long, the cable weight or impact could cause an unexpected force and result in damage to the connector and device.
  Take measures by fixing the wiring midway to the machine or device, etc.
- Pay attention to the following points when wiring to prevent trouble caused by noise.
  ① If noise could have an effect, prepare a power supply for each manifold solenoid valve and wire each independently when possible.
  ② Do not make the power cable needlessly long. Wire with the shortest distance possible.
  ③ Wire the cables separately from noise-generating devices such as inverters and motors.
  ④ Do not wire the power cable and communication cable in parallel with other power cables.
- Wire the power cable and communication cable within the specified range so that there is no incorrect wiring.
  Incorrect wiring could cause the slave station to malfunction or break.
- Before turning the power ON, confirming that each cable and plug, etc., is correctly connected.

4.1 Connection and wiring to communication socket

The standard Ethernet cable can be used with EtherCAT, and the wiring methods are flexible. However, there are limits according to the wiring material, devices, master and hub, etc., being used. Always understand the specifications thoroughly and wire the devices correctly. (Refer to the manuals issued by the master unit manufacturer and ETG (EtherCAT Technology Group).)
The communication plug is not enclosed with this product. Purchase a communication plug that meets the specifications.
Wire the communication cable to the communication plug and connect it to the communication socket on the slave unit.

<Recommended cable with M12-RJ-45 connector [Cat.5e]>

Model XS5W-T421-□MC-K	Straight	OMRON
09 45 700 50□□	Straight	HARTING

* □ differs according to the cable specifications.

<Recommended assembly type connector>

21 03 281 1405	Assembly type M12 connector	HARTING
09 45 151 1100	Assembly type RJ45 connector	HARTING

<Recommended cable [Cat.5e]>

09 45 600 01□□	Ethernet cable for industrial use	HARTING

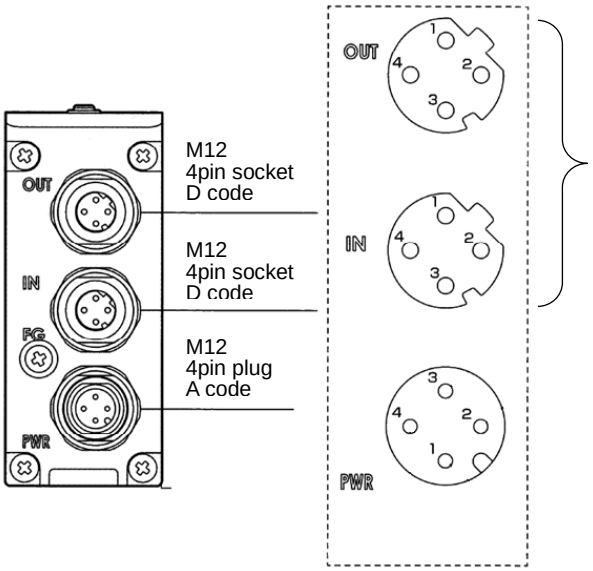
* □ differs according to the cable specifications.

Connecting the communication cable

Use the following steps to connect the communication cable to the communication plug.

① Check for safety, stop the communication, and turn OFF the power for the peripheral devices.

② Refer to the following drawing, and wire a EtherCAT Specification compatible cable to the M12 connector.



Port	Pin No.	Signal	Significance
IN / OUT	1	TD+	transmit data ＋
	2	TD-	transmit data －
	3	RD+	receive data ＋
	4	RD-	receive data －

CAUTION :

- For the network cable, use a dedicated cable that complies with EtherCAT specifications.
- Make sure the network cable has sufficient bending radius, and do not bend it forcibly.
- Separate the communication cable from the power cable and high-voltage cables.

4.2 Connection and wiring to power socket

The power plug is not enclosed with this product. Purchase a power plug that meets the specifications.
Wire the power cable to the power plug and connect it to the power socket on the slave unit.

<Unit power>
Power required to operate this slave unit.
Prepare a 21.6 to 26.4VDC power having low levels of noise.

<Valve power>
Power required to operate the solenoid valve, which is the load.
Prepare a 22.8 to 26.4VDC power having low levels of noise.

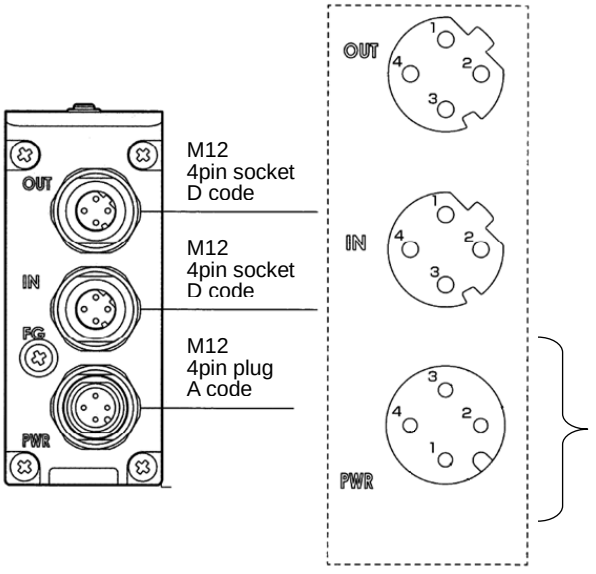
<Recommended M12-separated strand type power cable>
Model XS2F-D421-□8□-□ Straight OMRON
* □ differs according to the cable specifications.

<Recommended power plug and power cable>
21 03 212 2305 Assembly type M12 connector HARTING
Wire size: AWG22-18, applicable cable outer diameter: ø6-8

1) Connecting the power cable
Use the following steps to connect the power cable to the power plug.

① Check for safety and turn OFF the power connected to the slave unit.

② Refer to the following drawing. Wire the 24V wire of the power cable to the 24V terminal on the power plug, and wire the 0V wire to the 0V terminal.



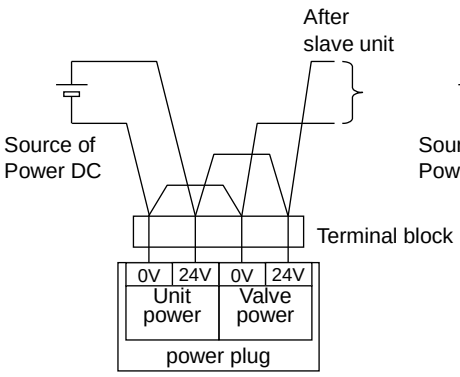
Port	Pin No.	Significance
PWR	1	Unit power 24V
	2	Valve power 24V
	3	Unit power 0V
	4	Valve power 0V

CAUTION :

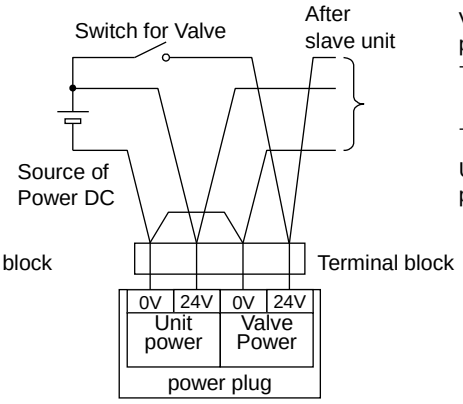
- Carefully check the polarity and rated voltage before connecting.
- Calculate the current consumption when selecting the power cable.
- If supplying power to multiple slave stations (remote I/O stations) from one power source, take the voltage drop caused by the wire into consideration when selecting and wiring the cable.
- If the voltage drop cannot be avoided, use several power cable systems, or prepare a separate power supply to ensure that the power voltage specifications are satisfied.
- If using a crossover wire for the power cable, set a terminal block before the power plug and wire the crossover wire from the terminal block.

2) Wiring of the power cable
The illustrations below are examples of power supply to two or more slave units from power source(s) at a single location. You may try other variations as required.

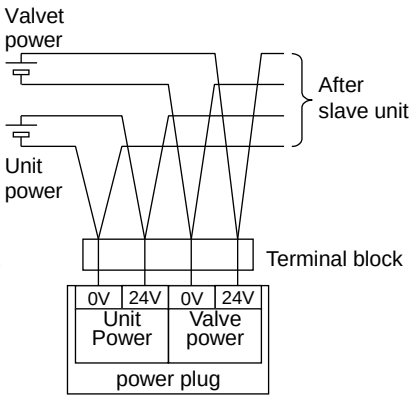
1. Common connection of Unit power and Valve power



2. Wiring to enable Valve power to be turned On ・ Off.



3. Seperate connection Unit power with Valve power



5. MAINTENANCE

5.1 Removing the Slave Unit

① Check for safety, stop the communication if necessary, and turn OFF the power for the peripheral devices.

② Check the safety, and turn OFF the power for the unit and valve.

③ Disconnect the communication plug and power plug.

④ Remove the slave station set screw.

⑤ Hold the product and pull it sideways and off.

5.2 Mounting the Slave Unit

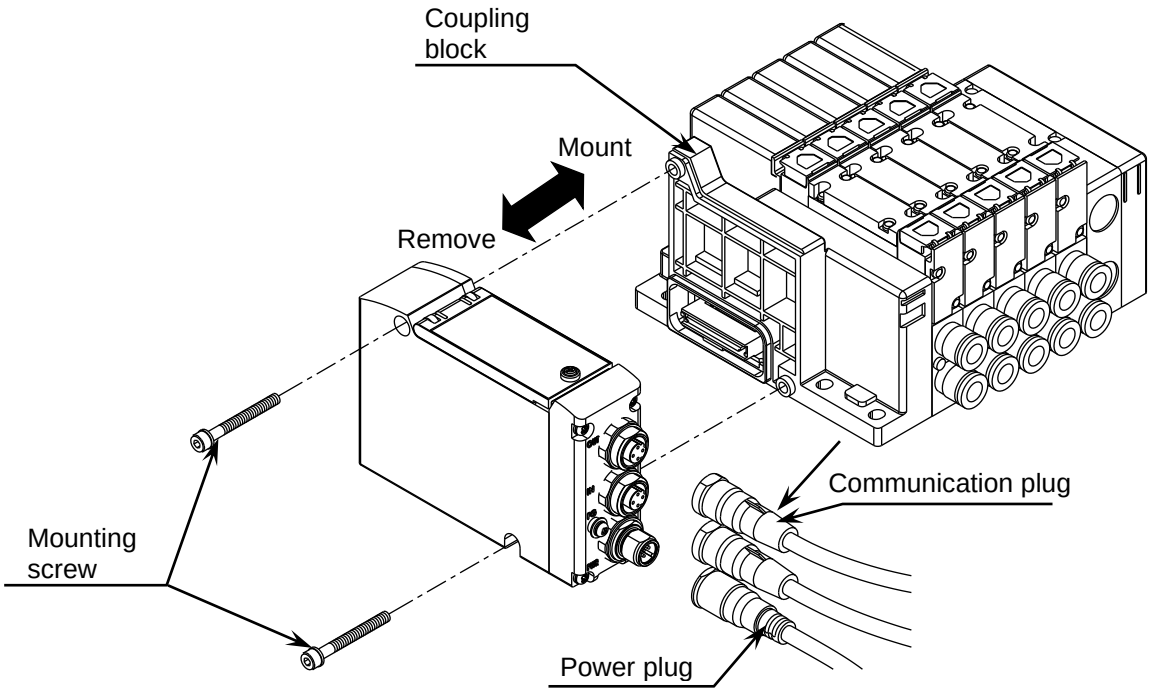
① Set this product's station No.

② Hold this product, align the coupling block connectors to the connectors on the slave station side, and gently press the product straight on.

③ Confirm that this product and the coupling block are connected, and then securely tighten the slave station set screws.
(Appropriate tightening torque 1.2N・m)

④ With the power (unit and valve) turned OFF, connect the communication plug and power plug.
If the plugs are connected while the power is ON, the system could start operating suddenly.
Pay special attention to the surrounding safety before connecting the plugs.
Communication plug: Reference tightening torque 0.6N・m
(Check with the plug manufacturer as this will vary according to the plug.)
Power plug: Reference tightening torque 0.45N・m
(Check with the plug manufacturer as this will vary according to the plug.)

⑤ Check the safety and then turn on each power.



CAUTION :

- The system and solenoid valve (cylinder) could move suddenly when the power is turned ON or OFF.
  Pay special attention to the surrounding safety before turning the power ON or OFF.
- Check the slave station node address and the setting for the output at communication error, etc., before turning the unit power ON.
- There is a risk of electric shock if the electric wiring connection (exposed live section) is touched.
- The internal components are precision parts. Do not drop the unit or apply abnormal vibration or impact.
- Do not connect or disconnect the plugs while the power is ON. There is a risk of fault or malfunction.
- Always attach a waterproof cap when not using the communication connector (OUT).
  <Recommended waterproof cap>
  21 01 000 0003 Cap M12 HARTING

5.3 Troubleshooting

Troubleshooting for this slave station must be carried out for the entire system instead of the single unit.

The system could start operating suddenly depending on the communication state. Pay special attention and ensure safety during the maintenance work.

[Symptom 1] PW, PW(V) is not lit

・Check that the power cable is connected and not disconnected.

・Check that the supplied power voltage is within the specified range.

[Symptom 2] ERR LED flashes

・Check that the power is supplied to the PLC.

・Check that there are no problems with the communication cable or connector connection state (broken or disconnected).

・Check that the communication cable complies with EtherCAT.

・Check that the transmission distance complies with EtherCAT.

・Check that there are no noise-generating devices or high-voltage wires near the communication line.

・Check that the SII data (ESI file) written into this product using TWINCAT PLC is correct.

[Symptom 3] RUN LED is not lit

・Check that the product name in the configuration matches this product name (polarity).

・Check that the IN and OUT cable connections are correct. (OUTs are connected together.)

・Check the node address setting state (incorrect or duplicate). If the setting has been changed, turn the power OFF and ON.

[Symptom 4] INFO LED flashes

・Check that the SII data (ESI file) written into this product using TWINCAT PLC is correct.

[Symptom 5] The status does not return to the output mode setting state when a communication error occurs.

・After setting a switch, turn the power OFF and ON.

5.4 Maintenance of components

This section explains the methods for daily device maintenance, cleaning and inspection, and the handling methods for replacing a slave station.

1) Cleaning
Periodically clean the device to ensure use in the optimum state.

① For daily cleaning, wipe the device with a dry, soft cloth.
② If the contamination cannot be wiped off with a dry cloth, wet a cloth with a diluted neutral detergent (2%), wring it out well, and wipe the device.
③ Stains could form if rubber, vinyl products or tape are left in contact with the slave station for a long time.
Remove these items when cleaning.

2) Inspections
Always conduct periodic inspections to ensure use in the optimum state.
Usually, the device should be inspected at a cycle of once or twice a year.
Shorten the inspection cycle when using in an extremely hot and humid environment or in a place with high levels of dust, etc.

■ Points of Inspection
Periodically inspect the following items to ensure that they do not deviate from the criteria.
If the items deviate from the criteria, adjust the environment so the criteria are met or adjust the Slave Unit itself.

Inspection item	Inspection details	Criteria	Inspection method
Environment state	Is the temperature in the area and in the panel appropriate?	Refer to the slave station specifications	Thermometer
	Is the humidity in the area and in the panel appropriate?	Refer to the slave station specifications	Hygrometer
	Is any dust accumulated?	Must be free of dust	Visual
Mounting state	Is the slave station securely fixed?	Must not be loose	Hexagon wrench
	Is the communication cable connector fully inserted?	Must not be loose	Visual
	Is the connection cable cut?	Must be no abnormalities in appearance	Visual

3) Replacing
The network consists of a master unit and one or several slave units. Malfunctioning of any unit can affect the entire network, so such unit must be replaced immediately. To restore network functions as quickly as possible, it is recommended that spare units be kept on hand at all times to replace the malfunctioning unit.

■ Precaution
When replacing a unit after periodic inspection has revealed a problem, check that the new unit does not have errors after replacement.

■ Setting the new Slave Unit after replacement
After replacing the Slave Unit, make necessary changes to the switches and other settings so that they are the same as before the Slave Unit was replaced.