Handling Instructions

EtherCAT Compatible Serial Transmission Device

T8EC* / T8ECP*

(OPP7-*EC / OPP7-*EC-P)

Thank you for purchasing CKD product.
Please review the precautions in this handling instructions thoroughly for safe operation of this product.
Incorrect usage may result in malfunction and dangers.
Keep this Instruction in a safe and convenient place for future reference.
For further information, refer to the instruction manual and product catalog.

⚠ CAUTION

- Verify that the station number of the serial transmission unit block is correctly set.
  Operation with incorrect station number will result in malfunction of solenoid valve and cylinder.
- Do not touch the live part with bare hands or the electrical wiring (bare live part), as an electric shock may occur.
- Read the instruction manual of the communication system before using the product.
- This product is DC dedicated. Use the product within the specified power supply voltage.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1. Device specifications: Always operate the device within its specifications.

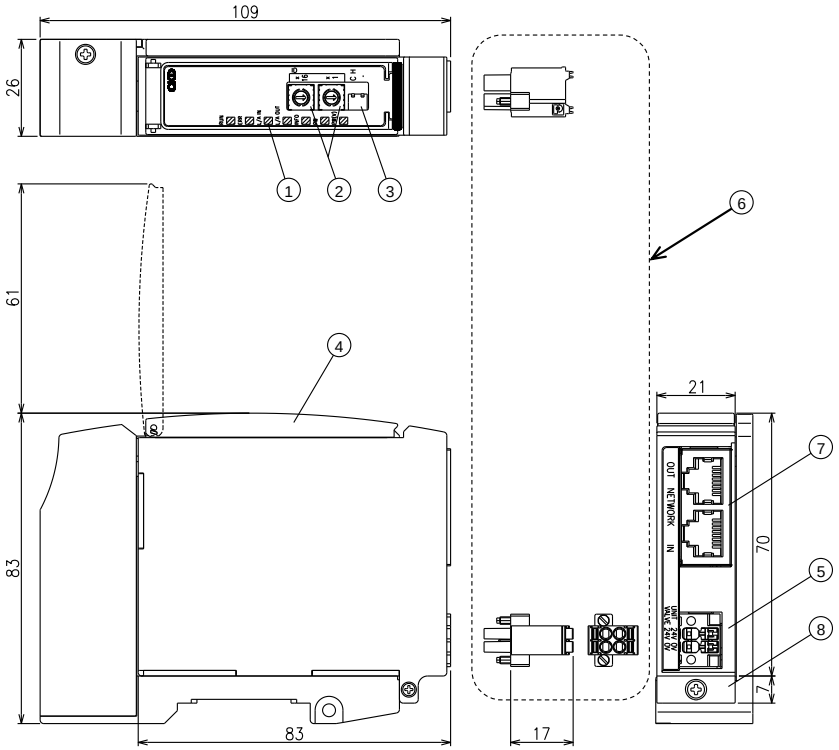
Item	Specifications			
Model No	**-T8EC1**	**-T8EC2**	**-T8ECP1**	**-T8ECP2**
Single device model No.	OPP7-1EC	OPP7-2EC	OPP7-1EC-P	OPP7-2EC-P
Unit power voltage	21.6 VDC to 26.4 VDC (24VDC±10%)			
Unit power current consumption	110 mA or less (at 24.0 VDC with all points ON)			
Valve power voltage	22.8 VDC to 26.4 VDC (24 VDC+10%, -5%)			
Valve power current consumption	15 mA or less (with all points OFF) 40 mA or less (with all points ON at no load)			
Output type	+COM(NPN)		-COM(PNP)	
Number of output points	16 points	32 points	16 points	32 points
Node address settings	With switches: 01 to FF (Hex) [1 to 255 (Dec)] Note 1			
Output setting when communication error occurs	Hold (all output points are hold) / Clear (all output points are OFF)			
Insulation resistance	Between external terminals and the case: 30 MΩ or more with 500 VDC			
Withstand voltage	Between external terminals and the case: 500 VAC for one minute			
Shock resistance	294.0 m/s^2 for 3 times in 3 directions			
Storage ambient temperature	-20°C to 70°C			
Storage humidity	30% to 85% RH (no dew condensation)			
Ambient temperature	-5°C to 55°C			
Ambient humidity	30% to 85% RH (no dew condensation)			
Atmosphere	No corrosive gas			
Installation location	Indoor use			
Altitude	Up to 2000 m			
Pollution degree	2			
Communication protocol	EtherCAT (asynchronous type) Note 2			
Transmission rate	100 Mbps			
Output insulation	Photo coupler insulation			
Leakage current	0.1 mA or less			
Residual voltage	0.5 V or less			
Fuse	Valve power: 24V, 3A/ Unit power: 24V, 2A (both fuses are non-replaceable)			
Operation indicator	LED (communication status, Unit power and valve power status) Note 3			

Note 1: Device follows address restrictions of the master unit. The node address is set from the master unit when “00” is set.

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

Note 3: Status can be monitored when the unit power is supplied with the voltage within the specified range.

2. Dimensional outline drawing



No.	Part name	Description
①	LED indicators	Indicate the status of the Device unit and network with RUN、ERR、L/A IN、L/A OUT、INFO、PW、PW(V) .
②	Rotary switches	Set the node address of the Device station.
③	Slide switch	Set the operation when communication is abnormal.
④	Cover	This clear cover protects the status monitoring lights and the switches This cover can be opened and closed with a single touch.
⑤	Unit/Valve power socket	This is the socket for connecting the Unit/Valve power plug
⑥	Unit / Valve power plug (included)	Unit / Valve power plug: This is the plug for connecting the Unit/Valve power cables (24V)
⑦	Network connector socket (RJ45*2 port [IN, OUT]) (Network connector plug is not included.)	IN： The EtherCAT network cable from the forward station is input to this port. OUT：The EtherCAT network cable is output to the next station from this port. ※If this Device is the EtherCAT terminal station, a network connector plug is not connected to OUT
⑧	Mounting screw (M2.5 tapping screw)	This screw is used to secure the Device Unit to the connecting block.

3. LED indicators and switch settings

3.1 Node address (ID) and CLR-HLD Switch settings

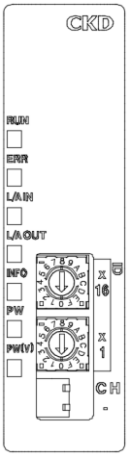
Set the node address of the device. Setting range：01 to FF (Hex)[1 to 255 (Dec)]
The node address is set from the master unit when “00” is set.

Part name	Settings
ID×16：upper digit × 1：lower digit （Address Setting）	Set the node address of the device between 01 to FF (Hex) [1 to 255 (Dec)]. Set the upper digit with x16, and the lower digit with x1.

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

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).

Part name	Settings
C H (Output mode setting)	Set the output status in the event of communication error. (Such as communication line disconnection or timeout) OFF(0)： Hold mode ON(1)： Clear mode

⚠ CAUTION

- Set switches while the unit power is turned off.
- The cover of serial transmission device can be opened and closed with one touch.
  Keep the cover of serial transmission device closed except when setting the switches. The cover may get damaged or foreign matters may enter inside and cause unexpected failure.
- Switches are precisely built and can be damaged if mishandled. Make sure not to touch the internal circuit board when setting the switches.

3.2 LED indicators

These LEDs indicate the status of the product and network. Refer to the following table for the description.

LED	Indication
RUN	Indicates the communication status of the EtherCAT with the LED (green) lighting (off, on, blinking). (Green on at normal communication.)
ERR	Indicates the error status of the EtherCAT with the LED (red) lighting (light off, light on, blinking). (Lights off at normal communication.)
L/A IN	Indicates the status of the EtherCAT port (Inside) with the LED (green) lighting (off, on, blinking(fast)).
L/A OUT	Indicates the status of the EtherCAT port (Outside) with the LED (green) lighting (off, on, blinking(fast)).
INFO	Indicates the notification status from the device with the LED (red) lighting. (Lights off at normal communication.)
PW	Lights on when the unit power is on. (Green on at normal condition.)
PW（V）	Lights on when the valve power is on. (Green on when the valve power is turned on.) (This indicator is disable when the unit power is off.)

4. Wiring

Function description and connection of the terminal are as following.

⚠ CAUTION

- 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.
- 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.
  ① If noise could have an effect, prepare power for each manifold solenoid valve and wire independently.
  ② Wire the power cable as short as possible.
  ③ Wire the power cables for the product separately from the power cables for noise-generating devices such as inverter motors.
  ④ Wire the power cable and network cable away from other power lines as much as possible.
- 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.
- When conformity to UL is required, the unit must be used with a power supply which classified as “LIM (Limited Energy Circuit) or UL 1310 Class 2” which is insulated from MAINS by double or reinforced insulation.
- When conformity to UL is required, separate power supplies should unit and valve.

4.1 Communication distance and wiring

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

4.2 Connecting and wiring to the unit/valve power socket

Unit/Valve power plug is included in the package with this product. Power is wired by connecting the Unit power cable and the Valve power cable to the power plug, and then connecting the power plug to the power socket on the device unit.

Power plug included

DFMC1,5/2-STF-3,5（1790292） 4 contacts Phoenix Contact

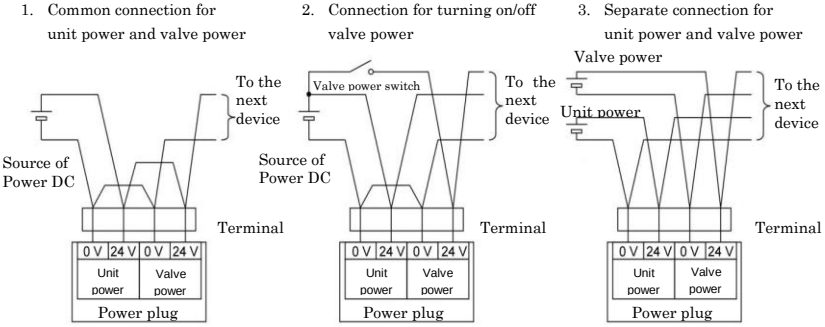
Recommended ferrules and crimping plier

Ferrule (without sleeve)：A0.5～1,5-10 Phoenix Contact

Ferrule (with sleeve) ：AI0.25～0.75-10 Phoenix Contact

Crimpling plier (common)：CRIMPFOX6（1212034） Phoenix Contact

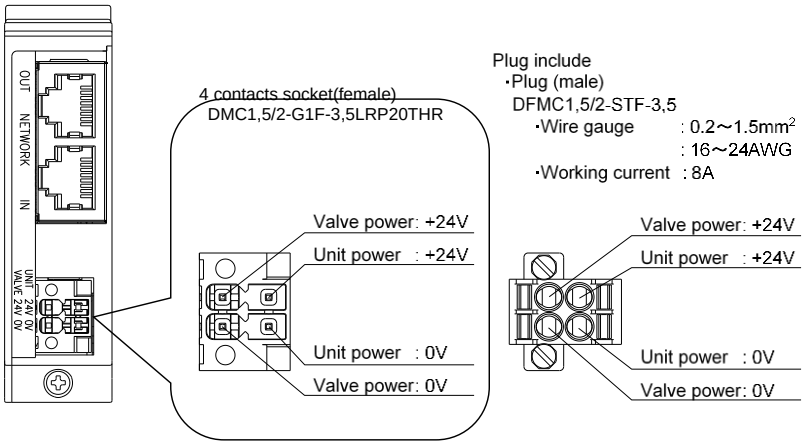
The illustrations below are examples of power supply to two or more Device units from power source(s) at a single location. You may try other variations as required.



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

＜Unit/Valve power cable＞

(1) After confirming safety, stop network communication and turn off all peripheral equipment.
(2) Stripping length of wire coating is 10mm. Attach a terminal such as a ferrule to the power cable when needed.
(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 (0.2 N·m).



⚠ CAUTION

- Check the polarity of the device and the cable terminal before connecting.
- Select the power cable by calculating the current consumption.
- Consider the voltage drop due to cables when selecting and wiring the cables if power is supplied to more than one device from one power supply.
- Take measures to secure the specified power supply voltage if voltage drop cannot be avoided. For example, wire the power cables in multiple systems or install other power supplies to secure the specified power supply voltage.
- Install a terminal block if multi-drop wiring of the power cables is needed. Install the terminal block so that it comes before the power plug.

4.3 Connecting and wiring to the network connector socket (RJ45 connector)

Network plug is not supplied with the product. Separately purchase a network plug that satisfies the specifications.

Wiring the network cable to the network plug enables the plug to connect to the network connector socket on the device.

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

ETP-SB-S***□ Industrial Ethernet Cable JMACS

***:Length, □:unit M=METRE C=CENTIMETER

Recommended assembly type RJ45 connector [Cat.6]

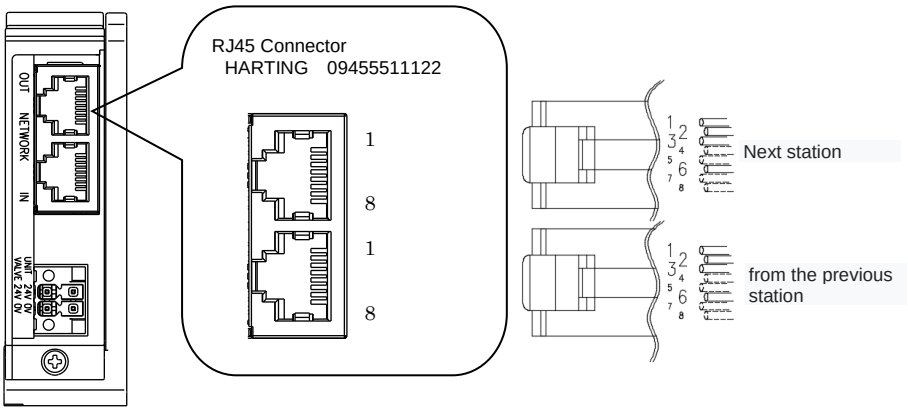
09 45 151 1560	Assembly type RJ45 connector	HARTING
09 45 151 1561	Assembly type RJ45 connector (angled)	HARTING

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

＜Network cable＞

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

② Connect the EtherCAT cable to network connector RJ45 plug according to the illustrations below.



Port	PIN	Signal	Significance
IN / OUT	1	TD+	Transmission data +
	2	TD-	Transmission data -
	3	RD+	Reception data +
	4	Not used.	Not used.
	5	Not used.	Not used.
	6	RD-	Reception data -
	7	Not used.	Not used.
	8	Not used.	Not used.

⚠ CAUTION

- Use a dedicated network cable that complies with EtherCAT specifications.
- Provide sufficient bending radius for the network cable and do not bend it forcibly.

5. Maintenance

5.1 Mounting the product (device)

① Set the node address and other switches of the product.

② Turn off the power (for unit/valve) and connect the network plug and power socket.
The system may start operating suddenly if they are connected while the power is turned on. Be careful of the surroundings and secure safety before performing work.

③ Hold this product and slowly insert it into the Device station connection block from the front along the side wall.

④ Make sure the Device Unit and the connecting block are connected and tighten the Device Unit mounting screw firmly. (Adequate tightening torque: 0.5N·m)

⑤ After confirming safety, turn on each power supply.

5.2 Removing the product (device)

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

② After confirming safety, turn off Unit power and Valve power as necessary.

(If the Device Unit is the last Device and its power is turned off, the power supply to terminating resistance will stop and communication throughout the whole system may become unstable or even stop.)

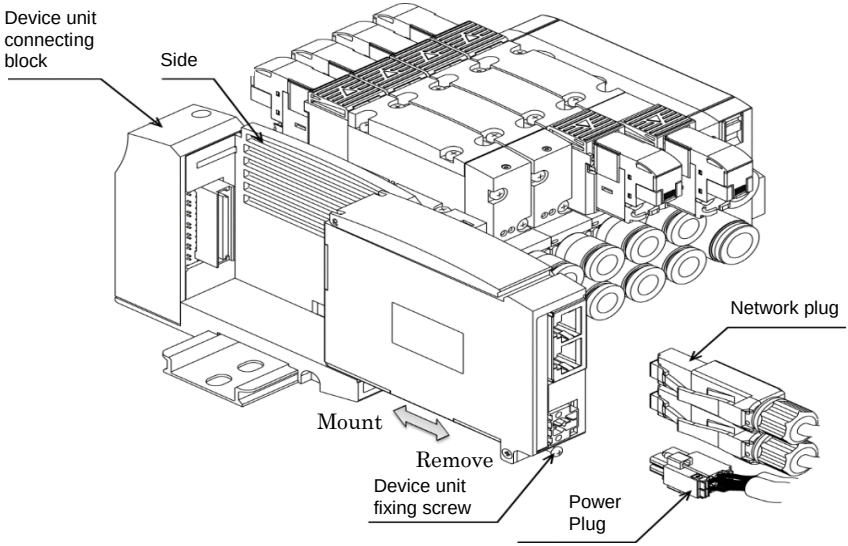
③ Remove the Device Unit mounting screw. Since this mounting screw is a fall-prevention type, stop loosening it as soon as it detaches from the Device Unit connecting block.

④ Hold the Device Unit and pull it toward you.

⑤ Remove the network connector plug and the power plug.

⚠ CAUTION

- Do not remove the device by pulling cable or connector that may cause disconnection or damage.
- Do not pull out the Device unit by pulling the cable or connector.
  This may cause cable disconnectionodeamage.
- An electric shock may occur by touching the electrical wiring connection (bare live part).



6. Settings by ESI file

In order for the EtherCAT device to join the network, it is necessary to register the device to the network using the ESI file which describes the communication specification of the device. Refer to the instruction manual of the master unit manufacturer for registering the ESI file. Use the ESI file that matches the device version used to ensure a suitable network configuration.

ESI file name（for OPP7-*EC-*）：CKD_OPP7.xml

(The above ESI file contains data for four models.)

6.1 Registering the device

Check the node address and specifications (model name) of the device before registering, as both the device and ESI file need to be matched.

Specifications and the model name in the ESI file

Item	Specifications			
Model No.	T8EC1	T8EC2	T8ECP1	T8ECP2
Single device model No.	OPP7-1EC	OPP7-2EC	OPP7-1EC-P	OPP7-2EC-P
Output type	+COM（NPN）		－COM（PNP）	
Number of output points	16 points	32 points	16 points	32 points
Model name in the ESI file	OPP7-1EC	OPP7-2EC	OPP7-1EC-P	OPP7-2EC-P

6.2 I/O mapping

There are two types of data: the PDO (Process Data Objects) output data sent from the master unit to a device (this product) and the input data sent from the device to the master unit.
The product is an output device that receives output data from the master unit and output to the valve.（not Input data）

Refer to the following table for I/O mapping.

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

Note: With the standard wiring of the double solenoid valve, the A-solenoid close to the product is assigned output data 00, and the B-solenoid is assigned output data 01 in order.

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 unit and valve power supplies.
- The system or solenoid valve (cylinder) may operate suddenly when powering on and off. Be careful of the surroundings and secure safety before performing work.
- For the delay time, refer to the instruction manual of the master unit. Transmission delay as a system varies depending on the PLC scan time and other devices connected to the same network.
- For the Response time of the solenoid valve, check the solenoid valve specifications.
- Solenoid valve OFF time is delayed by approximately 20 msec due to the surge absorbing circuit integrated in the device.
- Wire the power cable and network cable properly within its specifications to avoid any incorrect wiring.
- Do not apply tension or impact to the power cable or network cable.
- Make sure that cables and connectors are securely connected before turning on the power.
- Do not disassemble, modify, or repair the product as that may cause failure or malfunction.
- Do not drop or apply excessive vibrations or shocks to the product as the part inside are made precisely.
- Do not attach or detach the connector while the power is ON as that may cause a 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.

For inquiries regarding the product, please contact the following or the nearest sales office.

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