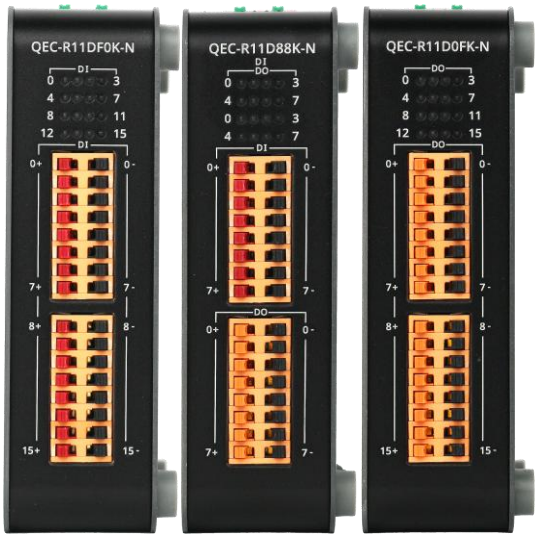


# User Manual

# QEC-RXXDXXK

EtherCAT SubDevice Digital I/O Module (PNP/NPN).

With Isolated 16-ch Digital Input/Output.

**(Revision 1.0)**

# REVISION

| DATE | VERSION | DESCRIPTION |
|---|---|---|
| 2025/08/01 | Version1.0 | New Release. |

# COPYRIGHT


Ver.1.0 August, 2025

# TRADEMARKS ACKNOWLEDGMENT



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- Global: www.icop.com.tw
- USA: www.icoptech.com
- Japan: www.icop.co.jp
- Europe: www.icoptech.eu
- China: www.icop.com.cn

For technical support or drivers download, please visit our websites at:

- https://www.icop.com.tw/resource_entrance

For EtherCAT solution service, support or tutorials, 86Duino Coding IDE 500+ introduction, functions, languages, libraries, etc. Please visit the QEC website:

- QEC: https://www.qec.tw/

This Manual is for the QEC series.

# SAFETY INFORMATION

- Read these safety instructions carefully.
- Please carry the unit with both hands and handle it with caution.
- Power Input voltage +19 to +50VDC Power Input (Typ. +24VDC)
- Make sure the voltage of the power source is appropriate before connecting the equipment to the power outlet.
- To prevent the QEC device from shock or fire hazards, please keep it dry and away from water and humidity.
- Operating temperature between -20 to +70°C/-40 to +85°C (Option).
- When using external storage as the main operating system storage, ensure the device's power is off before connecting and removing it.
- Never touch un-insulated terminals or wire unless your power adaptor is disconnected.
- Locate your QEC device as close as possible to the socket outline for easy access and avoid force caused by the entangling of your arms with surrounding cables from the QEC device.
- If your QEC device will not be used for a period of time, make sure it is disconnected from the power source to avoid transient overvoltage damage.

***WARNING!***

*DO NOT ATTEMPT TO OPEN OR TO DISASSEMBLE THE CHASSIS (ENCASING) OF THIS PRODUCT. PLEASE CONTACT YOUR DEALER FOR SERVICING FROM QUALIFIED TECHNICIAN.*

# Content

# Ch. 1

# General Information

# 1.1 Introduction

The QEC-RXXDXXK Series from ICOP is a compact, high-reliability EtherCAT SubDevice designed for digital input/output (DI/DO) applications. Supporting both NPN and PNP configurations, it offers up to 16 isolated digital channels, making it ideal for a wide range of industrial automation environments.
Certified by the EtherCAT Conformance Test Tool (ET9400), the QEC-RXXDXXK ensures seamless integration with EtherCAT masters, delivering robust performance and interoperability across various systems.

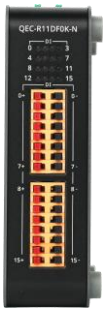
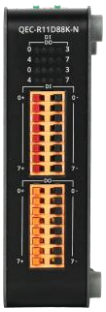
**Flexible I/O Configurations with Industrial-Grade Specs**
Available in three configurations—16 DI, 8 DI + 8 DO, or 16 DO—each module supports sink-type input compatible with both NPN and PNP sensors, operating at up to 3000 Hz. The output stage can drive loads up to 60 VDC, with a typical current of 500 mA and peak current of 1 A, making it suitable for relay control, actuator triggering, or machine interfacing. With 2,500 Vrms (DI) and 1,500 Vrms (DO) isolation, it ensures safe and noise-immune operation.

**Precision with Distributed Clocks**
The QEC-RXXDXXK supports Distributed Clock (DC) mode, enabling high-precision synchronization across EtherCAT nodes. This is crucial for time-sensitive applications such as motion control or synchronized I/O operations. With a minimum cycle time of 1 ms, the module balances speed and determinism.

**Compact, Robust, and Easy to Integrate**
Housed in a DIN-rail–mountable enclosure (107.45 × 77.4 × 34 mm) and weighing just 240 g, the module features rugged Euroblock terminals for secure wiring. It operates reliably in harsh environments with a wide temperature range of -20°C to +70°C, and includes built-in monitoring for temperature, voltage, current, and startup diagnostics.

**Scalable, Reliable I/O for EtherCAT Automation**
Whether you're building a flexible I/O station or upgrading to EtherCAT-based control, the QEC-RXXDXXK offers a scalable and standards-compliant solution. Its compact design, high-frequency support, and comprehensive protection features make it a perfect fit for modern industrial systems.

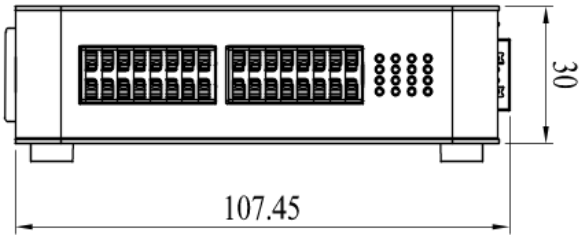
# 1.2 Specifications

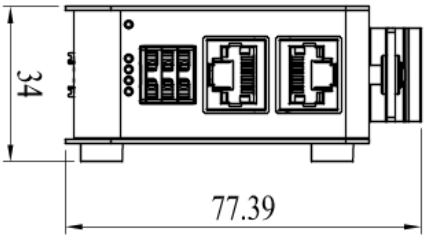



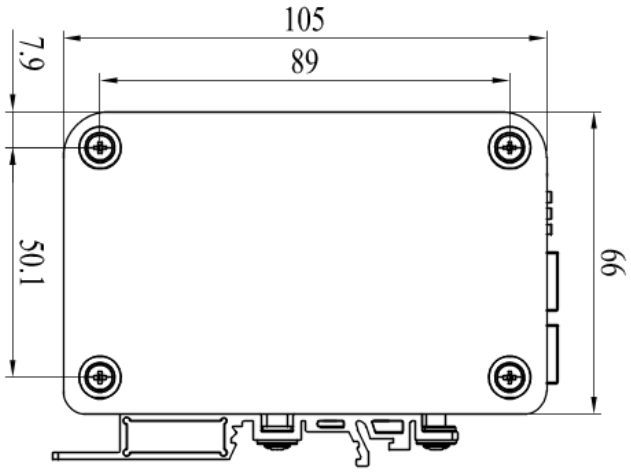

| Module Name/Title | QEC-RXXDF0K | QEC-RXXD88K | QEC-RXXD0FK |
|---|---|---|---|
| **Digital I/O** | | | |
| Channel | 16-ch Digital Input (Isolated Channel) | 8-ch Digital Input & 8-ch Digital Output (Isolated Channel) | 16-ch Digital Output (Isolated Channel) |
| Input/Output Type | Sink (Supports both NPN and PNP configurations) | | |
| DI - Frequency | Safe Operating Frequency: ≤3000 Hz | | - |
| DI - Delay | Rise Time (tr): 6 us, Fall Time (tf): 6 us | | |
| DI - Load Voltage | +24 Vdc (Options: 24V or 48V) | | - |
| DO - Frequency | - | Operating Frequency: 1000Hz | |
| DO - Delay | - | Turn-On Time: 0.25 ms, Turn-Off Time: 20 us | |
| DO - Load Voltage | - | +56 Vdc | |
| DO - Load Current | - | Typ. 500mA (Peak 1000mA) | |
| Isolation Protection | 2500 Vrms | DI : 2500 Vrms<br>DO: 1500 Vrms | 1500 Vrms |
| **EtherCAT** | | | |
| Connector | RJ-45 (Red housing for PoE; Black housing for non-PoE) | | |
| Cable Type | Ethernet/EtherCAT Cable (Min. CAT 5), Shielded | | |
| Cycle Time | 500 us | 1 ms | 1 ms |
| Mailbox Service | Yes | Yes | Yes |
| Distributed Clock (DC) | Yes | Yes | Yes |
| FoE | Yes | Yes | Yes |
| **General** | | | |
| I/O Connector | Euroblock (Digital Input: Red; Digital Output: Orange; Negative Electrode: Black) | | |
| Power Connector | 4-pin Power Input/Output (+V: Red / GND: Black) and 2-pin FGND (Green) | | |

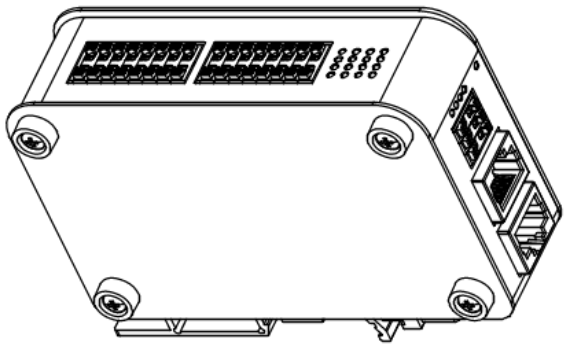
| | | | |
|---|---|---|---|
| Power Requirement | +19 to +50VDC Power Input (Typ. +24VDC) | | |
| Power Consumption | 3W | 3W | 3W |
| Operating Temperature | -20 to +70˚C | | |
| Dimension | 105 x 77.4 x 34 mm | | |
| Weight | 235 g | 237 g | 240 g |
| LED Indicator | PWR, RUN, LINK, ERROR, DI/DO status | | |
| Certifications | CE, FCC, VCCI | | |
| Mounting | DIN-Rail | | |
| Internal Monitoring | Temperature, Voltage, Current, Start-up time | | |

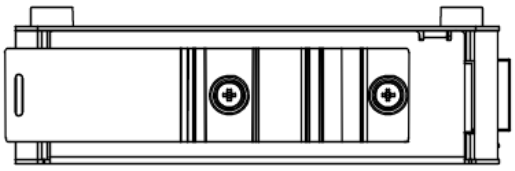
# 1.3 Dimension

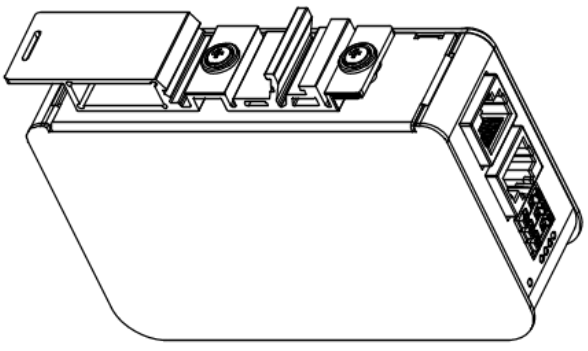




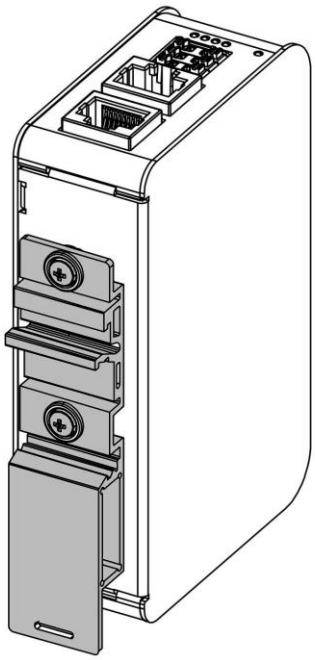


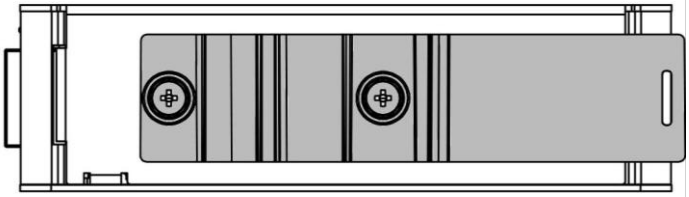
(Unit: mm)

# 1.4 Mounting Instruction

QEC-RXXDXXK is an easy-install design to help you set-up your modules easily. Please refer to Ch.3.1 DIN-Rail installation.

- **DIN-Rill**





# 1.5 Ordering Information

| Type | RJ45 power source | | Functions | | | Feature | - | Coating |
|---|---|---|---|---|---|---|---|---|
| | Input | Output | Digital | Input | Output | Digital Type | | |
| QEC-R | X | X | D | X | X | K | | X |

**1. Type:** Code 1~4

R: EtherCAT SubDevice.

**2. RJ45 Power source:** Code 5~6

0: RJ45 In/Out w/o power

1: RJ45 PoE Device, Red Plastic Housing

**3. Functions:** Code 7~9

D: Digital I/O

X: 0, 8, F (16) input channels

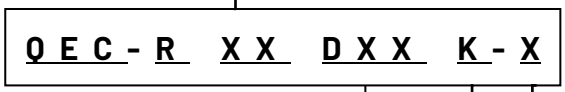
X: 0, 8, F (16) output channels

**4. Feature:** Code 10

K: Digital I/O support PNP/NPN configuration

**5. Coating:** Code 11

C: Yes / N: Normal




## 1.5.1 Reference Ordering Part Number:

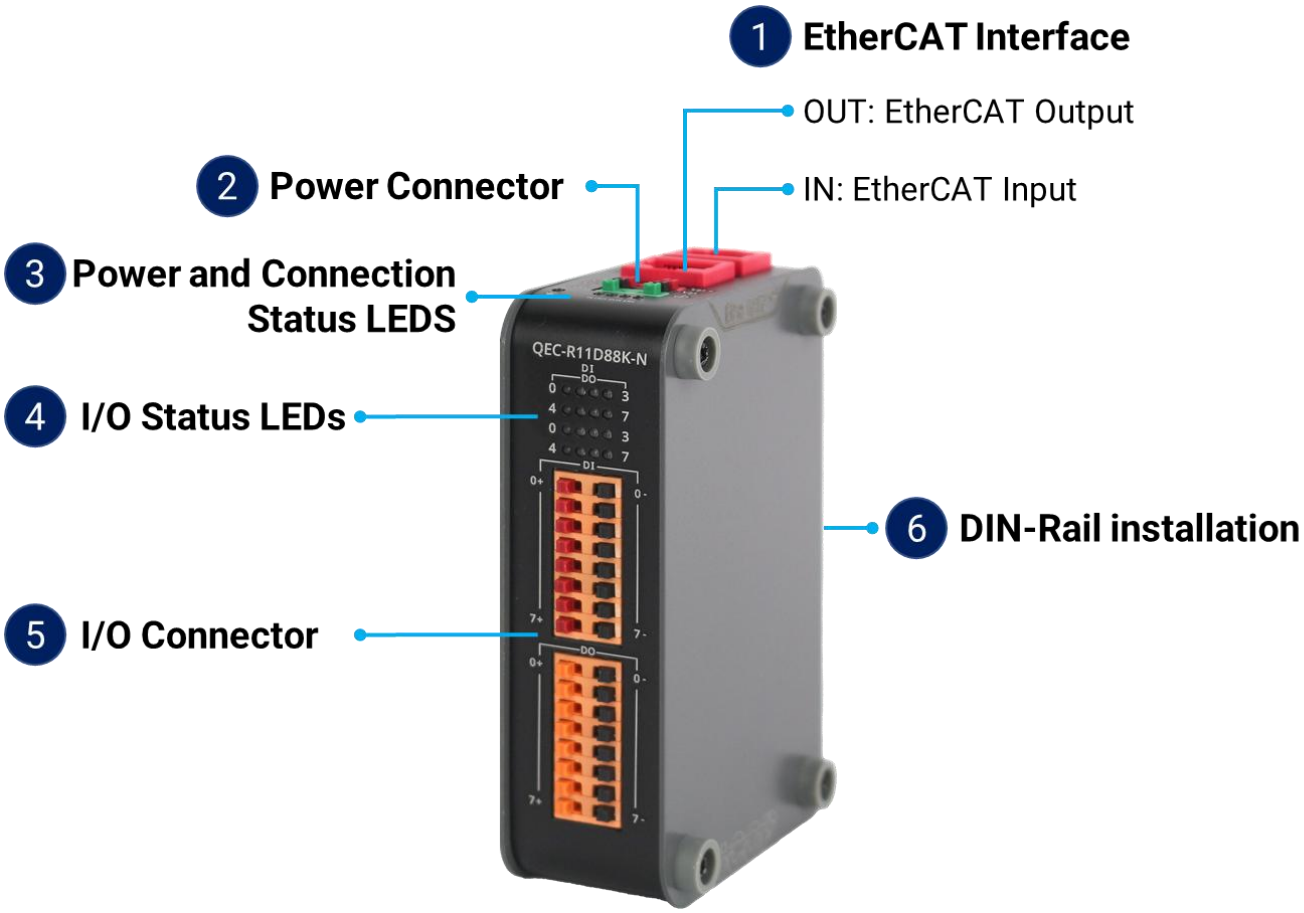
Below are the standard Part Numbers:

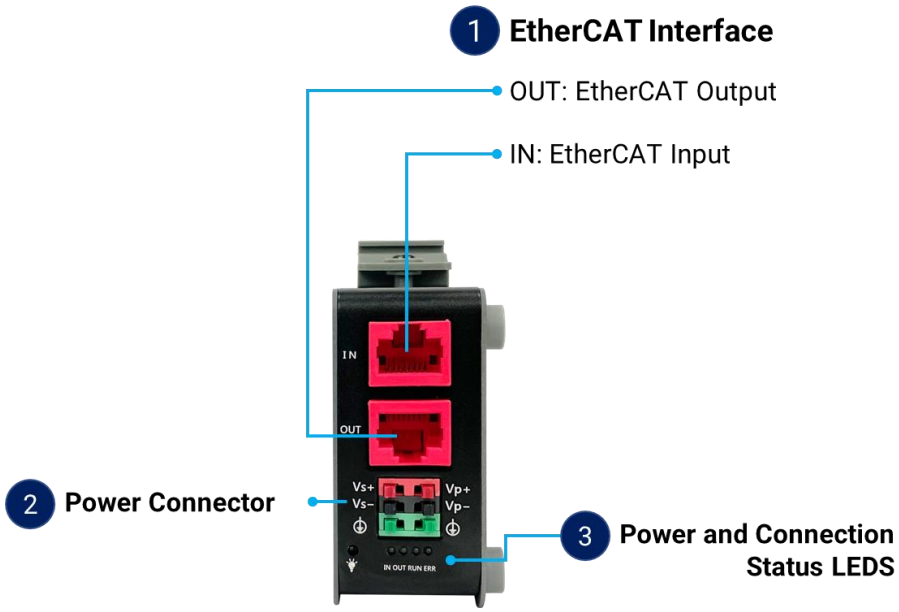
- **QEC-R00DF0K-N**: EtherCAT SubDevice 16-ch DI Module (PNP/NPN, Isolated)
- **QEC-R11DF0K-N**: EtherCAT SubDevice 16-ch DI Module (PNP/NPN, Isolated)/PoE
- **QEC-R00D88K-N**: EtherCAT SubDevice 8-ch DI + 8-ch DO Module (PNP/NPN, Isolated)
- **QEC-R11D88K-N**: EtherCAT SubDevice 8-ch DI + 8-ch DO Module (PNP/NPN, Isolated)/PoE
- **QEC-R00D0FK-N**: EtherCAT SubDevice 16-ch DO Module (PNP/NPN, Isolated)
- **QEC-R11D0FK-N**: EtherCAT SubDevice 16-ch DO Module (PNP/NPN, Isolated)/PoE

# Ch. 2

# Hardware System

## 2.1 General Technical Data



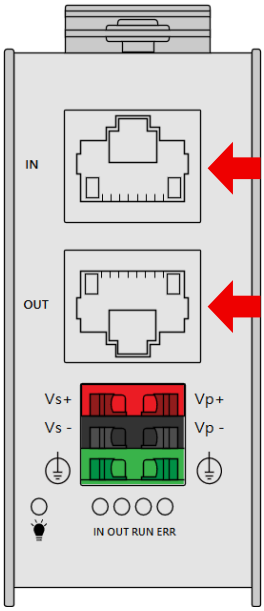



## 2.2 Connector Summary

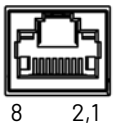
| No. | Description | | Type Narrative | Pin # |
|---|---|---|---|---|
| 1 | EtherCAT Interface | OUT | External RJ45 Connector (Gold finger) | 8-pin |
| | | IN | | 8-pin |
| 2 | Power Connector | | Terminal Block Interface | 6-pin |
| 3 | Power and Connection Status LEDs | | External Status LEDs | - |
| 4 | I/O Status LEDs | | External Status LEDs | - |
| 5 | I/O Connector | | 16 channels push-in Terminal (Euroblock) | 16-ch |
| 6 | DIN-Rail installation | | DIN-Rail | - |

## 2.2.1 EtherCAT Interface

RJ45 Connectors.



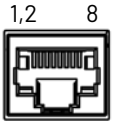

### 2.2.1.1 EC IN




| Pin # | Signal Name | Pin # | Signal Name |
|---|---|---|---|
| 1 | LAN1_TX+ | 2 | LAN1_TX- |
| 3 | LAN1_RX+ | 4 | VS+ |
| 5 | VP+ | 6 | LAN1_RX- |
| 7 | VS- (GND) | 8 | VP- (GND) |

* PoE LAN with the Red Housing; Regular LAN with Black Housing.
* L4, L5, L7, L8 pins are option, for RJ45 Power IN/OUT.

### 2.2.1.2 EC OUT

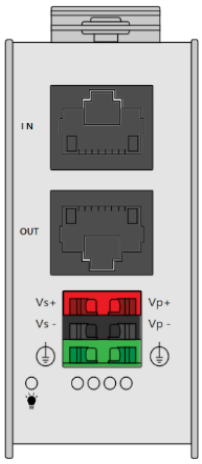
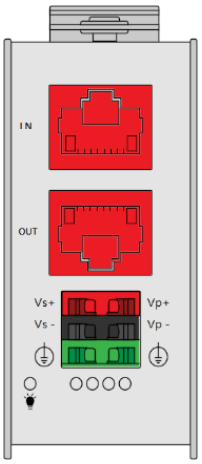



| Pin # | Signal Name | Pin # | Signal Name |
|---|---|---|---|
| 1 | LAN2_TX+ | 2 | LAN2_TX- |
| 3 | LAN2_RX+ | 4 | VS+ |
| 5 | VP+ | 6 | LAN2_RX- |
| 7 | VS- (GND) | 8 | VP- (GND) |

* PoE LAN with the Red Housing; Regular LAN with Black Housing.
* L4, L5, L7, L8 pins are option, for RJ45 Power IN/OUT.

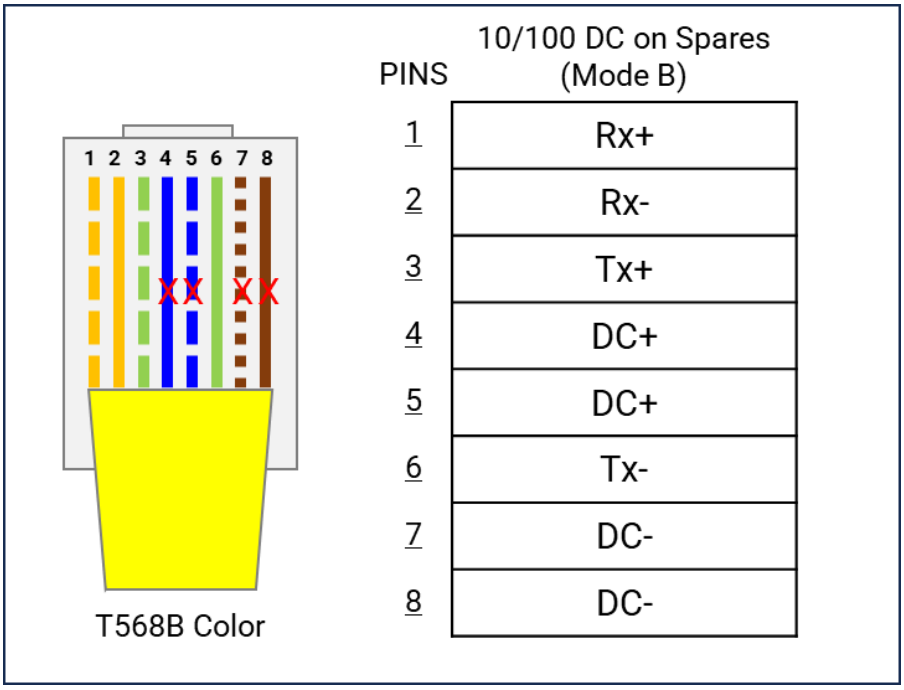
# Note. QEC's PoE (Power over Ethernet)

In QEC product installations, users can easily distinguish between PoE and non-PoE: if the RJ45 house is red, it is PoE type, and if the RJ45 house is black, it is non-PoE type.

| | |
|---|---|
|  |  |
| Non-PoE type | PoE type |

PoE (Power over Ethernet) is a function that delivers power over the network. QEC can be equipped with an optional PoE function to reduce cabling. In practice, PoE is selected based on system equipment, so please pay attention to the following points while evaluating and testing:

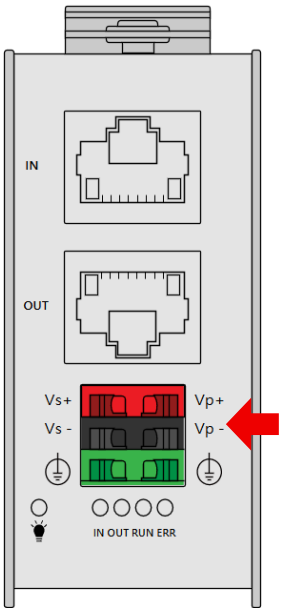
1. When connecting PoE and non-PoE devices, make sure to disconnect Ethernet cables at pins 4, 5, 7, and 8 (e.g., when a PoE-supported QEC EtherCAT MDevice connects with a third-party EtherCAT SubDevice).
2. The PoE function of QEC is different and incompatible with EtherCAT P, and the PoE function of QEC is based on PoE Type B, and the pin functions are as follows:




3. QEC's PoE power supply is up to **24V/3A**.

## 2.2.2 Power Connector

Euroblock Connectors.
4-pin Power Input/Output (+V: Red / GND: Black) and 2-pin FGND (Green).




Vs for system power; Vp for peripheral power and backup power.


| Pin # | Signal Name | Pin # | Signal Name |
|---|---|---|---|
| 1 | Vs+ | 2 | Vp+ |
| 3 | Vs- (GND) | 4 | Vp- (GND) |
| 5 | F.G | 6 | F.G |

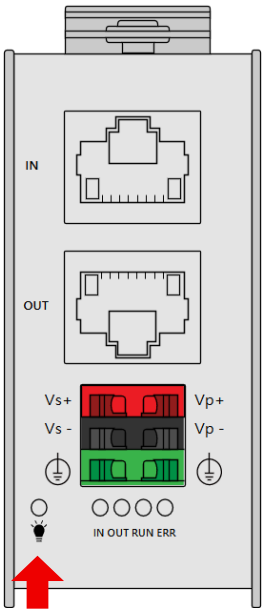
* Power Input voltage +19 to +50VDC Power Input (Typ. +24VDC)

## 2.2.3 Power and Connection Status LEDs

Power and connection status LEDs information.

### 2.2.3.1 Power Status LED

Power input is 24V (typical). The LED status provide high/low voltage warning.




| Notation | States | Condition | Description |
|---|---|---|---|
| PWR | Green LED On | Voltage <= 50V and >= 45V<br>Voltage <= 26V and >= 19V | When Vs and Vp voltages are confirmed to be normal, the Green LED will remain steady on. |
| | Green LED On<br>Red LED On | Voltage < 45V and > 26V<br>Voltage < 19V and > 12V | LEDs will alternately flash (at 0.3-second intervals) until the Vs and Vp voltages are correct. |
| | Orange LED On | Voltage > 50V or < 12V | Orange LED (Green + Red) will continuously flash (at 0.3-second intervals) until the Vs and Vp voltages are correct. |

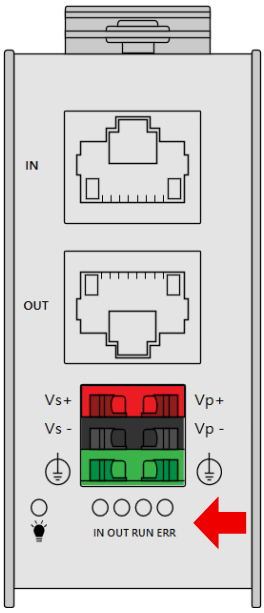
* Vs power status will be displayed first.

Power ERROR Code table (Red LED Flashing Display (2 seconds/cycle))：

| Long Light | Short Flash | Description |
|---|---|---|
| 0 Long Light | After microchip completes the Bootloader test, it proceeds to the APP program stage. | |
| | 1 short flash | Microchip communication with the EtherCAT chip failed. |
| | 2 short flashes | EtherCAT chip internal RAM test failed. |
| | 5 short flashes or 6 short flashes | Quartz oscillator on the board abnormality. |
| 1 Long Light | Indicates the microchip Bootloader stage during startup, APP program not yet executed. | |
| | 1 short flash | microchip internal SRAM failed. |
| | 2 short flashes | APP software CHECKSUM failed. |
| 2 Long Lights | Not yet defined. | |

* **Note:** If you encounter any of the above abnormal states, please contact us.

## 2.2.3.2 Connection Status LEDs




There are EtherCAT In, Out, Run, and Error Status LEDs.

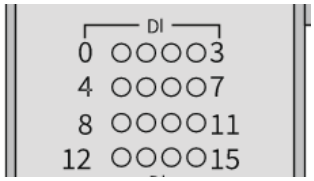

| Notation | Color | States | Description |
|---|---|---|---|
| In | Green | Off | No link |
| | | Blinking | Link and activity |
| | | On | Link without activity |
| Out | Green | Off | No link |
| | | Blinking | Link and activity |
| | | On | Link without activity |
| Run | Green | Off | The device is in state INIT |
| | | Blinking | The device is in state Pre-Operation |
| | | Single Flash | The device is in state Safe-Operation |
| | | On | The device is in state Operation |
| Err | Red | Off | No error |
| | | Blinking | Invalid Configuration |
| | | Single Flash | Local Error |
| | | Double Flash | Process Data Watchdog Timeout<br>EtherCAT Watchdog Timeout |
| | | On | The device is in state Error |

## 2.2.4 I/O Status LEDs

The I/O status LEDs for the digital input and output modules vary from module to module.

### 2.2.4.1 Digital Input (QEC-RXXDF0K)

The LEDs of 16 digital inputs are 0 to 16, individually indicating the status of the 16 digital channels.




| Notation | Color | States | Description |
|---|---|---|---|
| Digital Input | - | Off | Digital input status is “Off” |
| | Green | On | Digital input status is “On” |

### 2.2.4.2 Digital Output (QEC-RXXD0FK)

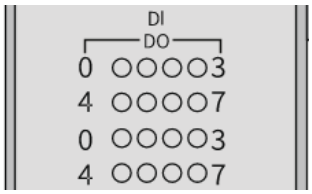
The LEDs of 16 digital outputs are 0 to 16, individually indicating the status of the 16 digital channels.


| Notation | Color | States | Description |
|---|---|---|---|
| Digital Output | - | Off | Digital input status is “Off” |
| | Green | On | Digital input status is “On” |

### 2.2.4.3 Digital Input/Output (QEC-RXXD88K)

The LEDs for the 8-channel digital inputs/outputs are 0 through 7, indicating the input and output channels respectively. The first 0 to 7 LEDs are for digital inputs’ status; and then, the next 0 to 7 LEDs are for digital outputs’ status.

Digital Input




Digital Output

| Notation | Color | States | Description |
|---|---|---|---|
| Digital Input | - | Off | Digital input status is “Off” |
| | Green | On | Digital input status is “On” |
| Digital Output | - | Off | Digital output status is “Off” |
| | Green | On | Digital output status is “On” |

## 2.2.5 Digital I/O Connector

The Digital I/O connector description.
For EtherCAT SubDevice index assignments, refer to Ch. 5.2 Object Dictionary.

The Digital I/O specification table:

| Digital I/O | Digital Input | Digital Output |
|---|---|---|
| Input Type | Sink (Supports both NPN and PNP configurations) | |
| Frequency | Safe Operating Frequency: ≤3000 Hz<br>Rise Time (tr): 6us, Fall Time (tf): 6us | Operating Frequency: 1000Hz<br>Turn-On Time: 0.25ms<br>Turn-Off Time: 20us |
| Load Voltage | +24Vdc (Options: 24V or 48V) | +56 Vdc |
| Load Current | - | Typ. 500mA (peak 1000mA) |
| Isolation Protection | 2500 Vrms | 1500 Vrms |

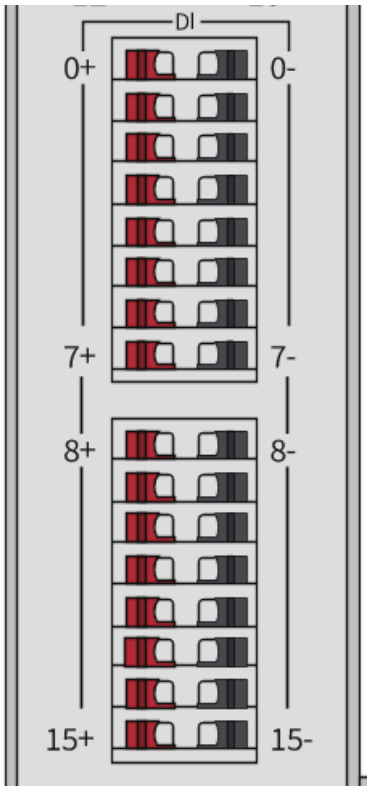
Color Define:

- Digital Input: Positive (Red), Negative (Black).
- Digital Output: Positive (Orange), Negative (Black).

## 2.2.5.1 Digital Input (QEC-RXXDF0K)

Digital Input: Positive (Red), Negative (Black).

| Pin # | Signal Name | | Pin # | Signal Name |
|---|---|---|---|---|
| 0+ | DI_00+ | | 0- | DI_00- |
| 1+ | DI_01+ | | 1- | DI_01- |
| 2+ | DI_02+ | | 2- | DI_02- |
| 3+ | DI_03+ | | 3- | DI_03- |
| 4+ | DI_04+ | | 4- | DI_04- |
| 5+ | DI_05+ | | 5- | DI_05- |
| 6+ | DI_06+ | | 6- | DI_06- |
| 7+ | DI_07+ | | 7- | DI_07- |
| 8+ | DI_08+ | | 8- | DI_08- |
| 9+ | DI_09+ | | 9- | DI_09- |
| 10+ | DI_10+ | | 10- | DI_10- |
| 11+ | DI_11+ | | 11- | DI_11- |
| 12+ | DI_12+ | | 12- | DI_12- |
| 13+ | DI_13+ | | 13- | DI_13- |
| 14+ | DI_14+ | | 14- | DI_14- |
| 15+ | DI_15+ | | 15- | DI_15- |




**Digital Input Load Voltage:**

- Maximum Load Voltage: Load Voltage+24 Vdc (Options: 24V or 48V)

**Channel Isolation:**

- Isolated Channels: 16

**Frequency**

- Safe Operating Frequency: ≤3000 Hz (Rise Time (tr): 6us, Fall Time (tf): 6us)

**I/O Type:**

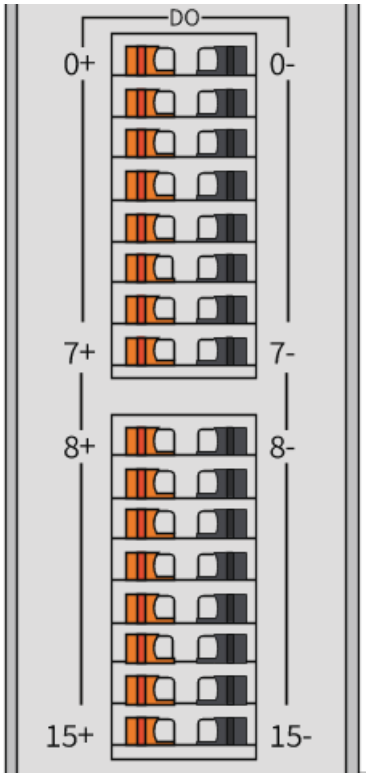
- Type: Sink (Supports both NPN and PNP configurations)

**Isolation Protection**

- 2500 Vrms

## 2.2.5.2 Digital Output (QEC-RXXD0FK)

Digital Output: Positive (Orange), Negative (Black).

| Pin # | Signal Name | | Pin # | Signal Name |
|---|---|---|---|---|
| 0+ | DQ_00+ |  | 0- | DQ_00- |
| 1+ | DQ_01+ | | 1- | DQ_01- |
| 2+ | DQ_02+ | | 2- | DQ_02- |
| 3+ | DQ_03+ | | 3- | DQ_03- |
| 4+ | DQ_04+ | | 4- | DQ_04- |
| 5+ | DQ_05+ | | 5- | DQ_05- |
| 6+ | DQ_06+ | | 6- | DQ_06- |
| 7+ | DQ_07+ | | 7- | DQ_07- |
| 8+ | DQ_08+ | | 8- | DQ_08- |
| 9+ | DQ_09+ | | 9- | DQ_09- |
| 10+ | DQ_10+ | | 10- | DQ_10- |
| 11+ | DQ_11+ | | 11- | DQ_11- |
| 12+ | DQ_12+ | | 12- | DQ_12- |
| 13+ | DQ_13+ | | 13- | DQ_13- |
| 14+ | DQ_14+ | | 14- | DQ_14- |
| 15+ | DQ_15+ | | 15- | DQ_15- |



**Digital Output Load Voltage:**

- Maximum Load Voltage: +60 Vdc

**Digital Output Load Current:**

- Typ. 500mA (peak 1000mA)

**Channel Isolation:**

- Isolated Channels: 16

**Frequency**

- Operating Frequency: 1000Hz (Turn-On Time: 0.25ms, Turn-Off Time: 20us)

**I/O Type:**

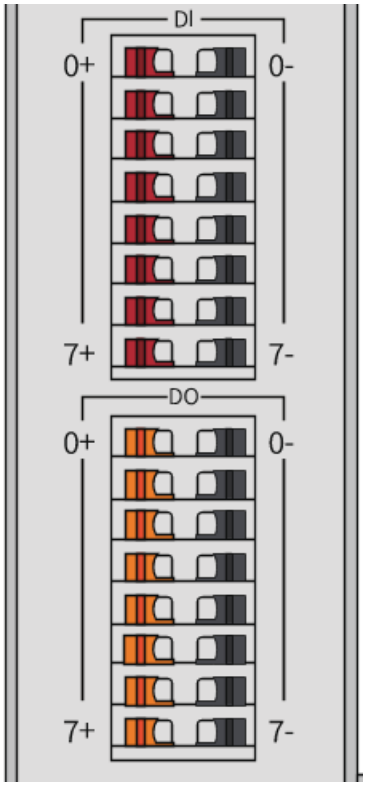
- Type: Sink (Supports both NPN and PNP configurations)

**Isolation Protection**

- 1500 Vrms

## 2.2.5.3 Digital Input/Output (QEC-RXXD88K)

Digital Output: Positive (Orange), Negative (Black).
Digital Input: Positive (Red), Negative (Black).

| Pin # | Signal Name | | Pin # | Signal Name |
|---|---|---|---|---|
| 0+ | DI_00+ |  | 0- | DI_00- |
| 1+ | DI_01+ | | 1- | DI_01- |
| 2+ | DI_02+ | | 2- | DI_02- |
| 3+ | DI_03+ | | 3- | DI_03- |
| 4+ | DI_04+ | | 4- | DI_04- |
| 5+ | DI_05+ | | 5- | DI_05- |
| 6+ | DI_06+ | | 6- | DI_06- |
| 7+ | DI_07+ | | 7- | DI_07- |
| 0+ | DQ_00+ | | 0- | DQ_00- |
| 1+ | DQ_01+ | | 1- | DQ_01- |
| 2+ | DQ_02+ | | 2- | DQ_02- |
| 3+ | DQ_03+ | | 3- | DQ_03- |
| 4+ | DQ_04+ | | 4- | DQ_04- |
| 5+ | DQ_05+ | | 5- | DQ_05- |
| 6+ | DQ_06+ | | 6- | DQ_06- |
| 7+ | DQ_07+ | | 7- | DQ_07- |



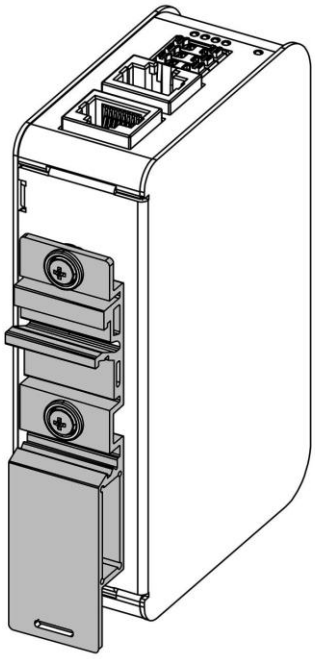
Please refer to the Digital I/O specification table.

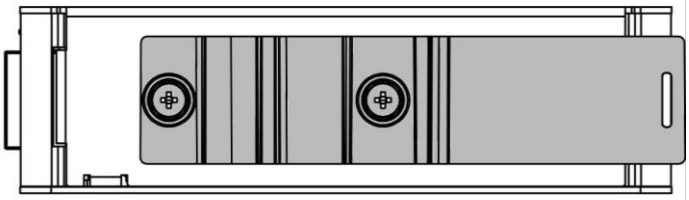
| Digital I/O | Digital Input | Digital Output |
|---|---|---|
| Input Type | Sink (Supports both NPN and PNP configurations) | |
| Frequency | Safe Operating Frequency: ≤3000 Hz<br>Rise Time (tr): 6us, Fall Time (tf): 6us | Operating Frequency: 1000Hz<br>Turn-On Time: 0.25ms<br>Turn-Off Time: 20us |
| Load Voltage | +24Vdc (Options: 24V or 48V) | +56 Vdc |
| Load Current | - | Typ. 500mA (peak 1000mA) |
| Isolation Protection | 2500 Vrms | 1500 Vrms |

## 2.2.6 DIN-Rail

QEC-RXXDXXK is an easy-install design to help you set-up your modules easily. Please refer to Ch.3.1 DIN-Rail installation.

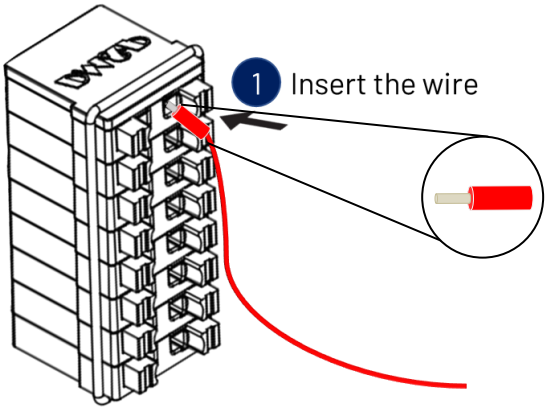
- **DIN-Rill**

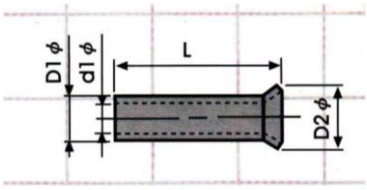




# 2.3 Wiring to the Connector

## 2.3.1 Connecting the wire to the connector

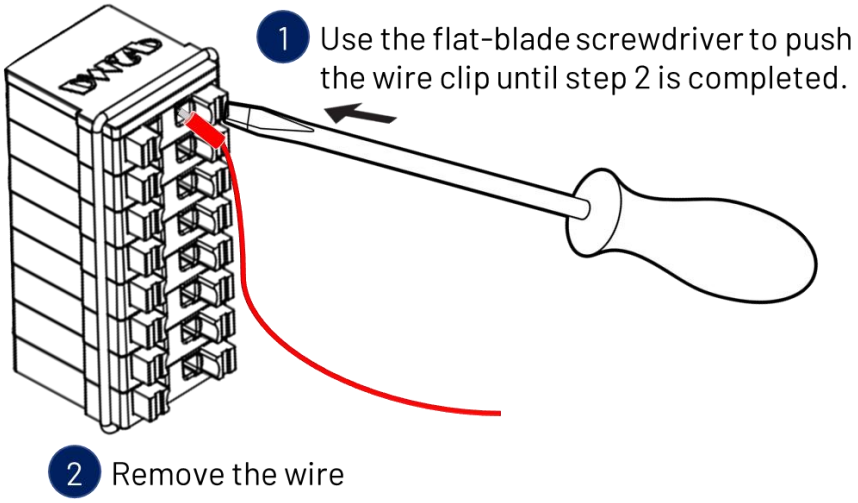



Insulated Terminals Dimensions (mm)

| Position | L | ØD1 | Ød1 | ØD2 |
|---|---|---|---|---|
| **CN 0.5-6** | 6.0 | 1.3 | 1.0 | 1.9 |
| **CN 0.5-8** | 8.0 | 1.3 | 1.0 | 1.9 |
| **CN 0.5-10** | 10.0 | 1.3 | 1.0 | 1.9 |

## 2.3.2 Removing the wire from the connector

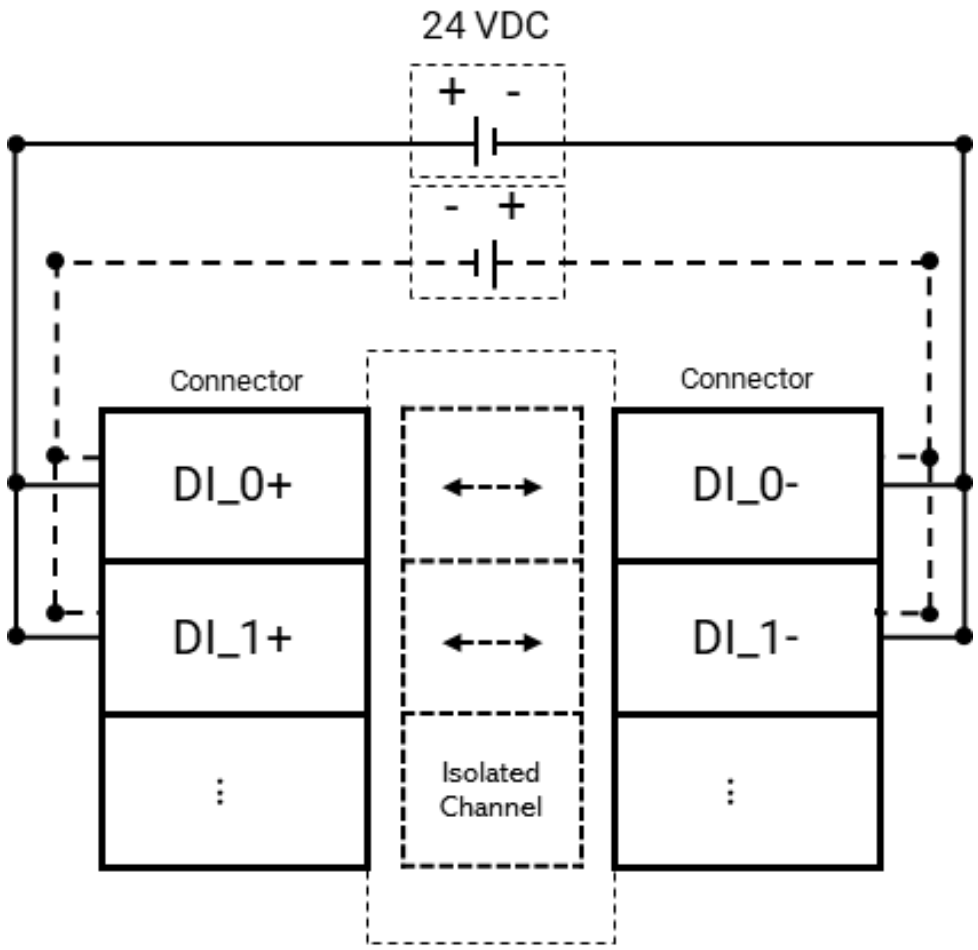


## 2.3.3 Application Wiring

For application wiring reference.

### 2.3.3.1 Digital Input

Example for Basic Digital Input Operation.

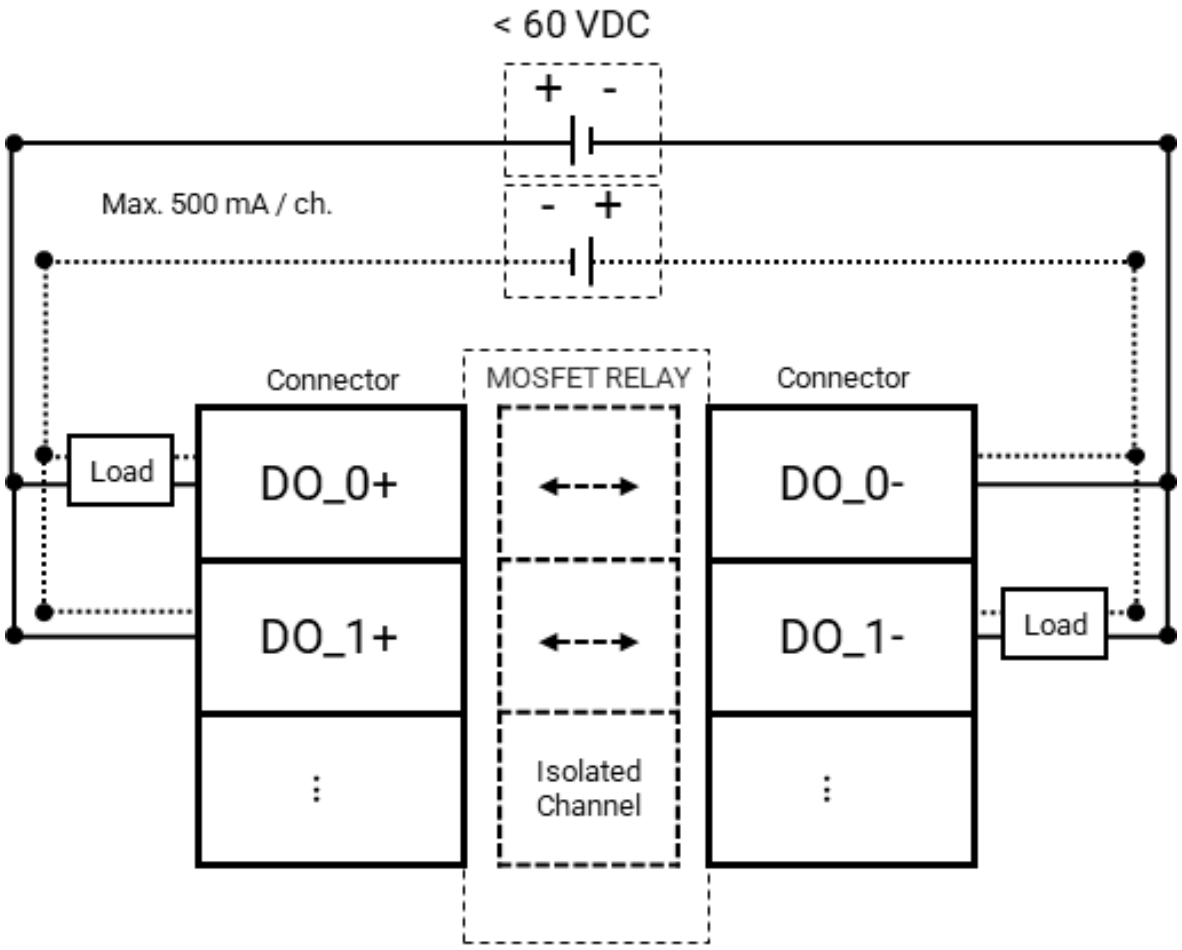



Digital Input Specification:

- Maximum Load Voltage: Load Voltage+24V (Options: 24V or 48V)
- Safe Operating Frequency: ≤3000 Hz (Rise Time (tr): 6us, Fall Time (tf): 6us)
- Type: Sink (Supports both NPN and PNP configurations)
- Isolation Protection: 2500 Vrms

## 2.3.3.2 Digital Output

Example for Basic Digital Output Operation.




Digital Output Specification:

- Maximum Load Voltage: +56Vdc
- Typ. 500mA (peak 1000mA)
- Operating Frequency: 1000Hz (Turn-On Time: 0.25ms, Turn-Off Time: 20us)
- Type: Sink (Supports both NPN and PNP configurations)
- Isolation Protection: 1500 Vrms

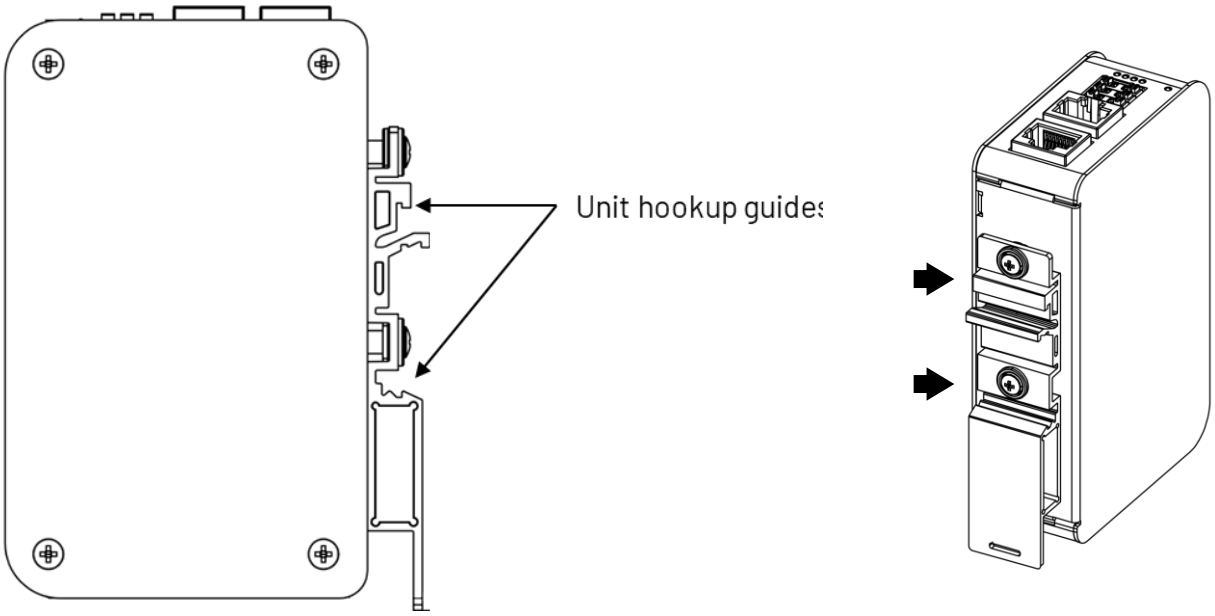
# Ch. 3

# Hardware Installation

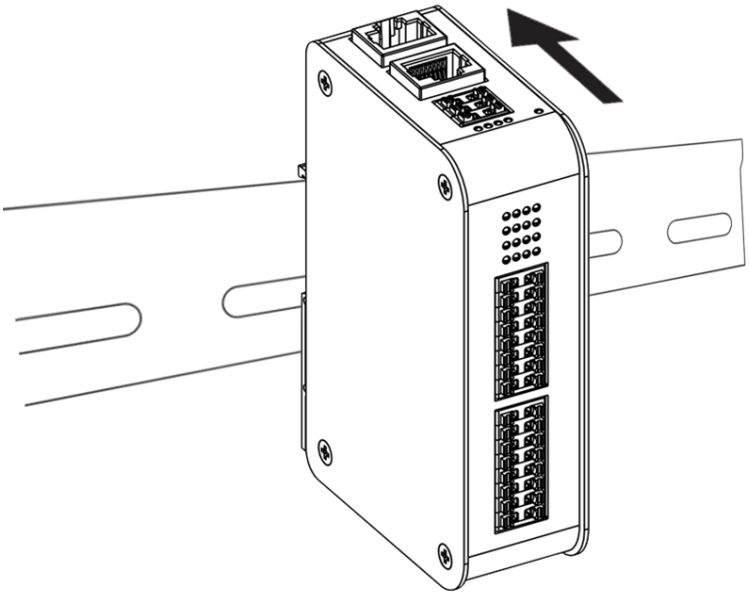
This section describes how to install QEC-RXXD. Please turn OFF the power supply before you mount QEC-RXXD. Always mount QEC-RXXD one at a time.

# 3.1 DIN-Rail installation

Slide in the QEC-RXXD on the hookup guides and press the QEC-RXXD with a certain amount of force against the DIN track until the DIN Track mounting hook lock into place.



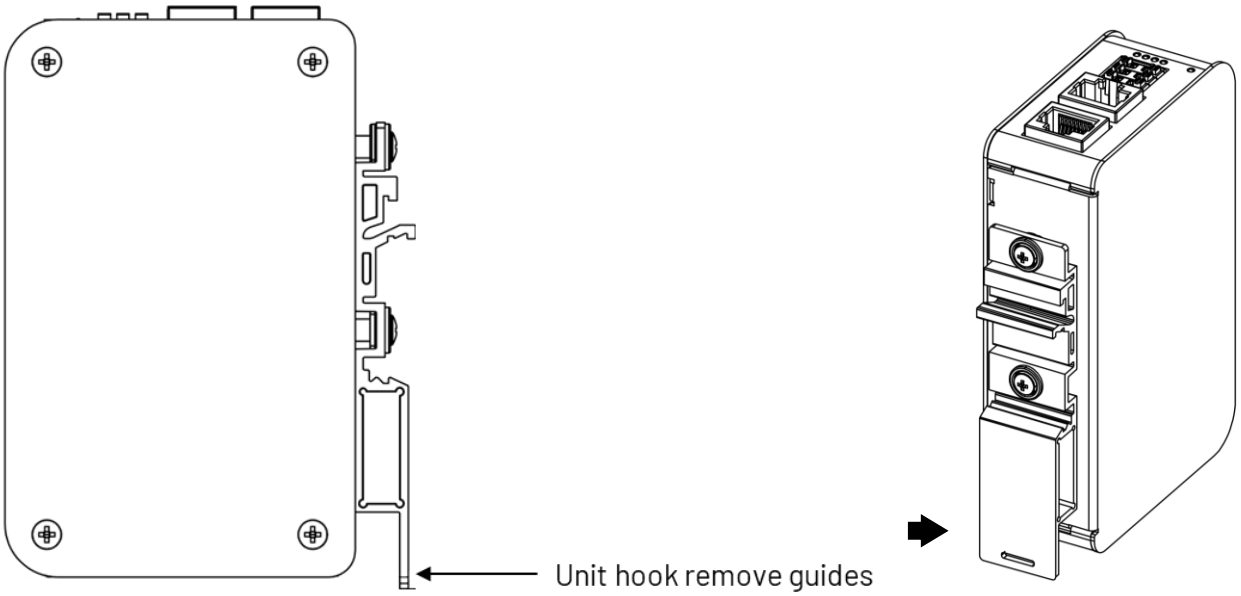

When you mount the QEC-RXXD, releasing the DIN track mounting hook on the QEC-RXXD is unnecessary. After you mount the QEC-RXXD, make sure it is locked to the DIN Track.



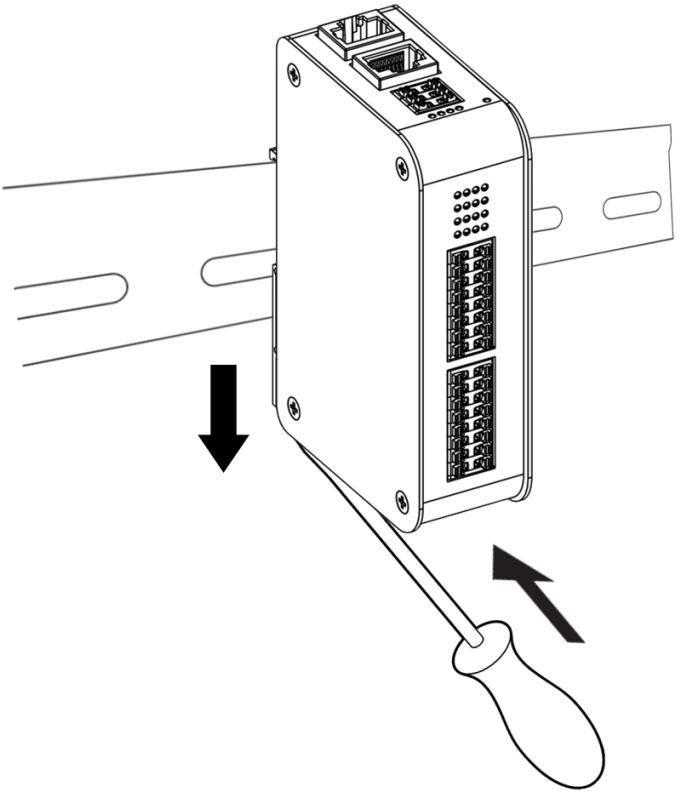
*__Note__: Always turn OFF the Unit power supply and I/O power supply before connecting and removing the QEC-RXXD.

## 3.2 Removing QEC-RXXD Unit

Use a flat-blade screwdriver to remove the DIN Track mounting hook on the unit.




Pull down and out the flat-blade screwdriver with force against the DIN track until you hear the DIN Track remove the hook.

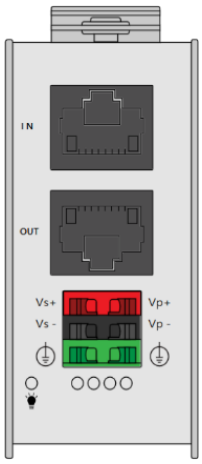
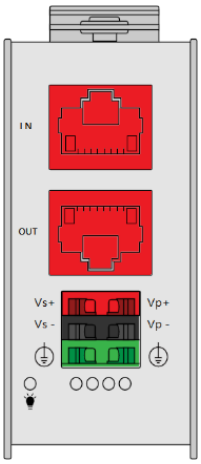


# Ch. 4

## Getting Started

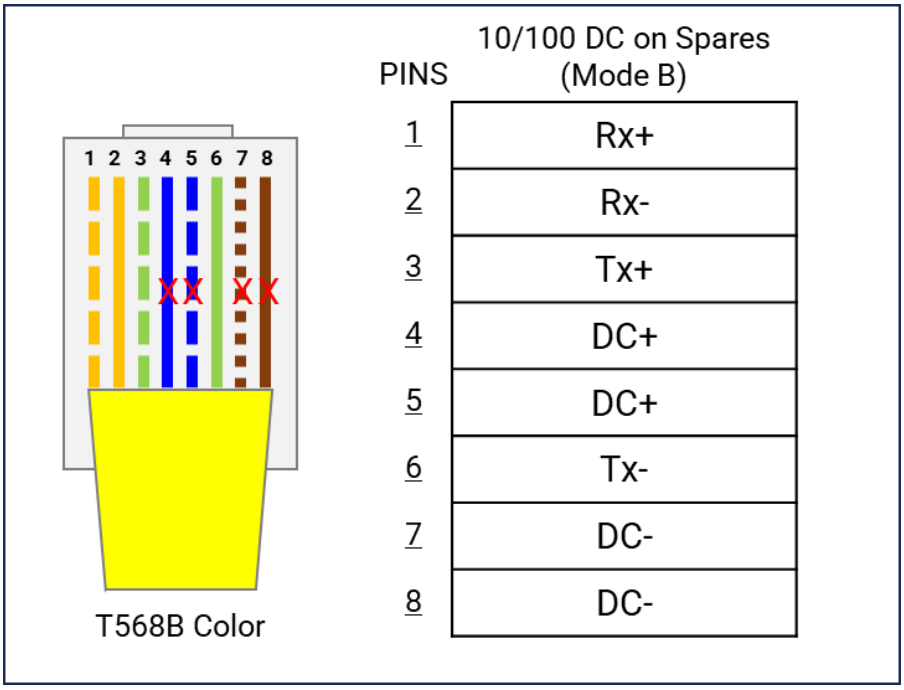
# Note. QEC's PoE (Power over Ethernet)

In QEC product installations, users can easily distinguish between PoE and non-PoE: if the RJ45 house is red, it is PoE type, and if the RJ45 house is black, it is non-PoE type.

| | |
|---|---|
|  |  |
| Non-PoE type | PoE type |

PoE (Power over Ethernet) is a function that delivers power over the network. QEC can be equipped with an optional PoE function to reduce cabling. In practice, PoE is selected based on system equipment, so please pay attention to the following points while evaluating and testing:

1. When connecting PoE and non-PoE devices, make sure to disconnect Ethernet cables at pins 4, 5, 7, and 8 (e.g., when a PoE-supported QEC EtherCAT MDevice connects with a third-party EtherCAT SubDevice).
2. The PoE function of QEC is different and incompatible with EtherCAT P, and the PoE function of QEC is based on PoE Type B, and the pin functions are as follows:




3. QEC's PoE power supply is up to **24V/3A**.

# 4.1 Introduction

Welcome to the Getting Started Chapter for the QEC-RXXDXXK module. This section is designed to assist you in efficiently setting up and utilizing the QEC-RXXDXXK module. To facilitate this process, we will focus on TwinCAT by Beckhoff Automation, which operates on a PC.

In the following pages, we will walk you through the steps for connecting your QEC-RXXDXXK and initiating your journey toward fully integrating this stepper motor driver into your projects. Our goal is to simplify the initial setup so you can quickly begin exploring your device's extensive capabilities.

*** Note: Ensuring Up-to-date Installation of the XML Device Description File (ESI)**

To ensure smooth functioning, it is important to install the latest version of the XML device description file in the EtherCAT MDevice software. The latest version of the XML device description file can be downloaded from the QEC website.
https://www.qec.tw/

## 4.2 TwinCAT Operation

This section is for you if you're ready to get your QEC-RXXDXXK module up and running with TwinCAT. We'll focus on using the Digital Input and Digital Output.

### 4.2.1 Install the ESI file

1. Obtain the ESI file: The ESI file for the QEC-R11D88K module is located on our website at the following link: https://www.qec.tw/.
   Simply download the ZIP file and extract it.

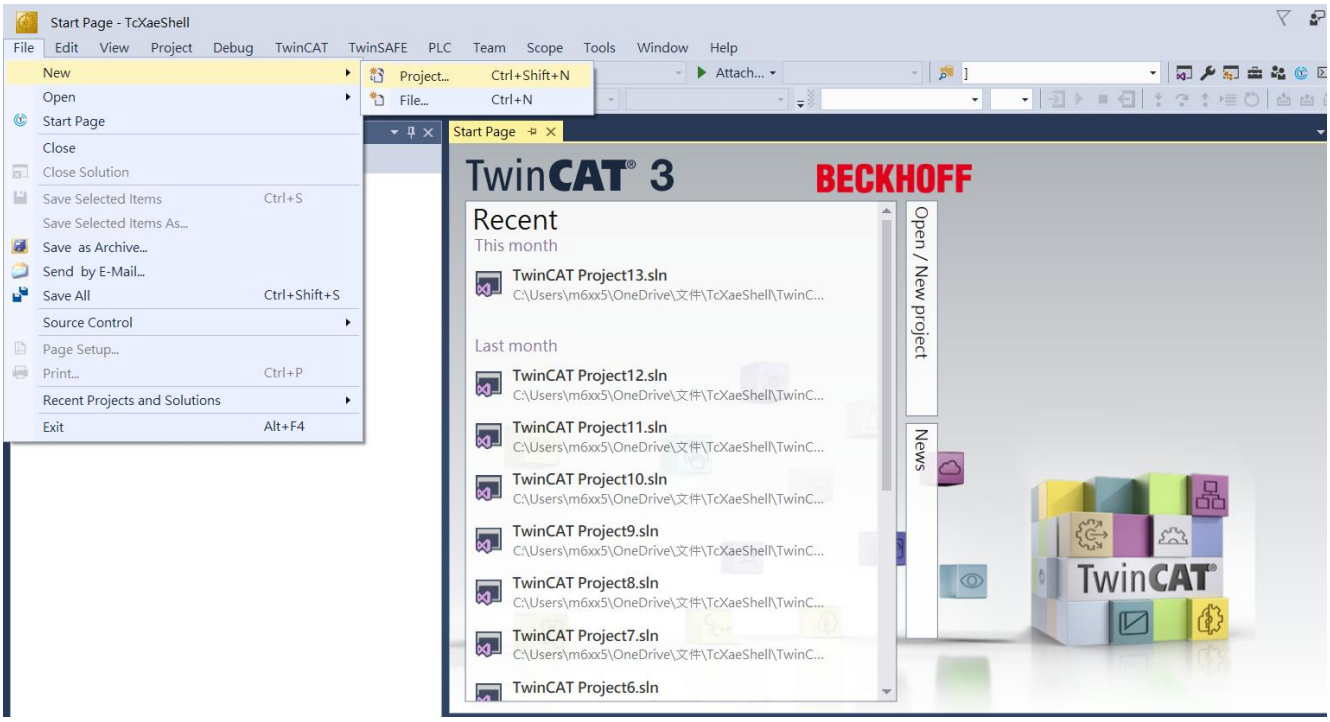
2. Install the ESI file: Once extracted, the XML file must be copied or moved to the appropriate system directory.

3. Restart the Programming System If Needed: If the TwinCAT program was running when the ESI file was copied to the appropriate system directory, you may have to restart the TwinCAT program before it will recognize the new ESI file.

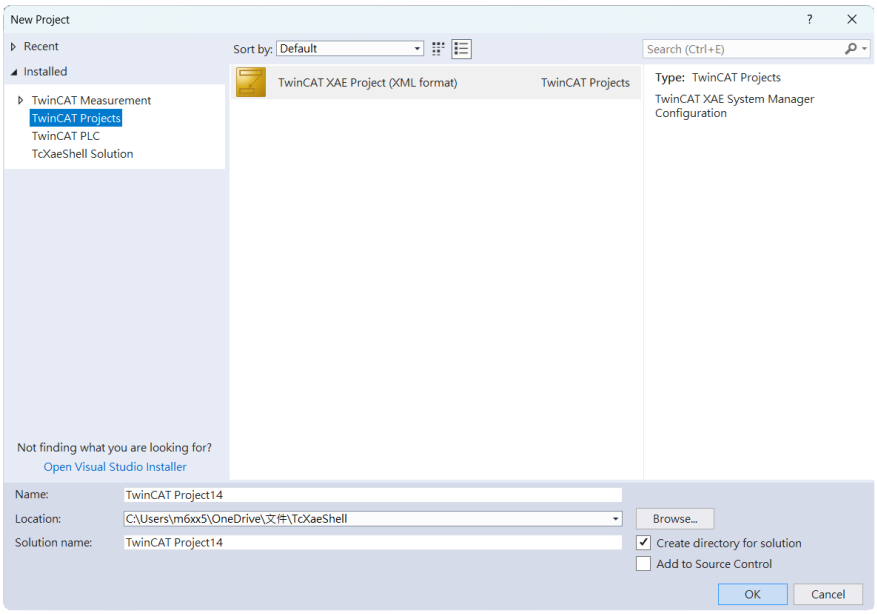
## 4.2.2 Add the QEC-R11D88K to the Project

This section assumes that the TwinCAT software is in Config Mode.
For more information about TwinCAT, please refer to [TwinCAT | Automation software | Beckhoff Worldwide](), or contact Beckhoff Automation.

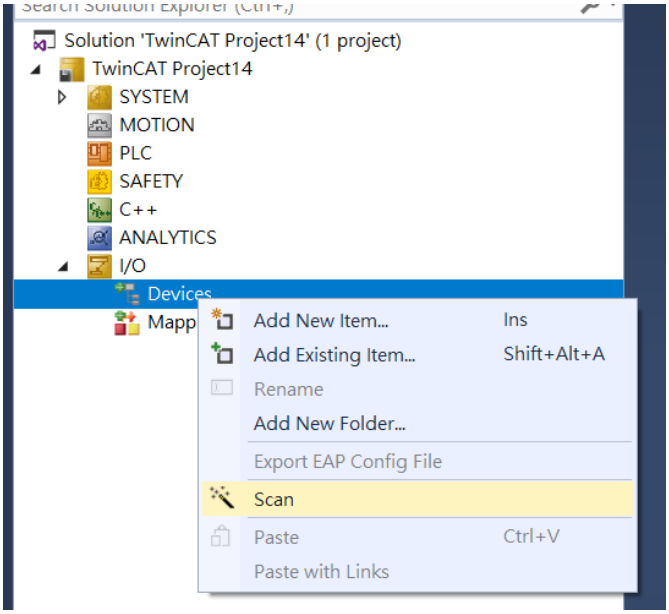
1. Click the New Project.



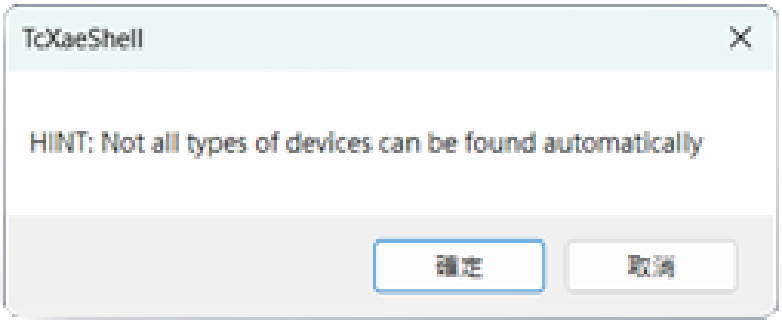

2. Select the “TwinCAT XAE Project (XML format), and change the project file name and location if you need. Then click “OK”.



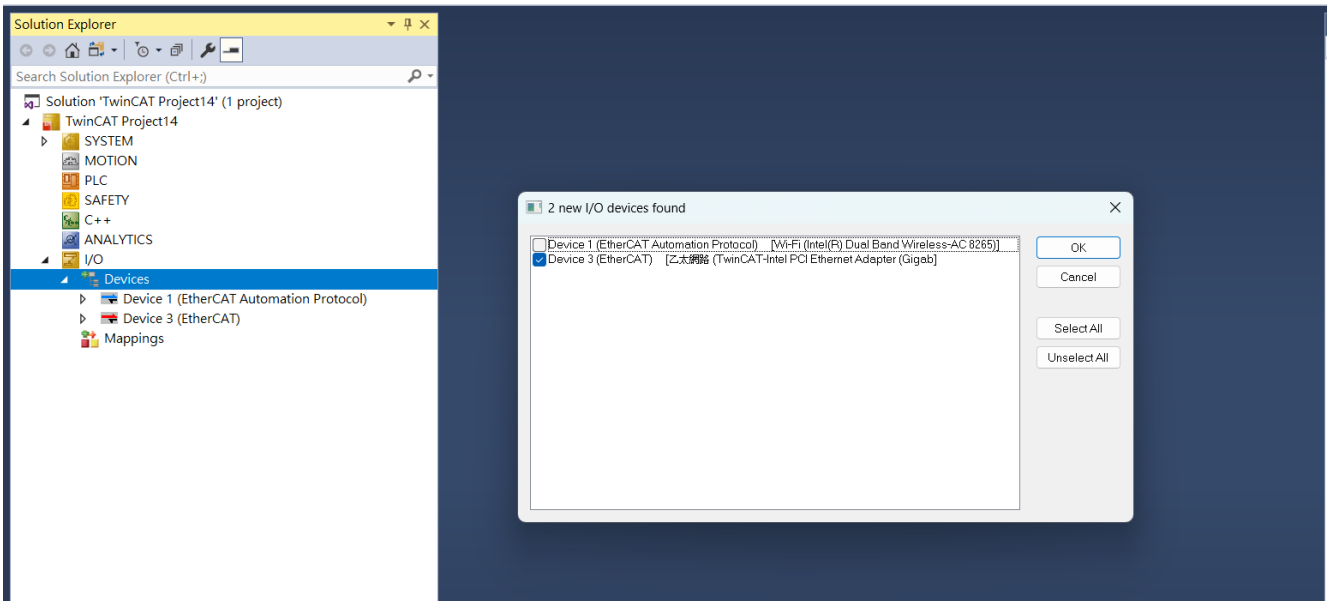
3. Right-click the “Devices” under the I/O node, and click the “Scan” button to start scanning. (If the “Scan” option is not available, the TwinCAT software is not in Config Mode.)



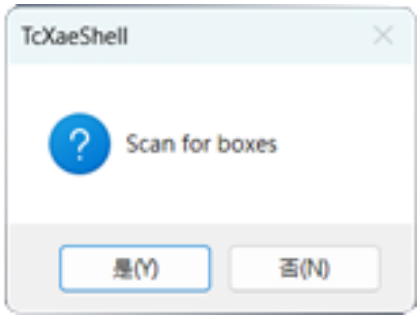

4. Click “OK” for the HINT message.



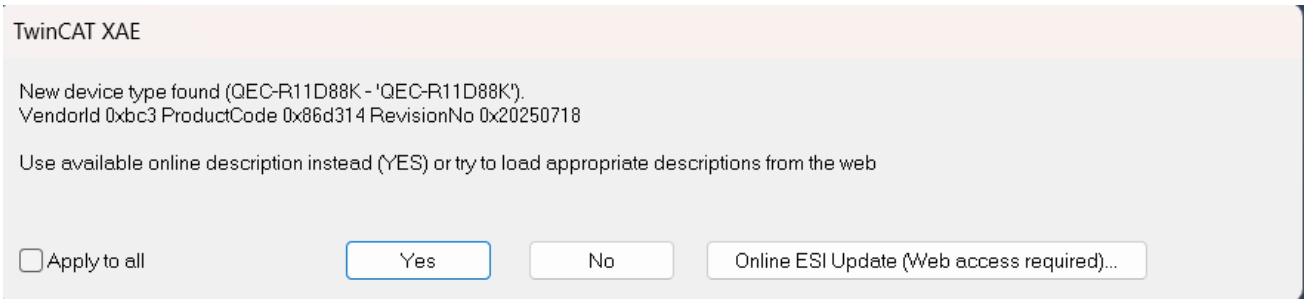

5. Choose the EtheCAT connection network.



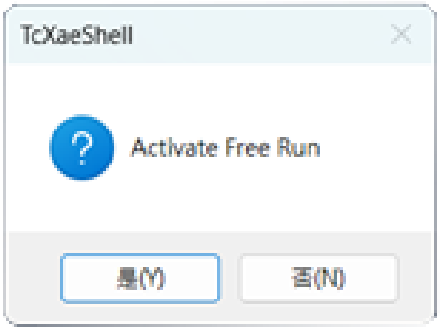
6. Confirm “Yes” to start the scan.



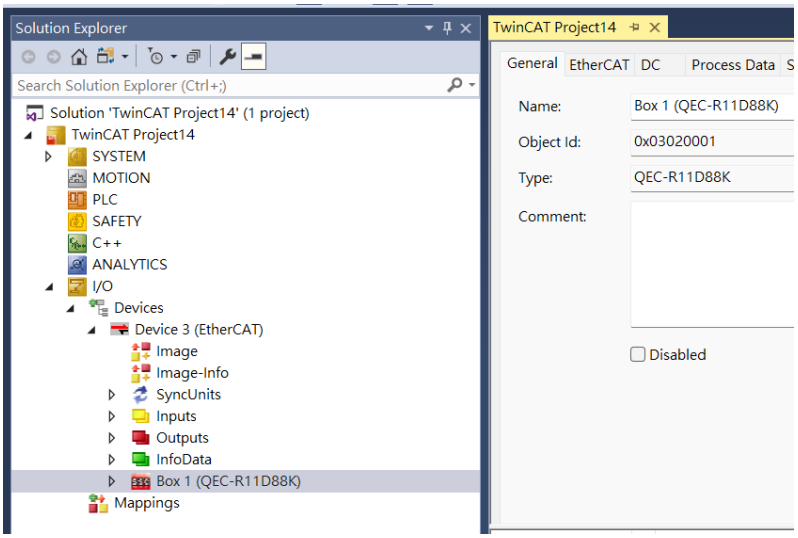

7. Choose “Yes” when TwinCAT asks you the new device type found.




8. Choose “Yes” when TwinCAT asks you to activate Free Run. Then, EtherCAT Network will translate into OP state automatically.

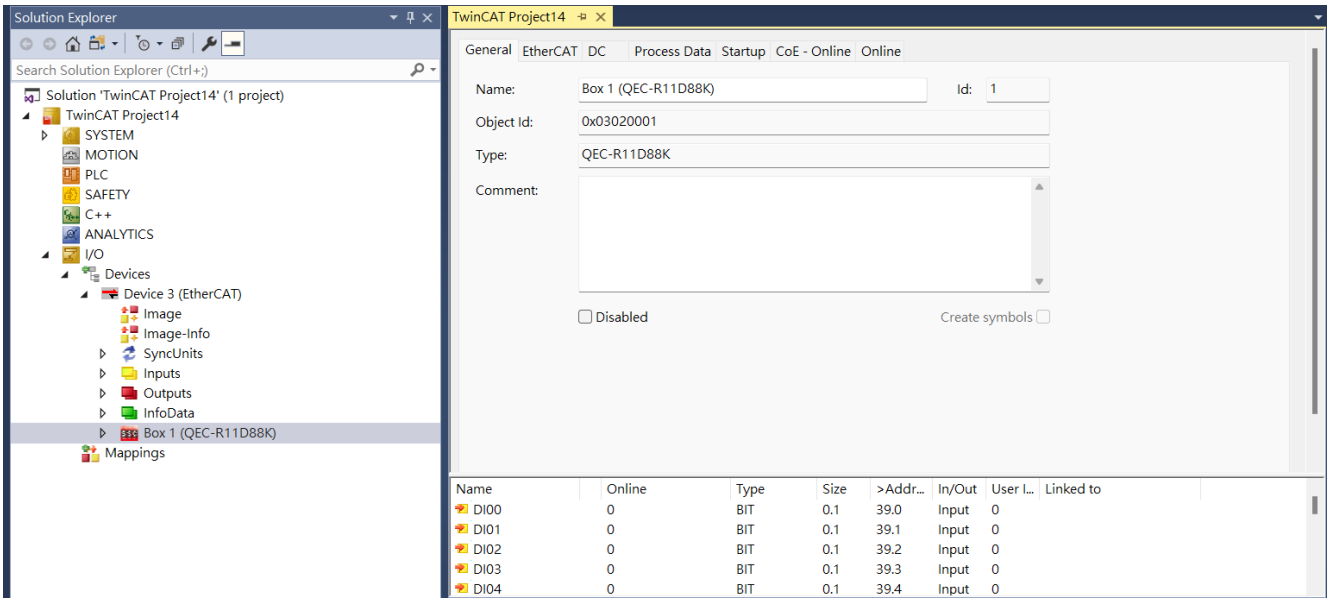



9. The QEC-R11D88K will appear in the device tree and the name will typically begin with “Box”.

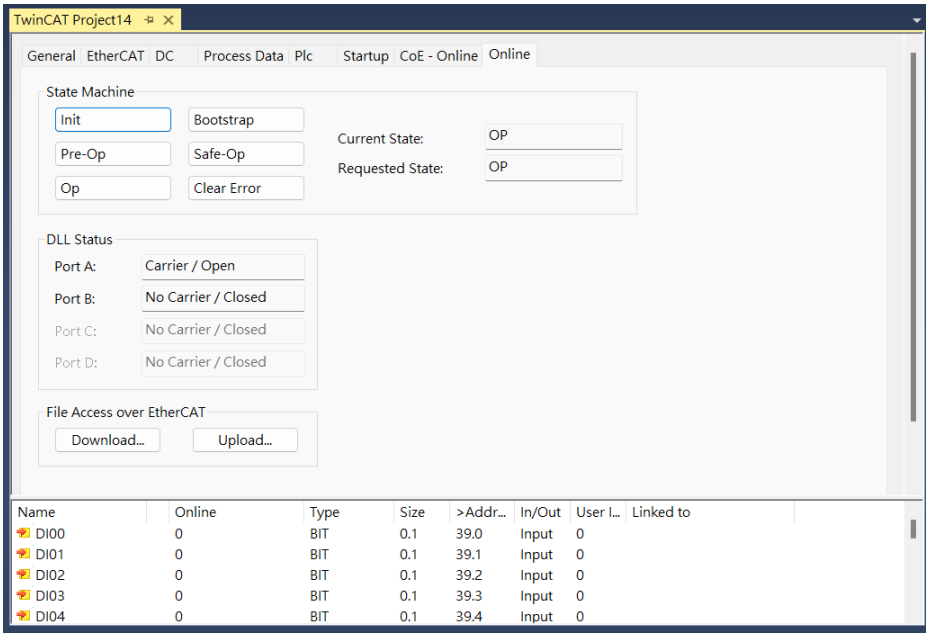


## 4.2.3 Start to Configure the QEC-R11D88K

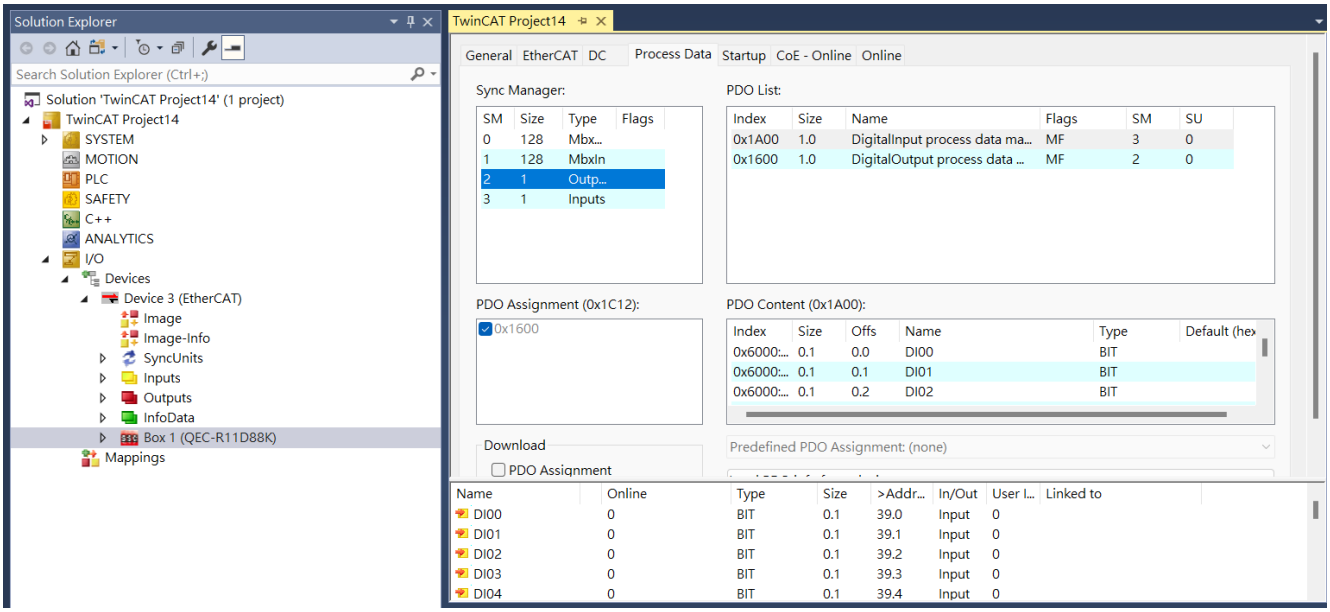
1. Click "Box 1 (QEC-R11D88K)," and a dashboard for the EtherCAT SubDevice will appear in the right window. The default tab is “General”, and you can see the SubDevice’s Name, Object Id, Type, and Comment in this tab.




2. Click on the “Online” tab to check the EtherCAT SubDevice EtherCAT State Machine (ESM) is on OP status.



3. Click on the “Process Data” tab to check the PDO Assignment; the default PDO Output are Digital Output Index (0x7000) and Analog Output Index (0x7001), and PDO Input are Digital Input Index (0x6000) and Analog Input Index (0x6001).



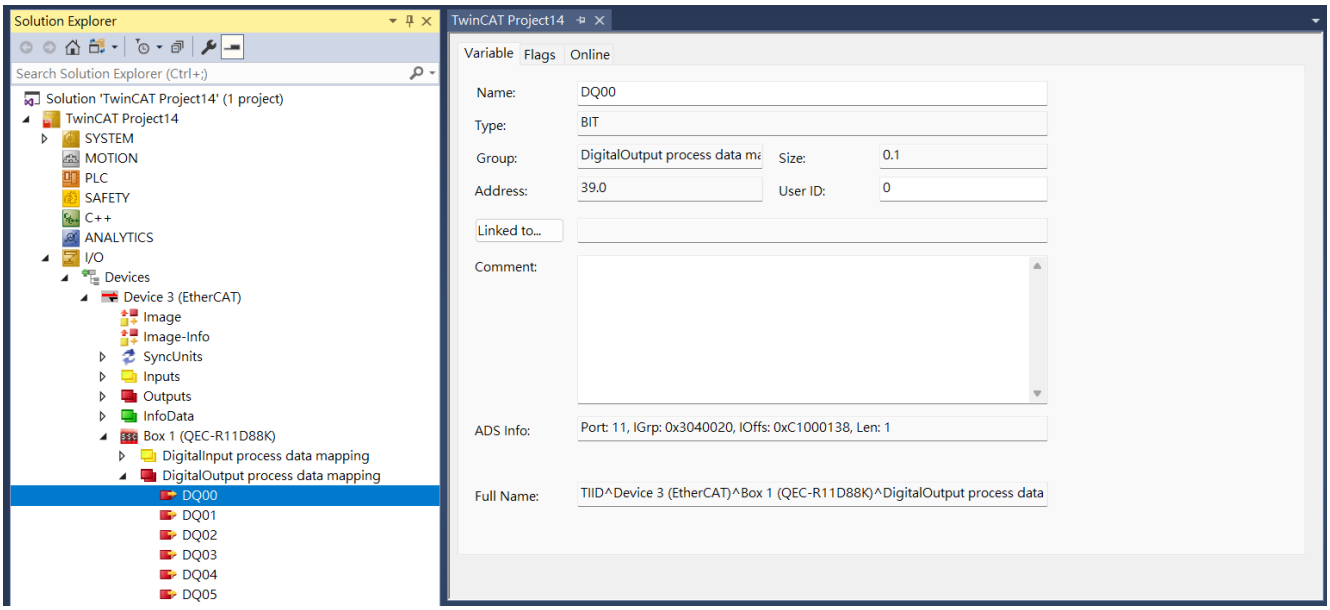
## 4.2.4 Control the QEC-R11D88K

Next, we will set the Digital Output channel 0 "DQ00" to 1 to let it pull high. And then we will read the Digital Input channel 0 "DI00".

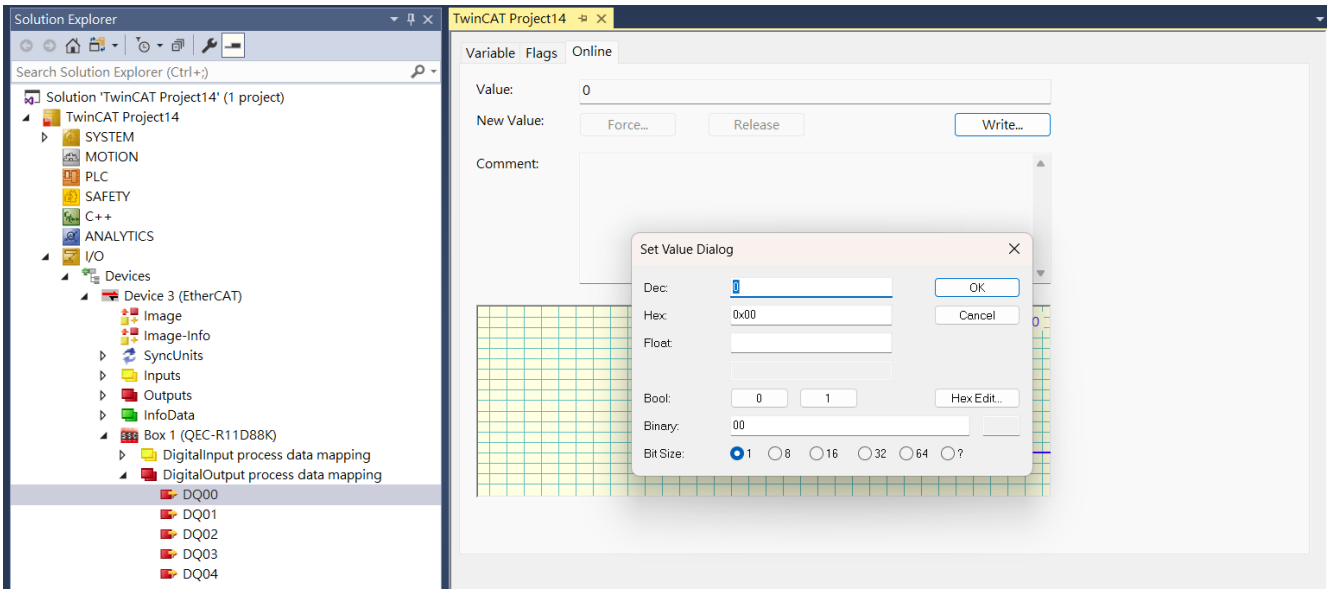
### 4.2.4.1 Configure the Digital Output

Configure the Digital Output.

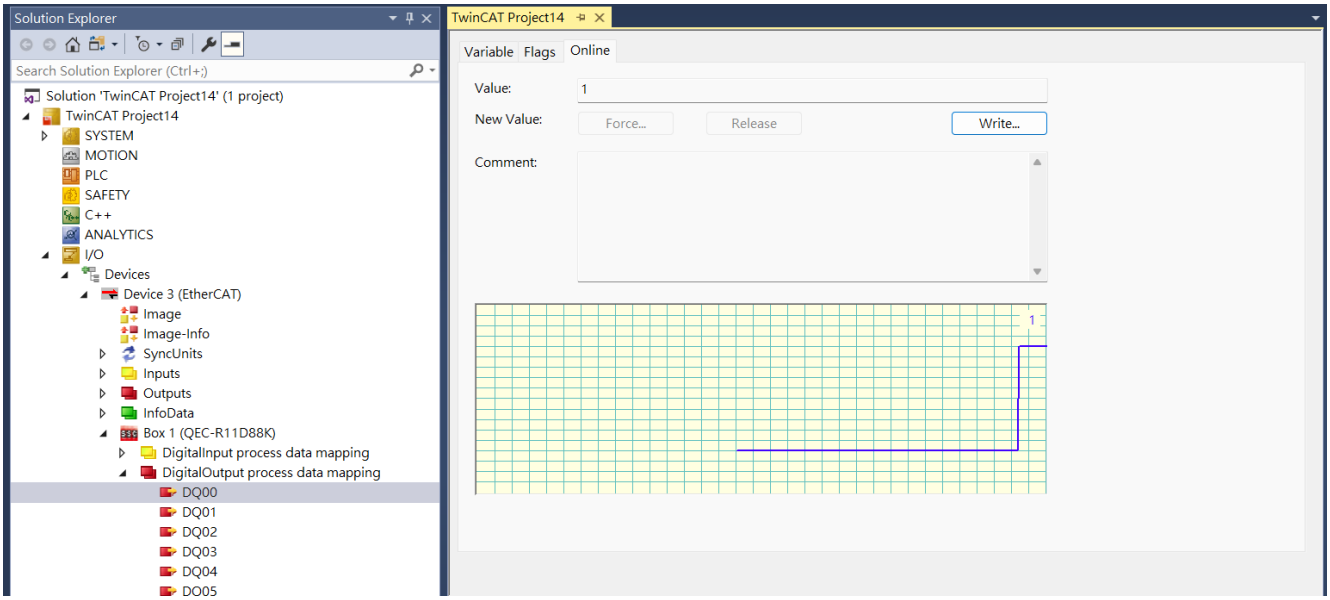
1. Select the drop-down list of the “Output mapping 0”. Click the “DQ00” and it’ll appear control dashboard in the right windows.



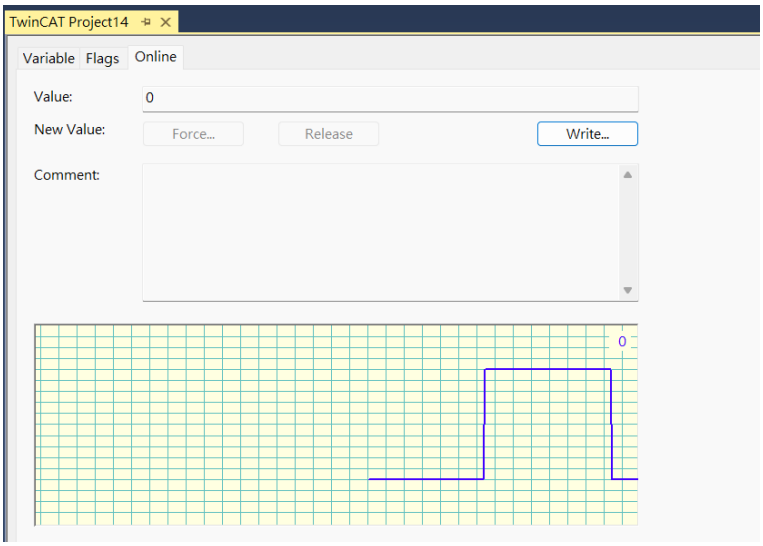

2. Click the “Online” tab, and click the "Write..." button. Enter "1" in the pop-up window to change the value of DQ00 to "1".



3. Then, the “DQ00” starts pull high (“Value” equals 1).



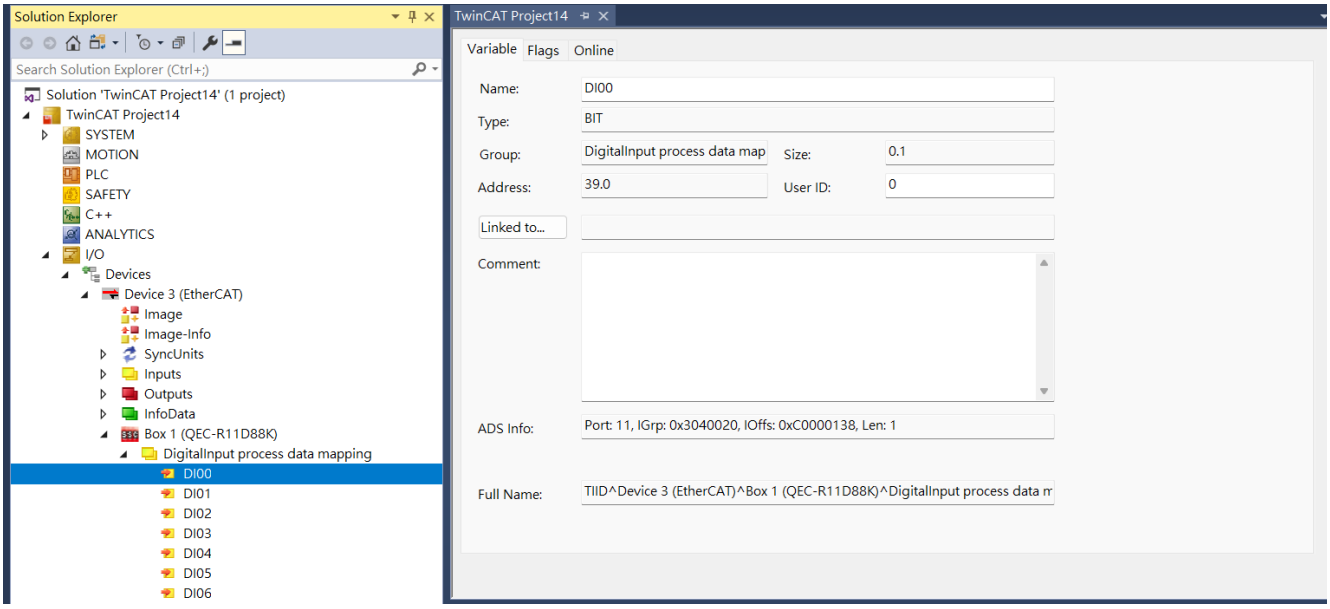

If you enter 0 to the Value, the “DQ00” starts pull low.



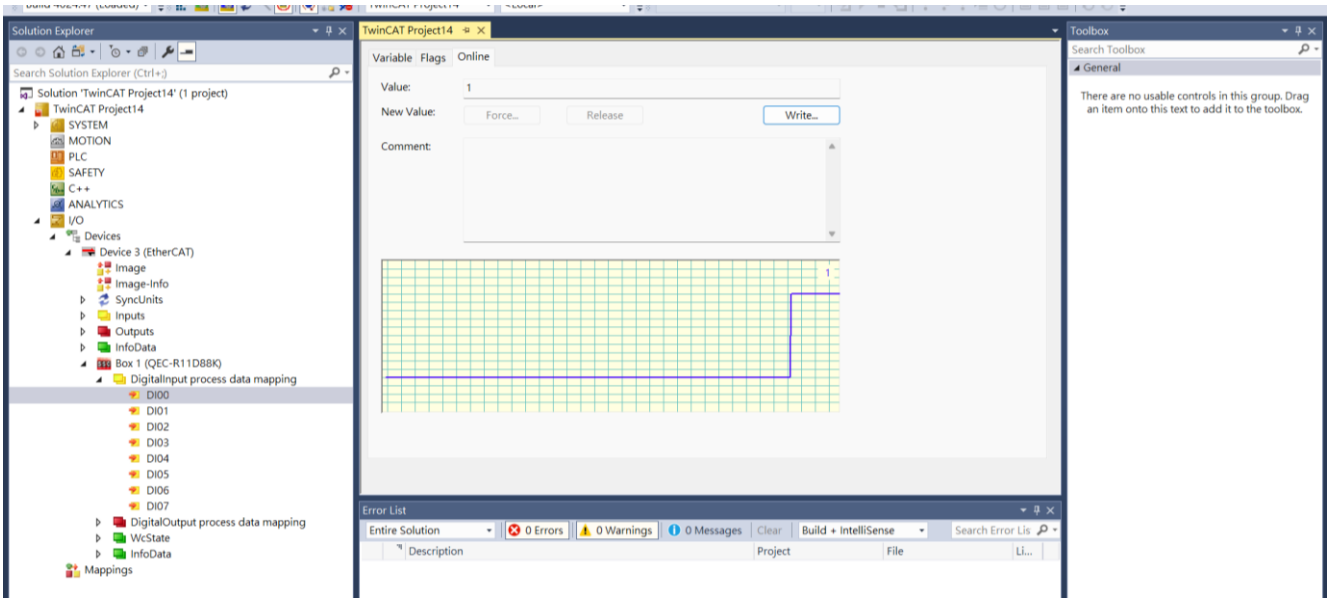
# 4.2.4.2 Read the Digital Input

Read the Digital Input.

1. Select the drop-down list of the “Input mapping 0”. Click the “DI00” and it’ll appear control dashboard in the right windows.




2. Click the “Online” tab, and you can see the Value from the DI00 channel if its value changed.



# Ch. 5

# SubDevice Information

# 5.1 ESI (EtherCAT SubDevice Information) file

The ESI files contain information unique to the EtherCAT SubDevice Terminals in XML format. You can load an ESI file into the Support Software to easily allocate SubDevice Terminal process data and other settings. The ESI files for QEC EtherCAT SubDevices are already installed in the Support Software.

*** Note: Ensuring Up-to-date Installation of the XML Device Description File (ESI)**

To ensure smooth functioning, it is important to install the latest version of the XML device description file in the EtherCAT MDevice software. The latest version of the XML device description file can be downloaded from the QEC website.
https://www.qec.tw/

# 5.2 Object Dictionary

The object dictionary defined here shall be used complementary with ETG.5001 and ETG.1000.

- Device Profile: 5001
- Modul Profile: 0
- Modular Device Profile

  Usage Notes:
  - The PDO mapping object and SyncManager assignment object doesn't need to be defined. In that case they are created automatically.
  - The following objects are fixed included in the SSC and shall not be defined in the file: 0x1000, 0x1001, 0x1008, 0x1009, 0x100a, 0x1010, 0x1011, 0x1018, 0x10F0, 0x10F1, 0x10F3, 0x1c00, 0x1c32, 0x1c33
  - Entries less or equal one 8Bit shall not overlap byte borders.
  - Entries greater 8Bit shall always start at an exact word border

### 5.2.1 Standard Objects (0x1000-0x1FFF)

## Index 1000 Device type

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1000** | Device type | UINT32 | RO | 0x00001389 (5001) |

## Index 1001 Error register

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1001** | Error register | UINT8 | RO | 0x00 (0) |

## Index 1008 Device name

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1008** | Device name | STRING | RO | Refer to Table 4-1. |

Table 4-1: Device Name

| Type | Device Name |
|---|---|
| QEC DIO K Series (PNP/NPN) | QEC-R00DF0K |
| | QEC-R11DF0K |
| | QEC-R00D88K |
| | QEC-R11D88K |
| | QEC-R00D0FK |
| | QEC-R11D0FK |

## Index 1009 Manufacturer Hardware version

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1009** | Hardware version | STRING | RO | DM 473 |

# Index 100A Manufacturer Software version

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **100A** | Software version | STRING | RO | 1.00 |

# Index 1018 Identity Object

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1018:0** | Identity | UINT8 | RO | > 4 < |
| **1018:01** | Vendor ID | UINT32 | RO | 0x00000BC3 (3011) |
| **1018:02** | Product code | UINT32 | RO | Refer to Table 4-2. |
| **1018:03** | Revision Number | UINT32 | RO | Depending by model. |
| **1018:04** | Serial number | UINT32 | RO | 0x00000000 (0) |

Table 4-2: Product code & Revision Number

| Model Name | Product code | Revision Number |
|---|---|---|
| QEC-R11DF0K | 0x0086d310 | 0x20250718 |
| QEC-R00DF0K | 0x0086d311 | 0x20250718 |
| QEC-R11D0FK | 0x0086d312 | 0x20250718 |
| QEC-R00D0FK | 0x0086d313 | 0x20250718 |
| QEC-R11D88K | 0x0086d314 | 0x20250718 |
| QEC-R00D88K | 0x0086d315 | 0x20250718 |

# Index 10F1 Error Settings

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **10F1:0** | Error Settings | UINT8 | RO | > 2 < |
| **10F1:01** | Local Error Reaction | UINT32 | RW | 0x00000001 (1) |
| **10F1:02** | Sync Error Counter Limit | UINT32 | RW | 0x0004 (4) |

# Index 10F8 Timestamp Object

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **10F8** | Timestamp Object | UINT8 | RW P | B5 36 21 E6 0D 00 00 00 |

# Index 1600 Output mapping 0

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1600:0** | Output mapping 0 | UINT8 | R0 | > 16 < |
| **1600:01** | SubIndex 001 | UINT32 | RO | 0x7000:01, 1 |
| **1600:02** | SubIndex 002 | UINT32 | RO | 0x7000:02, 1 |
| **1600:03** | SubIndex 003 | UINT32 | RO | 0x7000:03, 1 |
| **1600:04** | SubIndex 004 | UINT32 | RO | 0x7000:04, 1 |
| **1600:05** | SubIndex 005 | UINT32 | RO | 0x7000:05, 1 |
| **1600:06** | SubIndex 006 | UINT32 | RO | 0x7000:06, 1 |
| **1600:07** | SubIndex 007 | UINT32 | RO | 0x7000:07, 1 |
| **1600:08** | SubIndex 008 | UINT32 | RO | 0x7000:08, 1 |
| **1600:09** | SubIndex 009 | UINT32 | RO | 0x7000:09, 1 |
| **1600:0A** | SubIndex 010 | UINT32 | RO | 0x7000:0A, 1 |
| **1600:0B** | SubIndex 011 | UINT32 | RO | 0x7000:0B, 1 |
| **1600:0C** | SubIndex 012 | UINT32 | RO | 0x7000:0C, 1 |
| **1600:0D** | SubIndex 013 | UINT32 | RO | 0x7000:0D, 1 |
| **1600:0E** | SubIndex 014 | UINT32 | RO | 0x7000:0E, 1 |
| **1600:0F** | SubIndex 015 | UINT32 | RO | 0x7000:0F, 1 |
| **1600:10** | SubIndex 016 | UINT32 | RO | 0x7000:10, 1 |

* **Notes:** The number of valid SubIndexes varies by model.
This table shows the maximum configuration (16 channels) as an example. If using an 8-channel output model, only SubIndexes up to 0x1600:08h will be active.
Please refer to the specific model and its ESI/XML file for accurate mapping.

# Index 1A00 Input mapping 0

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1A00:0** | Input mapping 0 | UINT8 | R0 | > 17 < |
| **1A00:01** | SubIndex 001 | UINT32 | RO | 0x6000:01, 1 |
| **1A00:02** | SubIndex 002 | UINT32 | RO | 0x6000:02, 1 |
| **1A00:03** | SubIndex 003 | UINT32 | RO | 0x6000:03, 1 |
| **1A00:04** | SubIndex 004 | UINT32 | RO | 0x6000:04, 1 |
| **1A00:05** | SubIndex 005 | UINT32 | RO | 0x6000:05, 1 |
| **1A00:06** | SubIndex 006 | UINT32 | RO | 0x6000:06, 1 |
| **1A00:07** | SubIndex 007 | UINT32 | RO | 0x6000:07, 1 |
| **1A00:08** | SubIndex 008 | UINT32 | RO | 0x6000:08, 1 |
| **1A00:09** | SubIndex 009 | UINT32 | RO | 0x6000:09, 1 |
| **1A00:0A** | SubIndex 010 | UINT32 | RO | 0x6000:0A, 1 |
| **1A00:0B** | SubIndex 011 | UINT32 | RO | 0x6000:0B, 1 |
| **1A00:0C** | SubIndex 012 | UINT32 | RO | 0x6000:0C, 1 |
| **1A00:0D** | SubIndex 013 | UINT32 | RO | 0x6000:0D, 1 |
| **1A00:0E** | SubIndex 014 | UINT32 | RO | 0x6000:0E, 1 |
| **1A00:0F** | SubIndex 015 | UINT32 | RO | 0x6000:0F, 1 |
| **1A00:10** | SubIndex 016 | UINT32 | RO | 0x6000:10, 1 |

* **Notes:** The number of valid SubIndexes varies by model.
This table shows the maximum configuration (16 channels) as an example. If using an 8-channel input model, only SubIndexes up to 0x1A00:08h will be active.
Please refer to the specific model and its ESI/XML file for accurate mapping.

# Index 1C00 Sync manager type

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1C00:0** | Sync manager type | UINT8 | R0 | > 4 < |
| **1C00:01** | SubIndex 001 | UINT8 | RO | 0x01 (1) |
| **1C00:02** | SubIndex 002 | UINT8 | RO | 0x02 (2) |
| **1C00:03** | SubIndex 003 | UINT8 | RO | 0x03 (3) |
| **1C00:04** | SubIndex 004 | UINT8 | RO | 0x04 (4) |

# Index 1C12 SyncManager 2 assignment

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1C12:0** | SyncManager 2 assignment | UINT8 | R0 | > 1 < |
| **1C12:01** | SubIndex 001 | UINT16 | RO | 0x1600 (5632) |

* Note if this object is not defined it will be created automatically

# Index 1C13 SyncManager 3 assignment

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1C13:0** | SyncManager 3 assignment | UINT8 | R0 | > 1 < |
| **1C13:01** | SubIndex 001 | UINT16 | RO | 0x1A00 (6656) |

* **Note:** if this object is not defined it will be created automatically

# Index 1C32 SM output parameter

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1C32:0** | SM output parameter | UINT8 | R0 | > 32 < |
| **1C32:01** | Synchronization Type | UINT16 | RW | 0x0001 (1) |
| **1C32:02** | Cycle Time | UINT32 | RO | 0x00000000 (0) |
| **1C32:04** | Synchronization Types supported | UINT16 | RO | 0x401F (16415) |
| **1C32:05** | Minimum Cycle Time | UINT32 | RO | 0x000186A0 (100000) |
| **1C32:06** | Calc and Copy Time | UINT32 | RO | 0x00000000 (0) |
| **1C32:08** | Get Cycle Time | UINT16 | RW | 0x0000 (0) |
| **1C32:09** | Delay Time | UINT32 | RO | 0x00000000 (0) |
| **1C32:0A** | Sync0 Cycle Time | UINT32 | RW | 0x00000000 (0) |
| **1C32:0B** | SM-Event Missed | UINT16 | RO | 0x0000 (0) |
| **1C32:0C** | Cycle Time Too Small | UINT16 | RO | 0x0029 (41) |
| **1C32:0D** | Shift Time too Short Counter | UINT16 | RO | 0x0000 (0) |
| **1C32:20** | Sync Error | BOOL | RO | TRUE |

# Index 1C33 SM input parameter

| Index | Name | Data type | Flags | Default |
|---|---|---|---|---|
| **1C33:0** | SM input parameter | UINT8 | RO | > 32 < |
| **1C33:01** | Synchronization Type | UINT16 | RW | 0x0022 (34) |
| **1C33:02** | Cycle Time | UINT32 | RO | 0x00000000 (0) |
| **1C33:04** | Synchronization Types supported | UINT16 | RO | 0x401F (16415) |
| **1C33:05** | Minimum Cycle Time | UINT32 | RO | 0x000186A0 (100000) |
| **1C33:06** | Calc and Copy Time | UINT32 | RO | 0x00000000 (0) |
| **1C33:08** | Get Cycle Time | UINT16 | RW | 0x0000 (0) |
| **1C33:09** | Delay Time | UINT32 | RO | 0x00000000 (0) |
| **1C33:0A** | Sync0 Cycle Time | UINT32 | RW | 0x00000000 (0) |
| **1C33:0B** | SM-Event Missed | UINT16 | RO | 0x0000 (0) |
| **1C33:0C** | Cycle Time Too Small | UINT16 | RO | 0x0029 (41) |
| **1C33:0D** | Shift Time too Short Counter | UINT16 | RO | 0x0000 (0) |
| **1C33:20** | Sync Error | BOOL | RO | TRUE |

## 5.2.2 Manufacturer Objects (0x5000-0x5FFF)

### Index 0x5000 to 0x5007 Manufacturer Object

| Index | Object Code | DataType | Name | Default | Description |
|---|---|---|---|---|---|
| **5000** | VARIABLE | UINT16 | SP_Voltage | 0 | Read SP Voltage. |
| **5001** | VARIABLE | UINT16 | SP_Current | 0 | Read SP Current. |
| **5002** | VARIABLE | UINT16 | PP_Voltage | 0 | Read PP Voltage. |
| **5003** | VARIABLE | UINT16 | PP_Current | 0 | Read PP Current. |
| **5004** | VARIABLE | INT16 | Temperature | 0 | Read Temperature. |
| **5005** | VARIABLE | UINT8 | BoxStatus | 0 | Read Box Status, refer to Table 4-3. |
| **5006:0** | RECORD | | OrderInformation | > 4 < | Order Information. |
| **5006:01** | | STRING(6) | Customer | 0 | Customer. |
| **5006:02** | | STRING(8) | OrderNo | 0 | Order No. |
| **5006:03** | | STRING(11) | InvNo | 0 | Inv No. |
| **5006:04** | | STRING(4) | DelyDate | 0 | Dely Date. |
| **5007:0** | RECORD | UINT32 | MTBF | > 2 < | - |
| **5007:01** | | INT32 | WorkingHours | 0 | If return -1, the mean is EEPROM have error. |
| **5007:01** | | INT32 | BootTimes | 0 | If return -1, the mean is EEPROM have error. |

Table 4-3: Index 0x5005 BoxStatus Definitions

| Value | Description |
|---|---|
| **0** | Normal Operation |
| **3** | ESC 3p3 Power NG |
| **4** | DIQ 3p3 Power NG |
| **5** | External XTgal Stop |
| **6** | External XTgal Over Range |
| **0x10** | Power Voltage Low or High |
| **0x11** | Power Voltage Too Low or Too High |

## 5.2.3 Especial Objects (0x6000-0xFFFF)

### Index 0x6nnx Input Data of the Module (0x6000 - 0x6FFF)

| Index | DataType | Name | Flags | Default | Description |
|---|---|---|---|---|---|
| **6000:0** | - | DigitalInput | TX | > 16 < | Digital Input |
| **6000:01** | BOOL | DI00 | RO | FALSE | DI00 |
| **6000:02** | BOOL | DI01 | RO | FALSE | DI01 |
| **6000:03** | BOOL | DI02 | RO | FALSE | DI02 |
| **6000:04** | BOOL | DI03 | RO | FALSE | DI03 |
| **6000:05** | BOOL | DI04 | RO | FALSE | DI04 |
| **6000:06** | BOOL | DI05 | RO | FALSE | DI05 |
| **6000:07** | BOOL | DI06 | RO | FALSE | DI06 |
| **6000:08** | BOOL | DI07 | RO | FALSE | DI07 |
| **6000:09** | BOOL | DI08 | RO | FALSE | DI08 |
| **6000:10** | BOOL | DI09 | RO | FALSE | DI09 |
| **6000:11** | BOOL | DI10 | RO | FALSE | DI10 |
| **6000:12** | BOOL | DI11 | RO | FALSE | DI11 |
| **6000:13** | BOOL | DI12 | RO | FALSE | DI12 |
| **6000:14** | BOOL | DI13 | RO | FALSE | DI13 |
| **6000:15** | BOOL | DI14 | RO | FALSE | DI14 |
| **6000:16** | BOOL | DI15 | RO | FALSE | DI15 |

* **Notes:** The number of valid SubIndexes varies by model.

# Index 0x7nnx Output Data of the Module (0x7000 - 0x7FFF)

| Index | DataType | Name | Flags | Default | Description |
|---|---|---|---|---|---|
| **7000:0** | - | DigitalOutput | RX | > 16 < | Digital Output |
| **7000:01** | BOOL | DQ00 | RW | FALSE | DQ00 |
| **7000:02** | BOOL | DQ01 | RW | FALSE | DQ01 |
| **7000:03** | BOOL | DQ02 | RW | FALSE | DQ02 |
| **7000:04** | BOOL | DQ03 | RW | FALSE | DQ03 |
| **7000:05** | BOOL | DQ04 | RW | FALSE | DQ04 |
| **7000:06** | BOOL | DQ05 | RW | FALSE | DQ05 |
| **7000:07** | BOOL | DQ06 | RW | FALSE | DQ06 |
| **7000:08** | BOOL | DQ07 | RW | FALSE | DQ07 |
| **7000:09** | BOOL | DQ08 | RW | FALSE | DQ08 |
| **7000:10** | BOOL | DQ09 | RW | FALSE | DQ09 |
| **7000:11** | BOOL | DQ10 | RW | FALSE | DQ10 |
| **7000:12** | BOOL | DQ11 | RW | FALSE | DQ11 |
| **7000:13** | BOOL | DQ12 | RW | FALSE | DQ12 |
| **7000:14** | BOOL | DQ13 | RW | FALSE | DQ13 |
| **7000:15** | BOOL | DQ14 | RW | FALSE | DQ14 |
| **7000:16** | BOOL | DQ15 | RW | FALSE | DQ15 |

* **Notes:** The number of valid SubIndexes varies by model.

# Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster. Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, originality to use this product. Vendor will not be liable for any claim made by any other related party. Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.