LS ELECTRIC XGB PLC

AUTOMATIONDIRECT.com

LS XMC MOTION CONTROLLER

# XEL-BSSCT User Manual

**XEL-BSSCT**

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## Programmable Logic Control

# EtherCAT Smart I/O

## XGT Series

## User Manual

### XEL-BSSCT

## Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.
- Keep this manual within easy reach for quick reference.

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## Before using the product …

For your safety and effective operation, please read the safety instructions thoroughly before using the product.

- Safety Instructions should always be observed in order to prevent accident or risk with the safe and proper use the product.

- Instructions are divided into “Warning” and “Caution”, and the meaning of the terms is as follows.

**Warning** This symbol indicates the possibility of serious injury or death if some applicable instruction is violated.

**Caution** This symbol indicates the possibility of severe or slight injury, and property damages if some applicable instruction is violated.

Moreover, even classified events under its caution category may develop into serious accidents relying on situations. Therefore we strongly advise users to observe all precautions properly just like warnings.

- The marks displayed on the product and in the user’s manual have the following meanings.

  Be careful! Danger may be expected.

  Be careful! Electric shock may occur.

- The user’s manual even after read shall be kept available and accessible to any user of the product.

# Safety Instructions for Design Process

## ⚠ Warning

- **Please install a protection circuit on the exterior of PLC so that the whole system may operate safely regardless of failures from external power or PLC.** Any abnormal output or operation from PLC may cause serious problems to safety in whole system.
  - Install protection units on the exterior of PLC like an interlock circuit that deals with opposite operations such as emergency stop, protection circuit, and forward/reverse rotation or install an interlock circuit that deals with high/low limit under its position controls.
  - If any system error (watch-dog timer error, module installation error, etc.) is detected during CPU operation in PLC, all output signals are designed to be turned off and stopped for safety. However, there are cases when output signals remain active due to device failures in Relay and TR which can't be detected. Thus, you are recommended to install an addition circuit to monitor the output status for those critical outputs which may cause significant problems.
- **Never overload more than rated current of output module nor allow to have a short circuit**. Over current for a long period time may cause a fire.
- **Never let the external power of the output circuit to be on earlier than PLC power**, which may cause accidents from abnormal output operation.
- **Please install interlock circuits in the sequence program for safe operations in the system when exchange data with PLC or modify operation modes using a computer or other external equipments** Read specific instructions thoroughly when conducting control

## Safety Instructions for Design Process

### ⚠ Caution

- **I/O signal or communication line shall be wired at least 100mm away from a high-voltage cable or power line.** Fail to follow this.

## Safety Instructions on Installation Process

### ⚠ Caution

- **Use PLC only in the environment specified in PLC manual or general standard of data sheet.** If not, electric shock, fire, abnormal operation of the product may be caused.
- **Before install or remove the module, be sure PLC power is off.** If not, electric shock or damage on the product may be caused.
- **Be sure that every module is securely attached after adding a module or an extension connector.** If the product is installed loosely or incorrectly, abnormal operation, error or dropping may be caused. In addition, contact failures under poor cable installation will be causing malfunctions as well.
- **Be sure that screws get tighten securely under vibrating environments.** Fail to do so will put the product under direct vibrations which will cause electric shock, fire and abnormal operation.
- **Do not come in contact with conducting parts in each module**, which may cause electric

# Safety Instructions for Wiring Process

## ⚠ Warning

- **Prior to wiring works, make sure that every power is turned off.** If not, electric shock or damage on the product may be caused.
- **After wiring process is done, make sure that terminal covers are installed properly before its use.** Fail to install the cover may cause electric shocks.

## ⚠ Caution

- **Check rated voltages and terminal arrangements in each product prior to its wiring process.** Applying incorrect voltages other than rated voltages and misarrangement among terminals may cause fire or malfunctions.
- **Secure terminal screws tightly applying with specified torque.** If the screws get loose, short circuit, fire or abnormal operation may be caused. Securing screws too tightly will cause damages to the module or malfunctions, short circuit, and dropping.
- **Be sure to earth to the ground using Class 3 wires for PE terminals which is exclusively used for PLC**. If the terminals not grounded correctly, abnormal operation or electric shock may be caused.
- **Don't let any foreign materials such as wiring waste inside the module while wiring,** which may cause fire, damage on the product or abnormal operation.
- **Make sure that pressed terminals get tighten following the specified torque. External connector type shall be pressed or soldered using proper equipments.**

# Safety Instructions for Test-Operation and Maintenance

## ⚠ Warning

- **Don't touch the terminal when powered**. Electric shock or abnormal operation may occur.
- **Prior to cleaning or tightening the terminal screws, let all the external power off including PLC power.** If not, electric shock or abnormal operation may occur.
- **Don't let the battery recharged, disassembled, heated, short or soldered**. Heat, explosion or ignition may cause injuries or fire.

## ⚠ Caution

- **Do not make modifications or disassemble each module.** Fire, electric shock or abnormal operation may occur.
- **Prior to installing or disassembling the module, let all the external power off including PLC power.** If not, electric shock or abnormal operation may occur.
- **Keep any wireless equipment such as walkie-talkie or cell phones at least 30cm away from PLC**. If not, abnormal operation may be caused.
- **When making a modification on programs or using run to modify functions under PLC operations, read and comprehend all contents in the manual fully.** Mismanagement will cause damages to products and accidents.
- **Avoid any physical impact to the battery and prevent it from dropping as well.** Damages to battery may cause leakage from its fluid. When battery was dropped or exposed under strong impact, never reuse the battery again. Moreover skilled workers are needed when exchanging batteries.

# Safety Instructions for Waste Disposal

## ⚠ Caution

- **Product or battery waste shall be processed as industrial waste.** The waste may discharge toxic materials or explode itself.

# Revision History

| Version | Date | Remark | Part | Page |
|---|---|---|---|---|
| V 1.0 | 2018.12 | 1. First Edition | - | - |
| V 1.1 | 2020.06 | 1. Changed company name to LS ELECTRIC | - | - |

※ The number of User's manual is indicated the right side of the back cover.

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# About User's Manual

Congratulations on purchasing PLC of LS ELECTRIC Co., Ltd.

Before use, make sure to carefully read and understand the User's Manual about the functions, performances, installation and programming of the product you purchased in order for correct use and importantly, let the end user and maintenance administrator to be provided with the User's Manual.

The User's Manual describes the product. If necessary, you may refer to the following description and order accordingly. In addition, you may connect our website (http://www.lselectric.co.kr/) and download the information as a PDF file.

Relevant User's Manuals

| Title | Description | No. of User Manual |
|---|---|---|
| XG5000 User's Manual | It describes how to use XG5000 software especially about online functions such as programming, printing, monitoring and debugging by using XGT series products. | 10310000512 |
| XGK/XGB Series Instruction & Programming | It describes how to use the instructions for programming using XGK/XGB series. | 10310000510 |
| XMC Motion controller User's Manual | It describes how to use XMC motion controller unit, specifications, system configuration, program function, wiring, Built-in functions. | - |
| XGB Analog User's Manual | It describes how to use the specification of analog input/analog output/temperature input module, system configuration and built-in PID control for XGB main unit. | 10310000920 |
| XGB High speed counter module User's Manual | It describes how to use High speed counter(XBF-HO02A, XBF-HD02A) | 10310001240 |
| XGB Load cell input module User's Manual | It describes how to use the specification of load cell input module, system configuration and programing. | - |

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# Chapter 1 Overview

## 1.1 Composition of User's Manual

This user's manual contains information regarding the specification, handling method, wiring method and methods to use functions that are necessary for using this product. It is recommended to fully understand the performance and functions of the product through the user's manual before applying the product to the system. Also, place this user's manual near the product for reference at any time during operation.

**Notes**

Only the method to use the EtherCAT adapter 'XEL-BSSCT' is described in this manual.
For the method to use the EtherCAT master and XGB extension module necessary for system configuration, refer to the user's manual for each product. EtherCAT® is the registered copyright and the patent technology permitted through Beckhoff Automation GmbH in Germany.

## 1.2 Features

LS ELECTRIC Co., Ltd.'s extension type EtherCAT adapter XEL-BSSCT (EtherCAT adapter) has the following features.

(1) Observation of EtherCAT standard
Since this product is designed in accordance with the EtherCAT MDP standard, this product can be applied easily to various environments.

(2) Support of two device identification types
Two identification methods through the external rotary switch (Explicit ID) of the product and the parameter station address setting function are supported.

(3) Free Run / Refresh Sync
This is the EtherCAT slave device in Free Run method. When DC Sync is used in the EtherCAT master, the Refresh Sync function for the I/O refresh synchronization between our EtherCAT adapters in Free Run state is supported. By using this function, it is possible to match the I/O Refresh time and estimate the output time using the DC sync0 signal.

※ Only the synchronization between XEL-BSSCT is supported.

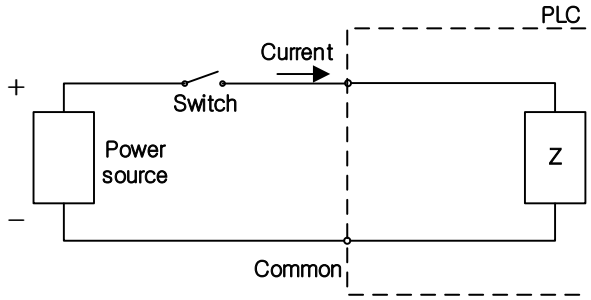
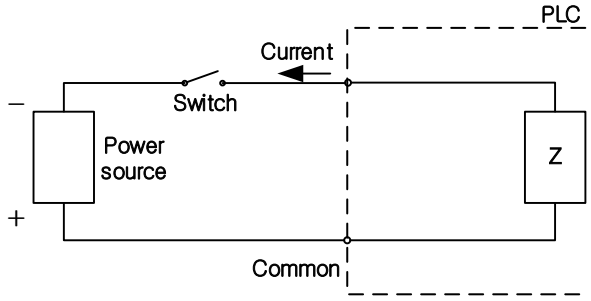
(4) Support of XG5000 setting function
In XG5000, the product parameter setting through USB or the test operation mode can be used.

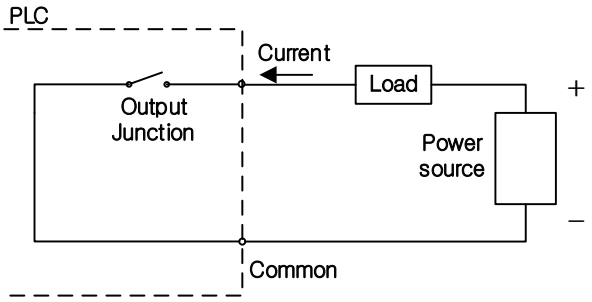
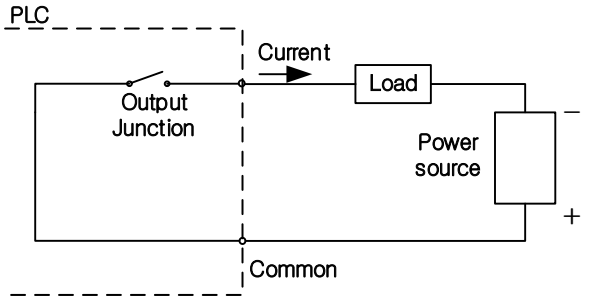
(5) Compatibility of XGB extension module
The extension I/O and special modules of XGB can be used.

## 1.3 Explanation of Terms

An explanation of the terms used in this user's manual is provided.

### 1.3.1 General Term

| Term | Definition | Note |
|---|---|---|
| Module (Module) | This is the standardized element with a certain function that configures the system and it includes devices such as I/O board. | i.e.) Extension module, special module, communication module |
| Unit (Unit) | Module or group of modules that becomes the minimum unit in the operation of the PLC system and is connected to another module or another group of modules, composing the PLC system. | i.e.) Basic unit |
| PLC System (PLC System) | A system which consists of the PLC and peripheral devices and is configured to be controlled by the user program. | |
| XG5000 | Integrated software that carries out the function to write, edit, debug and diagnose the parameters of the program and the communication module. | |
| I/O image area | Internal memory area of the XGB PLC for expressing input and output status. | |
| Sink input | A method that the current flows in from the switch to the PLC input terminal when the input signal is turned on.<br>  | Z: Input impedance |
| Source input | Method that the current flows out from the PLC input terminal to the switch when the input signal is turned on.<br>  | Z: Input impedance |

| | | |
|---|---|---|
| Sink output | Method that the current flows in from the load to the output terminal when the PLC output contact is turned on.<br>  | |
| Source output | Method that the current flows out from the output terminal when the PLC output contact is turned on.<br>  | |

### 1.3.2 Terms of EtherCAT

The general terms of EtherCAT are described. More information can be obtained through http://www.ethercat.org.

1) EtherCAT

EtherCAT is the protocol registered in the IEC 61158 International Standards. The Ethernet standards defined in IEEE 802.3 are used without modification. It features fast speed, flexible topology and easy configuration.

2) Object Dictionary

This is the table created for accessing data, parameters and functions using index and sub index, and all devices have the same basic structure.

3) Service Data Object (SDO)

A direct address of an object can be accessed using index and sub-index based on the client server module. It is generally used for transmitting larger data or changing a parameter. It communicates with CoE through MailBox.

4) Process Data Object (PDO)

It is used for transmitting data based on the producer consumer model. Unlike SDO, the protocol overhead is not included. PDO is driven by internal events such as a timer and trigger event or periodic transmission condition.

5) CANopen

This is the standard of CAN-in_Automation (CiA), and the core element of CANopen is the data communication technology through the object dictionary.

6) CoE (CANopen application protocol over EtherCAT)

EtherCAT provides the communication mechanism such as CANopen. Object Dictionary, PDO mapping and SDO also have similar network management method.

7) FoE (File Access over EtherCAT)

This is a protocol similar to TFTP, and it enables access to a file in the device. Through FoE, it is possible to upload the firmware of the network device. It is useful since the TCP/IP stack is not necessary.

8) ESI (EtherCAT Slave Information)

The ESI file is the file that includes all the unique information of the EtherCAT slave and this is the specification file in the XML format for communicating with the slave from the master. The ESI file is provided in the XG5000 by default, and the latest ESI file can be downloaded from our homepage. ESI is the document prepared based on XML.

9) Explicit Device Identification

Explicit Device Identification is one of Device Identification methods and this is the ID number that can be set through the external rotary switch (ID-Selector) of the product. This function can be used usefully for connecting and disconnecting the product in some applications and preventing incorrect fitting of the cable during the EtherCAT wiring work. When an ID is requested, the ID saved in ESC Register 0x0134 will be issued.

10) Configured Alias Address

Configured Alias Address is the function used under the name of “Second Address” in the previous EtherCAT specification, and when Alias Address set for the EEPROM is booted up, it will be loaded to the ESC Register 0x0012 and the relevant address will be issued when it is requested.

# Chapter 2 System Configuration

This product is the EtherCAT adapter that enables extension module installation, and various systems can be configured using the I/O and special modules.
In this chapter, an explanation of how to configure the system using the EtherCAT adapter is provided.

## 2.1 List of components

Modules that can be installed and used on the EtherCAT adapter are as follows.

| Classification | Model name | Contents | Note |
|---|---|---|---|
| Extension I/O module | XBE-DC08A | DC24V input 8 points | |
| | XBE-DC16A | DC24V input 16 points | |
| | XBE-DC32A | DC24V input 32 points | |
| | XBE-DC16B | DC12V/24V input 16 points | |
| | XBE-RY08A | Replay output 8 points | |
| | XBE-RY08B | Replay output 8 points (separate contact points) | |
| | XBE-RY16A | Replay output 16 points | |
| | XBE-DR16A | DC24V input 8 points, relay output 8 points | |
| | XBE-TN08A | Transistor output 8 points (sync type) | |
| | XBE-TN16A | Transistor output 16 points (sync type) | |
| | XBE-TN32A | Transistor output 32 points (sync type) | |
| | XBE-TP08A | Transistor output 8 points (source type) | |
| | XBE-TP16A | Transistor output 16 points (source type) | |
| | XBE-TP32A | Transistor output 32 points (source type) | |
| | XBE-DN32A | DC24V input 16 points, transistor output 16 points (sync type) | |
| Extension Special module | XBF-AD04A | Current/voltage input 4 channels, 1/4000 resolution | |
| | XBF-AD04C | Current/voltage input 4 channels, 1/16000 resolution | |
| | XBF-AD08A | Current/voltage input 8 channels, 1/4000 resolution | |
| | XBF-DC04A | Current output 4 channels, 1/4000 resolution | |
| | XBF-DC04C | Current output 4 channels, 1/16000 resolution | |
| | XBF-DV04A | Voltage output 4 channels, 1/4000 resolution | |
| | XBF-DV04C | Voltage output 4 channels, 1/16000 resolution | |
| | XBF-AH04A | Current/voltage input 2 channels, output 2 channels, 1/4000 resolution | |
| | XBF-RD04A | RTD input 4 channels, Pt100, Jpt100 | |
| | XBF-RD01A | RTD input 1 channel, Pt100, Jpt100 | |
| | XBF-TC04S | Thermocouple input 4Ch, Thermocouple K/J/T/R types (0~65,535) | |
| | XBF-HO02A | High-speed counter open collector, 2 channels | |
| | XBF-HD02A | High-speed counter line driver, 2 channels | |
| | XBF-LD02S | Load cell input, insulation-type 2 channels | |
| Accessories | USB-301A | Connection cable for USB (download) | |

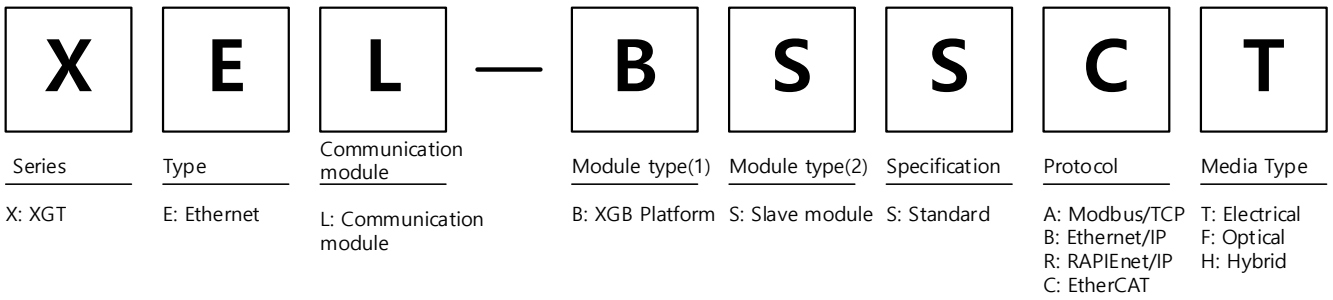
**Notes**

LS ELECTRIC Co., Ltd. develops and releases a new product continuously.
For a new product not stated in this user's manual, contact a nearby exclusive agency.

## 2.2 Classification and type of product model name

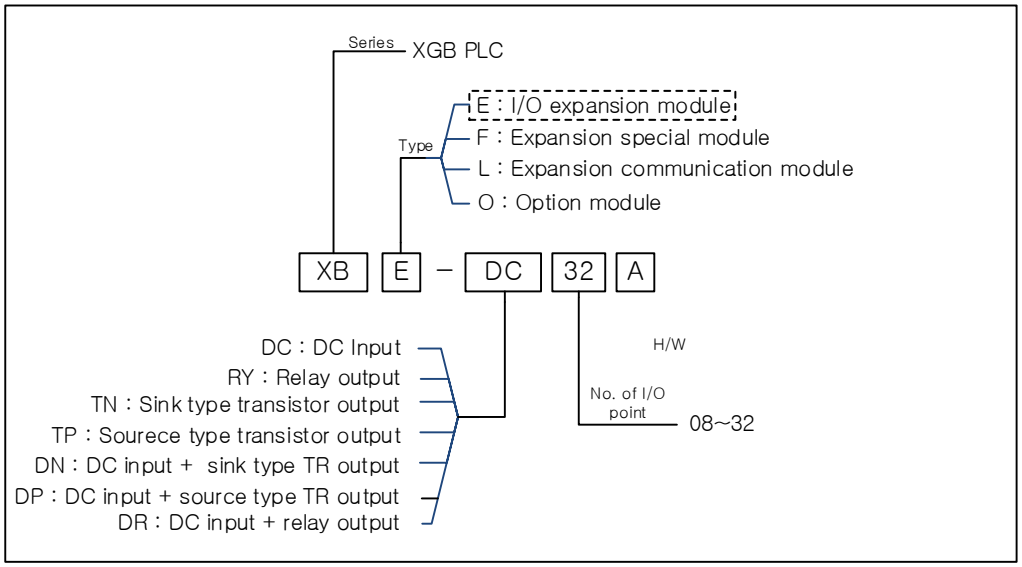
### 2.2.1 Classification of extension type smart I/O

The product name for the classification of extension type smart I/O is stated as follows.




### 2.2.2 Classification and type of extension I/O module

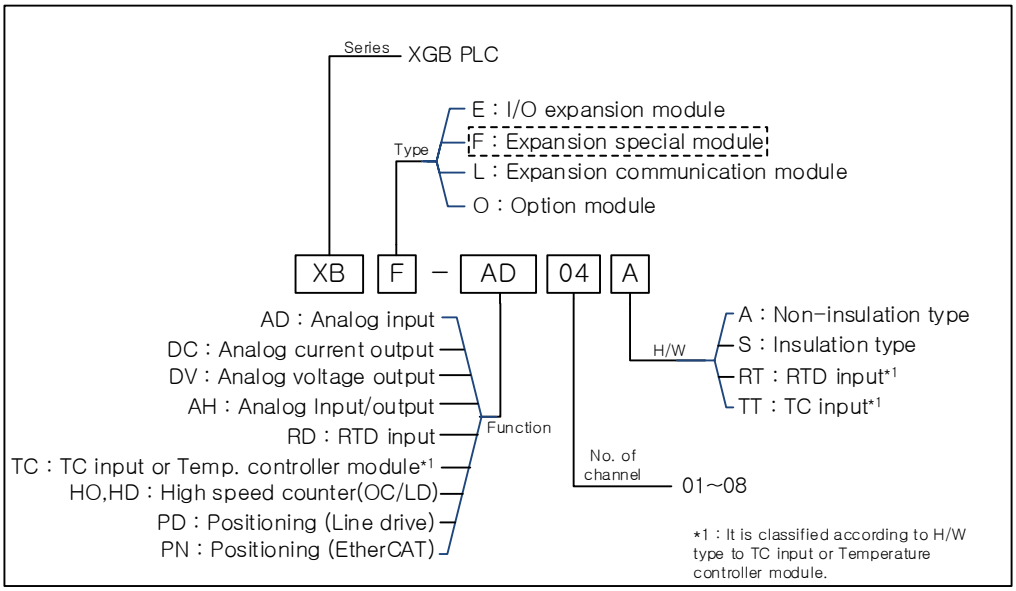
The product name of the extension I/O module is stated as follows.




| Model name | DC input | Replay output | Transistor output | Note |
|---|---|---|---|---|
| XBE-DC08A | 8 points | None | None | - |
| XBE-DC16A/B | 16 points | None | None | |
| XBE-DC32A | 32 points | None | None | |
| XBE-RY08A/B | None | 8 points | None | |
| XBE-RY16 A | None | 16 points | None | |
| XBE-TN08A | None | None | 8 points | Sync type |
| XBE-TN16A | None | None | 16 points | |
| XBE-TN32A | None | None | 32 points | |
| XBE-TP08A | None | None | 8 points | Source type |
| XBE-TP16A | None | None | 16 points | |
| XBE-TP32A | None | None | 32 points | |
| XBE-DR16A | 8 points | 8 points | None | - |
| XBE-DN32A | 16 points | None | 16 points | Sync type |

## 2.2.3 Classification and type of special module

The product name of the extension type special module is stated as follows.

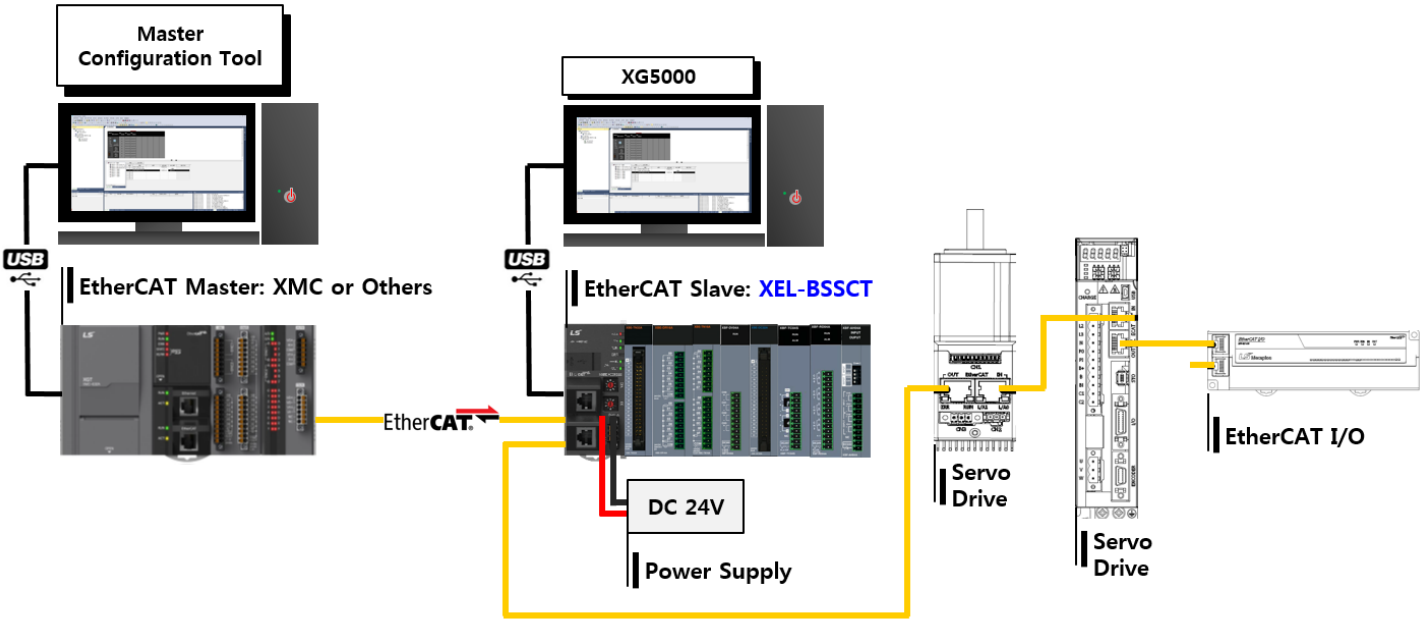



| Classification | Model name | Number of input channels | Input type | Number of output channels | Output type |
|---|---|---|---|---|---|
| Analog input | XBF-AD04A | 4 | Voltage/current | None | - |
| | XBF-AD08A | 8 | Voltage/current | None | - |
| | XBF-AD04C | 4 | Voltage/current | None | - |
| Analog output | XBF-DC04A | None | - | 4 | Current |
| | XBF-DV04A | None | - | 4 | Voltage |
| | XBF-DC04C | None | - | 4 | Current |
| | XBF-DV04C | None | - | 4 | Voltage |
| Analog I/O | XBF-AH04A | 2 | Voltage/current | 2 | Voltage/current |
| RTD input | XBF-RD01A | 1 | PT100/JPT100 | None | - |
| | XBF-RD04A | 4 | PT100/JPT100 | None | - |
| Thermocouple input | XBF-TC04S | 4 | K, J, T, R | None | - |
| High-speed counter | XBF-HO02A | 2 | Open collector | 4 | Voltage |
| | XBF-HD02A | 2 | Line driver | 4 | Voltage |
| Load cell input | XBF-LD02S | 2 | Voltage | None | - |

## 2.3 System Configuration

### 2.3.1 Devices required for EtherCAT system configuration

Various devices are necessary for the configuration of EtherCAT network.




(1) EtherCAT master

The EtherCAT master manages the network and checks the state of each slavein addition to the exchange of I/O data.

(2) EtherCAT adapter

The EtherCAT adapter is the slave module where the previous XGB extension module can be mounted, and the I/O configuration is available according to the user's needs.

(3) EtherCAT slave

The EtherCAT slave is the device that exchanges I/O data with the master.

(4) XG5000

This is the PC program that provides various functions for setting the operation of the EtherCAT master and the EtherCAT adapter and configuring the EtherCAT network.

(4) Communication cable

The communication cable which is appropriate for the specifications of the EtherCAT should be used. The cable with CATEGORY 5 and STP or higher should be used. For the details, refer to Paragraph 3.5 Specifications of EtherCAT communication.

(5) ESI (EtherCAT Slave Information)

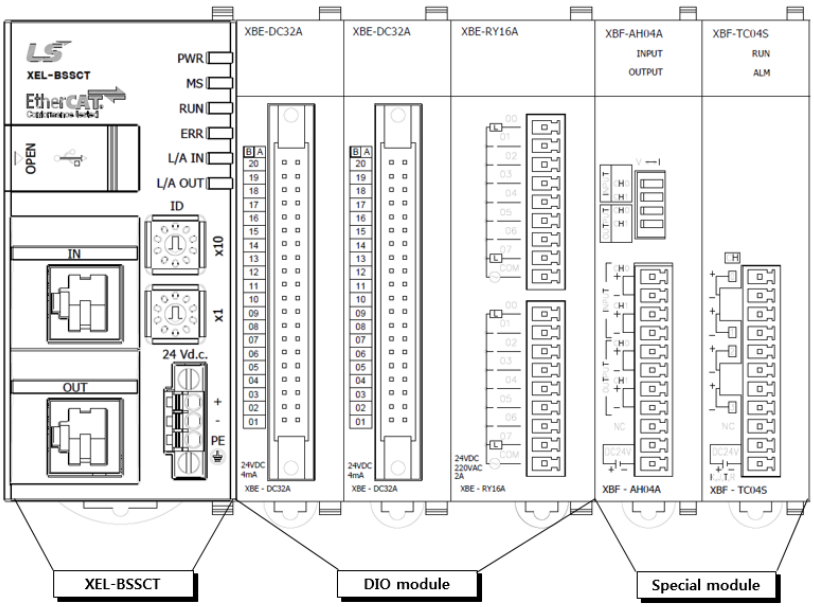
The ESI file is the file that includes all the unique information of the EtherCAT slave and this is the specification file in the XML format for communicating with the slave from the master. The ESI file is provided in the XG5000 by default, and the latest ESI file can be downloaded from our homepage.

(6) Power supply

This is the device for supplying power to each device, and an appropriate power supply for the power specifications should be selected.

## 2.3.2 Extension module configuration method

XEL-BSSCT can configure the system as follows.The existing XGB extension module can be used for the extension module and up to 8 modules can be mounted.




| Item | | Content | | |
|---|---|---|---|---|
| Number of units that can connect to the extension module | Digital I/O module | • Up to 8 modules | | |
| | Special module | • Up to 8 modules | | |
| | communication module | • Cannot be mounted | | |
| | High speed extension module | • Cannot be mounted | | |
| | Option module | • Cannot be mounted | | |
| Extension module | Digital I/O module | • XBE-DC08/16/32A<br>• XBE-DC16B | • XBE-TN08/16/32A<br>• XBE-TP08/16/32A<br>• XBE-DR16A | • XBE-RY08/16A<br>• XBE-RY08B<br>• XBE-DN32A |
| | Special module | • XBF-AD04A<br>• XBF-AD04C<br>• XBF-AD08A<br>• XBF-AH04A<br>• XBF-RD04A | • XBF-DC04A<br>• XBF-DC04C<br>• XBF-DV04A<br>• XBF-DV04C<br>• XBF-TC04S | • XBF-HO02A<br>• XBF-HD02A<br>• XBF-LD02S |

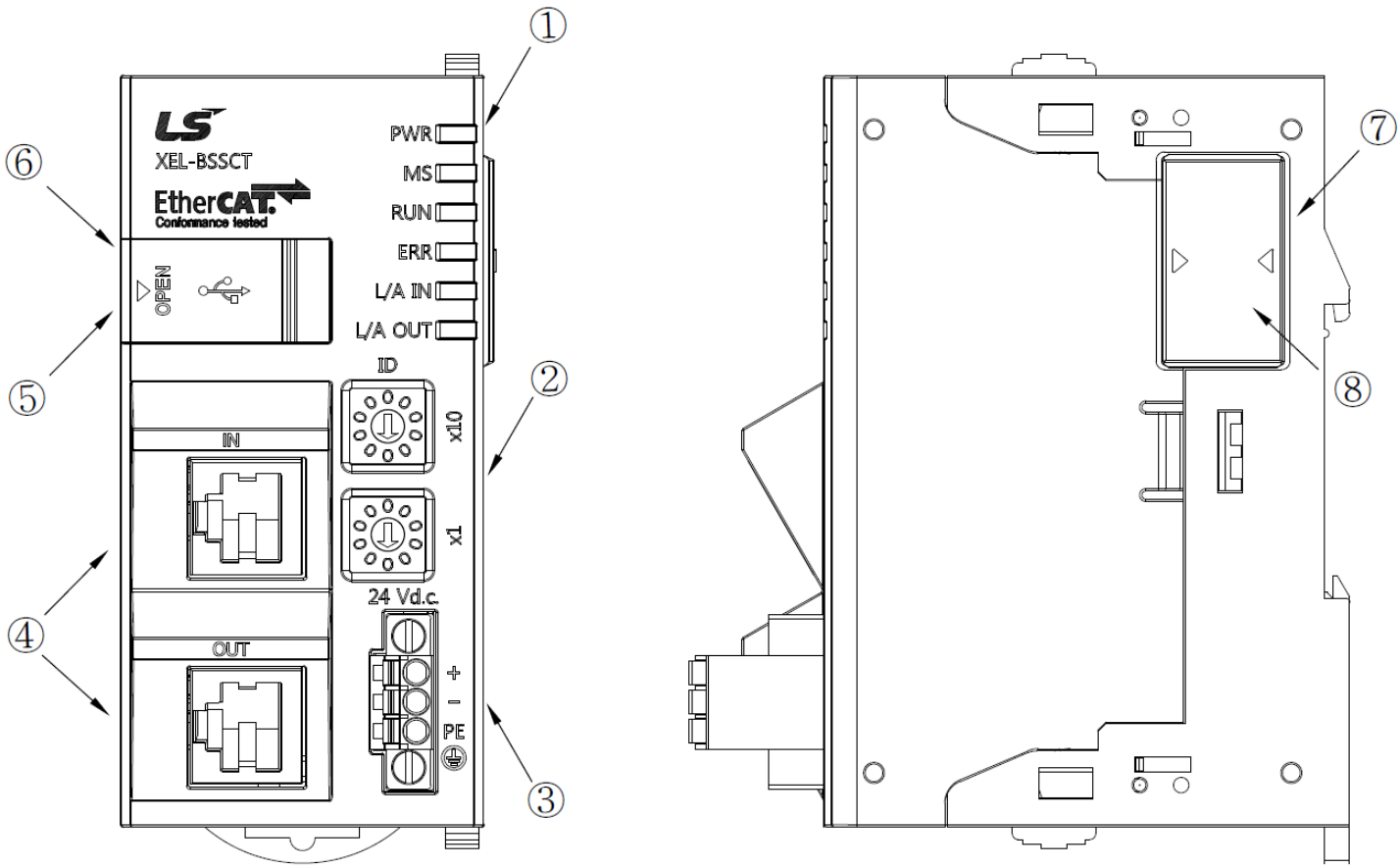
**Notes**

In XEL-BSSCT, the extension product mounted first occupies No. 0 slot.
Slots from No. 0 slot to No. 7 slot are assigned.
Configure and manage the extension module by referring to the above information.

# Chapter 3 Specifications

## 3.1 Name and features

### 3.1.1 Name of each part and features



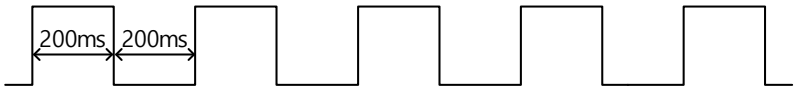
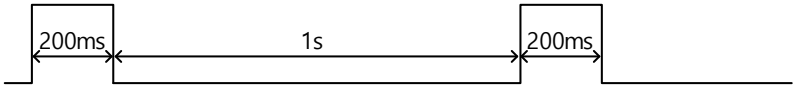
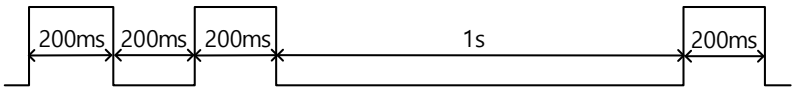
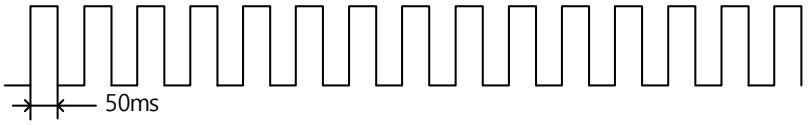

| No | Name | Usage |
|---|---|---|
| ① | Status indicator LED | ■ LED that indicates the operation status of EtherCAT adapter and network connection status |
| ② | Rotary switch | ■ Rotary switch for setting Node Address(Explicit ID) |
| ③ | Power connector | ■ Connector for DC24V power connection |
| ④ | EtherCAT connector | ■ IN and OUT connector for EtherCAT network connection |
| ⑤ | Connector for PADT connection | ■ USB connector for connecting to XG5000 |
| ⑥ | USB cover | ■ Cover for protecting the USB port |
| ⑦ | Extension cover | ■ Cover for protecting the extension connector |
| ⑧ | Extension connector | ■ Connector for connecting to the extension module |

### 3.1.2 Name and Functions of LED

RUN, ERR, L/A IN and L/A OUT LEDs operate according to the EtherCAT specification.

| Name | Color | Status | | Normal/Error | Operation by status |
|---|---|---|---|---|---|
| PWR | Red | Off | | - | Power Off |
| | | On | | - | Power On |
| RUN | Green | Off | | - | INIT status |
| | | Blinking | | - | PRE-OP status |
| | | Single Flash | | - | SAFE-OP status |
| | | Flickering | | - | Initialization or BOOTSTRAP status |
| | | On | | - | OP status |
| MS | Red/Green | Green | On | - | RUN mode |
| | | | Off | - | When an error where the STOP mode or the operation is unavailable has occurred |
| | | Red | On | Error | When an error that cannot be recovered has occurred |
| | | | 1s Flickering | Warning | Occurrence of an error which can be recovered or has no significant effect on the operation |
| | | | 500ms Flickering | Light error | Occurrence of a light error, an error that has no significant effect on the operation |
| | | | 100ms Flickering | Critical error | Occurrence of a critical error which has an effect on the operation |
| ERR | Red | Off | | - | No error |
| | | Blinking | | Error | General setting error such as register or object setting, or invalid H/W setting |
| | | Single Flash | | Error | The EtherCAT state cannot be changed to OP due to a local error. |
| | | Double Flash | | Error | Occurrence of sync manager watchdog timeout |
| | | Flickering | | Error | Booting error |
| | | On | | Error | Occurrence of ESC failure which is a hardware failure. |
| [1]L/A IN | Green | Off | | - | The connection to the Master is not established. No communication. |
| | | On | | - | The connection to the Master is established. No communication. |
| | | Flickering | | - | The connection to the Master is established. Communicating. |
| [1]L/A OUT | Green | Off | | - | The connection to the Master is not established. No communication. |
| | | On | | - | The connection to the Master is established. No communication. |
| | | Flickering | | - | The connection to the Master is established. Communicating. |

The flickering specification of the LED is as follows.

| | |
|---|---|
| Blinking |  |
| Single Flash |  |
| Double Flash |  |
| Flickering |  |

## 3.2 General specification

The general specification of the EtherCAT adapter is as follows.

<table>
<tr><th>No.</th><th>Item</th><th colspan="6">Specification</th><th>Reference</th></tr>
<tr><td>1</td><td>Service temperature</td><td colspan="6">0℃~55℃</td><td></td></tr>
<tr><td>2</td><td>Storage temperature</td><td colspan="6">-25℃~70℃</td><td></td></tr>
<tr><td>3</td><td>Service humidity</td><td colspan="6">5~95%RH ( Non-condensing)</td><td></td></tr>
<tr><td>4</td><td>Storage humidity</td><td colspan="6">5~95%RH ( Non-condensing)</td><td></td></tr>
<tr><td rowspan="8">5</td><td rowspan="8">Vibration resistance</td><td colspan="6">In case of occasional vibration</td><td></td></tr>
<tr><td>Frequency</td><td colspan="2">Acceleration</td><td>Amplitude</td><td>Time</td><td rowspan="8">IEC 61131-2</td></tr>
<tr><td>5≤f< 8.4Hz</td><td colspan="2">-</td><td>3.5mm</td><td rowspan="6">X,Y, Z<br>Each direction<br>10 times</td></tr>
<tr><td>8.4≤f≤150Hz</td><td colspan="2">9.8㎨(1G)</td><td>-</td></tr>
<tr><td colspan="4">In case of continuous vibration</td></tr>
<tr><td>Frequency</td><td colspan="2">Acceleration</td><td>Amplitude</td></tr>
<tr><td>5≤f< 8.4Hz</td><td colspan="2">-</td><td>1.75 mm</td></tr>
<tr><td>8.4≤f≤150Hz</td><td colspan="2">4.9㎨(0.5G)</td><td>-</td></tr>
<tr><td></td></tr>
<tr><td>6</td><td>Shock resistance</td><td colspan="6">* Peak impact acceleration: 147㎨(15G)<br>* Duration: 11㎳<br>* Pulse wave form: Half-sine ( 3 times per each direction of X, Y and Z)</td><td>IEC 61131-2</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Noise resistance</td><td colspan="3">Square wave impulse noise</td><td colspan="2">DC system: ± 900 V</td><td>Internal test specification of LS ELECTRIC Co., Ltd.</td></tr>
<tr><td colspan="3">Electrostatic discharge</td><td colspan="2">Voltage: ±4 kV (Contact discharge)</td><td>IEC 61131-2,<br>IEC 61000-4-2</td></tr>
<tr><td colspan="3">Radiated electromagnetic field noise</td><td colspan="2">80 ~ 1,000MHz, 10 V/m</td><td>IEC 61131-2,<br>IEC 61000-4-3</td></tr>
<tr><td rowspan="2">Fast Transient /Burst Noise</td><td>Classification</td><td>Power Module</td><td colspan="2">Digital/analog input and output, communication interface</td><td rowspan="2">IEC 61131-2,<br>IEC 61000-4-4</td></tr>
<tr><td>Voltage</td><td>2 kV</td><td colspan="2">1 kV</td></tr>
<tr><td>8</td><td>Ambient environment</td><td colspan="6">Free from corrosive gases and excessive dust.</td><td></td></tr>
<tr><td>9</td><td>Altitude</td><td colspan="6">Below 2000m</td><td></td></tr>
<tr><td>10</td><td>Pollution degree</td><td colspan="6">2 or less</td><td></td></tr>
<tr><td>11</td><td>Cooling method</td><td colspan="6">Naturally air-cooled</td><td></td></tr>
</table>

**Notes**

1) IEC (International Electrotechnical Commission): It is an international private organization that promotes international cooperation in the standardization in the electricity and electronics fields, publishes international standards and operates the relevant conformance evaluation system.

2) Pollution degree: This is the index that indicates the pollution degree of the service environment that decides the insulation performance of the device. Pollution degree 2 is the state that only non-conductive pollution occurs generally. However, temporary conduction occurs due to moisture in this state.

## 3.3 Power specification

It indicates the power specification of the EtherCAT adapter.

| Item | | Specification | Condition |
|---|---|---|---|
| Input | Rated input voltage | DC24V | |
| | Input voltage range | DC20.4 ~ 28.8V (-15%, + 20%) | Within -15% and +20% of the rated input |
| | Input current | Less than 1.3A (Typ.1A) | Input +DC28.8V, maximum load |
| | Inrush current | 50A peak or less | Input +DC28.8V, maximum load |
| | Efficiency | 80 % or more | Input +DC28.8V, maximum load |
| | Permitted instantaneous interruption | Within 10 ms | Input +DC28.8V, maximum load |
| Output | Rated output voltage | DC5V (±2%) | |
| | Output current | 3.0A | |
| Indication of voltage status | | LED On when the output voltage is normal | |
| Cable specification | | 22 ~ 20 AWG (0.3 ~ 0.5mm2) | |

*It is recommended to use a power supply that has an up to 4A fuse in order to protect the power supply.

Notes

1. Permitted instantaneous interruption time
   This is the time that the normal output voltage is maintained (normal operation) in the state that the input voltage (DC24V) is below the rated value (DC20.4V).
2. Use a UL-certified power supply.
   - Use a power supply that satisfies Class 2 or LVLC (Limited voltage Limited circuit).

### 3.3.1 Current consumption by module

The current consumption of each module that can be used in the EtherCAT adapter is explained.

(Unit: ㎃)

| Item name | Model name | Content | Current consumption |
|---|---|---|---|
| EtherCAT adapter | XEL-BSSCT | Extension type EtherCAT adapter | 300 |
| Extension I/O module | XBE-DC32A | DC24V input 32 points | 50 |
| | XBE-DC16A/B | DC24V input 32 points, DC12V/24V input 16 points | 40 |
| | XBE-DC08A | DC24V input 8 points | 20 |
| | XBE-RY16A | Replay output 16 points | 440 |
| | XBE-RY08A/B | Relay output 8 points, relay output 8 points (separate contact points) | 240 |
| | XBE-TN32/16/08A | Transistor output 32/16/8 points (sync type) | 80/50/40 |
| | XBE-DR16A | DC24V input 8 points, relay output 8 points | 250 |
| | XBE-TP32/16/08A | Transistor output 32/16/8 points (source type) | 80/50/40 |
| Extension special module | XBF-AD04A | Current/voltage input 4 channels, 1/4000 resolution | 120 |
| | XBF-AD08A | Current/voltage input 8 channels, 1/4000 resolution | 105 |
| | XBF-AH04A | Current/voltage input 2 channels, output 2 channels, 1/4000 resolution | 120 |
| | XBF-DV04A | Voltage output 4 channels, 1/4000 resolution | 110 |
| | XBF-DC04A | Current output 4 channels, 1/4000 resolution | 110 |
| | XBF-RD04A | RTD input 4 channels, Pt100, Jpt100 | 100 |
| | XBF-RD01A | RTD input 1 channel, Pt100, Jpt100 | 100 |
| | XBF-TC04S | Thermocouple input 4Ch, Thermocouple K/J/T/R types (0~65,535) | 100 |
| | XBF-HO02A | High-speed counter open collector, 2 channels | 270 |
| | XBF-HD02A | High-speed counter line driver, 2 channels | 330 |
| | XBF-AD04C | Current/voltage input 4 channels, 1/16000 resolution | 105 |
| | XBF-DC04C | Current output 4 channels, 1/16000 resolution | 70 |
| | XBF-DV04C | Voltage output 4 channels, 1/16000 resolution | 70 |
| | XBF-LD02S | Load cell input module | 110 |

### 3.3.2 Example of current consumption/power calculation

Configure the extension of the EtherCAT adapter not to exceed the current output capacity by checking the current consumption of each module as shown in the following example. For the current consumption of each module, refer to Paragraph 3.3.1.

(1) Example of system configuration 1

| Type | Model name | Number of units to be mounted | Internal 5V Current consumption (Unit: ㎃) | Note |
|---|---|---|---|---|
| EtherCAT adapter | XEL-BSSCT | 1 | 300 | When the contact is On (Maximum current consumption) |
| Extension module | XBE-DC32A | 2 | 50 | |
| | XBE-TN32A | 2 | 80 | |
| | XBF-AD04A | 1 | 120 | Use of all channels (Maximum current consumption) |
| | XBF-DC04A | 1 | 110 | |
| | XBL-AD04C | 1 | 105 | |
| Current consumption | 895㎃ | | | - |
| Power consumption | 4.48W | | | 0.895A x 5V = 4.475W |

When the system is configured as shown above, the 5V current consumption will be 895㎃, and the 5V output of the adapter is up to 3.0A, so normal system configuration is possible.

(2) Example of system configuration 2

| Type | Model name | Number of units to be mounted | Internal 5V Current consumption (Unit: ㎃) | Note |
|---|---|---|---|---|
| EtherCAT adapter | XEL-BSSCT | 1 | 300 | When all contacts are On (Maximum current consumption) |
| Extension module | XBE-DR16A | 2 | 250 | |
| | XBE-RY16A | 5 | 440 | |
| | XBF-AD04A | 1 | 120 | Use of all channels |
| Current consumption | 3,120㎃ | | | - |
| Power consumption | 15.6W | | | 4.22A x 5V = 21.1W |

When the system is configured as shown above, the 5V current consumption will be 3,120mA, exceeding the maximum 5V output of the adapter, so the system configuration is impossible. Of course, the above example of current consumption calculation is based on the assumption that all I/O contacts are On at the same time. However, be sure to configure the system within the 5V output current of the EtherCAT adapter for the stability of the system.

## 3.4 Performance specification

The performance specification of the EtherCAT adapter is as follows.

| Classification | Item | | | Specification |
|---|---|---|---|---|
| Performance specification of adapter | Maximum number of levels for the extension | | | 8 levels |
| | Operation mode | | | RUN, STOP<br>(The test operation through the XG5000 is only available in STOP mode.) |
| | Refresh time | | | DC Sync0 time x refresh time (0 ~ 100) |
| | Standard input filter | | | 1, 3, 5, 10, 20, 70, 100ms |
| | Self-diagnosis function | | | Indication of a current error and warning |
| | EEPROM | | Self-recovery function | Enable/disable automatic recovery |
| | | | EEPROM size | 4 KB |
| | Memory | System flag area | F area | 2 KB |
| | | Extension module mapping area | I area | 2 KB |
| | | | Q area | 2 KB |
| | | | U area | 1 KB |
| | External connection terminal | | Programming port | USB 1 channel |
| | | | Communication port | RJ45 2 ports (Response to shield) |
| | | | Power port | 3-Pin push-in/screw fixing type connector |
| | Status indicator LED | | | 6 types including PWR, MS, RUN, ERR, IN and OUT |
| Communication specification of EtherCAT | Maximum number of extension modules to be mounted | | | 8 modules |
| | Communication protocol | | | EtherCAT |
| | Data transfer speed | | | 100Mbps |
| | Physical layer | | | 100BASE-TX (IEEE 802.3) |
| | Topology | | | Conforms to the specification of EtherCAT master. |
| | Transmission media | | | STP (Shielded Twisted-pair) cable with Category 5 or higher |
| | Transmission distance | | | 100m or less between the nodes |
| | Size of PDO data for transmission and reception | | | Input: Up to 1,024 byte, output: Up to 1,024 byte |
| | Size of mailbox data | | | Input: Up to 256 byte, output: Up to 256 byte |
| | Mailbox support command | | | SDO requests, SDO information |
| | Refresh method | | | Free-Run, Refresh Sync mode (For LS ELECTRIC Co., Ltd. only) |
| | Node address setting method | | | Rotary switch, master, PADT |
| | Node address setting range | | | Explicit ID(1 ~ 99) |
| | | | | Alias Address(1 ~ 65535) |
| | | | | Applies the EEPROM value set by the master when setting PADT 0 |
| Weight | 130g | | | |

# Chapter 4 Installation and Wiring

## 4.1 Safety precautions

### ⚠ Danger

- Please design protection circuit at the external of PLC for entire system to operate safely because an abnormal output or an malfunction may cause accident when any error of external power or malfunction of PLC module.
  (1) It should be installed at the external side of PLC to emergency stop circuit, protection circuit, interlock circuit of opposition action such as forward /reverse operation and interlock circuit for protecting machine damage such as upper/lower limit of positioning.
  (2) If PLC detects the following error, all operation stops and all output is off.
  (Available to hold output according to parameter setting)
  (a) When over current protection equipment or over voltage protection operates
  (b) When self diagnosis function error such as WDT error in PLC CPU occurs
- When error about IO control part that is not detected by PLC CPU, all output is off.
  Design Fail Safe circuit at the external of PLC for machine to operate safely. Refer to 4.1.1 Fail Safe circuit.
  (1) Because of error of output device, Relay, TR, etc., output may not be normal. About output signal that may cause the heavy accident, design supervisory circuit to external.
- When load current is more than rating or over current by load short flows continuously, danger of heat, fire may occur so design safety circuit to external such as fuse.
- Design for external power supply to be done first after PLC power supply is done. If external power supply is done first, it may cause accident by misoutput, misoperation.
- In case communication error occurs, for operation status of each station, refer to each communication manual.
- In case of controlling the PLC while peripheral is connected to CPU module, configure the interlock circuit for system to operate safely. During operation, in case of executing program change, operation status change, familiarize the manual and check the safety status. Especially, in case of controlling long distance PLC, user may not response to error of PLC promptly because of communication error or etc.
  Limit how to take action in case of data communication error between PLC CPU and external device adding installing interlock circuit at the PLC program.

## ⚠ Danger

- Don't close the control line or communication cable to main circuit or power line. Distance should be more than 100mm. It may cause malfunction by noise.

- In case of controlling lamp load, heater, solenoid valve, etc. in case of Off -> On, large current (10 times of normal current) may flows, so consider changing the module to module that has margin at rated current.

- Process output may not work properly according to difference of delay of PLC main power and external power for process (especially DC in case of PLC power On-Off and of start time.
  For example, in case of turning on PLC main power after supplying external power for process, DC output module may malfunction when PLC is on, so configure the circuit to turn on the PLC main power first
  Or in case of external power error or PLC error, it may cause the malfunction.

- Not to lead above error to entire system, part causing breakdown of machine or accident should be configured at the external of PLC

### 4.1.1 Calculation of current consumption

(1) Power consumption of each part

(a) Power consumption of module

The power conversion efficiency of the power module is approximately 70%, and the remaining 30% is consumed through heating,and 3/7 of the output power becomes its power consumption. Therefore, the calculation formula is as follows.

- Wpw = 3/7 {(I5V X 5) + (I24V X 24)} (W)

I5V: Current consumption of each module DC5V circuit (Internal current consumption)

I24V: Average DC24V current consumption used inside of the output module

(Current consumption of concurrent On point)

It does not apply if DC24V is supplied from the outside or if the power module with no DC24V output is used.

(b) Sum of DC5V circuit power consumption

The power consumption of DC5V output circuit in the power module is sum of power consumption of each module.

- $W_{5V} = I_{5V} X 5$ (W)

(c) Average DC24V power consumption (power consumption of concurrent On point)

Average power consumption of DC24V output circuit in the power module is the total power consumption of each module.

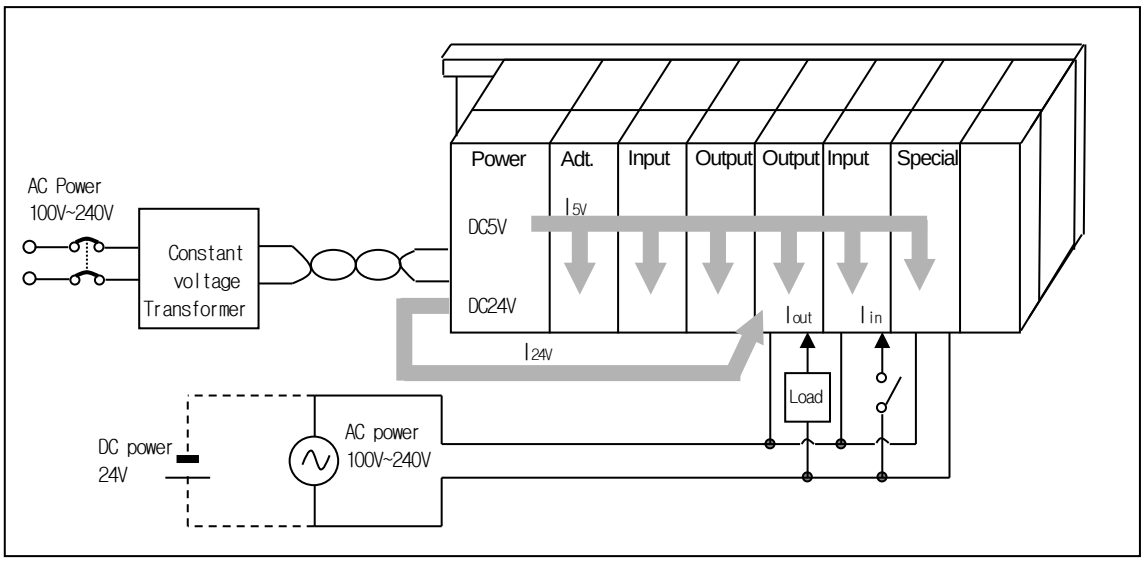
- W24V = I24V X 24 (W)

(d) Average power consumption of output module by output voltage drop (power consumption of concurrent On point)

- Wout = Iout X Vdrop X output point X ratio of concurrent On (W)

Iout : Output current (Actual service current) (A)

Vdrop: Voltage drop of each output module (V)



(e) Average power consumption of input unit in the input module (power consumption of concurrent On point)

- Win = Iin X E X input point X ratio of concurrent On (W)

Iin: Input current (virtual value in case of alternating current) (A)
E : Input voltage (Actual service voltage) (V)

(f) Power consumption of special module power unit

- WS = I5V X 5 + I24V X 24 + I100V X 100 (W)

The sum of power consumption calculated for each block becomes the overall power consumption of the PLC system.

- W = WPW + W5V + W24V + Wout + Win + Ws (W)

Review a temperature rise in the control panel by calculating the caloric value according to whole power consumption (W).
The approximate calculation formula for a temperature rise in the control panel is displayed as follows.

T = W / UA [°C]
W : Overall power consumption of the PLC system (Value obtained above)
A : Surface area in the control panel [m2]
U : If a constant temperature in the control panel is maintained by a fan : 6
If the air in the control panel is not circulated : 4

If the temperature inside the control panel exceeds the regulated range, mount a fan to maintain the temperature inside the control panel within the regulated temperature. If the fan is used, dust will be brought in along with the air from the outside and such dust may affect the PLC. Caution should be taken.

## 4.2 Mounting and separation of module

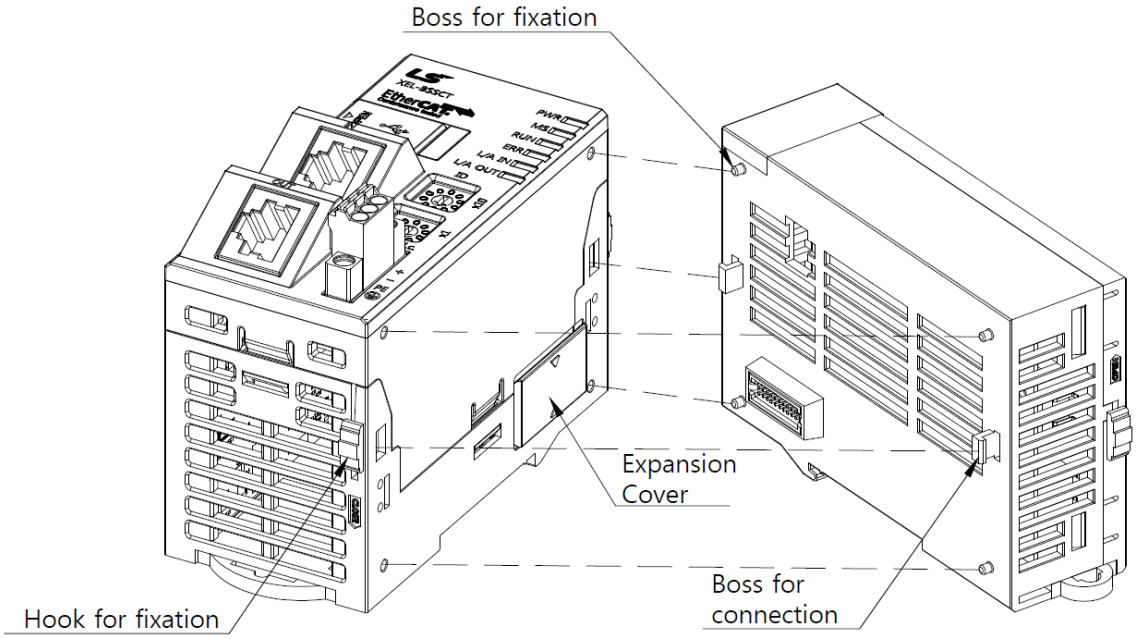
### 4.2.1 Mounting and separation of module

**⚠ Caution**

- Be sure to fix the module after mounting the module fixing protrusion on the module fixing hole properly. If the module is attached forcibly, it may be damaged. If the module is not mounted correctly, malfunction and a failure may occur.
- Do not drop the module case and terminal connector or apply strong impact.
- Do not separate the PCB substrate of the module from the case.

(1) Mounting of the module

- Remove the extension cover at the bottom right side of the product you intend to connect to.
- Connect the protrusion for connection to the position fixing protrusion on four corners by pushing them to each other.
- After connection, lower the module fixing hook down and fix it firmly.




(2) Detachment of the module

- Lift the fixing hook up and hold the product with both hands and detach it. (Do not apply excessive force.)

**Notes**

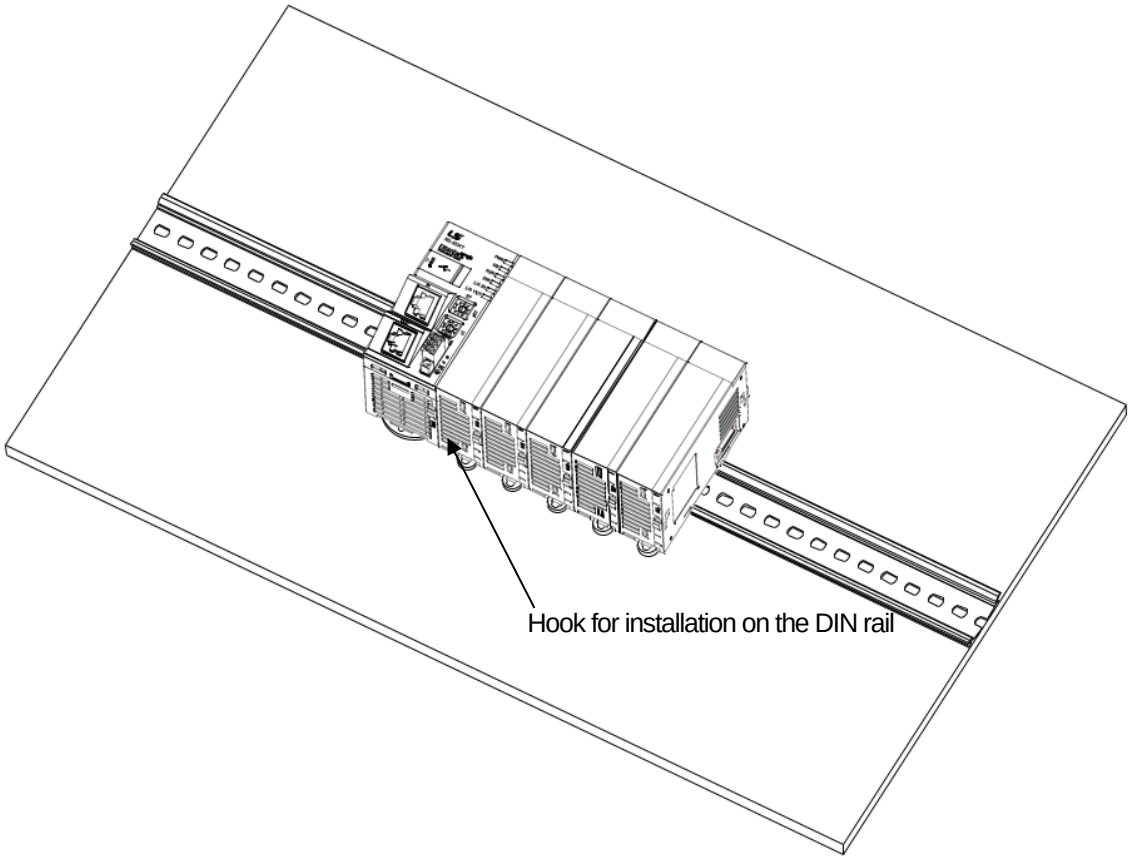
Use the PLC in the range of general specifications presented in this user's manual.
Using it beyond the range may cause electric shock, fire, malfunction, product damage or burning.

(3) Installation of module

The XGB PLC has the hook for DIN rail (width of rail - 35mm) mounted on the basic unit and the extension module as standard, so it can be installed on the DIN rail.

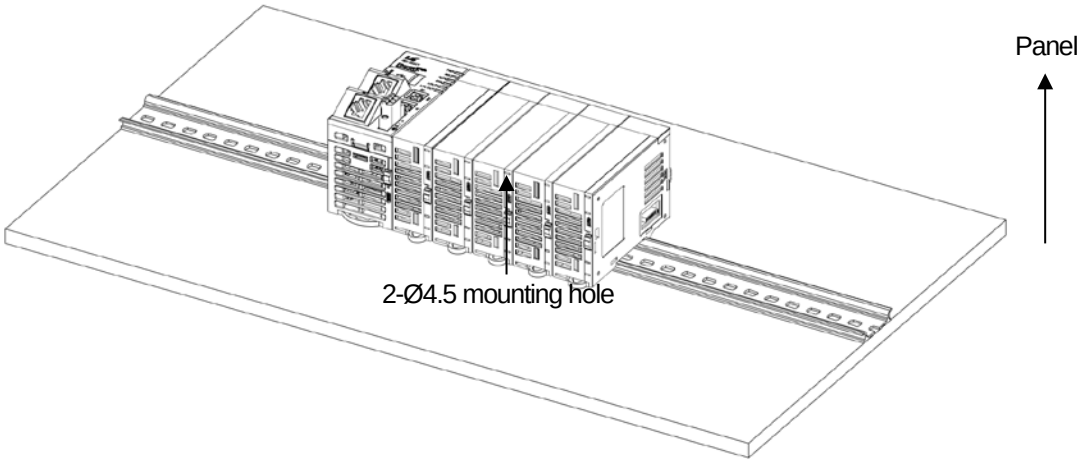
(a) If it is installed on the DIN rail

- Pull the hook for installation on the DIN rail at the bottom of the module to enable installation on the DIN rail.
- Install the module on the DIN rail and push the hook to fix the module to the DIN rail.



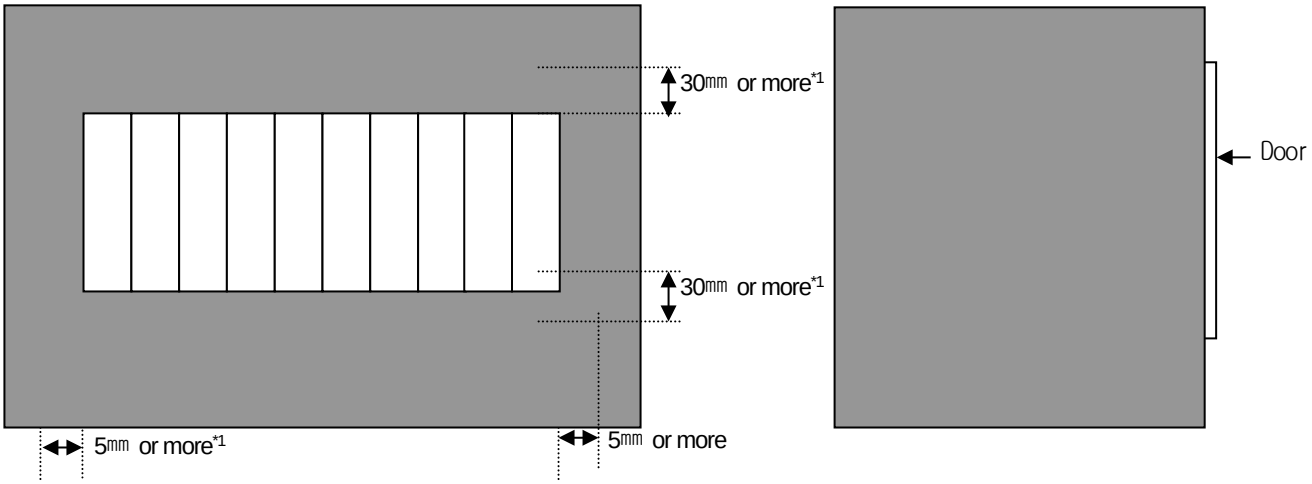

(B) If it is installed on the panel directly

- The basic unit can be installed on the panel directly using the screw mounting hole.
- Use the M4 type fixing screw for installing the product on the panel directly.



(4) Module mounting position

Install the module at intervals of the distance specified below from the structure or a part on top of or at the bottom of the module to facilitate ventilation or module replacement.



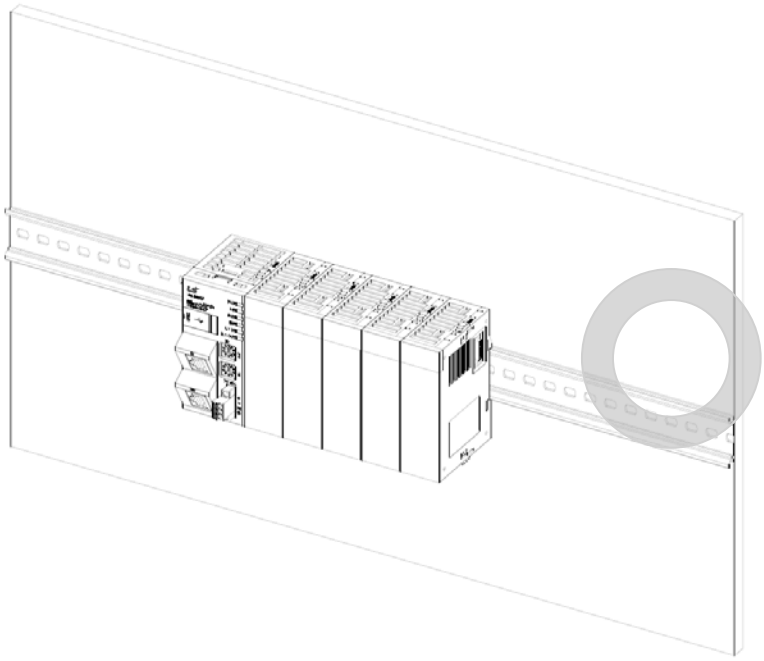

*1 : If the height of wiring duct is 50 ㎜ or less (40 ㎜ or more for all other cases)

*2 : 20 ㎜ or more for the case that cable is mounted without removing an adjacent module

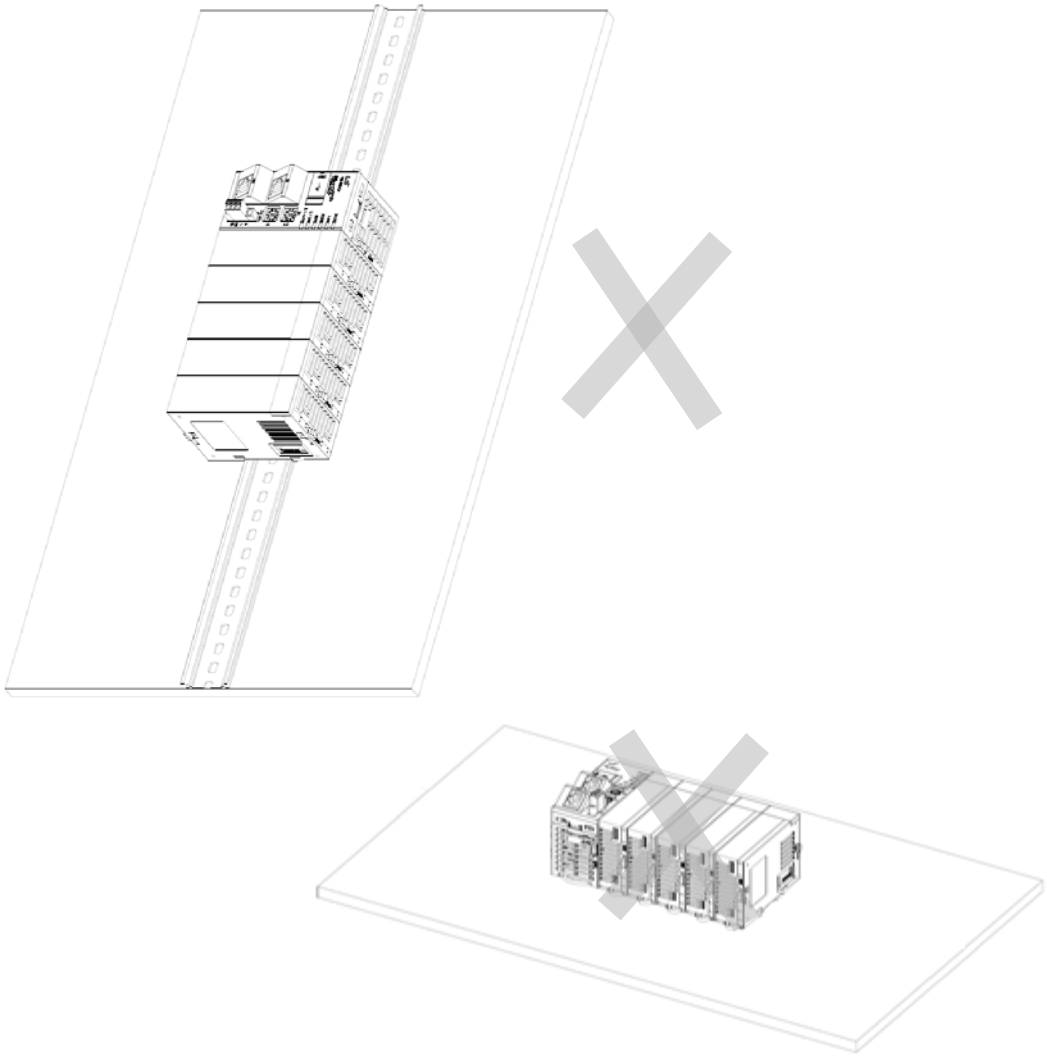
*3 : 20 ㎜ or more for the case of connector type

(5) Module mounting direction

(a) Install the PLC in the direction as shown in the figure below where is well-ventilated for the radiation of heat.

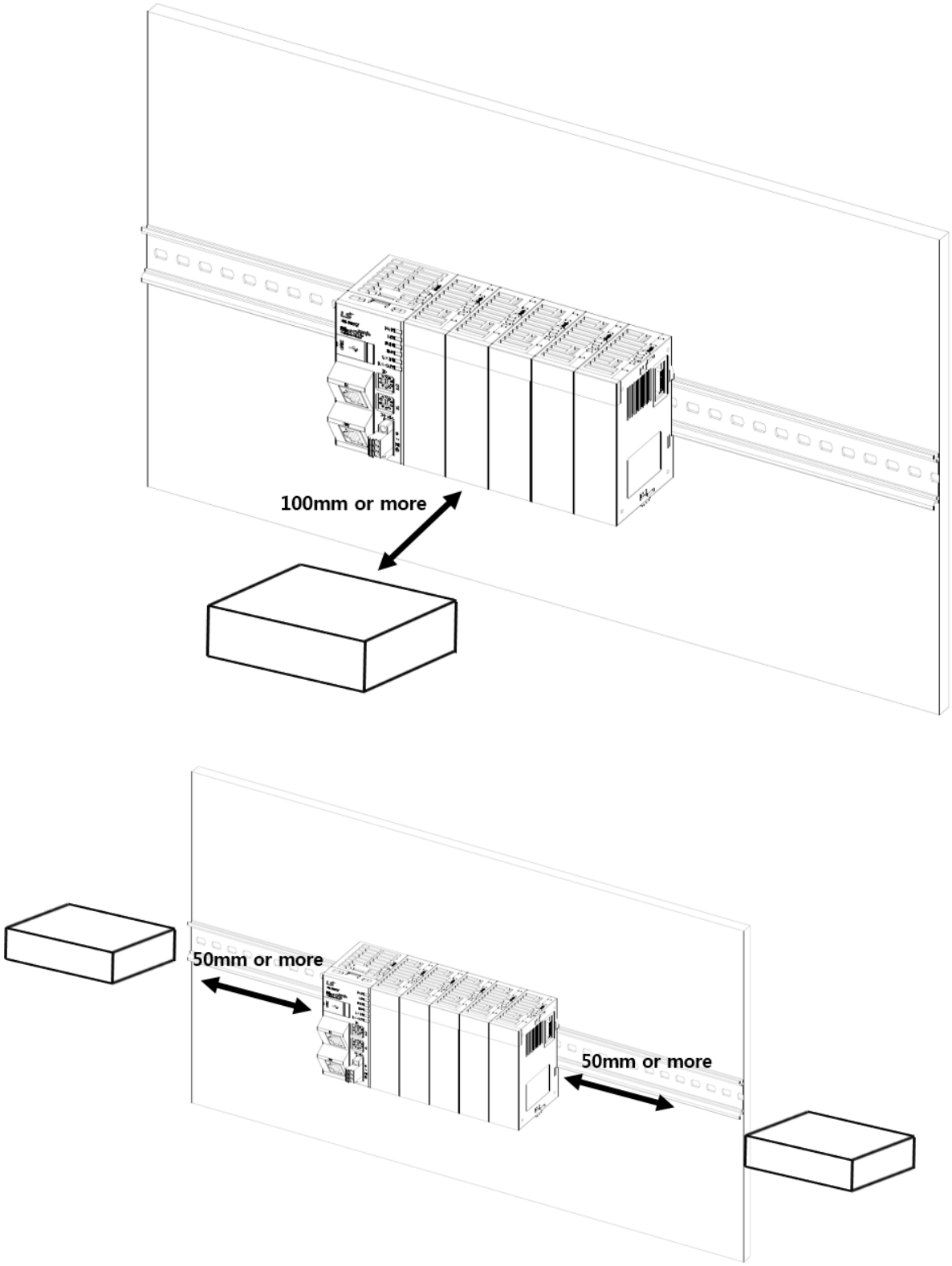


(b) Do not install it in the direction as shown in the figure below.



(6) Distance from another device

Install the PLC for the following distance away from the device (connector and relay) in order to avoid the effect of radiation noise or heat.



## 4.2.2 Handling Precautions

An explanation of handling precautions for each module from opening to the installation is provided.

- Do not drop or apply a strong impact.
- Do not separate PCB from the case. Doing so may cause a failure.
- During wiring, caution should be taken so that foreign materials such as wiring remnants enter on top of the module. If any foreign material has entered, remove it.

(1) Cautions in handling the I/O module

An explanation of cautions for handling or installing the I/O module is provided.

(a) Check the specification of I/O module again

Caution should be taken on the input voltage for the input module, and in case of the output module, the voltage that exceeds the maximum open/close capacity of the output module is applied, it may cause failure, destruction or fire.

(b) Cable

The cable should be selected in consideration of surrounding temperature and permitted current, and the minimum specification of the cable should be at least AWG22 (0.3mm2).

(c) Environment

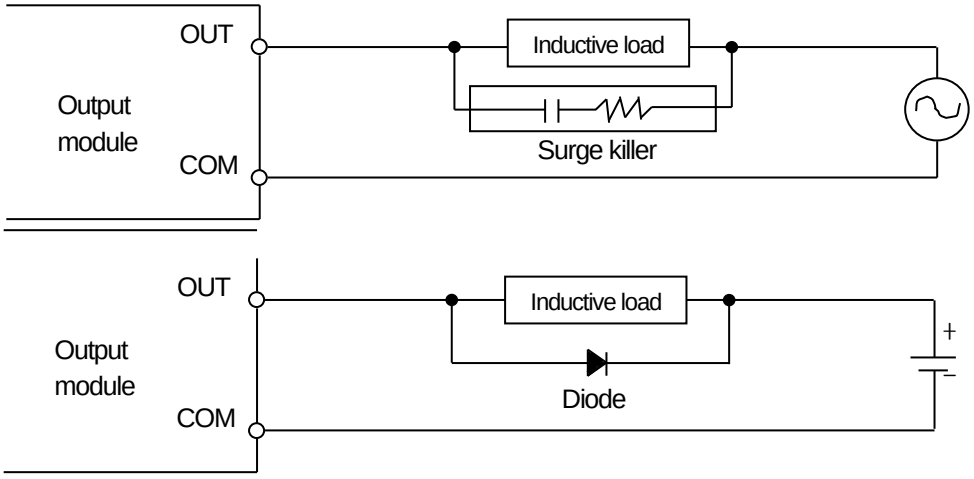
When wiring the I/O module, if it is too close to a device or material that generates high heat or the wire comes into contact with oil for a long period of time, a short circuit, damage or malfunction may occur.

(d) Polarity

For a module that has polarity in its terminal, the polarity should be checked before the power is supplied.

(e) Wiring

- If I/O wiring is carried out together with high-tension line or power line wiring, an inductive obstruction may occur, causing malfunction or failure.
- The cable should be pass in front of the I/O operation display unit (LED).
(I/O mark cannot be identified accurately.)
- If the inductive load is connected to the output module, connect the surge killer or the diode to the load in parallel. Connect the cathode of the diode to the + side of the power supply.




(f) Terminal

Check the adhesion status of the terminal, and in case of terminal writing or processing the screw hole, wiring remnants may enter into the PLC, so caution should be taken, Failure to do so may cause malfunction and a failure.

(g) Do not apply strong impact to the I/O module or separate the PCB substrate from the case except for the cases listed above.

## 4.3 Wiring

An explanation of cautions regarding wiring for using the system is provided.

### ⚠ Danger

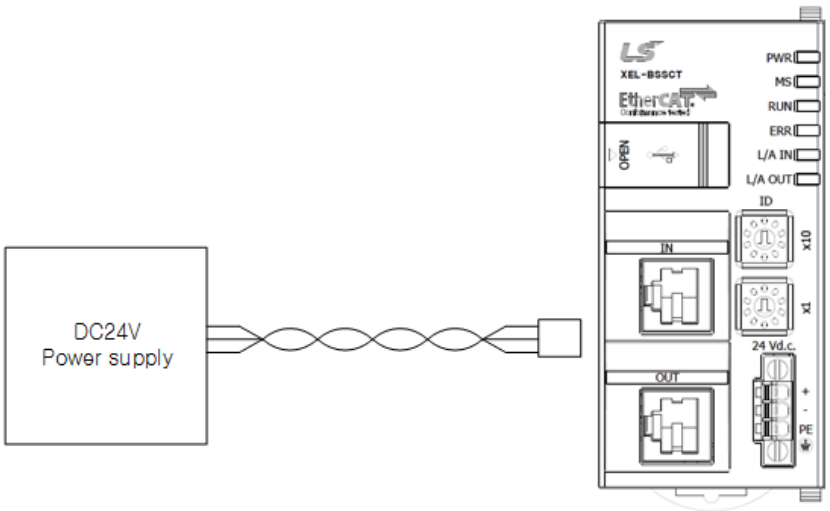
- Make sure to disconnect all power supplies from the outside before wiring.
- If all external power supplies are not disconnected, an electric shock or damage to the product may occur.
- Always use the terminal cover included with the product when applying the current or carrying out operation after wiring. Failure to do so may cause an electric shock.

### ⚠ Caution

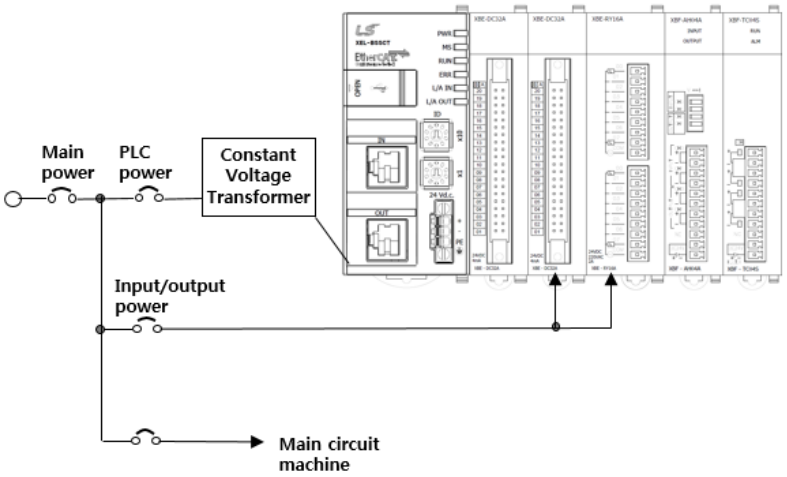
- Ground the FG and LG terminals with exclusive D class grounding (Class III grounding) or higher. Failure to do so may cause an electric shock or malfunction.
- Carry out module wiring properly after checking the rated voltage and the terminal layout of the product. Connecting or wiring the power supply that is different from the rated power supply may cause a fire or failure.
- For external connecting connector, use a device and a solder designated by the manufacturer. Unsafe connection may cause a short circuit, fire or malfunction.
- Tighten the terminal screw within the range of regulated torque. If the terminal screw is loose, it may cause a short circuit, fire or malfunction.
- Caution should be taken that a foreign material such as a disconnected piece or wiring remnants will not enter into the module. Failure to do so may cause a fire, failure or malfunction.

### 4.3.1 Power wiring

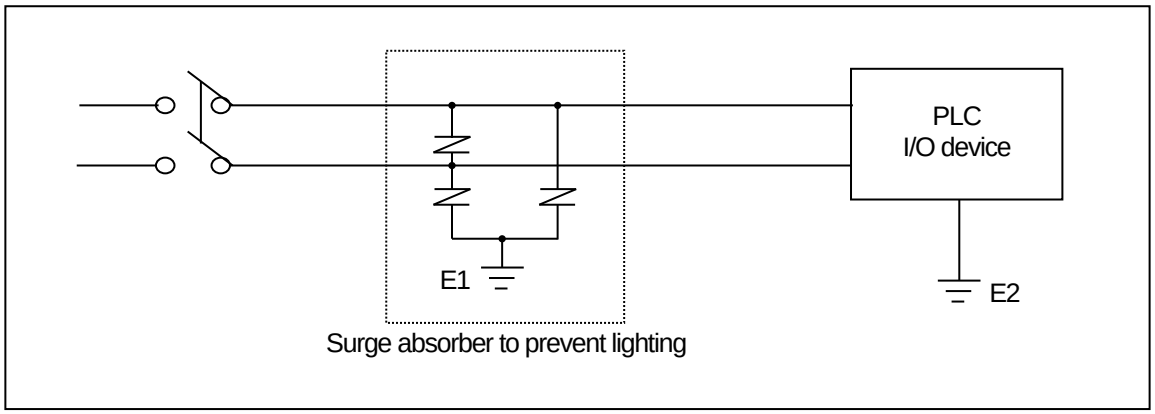
(1) Twist the AC100V wire, AC220V wire and DC24V wire as densely as possible and connect them at the shortest distance.



(2) Use the DC power supply that has the capacity of 1A or higher.
(3) Separate the system of supper supply for the PLC, I/O device and power unit as shown below.




(4) For AC110V wire and AC220V wire, use as a wire that is as thick as possible (2mm2) for reducing a voltage drop.
(5) Do not place the AC110V wire and the DC24V wire near the main circuit (high voltage, high current) wire and the I/O signal wire. Place these wires at least 100mm away.
(6) Use the lightning surge absorber as shown in the figure below for a lightning surge measure.




Surge absorber to prevent lighting

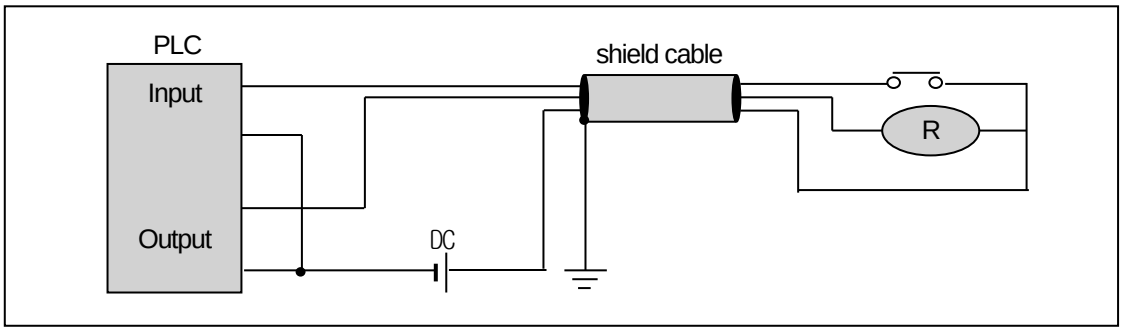
(7) Use an insulated shielding transformer or noise filter when there is a possibility of noise interference.
(8) Twist each input power wire as shortly as possible, and do not route the wire of insulated shielding transformer or noise filter through the duct.

**Notes**

(1) Isolate the grounding (E1) of lightning surge absorber from the grounding (E2) of the PLC.
(2) Select the surge absorber in the way that its maximum allowable voltage will not be exceeded even if the power supply voltage increases to its maximum.

### 4.3.2 I/O device wiring

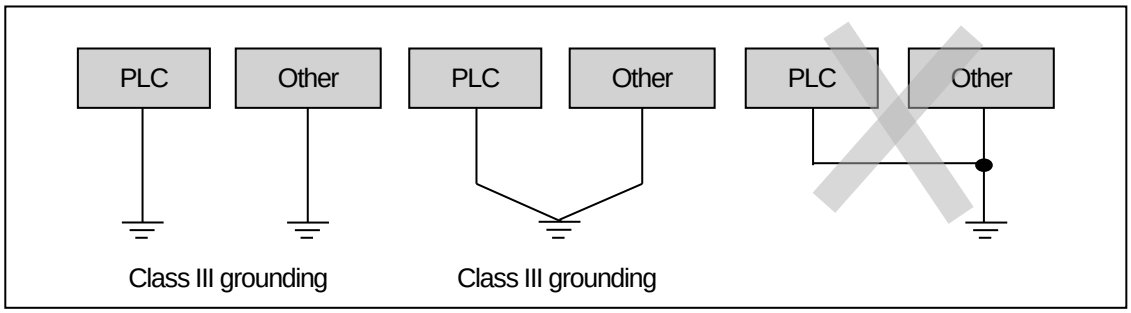
(1) The specification of wire for I/O wiring is 0.3~2 mm2. Select a wire in consideration of convenience in wiring within the specification.
(2) Wire the input wire and the output wire separately.
(3) Wire the I/O signal fire for more than 100mm away from high voltage ·and high current main circuit wire.
(4) If the main circuit wire cannot be separated from the power wire, use one shield cable and ground the PLC side.




(5) Ground the pipe in case of piping and wiring.

### 4.3.3 Ground wiring

(1) Proper noise measures are carried out for this PLC. However, it is recommended to apply and use grounding unless there is a special reason. Refer to the following items for grounding.
(2) Use the exclusive grounding if possible. Apply Class III grounding (ground resistance less than 100Ω).
(3) If the exclusive grounding is not available, apply common grounding as shown in the figure (b) below.




(a) Exclusive grounding: Best (b) Common grounding: Satisfactory (c) Common grounding: Defective

(4) Use the grounding wire of 2 mm2 or larger. Place the grounding point as closely as possible to the PLC to shorten the length of the grounding wire.
(5) If malfunction occurs due to the grounding, separate FG from the grounding.

### 4.3.4 Specification of wiring cable

The specification of cable used for wiring is as follows.

| Types of external connection | Specification of cable ($mm^2$) | |
|---|---|---|
| | Low limit | High limit |
| Digital input | 0.18 (AWG24) | 1.5 (AWG16) |
| Digital output | 0.18 (AWG24) | 2.0 (AWG14) |
| Analogue input and output | 0.18 (AWG24) | 1.5 (AWG16) |
| Main power | 1.5 (AWG16) | 2.5 (AWG12) |
| Protective grounding | 1.5 (AWG16) | 2.5 (AWG12) |

# Chapter 5 Maintenance

Carry out daily and periodic inspections in order to maintain EtherCAT adapter in its best condition always.

## 5.1 Repair and inspection

The I/O module mainly consists of semiconductor devices and its service life is semi-permanent. However, ambient environment may cause damage to the devices, so periodic inspection is necessary. Refer to the following items for maintenance.

| Inspection item | | Judgment | Corrective action |
|---|---|---|---|
| Power supply | | Within the power variation range (Refer to general specification) | Maintain the supplied power to be in the permitted voltage variation range. |
| Power supply for input/output | | Input/Output specification of each module | Maintain the supplied power to be in the permitted voltage variation range of each module. |
| Ambient environment | Temperature measurement | 0 ~ + 55℃ | Adjust the service temperature and humidity properly. |
| | Humidity measurement | 5 ~ 95%RH | |
| | Vibration | No vibration | Use the vibration proof rubber or other vibration prevention methods. |
| Movement of each module | | No movement allowed | All modules should be tightened securely. |
| Connecting conditions of terminal screws | | Screws should not be loose. | Re-tighten terminal screws. |
| Spare parts | | Check the number of spare parts and their storage condition. | Fill the shortage and improve the storage condition. |

## 5.2 Daily inspection

The following items require daily inspection.

| Inspection item | | Inspection contents | Judgment | Corrective action |
|---|---|---|---|---|
| Panel attachment condition of the PL | | Check for attach screws for loosening | The screws should be attached firmly. | Re-tighten screws. |
| Attachment condition of I/O module | | Check the condition of module fixing hooks | The hooks should be in CLOSE position. | Fix the Hooks to close position |
| Connection conditions of terminal and I/O connector | | Connecting conditions of terminal screws | Screws should not be loose. | Re-tighten screws. |
| | | Distance between solderless terminals | Proper distance should be provided. | Correct |
| | | I/O connector unit | The connector should not be loose. | Correct |
| Indicator LED | Power LED | Check that the LED is On. | On (Off indicates abnormal power.) | |
| | MS LED | Check that the LED is On in Run state. | Green lighting is normal. | |
| | MS LED | Check that the LED is Off in Run state. | Red lighting or flickering is abnormal. | |
| | IN LED | Check that the LED turns On and Off. | Flickering in case of normal connection and operation | |
| | OUT LED | Check that the LED turns On and Off. | Flickering in case of normal connection and operation | |

## 5.3 Periodic inspection

Inspect the following items one or two times every month and take necessary actions.

| Inspection item | | Inspection method | Judgment | Corrective action |
|---|---|---|---|---|
| Ambient environment | Ambient temperature | Measure using the thermometer and hygrometer Measure corrosive gas | 0 ~ 55 °C | Adjust according to general specification (Environment standard in the control panel) |
| | Ambient humidity | | 5 ~ 95%RH | |
| | Ambient pollution level | | There should be no corrosive gases. | |
| PLC condition | Loosening, shaking | Move each module. | The module should be mounted securely. | Tighten the screws and hooks. |
| | Attachment of dust or foreign material | Inspect visually | No dust or foreign material should be attached. | |
| Connection condition | Loosening of screws | Tighten using a screw driver. | Screws should not be loose. | Tighten |
| | Distance between solderless terminals | Inspect visually | Proper distance should be provided. | Correct |
| | Loosening of connector | Inspect visually | Connectors should not be loose. | Tighten the connector fixing screws. |
| Check power supply voltage | | Check the power supply through the power input terminal using a tester. | Refer to general specification | Change power supply |

# Chapter 6 Troubleshooting

In this chapter, an explanation of the details of various errors that occur during the system operation, causes of such errors, how to detect such errors and measures is provided.

## 6.1 Initial troubleshooting procedure

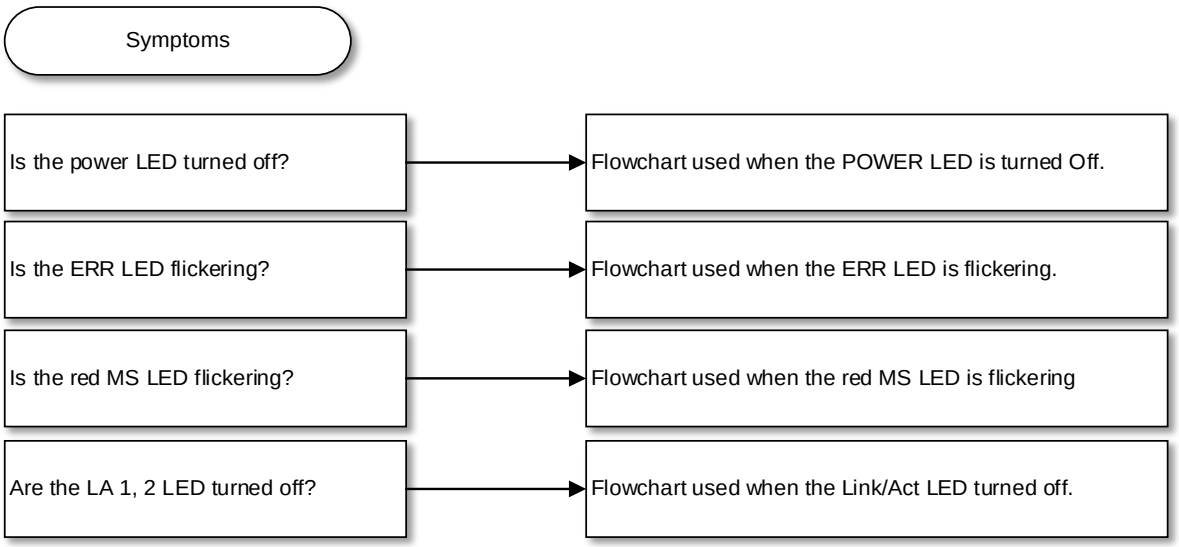
It is important to use a highly reliable device in order to improve the reliability of the system, but it is also important to take measures promptly when an error occurs.
It is most important to discover the cause of trouble and take action promptly for operating the system promptly. Basic matters requiring caution for troubleshooting are as follows.

(1) Visual check
Check the following items visually.
- Operation status of equipment (stop status, operation status)
- Power supply status
- I/O device status
- Wiring status (I/O wiring, communication cable)
- Check the indication status of various indicators (PWR LED, ERR LED, RUN LED, MS LED, IN/OUT ACT LED, etc.), connect a peripheral device and check the operation status of the adapter and parameter values such as station address.

(2) Limitation of range
Estimate the cause of a failure from the following.
- EtherCAT adapter's own problem An external factor
- I/O module Other factors
- EtherCAT Configuration

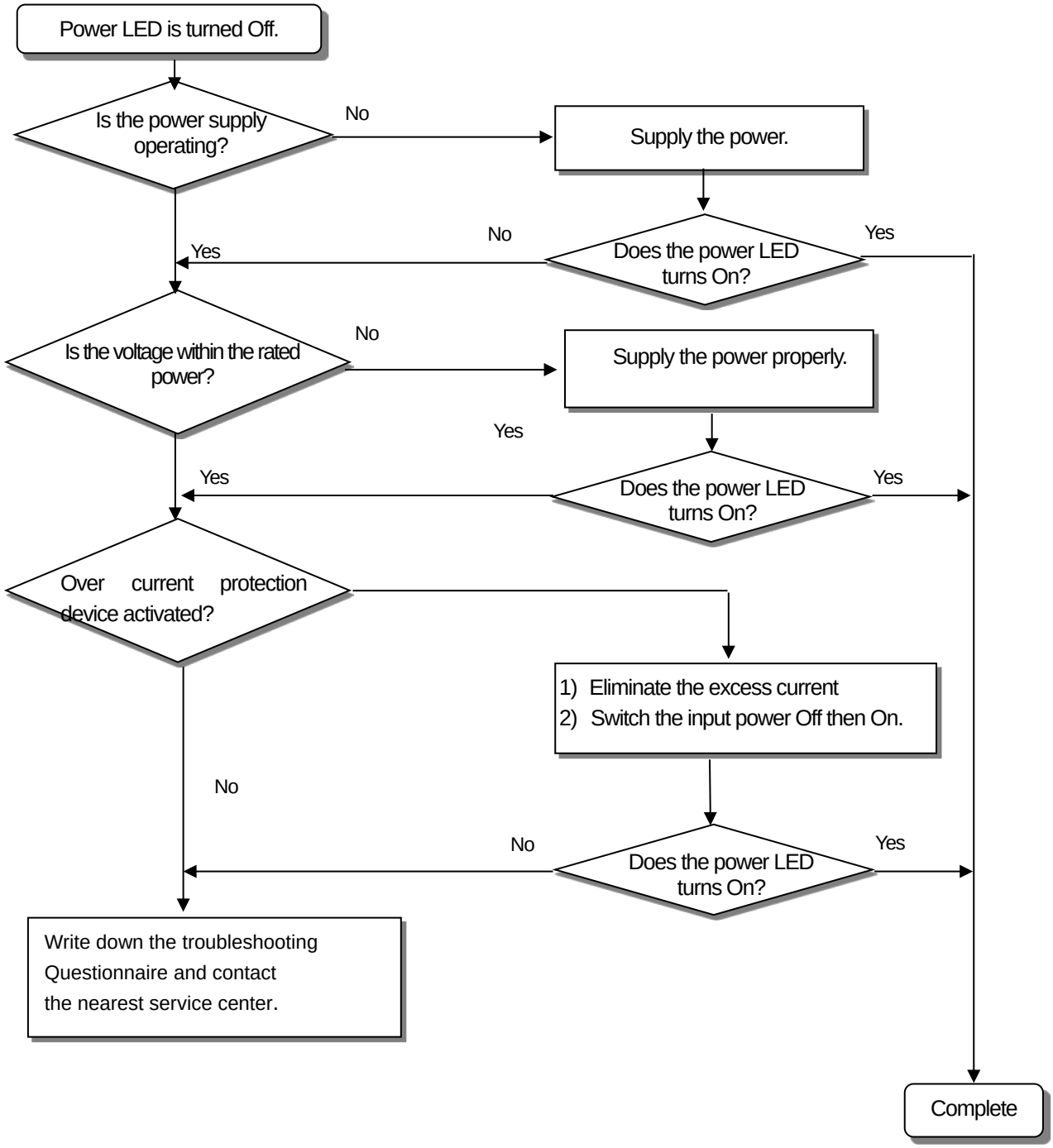
## 6.2 Troubleshooting

An explanation of method to discover an error, the contents of the error according to the error code and actions is provided separately for each symptom.



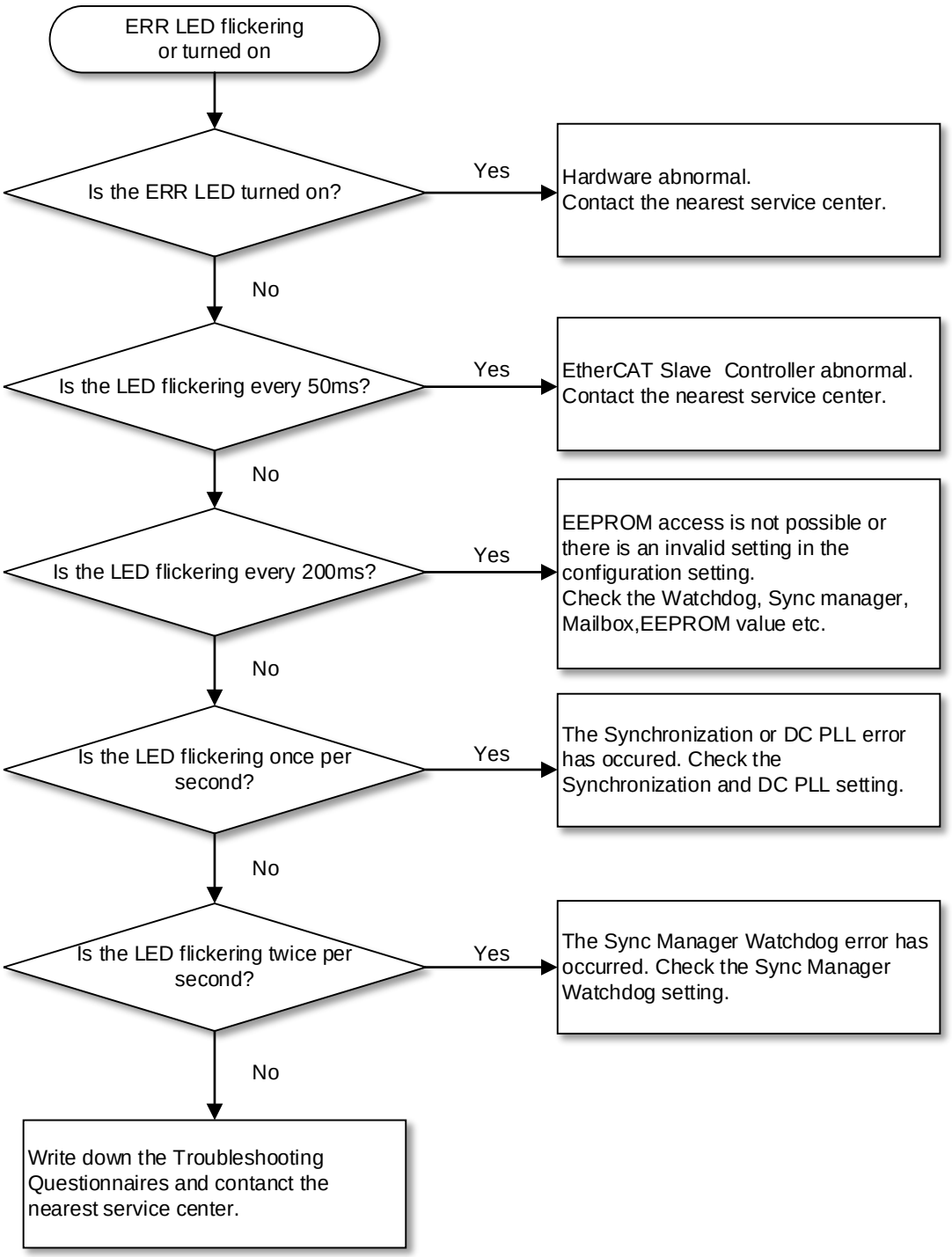
### 6.2.1 Actions when the PWR (Power) LED is turned off

An explanation of troubleshooting order in case the PWR LED is turned off when power is supplied or during operation is provided.



### 6.2.2 Actions in case the ERR (Error) LED is on or flickering

An explanation of troubleshooting order in case the ERR LED flickers when the power is supplied, the operation begins or during operation is provided.

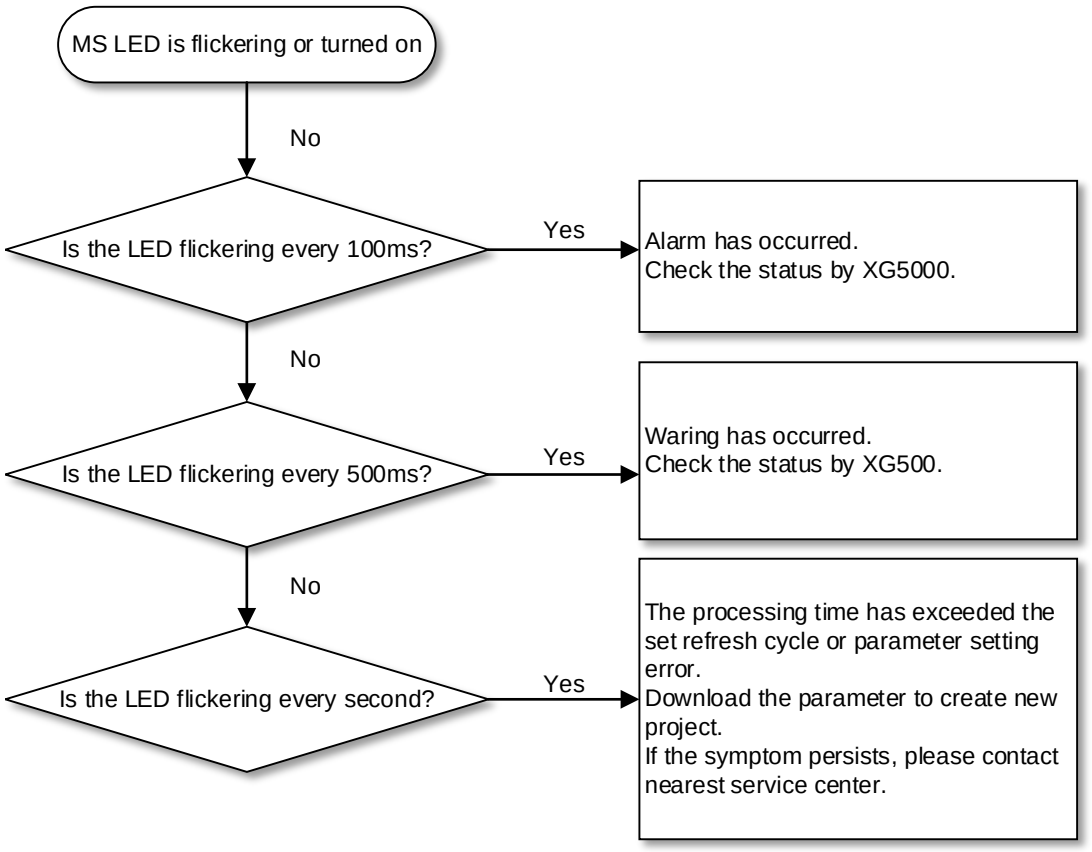



**Notes**

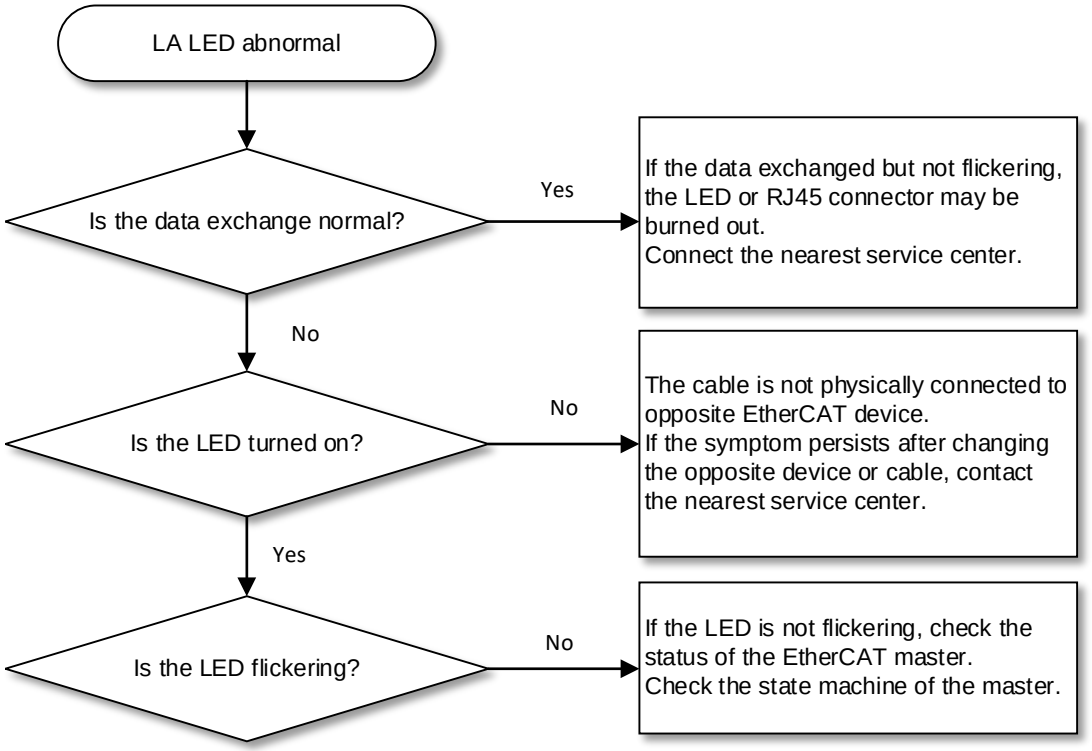
The ERR LED operates according to the EtherCAT standard.

### 6.2.3 Actions in case the red MS LED is on or flickering

An explanation of actions in case the red MS LED is flickering or on, although it is set to operate normally after the power is supplied, is provided.



### 6.2.4 Actions in case the Link/Act LED is not on or flickering



## 6.3 Troubleshooting Questionnaire

If an error has occurred while using the product, fill out this questionnaire and contact the A/S center by phone or FAX.

• For an error related to the special or communication module, fill out the questionnaire attached to the user's manual of the relevant product.

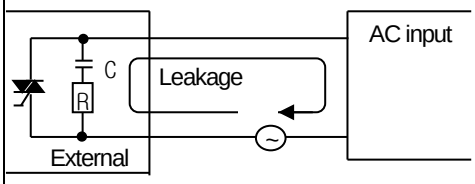
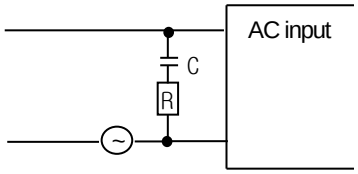
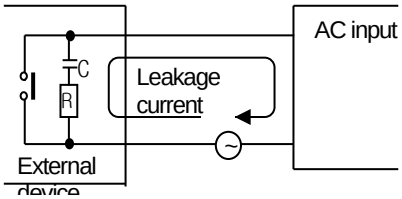
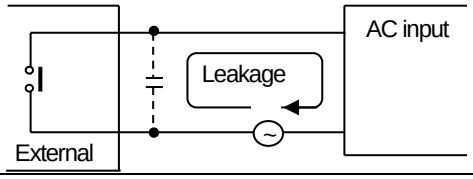
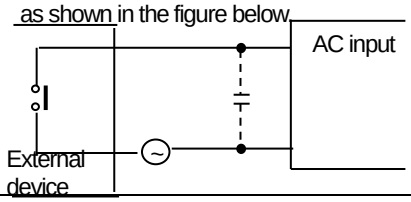
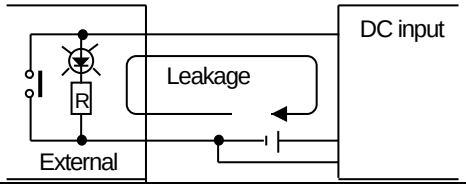
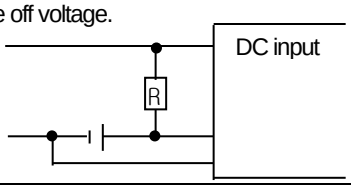
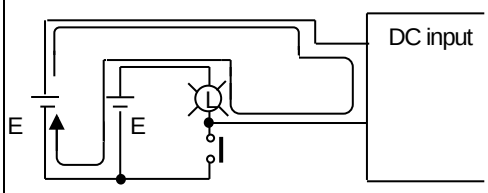
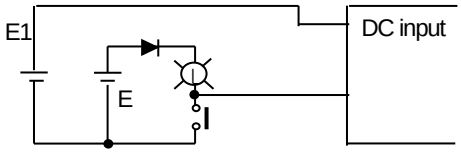
1. Contact information of the user : Tel)
   FAX)
2. Type : ( )
3. Details of the applied device
   – Details of CPU module: – OS version ( ), – Serial No. of the product ( )
   – XG5000 version number used for program compiling: ( )
4. Brief description of target device and system for control
5. CPU module used :
   – Operation by key switch ( ), – Operation through XG5000 or communication ( )
   – Memory module operation ( )
6. Is the STOP LED of the CPU module On? Yes( ), No( )
7. Contents of error message from XG5000:
8. Situation of attempting an action for the error code specified in Paragraph 7 :
9. Other troubleshooting methods used for solving the error:
10. Characteristics of the error
    • Recursive ( ) : Periodic ( ), Related to a certain sequence level ( )
      Related to the environment ( )
    • Occasional ( ) : general error interval :
11. Detailed description of the error:
12. Configuration diagram of applied system:

## 6.4 Various cases

An explanation of types of trouble or actions for various circuits is provided.

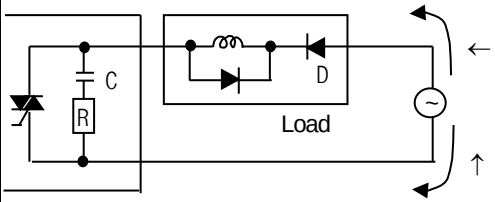
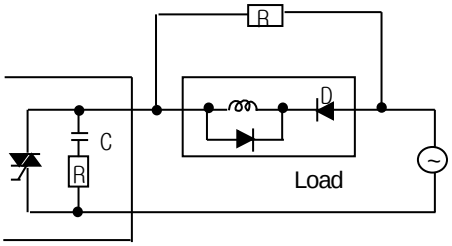
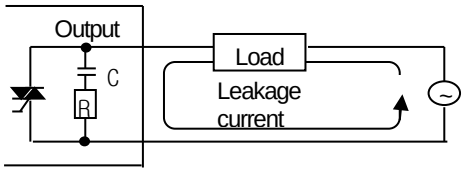
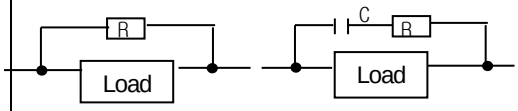
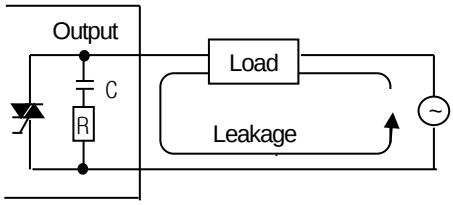
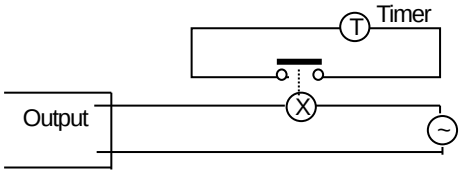
### 6.4.1 Type of trouble for input circuit and actions

An explanation of and example of trouble in the input circuit and relevant actions is provided.

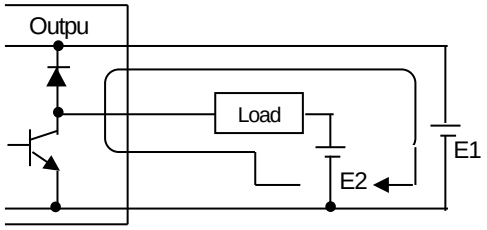
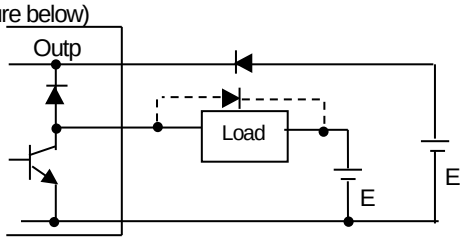
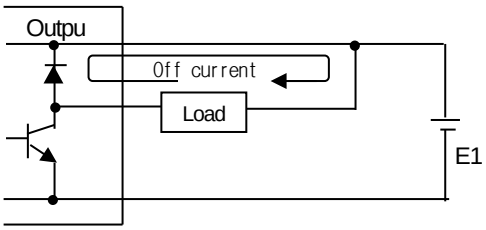
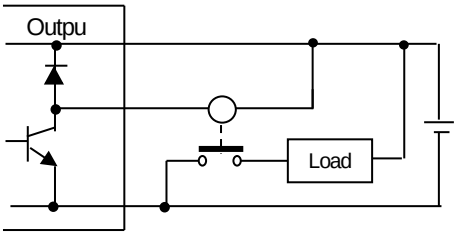
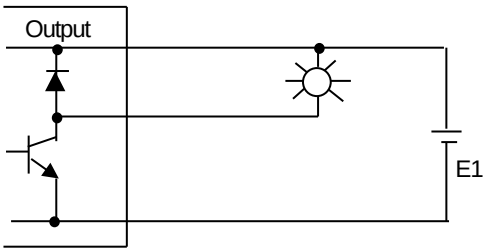
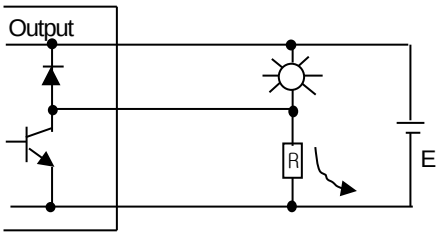
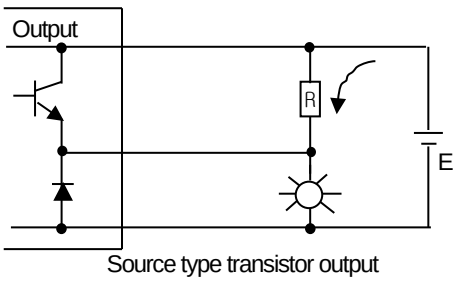
<table>
<tr><th>Symptom</th><th>Cause</th><th>Actions</th></tr>
<tr><td>The input signal cannot be turned off.</td><td>Leakage current of external device<br>(If driven by a proximity switch)<br>  </td><td>• Connect an appropriate resistor and capacitor so that the voltage between the terminals of the input module is lower than the return voltage.<br>  </td></tr>
<tr><td>The input signal cannot be turned off.<br>(There is also a case that the neon lamp is on.)</td><td>Leakage current of external device<br>(Driven by the limit switch where the neon lamp is attached)<br>  </td><td>• CR values are determined by the leakage current value.<br>– Recommended value C : 0.1 ~ 0.47Uf<br>R : 47 ~ 120 Ω (1/2W)<br>Or, install the circuit that is displayed separately by separating the circuit completely.</td></tr>
<tr><td>The input signal cannot be turned off.</td><td>Leakage current by the capacity between wiring cables<br>  </td><td>• Install the power supply on the external device as shown in the figure below.<br>  </td></tr>
<tr><td>The input signal cannot be turned off.</td><td>Leakage current of external device<br>(Driven by the switch where the LED display is attached)<br>  </td><td>• Connect an appropriate resistor as shown in the figure below so that the voltage between the input module terminaland the common terminal is higher than the off voltage.<br>  </td></tr>
<tr><td>The input signal cannot be turned off.</td><td>• Circulating current by the use of a number of different power supplies<br>  <br>• Circulated in case of E1 > E2</td><td>• Use a number of power supplies as the single power supply.<br>• Connect the circulating current prevention diode (figure below)<br>  </td></tr>
</table>

## 6.4.2 Type of trouble for output circuit and actions

An explanation of example of trouble for the output circuit and relevant actions is provided.

| Symptom | Cause | Actions |
|---|---|---|
| When the output contact is Off, excessive voltage is applied to the load. | •If the load is half-wave rectified inside (This case occurs in the solenoid value.)<br>•If the polarity of the power supply is ←, C will be charged.<br>If the polarity is ↑, the voltage charged in C is added to the power supply voltage and it is applied to the both ends of the diode(D).<br>The maximum voltage is approximately 2√2.<br>  <br>Note) If it is used in this way, there will be no problem in the output element, but the performance of diode(D) will be degraded, causing a problem. | • Connect the resistor of tens kΩ to hundreds kΩ to the load in parallel.<br>  |
| The load cannot be turned off. | • Leakage current due to the surge absorbing circuit connected to the device in parallel<br>  | • Connect the resistor of tens kΩ or CR with the equal impedance to the load in parallel.<br>Note) If the length of cable from the output module to the load is long, there is also leakage current by capacity between lines,so caution should be taken.<br>  |
| If the load is C–R type timer<br>Time error | • Leakage current due to the surge absorbing circuit connected to the device in parallel<br>  | • Drive the C–R type timer through the relay.<br>• A timer other than the C–R type timer is used.<br>Note) Caution should be taken that the internal circuit may be half-wave rectified according to the timer.<br>  |

Type of trouble for output circuit (continued)

| Symptom | Cause | Actions |
|---|---|---|
| The load cannot be turned off. (For direct current) | • Circulating current by the use of two different power supplies<br>  <br>• Circulated in case of E1< E2<br>• Circulated also if E1 is Off(E2 is On) | • Use a number of power supplies as the single power supply.<br>• Connect the circulating current prevention diode (figure below)<br>  <br>Note) If the load is relay, etc., it is necessary to connect to the diode for absorbing counter electromotive voltage as shown in the dotted line. |
| The off response time of the load is strangely long. | • Transient current at the time of Off<br>[In case of driving inductive load (one with large time constant L/R) of large current such as solenoid directly with the transistor output<br>  <br>• The current flows across the diode at the off time of the transistor output, so there is also a case that it is delayed for more than 1 second according to the load. | • Insert a magnetic contactor with small time constant and drive the load with each contact.<br>  |
| For output The transistor is destroyed. | Inrush current of incandescent current<br>  <br>There is a case that more than 10 times of inrush current flows at the time of on. | • In order to reduce the inrush current, let the dark current that is 1/3 ~ 1/5 of the rated current of incandescent lamp flow.<br>  <br>sync type transistor output<br>  <br>Source type transistor output |

## 6.5 List of Error Codes

| Error code (Dec) | Cause of error | Actions | Error type | MS LED status | Diagnosis time |
|---|---|---|---|---|---|
| 24 | I/O parameter error | Upload I/O parameter and check its preservation status. If it is broken, modify and download it again and check the operation. If the error persists, replace the basic unit. | Light error | 0.5 second Red flickering | reset, after download is completed |
| 25 | Basic parameter error | Upload the basic parameter and check its preservation status If it is broken, modify and download it again and check the operation. If the error persists, replace the basic unit. | Light error | 0.5 second Red flickering | reset, after download is completed |
| 30 | The module set for the parameter does not match with the actually mounted module. | Modify the parameter and download it again | Light error | 0.5 second Red flickering | reset, after download is completed |
| 31 | Detachment of extension module | Needs to take an action for the detached extension module | Critical error | 0.1 second Red flickering | Regularly |
| 33 | During operation I/O module data cannot be accessed normally. | Check the position of the slot in XG5000 where an access error has occurred, replace the module and operate again (in accordance with the parameter) | Critical error | 0.1 second Red flickering | Regularly |
| 34 | Data of special/communication module cannot be accessed during operation normally. | Check the position of the slot where the access error occurred using XG5000, replace the module and run the product again. | Critical error | 0.1 second Red flickering | Regularly |
| 38 | The extension module has been exceeded | The extension module is mounted for more than 8 levels. | Critical error | 0.1 second Red flickering | When booting initially or switching from the test mode to the run mode |
| 39 | PLC CPU runaway or error | The system is shut down abnormally due to noise or hardware error.<br>1) If it occurs repeatedly when the power is supplied again, request A/S.<br>2) Carry out an action for noise. | Critical error | 0.1 second Red flickering | Regularly |

# Chapter 7 EMC Specifications

## 7.1 Requirements for Conformance to EMC Directive

The EMC Directive specifies the products must "be so constructed that they do not cause excessive electromagnetic interference (emissions) and are not unduly affected by electromagnetic interference (Immunity)". The applicable products are requested to meet these requirements.
This section summarizes the precautions on conformance to the EMC Directive of the machinery assembled using PLC XGB series. The contents described below are the summary of the requirements or specification in the EMC regulations we obtained, but it does not guarantee that all the machinery conforms to the following specification.
The method for conforming to the EMC directive or the compliance should be determined finally by the manufacturer of the machinery.

### 7.1.1 EMC Specifications

The EMC specification applied in the PLC is as shown in the table below.

| Specification | Test item | Test details | Specification value |
|---|---|---|---|
| EN50081-2 | EN55011 radiation noise *2 | Measure the wave emitted by the product. | 30~230 ㎒ QP : 50 dB㎶/m *1<br>230~1000 ㎒ QP : 57 dB㎶/m |
| | EN55011 conduction noise | Measure the noise that the product releases to the power supply line. | 150~500 ㎑ QP : 79 dB<br>Mean : 66 dB<br>500~230 ㎒ QP : 73 dB<br>Mean : 60 dB |
| EN61131-2 | EN61000-4- Electrostatic immunity | Immunity test in which static electricity is applied to the case of the equipment | 15 ㎸ aerial discharge<br>8 ㎸ contact discharge |
| | EN61000-4-4<br>Fast transient burst noise | Immunity test in which fast noise is applied to the power line and the signal line | Power line: 2 ㎸<br>Digital I/O: 1 ㎸<br>Analog I/O, signal line: 1 ㎸ |
| | EN61000-4-3<br>Radiation field AM modulation | Immunity test in which an electric field is exposed to the product | 10Vm,26~1000 ㎒<br>80%AM modulation@ 1 ㎑ |
| | EN61000-4-12<br>Damped oscillatory wave immunity | Immunity test in which a damped oscillatory wave is superimposed on the power wire | Power line: 1 ㎸<br>Digital I/O (24V or higher) : 1 ㎸ |

* 1 : QP(Quasi Peak) : Quasi Peak, Mean : Mean
* 2 : The PLC is an open type device (device assembled to another device) and must be installed in the control panel.

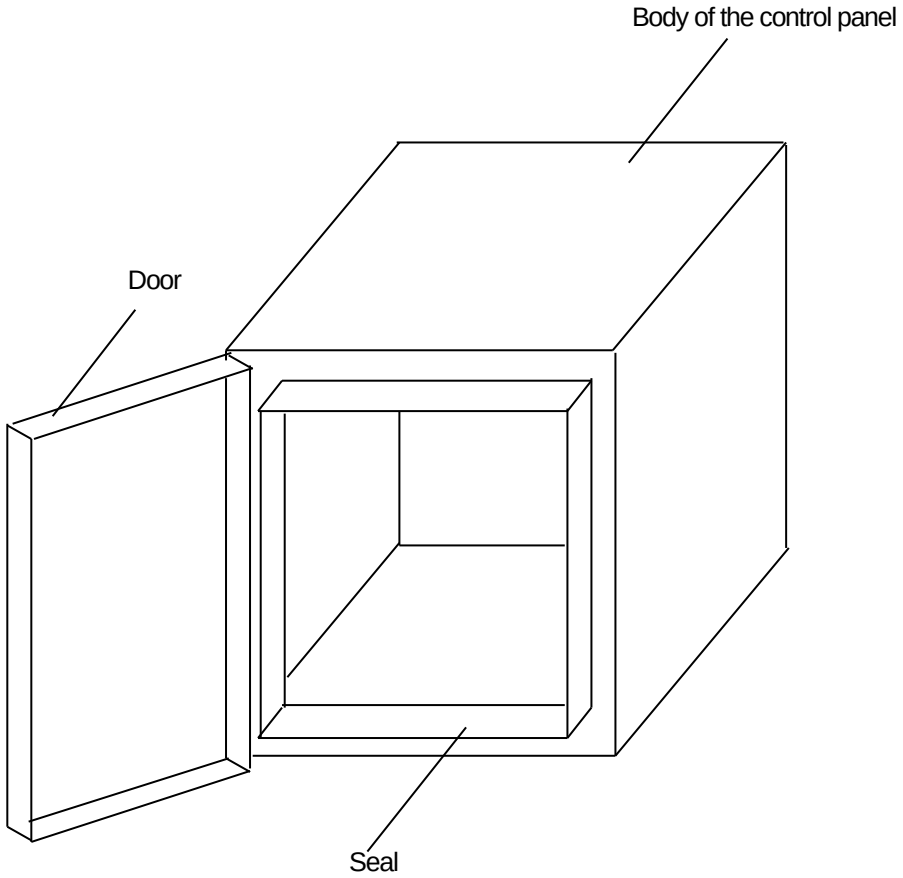
### 7.1.2 Control Panel

The PLC is an open-type device (device assembled to another device) and it should be installed in the control panel. It's because it prevents a person from touching the product (XGB PLC) and causing an accident such as an electric shock and the control panel reduces a noise that is generated in the PLC. PLC should be installed in a metallic control panel in order to reduce a wave (EMI) radiated from the product. The specifications for the control panel are as follows.

(1) Control panel

The PLC control panel must have the following features.

(a) Use SPCC (Cold Rolled Mild Steel) for the control panel.
(b) The steel plate should be at least 1.6 ㎜ or thicker.
(c) Use an insulation transformer for all the power supplied to the control panel in order to protect from external surge voltage.
(d) The control panel should have a structure that prevents the radio wave leaking to the outside. For example, the door should be made in the form of box and the body of the control panel should be made in a structure that overlaps the door. This is to reduce any radiation noise that is generated in the PLC.




(e) In order to secure the electrical contact with the body of the control panel, peel off the paint on the fixing bolt part for the inner plate inside the control panel and secure the conductivity with as wide a surface as possible.

(2) Power and ground wiring

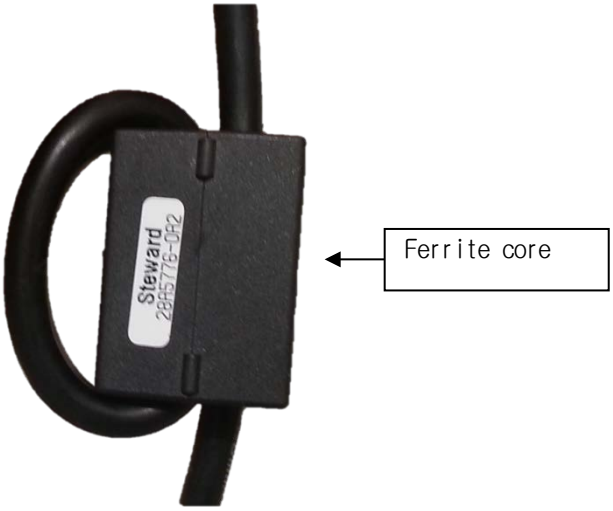
Grounding and power wiring of the PLC should be carried out as follows.

(a) Ground the control panel with a short and thick grounding wire so that a low impedance can be secured at a high frequency.

(b) The FG terminal plays the role of passing noise that is generated inside the PLC to the ground. Therefore, use a grounding wire that has as low impedance as possible.

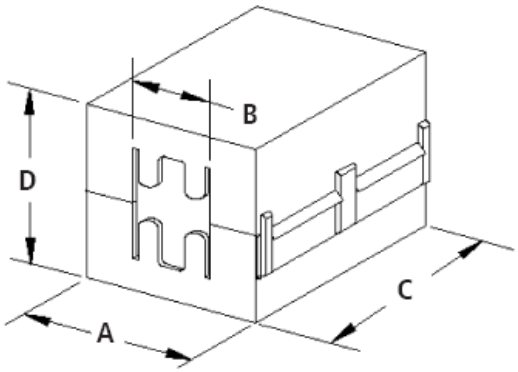
(c) The grounding wire can generate a noise, so grounding with a short and thick grounding wire prevents such wire from acting as an antenna.

(d) Attach ferrite core to the power cable as shown in the figure below in order to secure the compliance to the CE specification.




[Product for reference - Ferrite core]

| Manufacturer | Model name of product | External dimension (mm) | | | | Maximum diameter of cable (mm) | Note |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | | |
| Laird | 28A3851-0A2 | 30.00 | 13.00 | 33.70 | 30.00 | 12.85 | www.lairdtech.com |
| Laird | 28A5776-0A2 | 29.20 | 20.00 | 42.00 | 42.00 | 19.40 | www.lairdtech.com |
| Coilmaster | C2L RU130B | 31.50 | 13.00 | 33.00 | 31.50 | 13.00 | www.coilmaster.com.tw |
| TDK | ZCAT3035-1330 | 30.00 | 13.00 | 34.00 | 30.00 | 13.00 | www.tdk.com |



## 7.2 Requirements for Conformance to Low-voltage Directive

The low-voltage directive requires a device driven by the power supply ranging from AC50V to AC1000V and from DC75V to DC1500V to satisfy the safety requirements. Cautions for installation and wiring of the GB PLC are summarized below for conformance to the low-voltage directive. Also, the contents described are prepared according to the requirements or specification in the regulations of which we are aware, but it does not guarantee that all machinery produced in accordance with these contents conform to the above directive. The method for conforming to the low-voltage directive or the compliance should be determined by the manufacturer of the machinery.

### 7.2.1 Specification applied to the XGB PLC series

The XGB PLC series conform to EN6100-1 (safety of devices used in the measurement and control laboratories).
The XGB PLC series have been developed in accordance with the above specification for the module that operates at the rated voltage of AC50V/DC75V or higher.

### 7.2.2 Selection of XGB PLC

(1) Extension type EtherCAT adapter
The rated voltage of the adapter is the rated DC24V or less, so it is not included in the target of low-voltage directive.

(2) I/O module
The I/O modules whose rated voltage is AC110/220V series have dangerous voltages (peak 42.4V or higher) inside, so CE mark-compliant models feature enhanced insulation between the primary and secondary windings. I/O modules of the rated DC24V or less are not included in the target range of low-voltage directive.

(3) Special and communication modules
The rated voltage of special and communication modules is less than DC24V, so these modules are not included in the target of low-voltage directive.

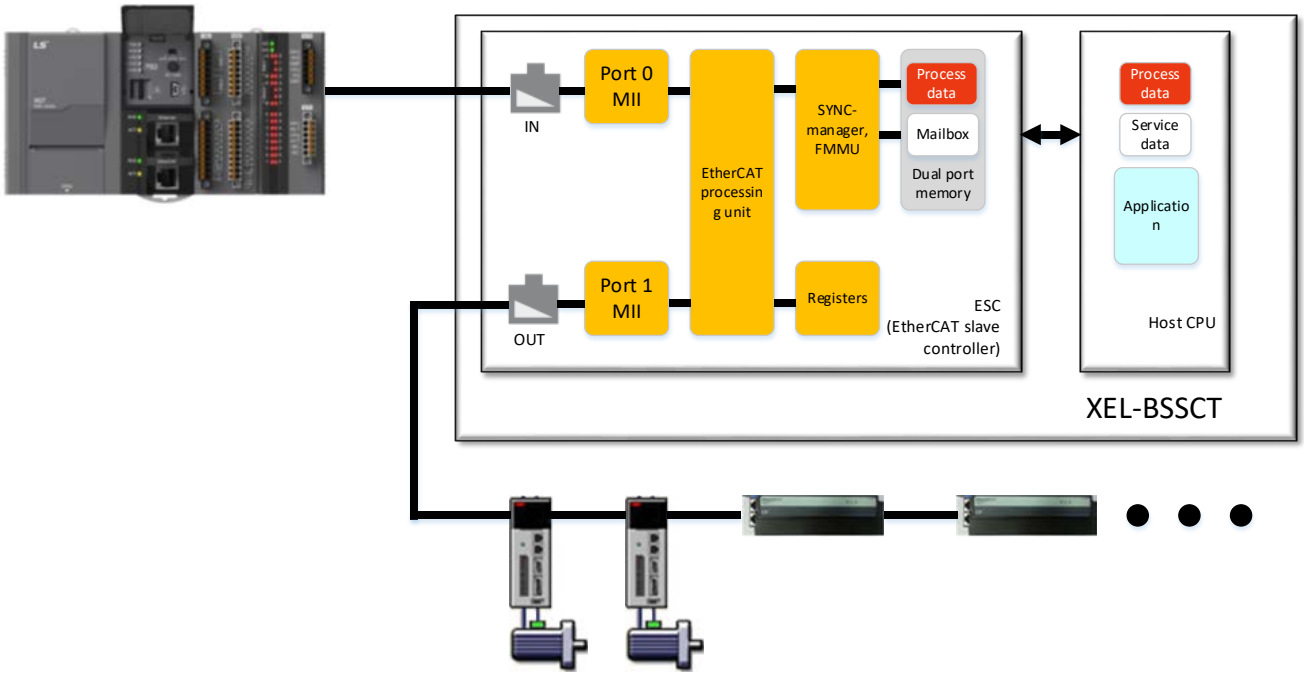
# Chapter 8 EtherCAT Communication

## 8.1 Operation method of EtherCAT

XEL-BSSCT is the extension type adapter(EtherCAT adapter) using the EtherCAT (Ethernet Control Automation Technology) network and up to eight extension modules can be mounted and used through the EtherCAT. The EtherCAT is the Ethernet-based fast and effective network technology. Each node of EtherCAT delivers the Ethernet frame in high speed and communicates in a short communication cycle.
The EtherCAT uses general-purpose Ethernet physical layers, so a compatible Ethernet cable can be used.

### 8.1.1 Example of EtherCAT network configuration

In this paragraph, a configuration example of EtherCAT network where XMC-E32A which is the LS ELECTRIC Co.,Ltd.'s EtherCAT master device as the master is explained.




This product has a built-in ESC (EtherCAT Slave Controller), and the ESC delivers the EtherCAT frame to the next node and reads or writes necessary data from or on the EtherCAT adapter at the same time.
In this way, the EtherCAT adapter operates in the EtherCATnetwork as a node and the number of EtherCAT adapters that can be installed in the network is the same as the maximum number of nodes in the master.

### 8.1.2 Necessary tools for EtherCAT network configuration

The EtherCAT network consists of the master that manages the network, the slave that plays a role of network node and the configuration tool that configures the network information by interpreting the ESI of the slave (refer to 8.1.7 ESI) and delivers the configuration information to the master.
XMC-E32A which is the LS ELECTRIC Co.,Ltd.'s EtherCAT master product uses XG5000 as the configuration tool.

#### 8.1.2.1 EtherCAT master

The EtherCAT master creates the EtherCAT frame that passes through each node and sends it to the first slave. The EtherCAT frame contains at least one datagram and each datagram type includes read, write and read/write. For addressing the slave device, logical addressing and direct addressing are used, and logical addressing is used for periodic exchange of process data. Direct addressing is mainly used for initializing the network such as the determination of non-periodic communication or network topology.

#### 8.1.2.2 EtherCAT slave

The EtherCAT slave uses ESC in order to process a frame delivered from the previous node promptly. It exchanges periodic or non-periodic data with the master, with periodic data mainly data requiring prompt update such as I/O information, and it reads or writes fixed size data for each frame from/on DPRAM. Non-periodic data is used for setting a parameter, and when a request frame such as writing or reading is sent from the master, the slave provides the requested service.

#### 8.1.2.3 Configuration tool

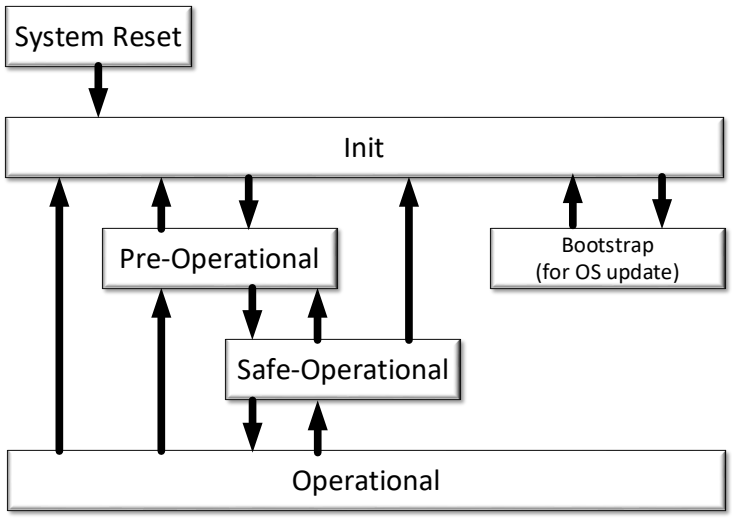
EtherCAT slave contains each piece of information in the ESI. The configuration tool checks the slave information using the ESI, configures the PDO of the whole network including the PDO setting, summarizes and delivers the synchronization mode and initialization command, etc., for network configuration to the master in an ENI file (EtherCAT Network Information).

### 8.1.3 General operation method

The EtherCAT adapter supports the CAN application protocol over EtherCAT(CoE) among various protocols of EtherCAT. CoE is the protocol created for providing compatibility between EtherCAT devices.
In the CAN application protocol, the object dictionary is classified into PDO (Process data objects) and SDO (Service data objects). The PDO is included in the object dictionary and it can be mapped to some elements of the object dictionary. The PDO is the area that exchanges data with the master periodically.
The SDO is an object that can read or write. The SDO is the area that exchanges data with the master non-periodically. The relevant area can be accessed using the SDO read/write function of the EtherCAT master. The SDO communication is carried out through the Mailbox of the ESC.
PDO is set for the I/O contact or U device area of the extension module by default and is updated periodically. Settings such as SDO communication and read are possible for the parameter area of the extension module.
In this way, the EtherCAT adapter manages the data of the extension module as an object. For detailed contents regarding the object, refer to Appendix 2 List of Objects.

### 8.1.4 State Machine

The state machine is implemented in the EtherCAT adapter. In each state, it carries out the defined communication service. The state when the power is supplied initially is Init state; the state can be changed in the arrow direction indicated below. For example, the state can be changed from OP (Operational) state to the Init state directly, but the state from the Init state to the OP state cannot be changed directly. In order to change the state from the Init state to the OP state, the Pre-Operational state and the Safe-Operational state should be passed through.
The Bootstrap state is used for updating the OS of the EtherCAT adapter, and only the Init state can be changed to the Bootstrap state, and the Bootstrap state can be changed to the Init state only.




#### 8.1.3.1 Init state

Each node of the EtherCAT network becomes the Init state when the power is supplied. In the Init state, the process data communication or Mailbox communication for the master application is impossible. The EtherCAT master can initialize Syncmanager channel 0 and 1 through the Mailbox communication. Syncmanager channel 0 and 1 are the settings for Mailbox communication.

#### 8.1.3.2 Pre-Operational(Pre-Op)

The mailbox communication is available in pre-operational state. In this state, the SDO access using the Mailbox is also possible. The EtherCAT master initializes the Syncmanager channel 2 (TxPDO area). It checks whether the mailbox is initialized when the state is changed from Init to Pre-OP precisely or not. The PDO communication in Pre-Op state is impossible.

#### 8.1.3.3 Safe-Operational(Safe-Op)

In this state, input data is updated periodically. For example, the digital input contact or the analog input value is updated periodically. The access to SDO that can be carried out in the Pre-Op state is also possible.

#### 8.1.3.4 Operational(Op)

In this state, the operation carried out in Safe-Op and output data are updated periodically. For example, digital output contact or analog output value is periodically updated and applies to actual output.

#### 8.1.3.5 Bootstrap(Boot)

This is the state used for updating the OS of the EtherCAT adapter through the EtherCAT master. In the EtherCAT adapter, the OS update through the bootstrap and the OS update through the USB are possible.

### 8.1.5 Free Run operation method

In the Free Run mode, the EtherCAT slave carries out extension module refresh separately from the communication interval. The Free Run method does not use the sequence for matching with the synchronization, so an unclear time difference in the application of output for each node occurs.

### 8.1.6 Distributed Clock(DC) operation method

In the Distributed Clock mode, the EtherCAT slave synchronizes to the DC Sync event defined by the master and carries out extension module refresh. It is used to match the time that the output signal is applied for each node. However, a time difference taken for refreshing each extension module occurs at this time.

### 8.1.7 ESI

The setting information of the EtherCAT slave is provided in the ESI (EtherCAT slave information) file. The setting of the EtherCAT communication is defined by the ESI file of the connected slave and the network connection information.
The ESI file is used in the Configuration tool which is used in the EtherCAT master, and in XMC-E32A, XG5000 is used as the configuration tool. The ESI file is the data related to the EtherCAT network connection and operation in addition to the product information from the manufacturer, and if it is modified arbitrarily, the product operation cannot be guaranteed.
The ESI of the XEL-BSSCT can be obtained from the XG5000 installation folder or the download center at www.lselectric.co.kr

## 8.2 Types of EtherCAT communication

The EtherCAT communication includes the process communication and the mailbox communication. Process communication is used for reading and writing a fixed object at the communication intervals of the master and exchanging data with the Mailbox slave non-periodically, and the EtherCAT adapter provides CoE and FoE.

### 8.2.1 Process data communication

Process data communication has real-time characteristics and it is used for exchanging data between the master and the slave periodically. Just as the I/O contact or U device area of the previous XGB extension module is updated at the scan intervals of the PLC CPU unit, the process data is exchanged at the span program intervals of the EtherCAT master. Process data is divided into RxPDO and TxPDO. In the EtherCAT adapter, the refresh area of each extension module is set as PDO by default. Word type data in the Refresh area can be added and deleted using the PDO add/delete function of the configuration tool.

#### 8.2.1.1 RxPDO

RxPDO is the data that the slave will receive from the EtherCAT master. For example, digital output contact information is data that will be delivered from the EtherCAT master, and digital output value received through RxPDO is delivered to the extension module at next extension module refresh.

#### 8.2.1.2 TxPDO

TxPDO is the data that the slave will send to the EtherCAT master. For example, digital input contact information is data to be delivered to the EtherCAT master, and input contact data delivered through the extension module refresh is delivered to the master at next process data communication.

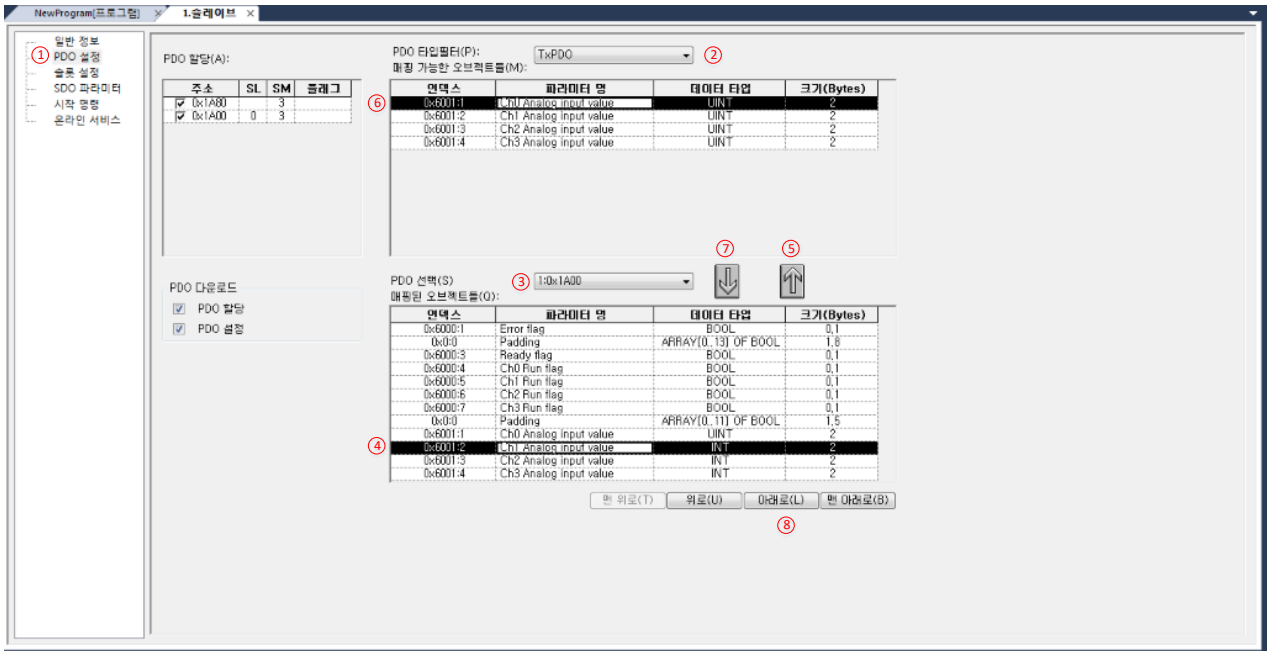
#### 8.2.1.3 PDO Mapping

Each PDO can be deleted or added as needed. In the EtherCAT adapter, a word-type PDO item can be deleted or added.
For the PDO list by EtherCAT adapter and extension module, refer to Appendix 2 List of Objects.

### 8.2.1.4 PDO mapping using XG5000

When a project is created in XG5000 with XMC-E32A as the master and the EtherCAT adapter is registered as the slave, PDO mapping will be possible. The basic refresh area for the EtherCAT adapter and the extension module is registered as PDO. The 16Bit type PDO item can delete a registered PDO or add it again as needed. The order of PDO items that can be deleted or added also can be changed.

The following is an example of the method to delete or add PDO after XBF-AD04A is registered to No. 0 slot.




① Click PDO setting on the slave setting window.

② In XBF-AD04A, the analog input value has been mapped to TxPDO.

③ Select 0x1A00 which is TxPDO of No. 0 slot.

④ Click an item you wish to delete from the PDO item. At this time, only an item that is of 16-bit size can be deleted.

⑤ After selecting the item you wish to delete, delete the item from the PDO list by clicking the Up arrow.

⑥ Items that can be mapped to PDO are listed in the objects that can be mapped, Click an item you wish to add to the PDO item.

⑦ Add the item to the PDO list by clicking the Down arrow.

⑧ The order of objects that can be deleted or added among the PDO list can be switched amongst each other. You can select an object and change its order in a downward direction or an upward direction. However, the order of an object whose order you wish to change cannot be changed to the position of a fixed object which is in a higher position.

## 8.2.2 Mailbox communication

Mailbox communication is used for exchanging data with the EtherCAT master non-periodically. The EtherCAT adapter provides CoE and FoE during the Mailbox communication.

#### 8.2.2.1 CoE

Data is accessed using the Index and Subindex of the object dictionary. Index and SubIndex are defined in the ESI file and the list can be confirmed through the SDO confirmation window of the Configuration tool. For example, in case of EtherCAT adapter's Index: 3000, SubIndex: 01, it is Refresh_Period_Time, and the relevant area can be read or written through the SDO read/write function.

When an inappropriate access or condition occurs in the SDO communication, the master returns the error code, and the following is the description of the error code for the EtherCAT adapter displayed in the master.

| Value | Description |
|---|---|
| 05030000 hex | Toggle bit error |
| 05040000 hex | Timeout |
| 05040001 hex | Unsupported command |
| 05040005 hex | The memory range has been exceeded. |
| 06010000 hex | Access to the object is restricted. |
| 06010001 hex | Reading an object that only Write is available has been attempted |
| 06010002 hex | Writing an object that only Read is available has been attempted |
| 06010004 hex | Connection to an area that cannot be connected using complete access has been attempted |
| 06020000 hex | Access to an object that does not exist. |
| 06070010 hex | Object length error |
| 06090011 hex | SunIndex error |
| 08000020 hex | Data cannot be read or saved. |
| 08000022 hex | State that data cannot be read or saved. |

#### 8.2.2.2 FoE

For the EtherCAT adapter, this is the communication used for updating the OS, and it is used to download the provided OS through the EtherCAT master. When the OS is downloaded through FoE, the product will operate in the OS of the downloaded version only when power is supplied again. If a communication error such as the detachment of a cable occurs while downloading OS through FoE, download OS again after supplying power again.

# Chapter 9 Operation Method of the Adapter

## 9.1 Operation mode of the adapter

In this chapter, an explanation of operation of the EtherCAT adapter (EtherCAT adapter) is provided.

### 9.1.1 Basic operation

The EtherCAT adapter delivers refresh data sent from the EtherCAT master to the extension module and sends refresh data received from the extension module to the EtherCAT master. The extension module including the EtherCAT adapter operates a parameter for setting the operation and this parameter can be set through the SDO service. An object can be accessed using the CoE protocol and all the information for operating the EtherCAT adapter and the extension module is listed in the object. The following table is used for each object address area.

| Index (hex) | SubIndex (hex) | Name | Description | Content | Access |
|---|---|---|---|---|---|
| 1000 | - | Device type | This indicates the value of the slave device. | 1389(hex, indicates the MDP product) | RO |
| 1008 | - | Device name | The product name is displayed. | EtherCAT adapter EtherCAT Slave(MDP) | RO |
| 1009 | - | Hardware version | This indicates the hardware version. | Hardware version | RO |
| 100A | - | Software version | This indicates the software version. | Software version | RO |
| 1010 | - | Parameter save | This indicates an object related to parameter save. | - | - |
| | 00 | Number of items | - | - | RO |
| | 01 | SAVE ALL | This is the object for saving a parameter. | When “save” is entered, the parameter will be saved. | RW |
| 1018 | - | Device information | This is the object for the manufacturer of the product and the product ID, etc. | Vendor ID/Product code/Revision number | - |
| | 00 | Number of items | - | - | RO |
| | 01 | Vendor ID | This indicates the manufacturer's ID. | 000005E1(hex) | RO |
| | 02 | Product code | This indicates the product code. | 00005FC1(hex) | RO |
| | 03 | Revision number | This indicates the product revision number. | Revision number | RO |
| 10F1 | - | Error setting | This is the object for EtherCAT communication error setting. | - | - |
| | 00 | Number of items | - | - | RO |
| | 02 | Sync Error Counter Limit | This is the limit of sync error with process data when the DC sync function is used.<br>When the value where the Sync error count is set is exceeded, a sync error occurs. | Error Count Limit | RW |

| Index (hex) | SubIndex (hex) | Name | Description | Content | Access |
|---|---|---|---|---|---|
| 16xx | - | RxPDO entry | This is the RxPDO registration area. | For detailed contents, refer to Appendix 2.3 PDO List. | - |
| 1Axx | - | TxPDO entry | This is the TxPDO registration area. | For detailed contents, refer to Appendix 2.3 PDO List. | - |
| 1C00 | - | Sync manager type | This is the area where the type of each sync manager is saved. | - | - |
| | 00 | Number of items | - | - | RO |
| | 01 | SubIndex 001 | This indicates the type of Sync manager 0(SM0). | 1(Mail box receive, master -> slave) | RO |
| | 02 | SubIndex 002 | This indicates the type of Sync manager 1(SM1). | 2(Mail box send, slave -> master) | RO |
| | 03 | SubIndex 003 | This indicates the type of Sync manager 2(SM2). | 3(Process data output, master -> slave) | RO |
| | 04 | SubIndex 004 | This indicates the type of Sync manager 3(SM3). | 4(Process data input, slave -> master) | RO |
| 1C12 | - | SM2 PDO assigned item(RxPDO) | This is the PDO list assigned to SM2.<br>This is the area filled automatically by the master while the state of the adapter is changing from the Init state to the Op state. Do not change it arbitrarily. | - | - |
| | 00 | Number of items | - | - | RW |
| | 01~14 | SubIndex 000~020 | This is the index of PDO registration area to be used as PDO. Up to 20 index No. of PDO registration area can be assigned. | Index No, of PDO registration area for the adapter and the extension module | RW |
| 1C13 | - | SM3 PDO assigned item(TxPDO) | This is the PDO list assigned to SM3.<br>This is the area filled automatically by the master while the state of the adapter is changing from the Init state to the Op state. Do not change it arbitrarily. | - | - |
| | 00 | Number of items | - | - | RW |
| | 01~14 | SubIndex 000~020 | This is the index of PDO registration area to be used as PDO. Up to 20 index No. of PDO registration area can be assigned. | Index No, of PDO registration area for the adapter and the extension module | RW |

| Index (hex) | SubIndex (hex) | Name | Description | Content | Access |
|---|---|---|---|---|---|
| 1C32 | - | SM input setting value | This is the area for setting the communication mode of the SM3. Since this area is controlled by the master, do not change it arbitrarily. | | |
| | 00 | Number of items | - | - | RO |
| | 01 | Synchronization Type | The communication mode of the Sync Manager 3 can be checked. | 0000(hex): Fres-Run mode<br>0002(hex): DC mode(Sync0) | RW |
| | 04 | Synchronization Types supported | The synchronization modes that can be supported are displayed. The EtherCAT adapter supports the Free Run mode the DC Sync0 mode. | Free Run and DC Sync0 supported | RO |
| | 05 | Minimum Cycle Time | This is the minimum DC Sync0 Event cycle. | 1000000 | RO |
| | 06 | Calc and Copy Time | This is the normal time taken for processing process output data. | 50000 | |
| | 09 | Delay Time | This is the delay time taken for executing refresh after DC Sync0 event. | 200000 | |
| | 0A | Sync0 Chcle Time | This indicates the DC Sync0 cycle. | This indicates the DC Sync0 cycle. | RW |
| | 0B | SM-Event Missed | This is the object for checking a sync error between process data and DC Sync0 event.<br>If it is larger than the sync error counter limit, a sync error will be issued. | Increases by 3 when a sync error occurs, decreases by 1 when a process data event occurs | RO |
| | 0C | Cycle Time Too Small | Counts the number of times that process data cannot be processed. | The count value is displayed. | RO |
| | 20 | Sync Error | It indicates the error occurrence status. | Set when an error occurs | RO |

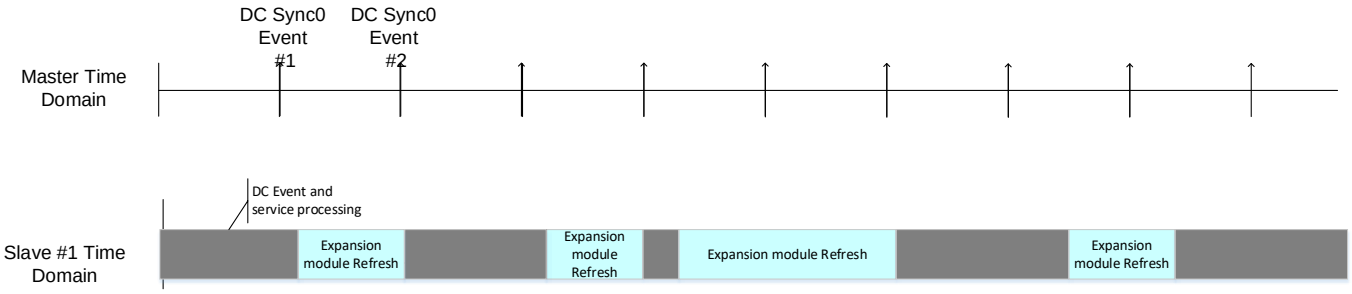
| Index (hex) | SubIndex (hex) | Name | Description | Content | Access |
|---|---|---|---|---|---|
| 1C33 | - | SM input setting value | This is the area for setting the communication mode of the SM3. Since this area is controlled by the master, do not change it arbitrarily. | | |
| | 00 | Number of items | - | - | RO |
| | 01 | Synchronization Type | The communication mode of the Sync Manager 3 can be checked. | 0000(hex): Fres-Run mode<br>0002(hex): DC mode(Sync0) | RW |
| | 04 | Synchronization Types supported | The synchronization modes that can be supported are displayed. The EtherCAT adapter supports the Free Run mode the DC Sync0 mode. | Free Run and DC Sync0 supported | RO |
| | 05 | Minimum Cycle Time | This is the minimum DC Sync0 Event cycle. | 1000000 | RO |
| | 06 | Calc and Copy Time | This is the normal time taken for processing process output data. | 50000 | |
| | 09 | Delay Time | This is the delay time taken for executing refresh after DC Sync0 event. | 200000 | |
| | 0A | Sync0 Chcle Time | This indicates the DC Sync0 cycle. | This indicates the DC Sync0 cycle. | RW |
| | 0B | SM-Event Missed | This is the object for checking a sync error between process data and DC Sync0 event.<br>If it is larger than the sync error counter limit, a sync error will be issued. | Increases by 3 when a sync error occurs, decreases by 1 when a process data event occurs | RO |
| | 0C | Cycle Time Too Small | Counts when the next process data event occurs before process data is processed | Increase by 1 when the next process data event occurs before process data is processed | RO |
| | 20 | Sync Error | It indicates the error occurrence status. | Set when an error occurs | RO |

| Index (hex) | SubIndex (hex) | Name | Description | Content | Access |
|---|---|---|---|---|---|
| 2000 | - | System Status | This is the flag information that indicates the system status. | For detailed contents, refer to Appendix 2.1 Flag object list. | - |
| 2010 | - | System error (critical error) | This is the flag information that indicates a critical error of the system. | For detailed contents, refer to Appendix 2.1 Flag object list. | - |
| 2020 | - | System error (light error) | This is the flag information that indicates a light error in the system. | For detailed contents, refer to Appendix 2.1 Flag object list. | - |
| 2030 | - | System status data | This is data that indicates the system status. | For detailed contents, refer to Appendix 2.1 Flag object list. | - |
| 2040 | - | System control flag | This is the flag information that indicates the error status of system control and the extension module. | For detailed contents, refer to Appendix 2.1 Flag object list. | - |
| 3000 | - | Adapter parameter | This is the parameter of the adapter. | For detailed contents, refer to Appendix 2.2 Parameter object list. | |
| 6xxx | - | TxPDO data | This is the list of data assigned to the TxPDO of each extension module. | For detailed contents, refer to Appendix 2.3 PDO list. | - |
| 7xxx | - | RxPDO data | This is the list of data assigned to RxPDO of each extension module. | For detailed contents, refer to Appendix 2.3 PDO list. | - |
| 8xxx | - | Extension module parameter | This is the parameter of each extension module. | For detailed contents, refer to Appendix 2.2 Parameter object list. | |
| F000 | - | Modular Device Profile | This is the configuration information of Modular Device Profile. | | |
| | 00 | Number of items | - | - | RO |
| | 01 | Module Index Distance | This is the index for each slot of data assigned to PDO. | 10(hex) | |
| | 02 | Maximum Number of Modules | This the maximum number of modules that can be mounted. | 8(hex) | |
| F030 | - | Set module configuration | This is the module configuration set from the configuration tool. | When the module configuration download set from the master is enabled, the module configuration set from the configuration tool will be displayed. | - |
| | 00 | Number of items | - | - | RW |
| | 01~08 | SubIndex 001~008 | This is the module ID set from the configuration tool for each slot. | Set module ID | RW |
| F030 | - | Set module configuration | This is the configuration of module actually mounted for each slot. | - | - |
| | 00 | Number of items | - | - | RO |
| | 01~08 | SubIndex 001~008 | This is the ID of the module actually mounted for each slot. | Set module ID | RO |

### 9.1.2 Free-Run refresh

In Free Run mode, the extension module refresh operates regardless of DC Sync0 signal. Since there is no waiting time for DC Sync0 event, the extension module refresh is carried out on the fastest cycle. Since the refresh is carried out for each adapter according to separate processing times, if a number of adapters are used, the times to begin refresh for each adapter do not match. When the other services of the adapter are processed as shown in the figure below, the extension module refresh will be carried out immediately.

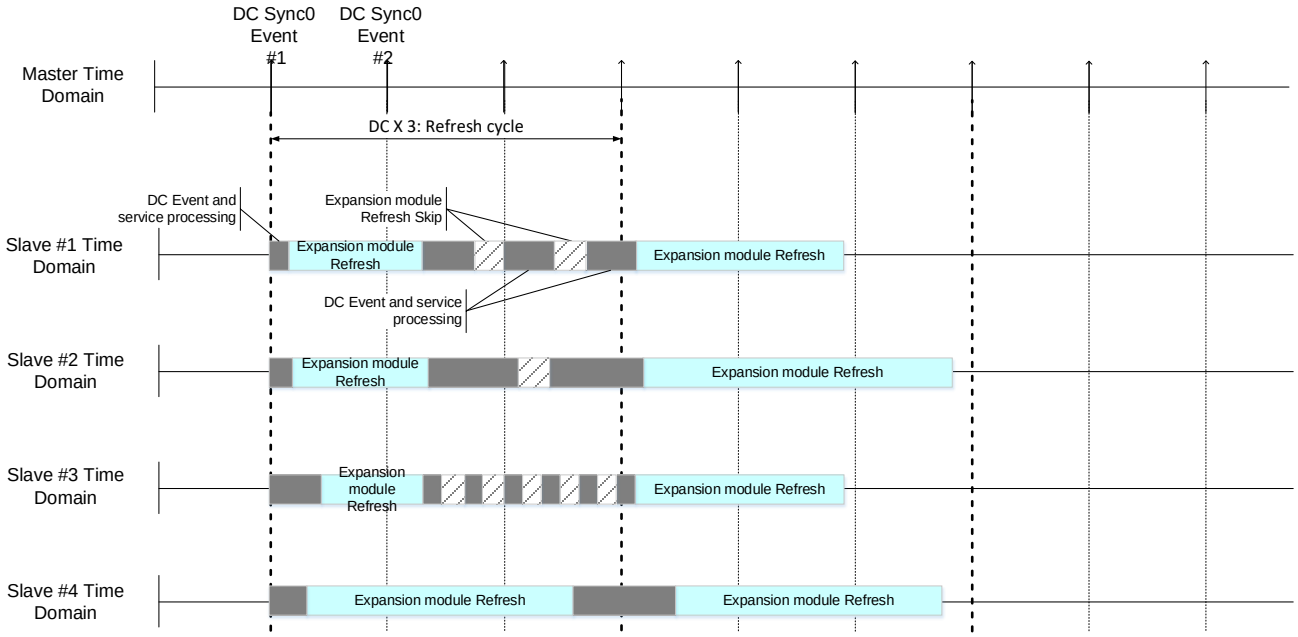
When the adapter operation is divided into DC Event process, other services and extension module refresh as shown in the figure below, the extension module refresh will be carried out right after the DC event process and other services are completed. At this time, the time to begin the extension module refresh is irrelevant to DC Sync0 Event.In order to operate the EtherCAT adapter in Free-Run mode, set Free Run for the operation mode of the EtherCAT adapter in the master.



### 9.1.3 Refresh synchronization between adapters using DC Sync

In the DC Sync mode, the extension module refresh is carried out through synchronization with the DC Sync0 signal. The EtherCAT adapter carries out the extension module refresh with one-on-one method in series. Therefore, the time taken for carrying out one refresh may vary according to the module configuration

If the refresh execution time is longer than the DC Sync0 event cycle, the refresh can be carried out in multiples of DC Sync0 event cycle using the refresh period time among the adapter parameters. For example, if 3 is set for the refresh period time, the refresh is carried out in 3 time cycles of DC Sync0 event cycle. If the refresh cannot be completed within the set refresh time, a refresh time excess warning error will occur. If the Refresh Period Time is 0, the refresh is carried out in the same way with the case that 1 is set for the Refresh Period Time, but the refresh time excess warning error will not occur.The following is the operation in case 3 is set for the Refresh Period Time. If the DC Sync0 cycle is 1ms, the extension module refresh will be carried out every 3ms.




When the set refresh time arrives, the extension module refresh will be carried out. However, the extension module refresh will be carried out after DC event and other services with higher priority are processed first.

If the refresh period time is larger than 1, the DC Sync0 event will be counted for each adapter, and if the count value is the same as the refresh period time, the refresh will be carried out. Therefore, if a number of adapters are used, the time to carry out refresh may vary according to the time to count a DC Sync0 event.

The following shows the method to match the time to carry out refresh when a number of adapters are used.

(1) Set the same refresh period time for each adapter.
(2) Change the operation mode of each adapter to the Op mode.
(3) (2) Next, the 2040:03(_DC_SYNC_COUNT_CLT) value of each adapter is turned on at the same time.
(4) Each adapter resets the DC Sync0 event count to 0 when the 2040:03 value is set, and the time to begin the extension module refresh for each adapter will be the same from the next refresh.

## 9.2 Refresh performance

### 9.2.1 Time taken for refresh by extension module

Various extension modules including simple digital I/O modules and 2-channel load cell module can be mounted on the EtherCAT adapter.The EtherCAT adapter carries out the extension module refresh with one-on-one method in series; the time taken for refresh may vary according to the extension module. The following table shows the time taken for carrying out refresh for each extension module.

| Type | Basic operation processing time | Refresh processing time |
|---|---|---|
| EtherCAT adapter | 0.4ms | - |
| XBE-DC08A | | 0.4ms |
| XBE-DC16A/B | | 0.4ms |
| XBE-DC32A | | 0.5ms |
| XBE-TN/TP08A | | 0.4ms |
| XBE-TN/TP16A | | 0.4ms |
| XBE-TN/TP32A | | 0.5ms |
| XBE-RY08A/B | | 0.4ms |
| XBE-RY16A | | 0.4ms |
| XBE-DR16A | | 0.7ms |
| XBE-DN32A | | 0.7ms |
| XBF-AD04A | | 0.7ms |
| XBF-AD08A | | 1.0ms |
| XBF-AD04C | | 1.1ms |
| XBF-DV04A | | 1.0ms |
| XBF-DC04A | | 1.0ms |
| XBF-DC04B | | 1.0ms |
| XBF-DV04C | | 1.5ms |
| XBF-DC04C | | 1.5ms |
| XBF-AH04A | | 1.1ms |
| XBF-RD04A | | 1.6ms |
| XBF-RD01A | | 1.4ms |
| XBF-TC04B | | 2.6ms |
| XBF-TC04S | | 2.6ms |
| XBF-LD02S | | 2.9ms |
| XBF-HO02A | | 3.1ms |
| XBF-HD02A | | 3.1ms |

For example, the case of using one XBE-DC08A and one XBF-HD02A is as follows.
Basic operation processing time (0.4ms) + refresh processing time by module (0.4ms+3.1ms) = 3.9ms
In other word, the refresh period time is approximately 3.9ms. ±1ms deviation on the refresh period time may occur for each module during the product operation. Also, data which should be processed occurs when connecting to and monitoring XG5000, so the refresh period time may be 200~400us longer than normal refresh period time. When DC Sync0 event synchronization refresh is set, set the Refresh Period Time(3000:01) by referring to the DC Sync0 cycle set from the master and the above table.

## 9.3 Parameter operation method

The EtherCAT adapter operates the EtherCAT adapter's own parameter (adapter's unique parameter) and the extension module parameter.When the parameter is saved (Enter “save” on 1010:01), the adapter's unique parameter, extension module parameter and extension module configuration information will be saved in the built-in non-volatile memory of the EtherCAT adapter.When the power is supplied to the EtherCAT adapter, the extension module configuration information saved in the non-volatile memory is compared with the configuration information of the actual module mounted, and if they match, the parameter saved in the non-volatile memory will be delivered to the extension module. If they do not match, an extension module type mismatch error (Set _IO_DEER, 2010:02) will occur and the initialized parameter will be delivered to the extension module actually mounted. However, the previously saved data will be maintained in the non-volatile memory at this time. The case of saving currently configured module information and the parameter in the non-volatile memory is as follows.

(1) When entering “save” on 1010:01
(2) When writing a parameter using XG5000
(3) When executing the I/O synchronization function from Menu-Online-Diagnosis-I/O information of XG5000
(4) When Initial parameter value applies for each slot, the initialized parameter will be saved.

For the method to change the extension module parameter and time that the changed parameter applies, refer to the following table.

| Parameter setting tool | Method to change | Time of operation with the changed parameter |
|---|---|---|
| XG5000 | Execute Online-Write<br>(Write is possible only when the adapter has stopped) | When the adapter enters the run state after Write is completed, the changed parameter will apply. |
| | Execute Monitor-Special module monitor-Test<br>(Test is possible only when the adapter has stopped) | When Test is clicked, the changed parameter will apply immediately, but if the adapter enters the Run state after the test is completed, it will operate with the previous parameter. |
| EtherCAT Master | SDO service | After SDO Write is completed, the changed parameter will apply immediately. |

### 9.3.1 Parameter memory structure

The EtherCAT adapter shares and uses the extension module mounted on LS ELECTRIC Co., Ltd.'s XGB series CPU module. The XGB CPU unit specifies the address to the memory of the PUT/GET area for the extension module parameter. The EtherCAT adapter assigns and uses the same memory area to an object. SubIndex and module area address (memory address of PUT/GET area) are summarized in Appendix 2.2 List of Parameter Objects. Refer to Appendix 2.2 List of Parameter Objects for checking the internal memory from the user’s manual of the extension module.

### 9.3.2 Automatic setting of initial parameter value

The EtherCAT adapter can operate with the initial parameter value of each module even if the parameter of the extension module is not set by the master or XG5000. The following is the case that the EtherCAT adapter initializes the parameter of the extension module to the initial value and begins operation.

If the extension module is mounted on the slot but nothing is set in the module configuration information in the non-volatile memory of the EtherCAT adapter, operation will begin with the initial parameter value based on the extension module actually mounted. At this time, a module type mismatch error does not occur.

If the extension module mounted on the slot is different from the extension module saved in the configuration information in the non-volatile memory, operation will begin with the initial parameter value based on the extension module actually mounted. At this time, a module type mismatch error occurs.

Even if the operation begins with the initial value due to the condition specified in (1) and (2) above, the initial parameter value will not be saved in the non-volatile memory of the EtherCAT adapter. In order to save the currently set parameter in the non-volatile memory, execute the operation corresponding to the case of saving listed parameters in 9.3 Parameter operation method. If the saved parameter is different from the extension module actually mounted, carry out I/O synchronization to XG5000 or correct the slot setting of the master and save using Save parameter (INDEX 1010:0). When it is saved, if the module type set as the parameter matches with the module type actually mounted, the module type mismatch error will be cleared together.

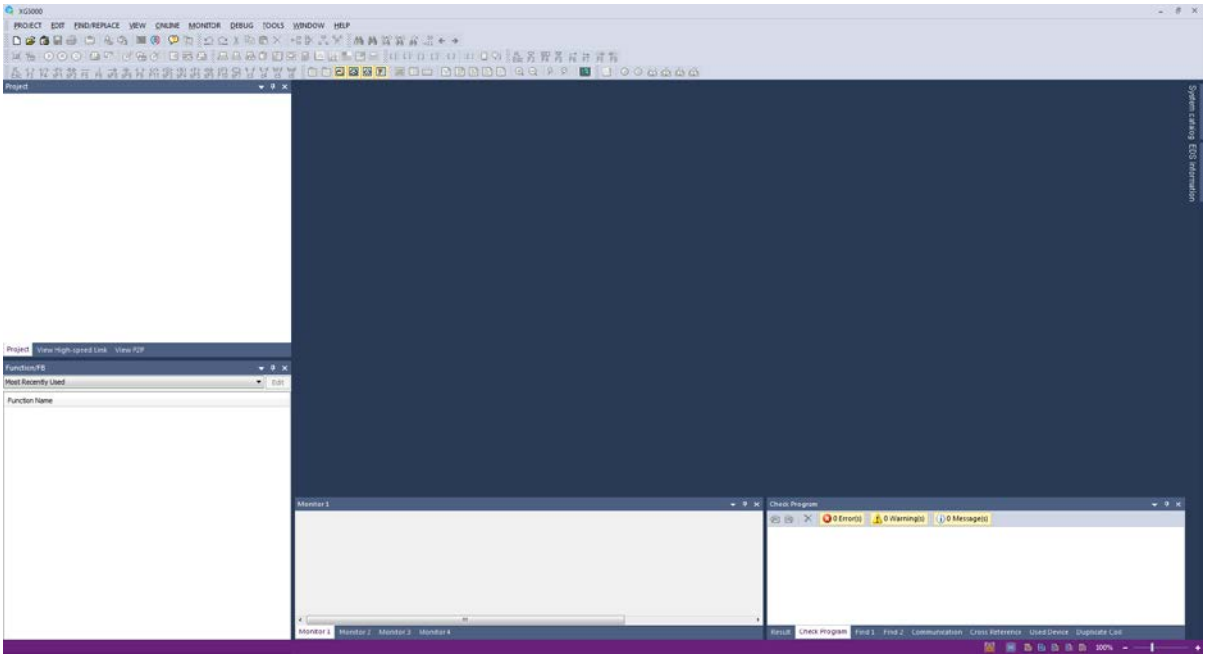
## 9.4 Test mode

The EtherCAT adapter allows you to use all functions through object setting using the EtherCAT master, but when configuring the initial system, the test function using XG5000 is provided for convenience.
The test function provides an environment to change the parameter and refresh data arbitrarily using XG5000.
However, the EtherCAT adapter is the product controlled basically by the EtherCAT master, so refresh data will be updated to the value delivered from the master each time when process data is processed. Therefore, in order to change refresh data arbitrarily in XG5000, the operation state of the EtherCAT adapter should be changed to the Stop state. If the EtherCAT adapter is in the Stop state, refresh data delivered through the master will be discarded. After the test is completed, refresh data can be applied normally through the master only when the state of the EtherCAT adapter is changed to the Run state.
In this paragraph, an explanation of test method through the special module monitor of XG5000 using XBF-AD04A as an example is provided.For EtherCAT adapter connection and setting, install the latest version of XG5000.

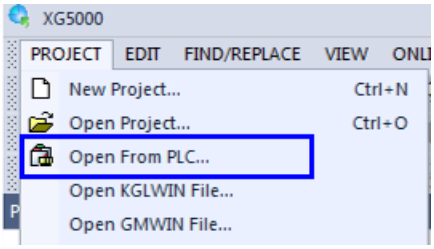
### 9.4.1 How to use the test mode

The EtherCAT adapter can connect to XG5000 through the USB. Due to the characteristics of ESC used in the EtherCAT slave, connection to XG5000 using the RJ45 port included in the product cannot be made.
Use the test mode in the following order.

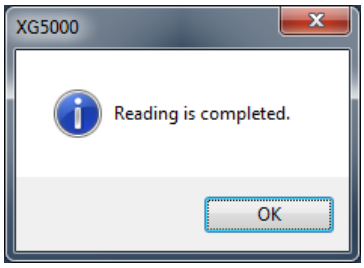
(1) Execute XG5000.



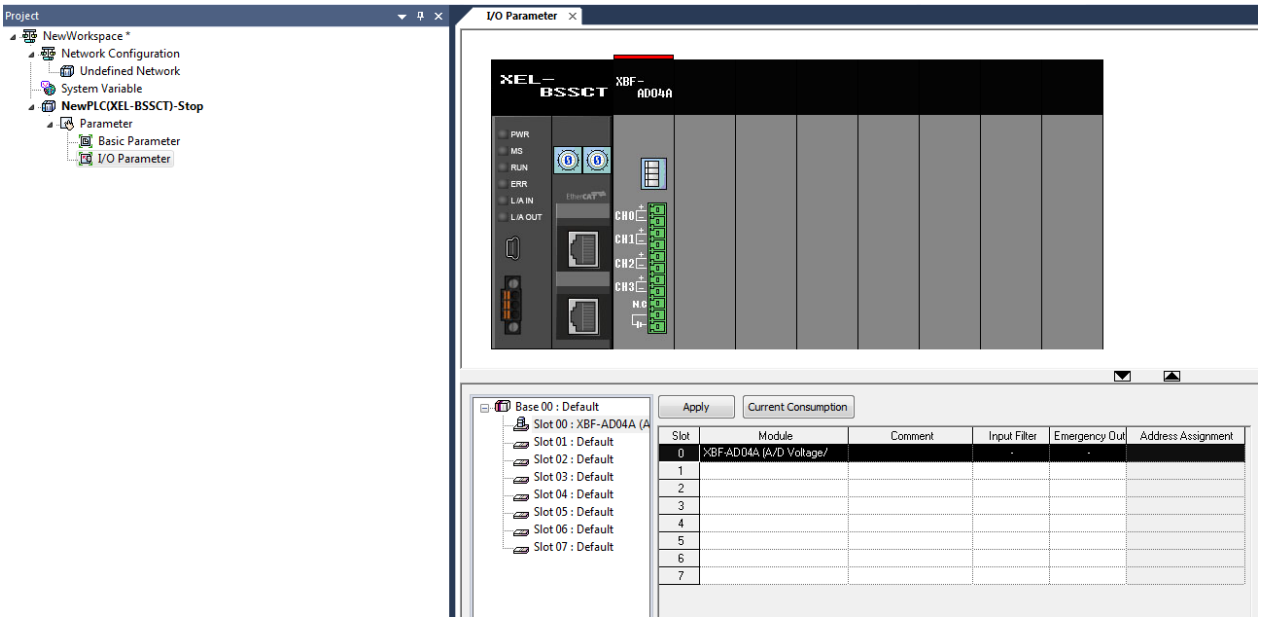
(2) Execute Open from the project-PLC on the menu.



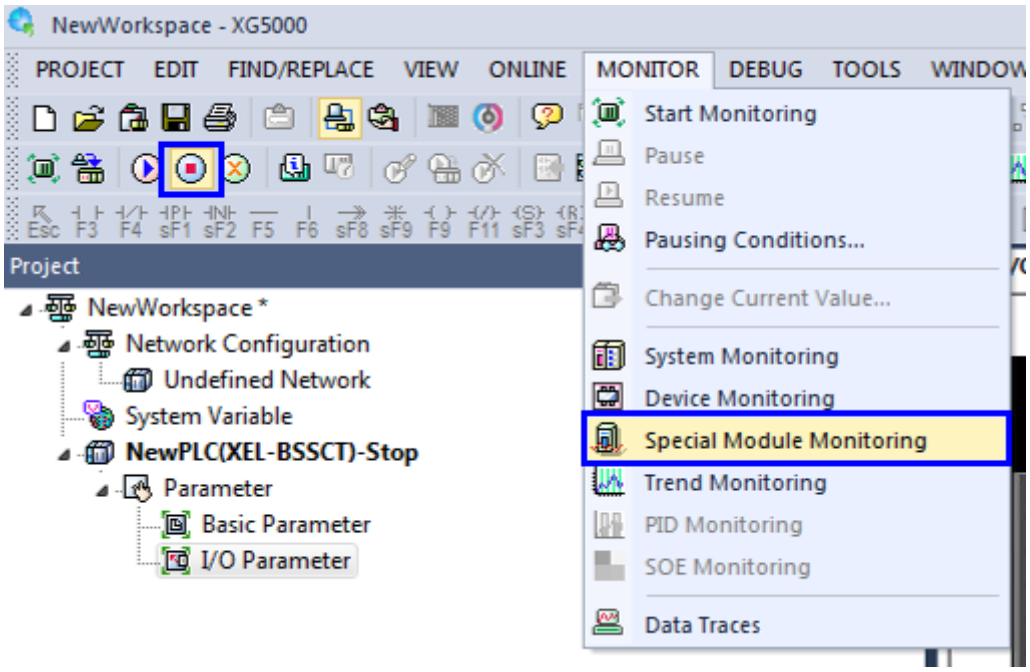
(3) When Read is completed normally, the dialog box will be displayed as shown below. If Read is not carried out normally, install the latest version of XG5000 or check the USB connection status between the EtherCAT adapter and the PC.



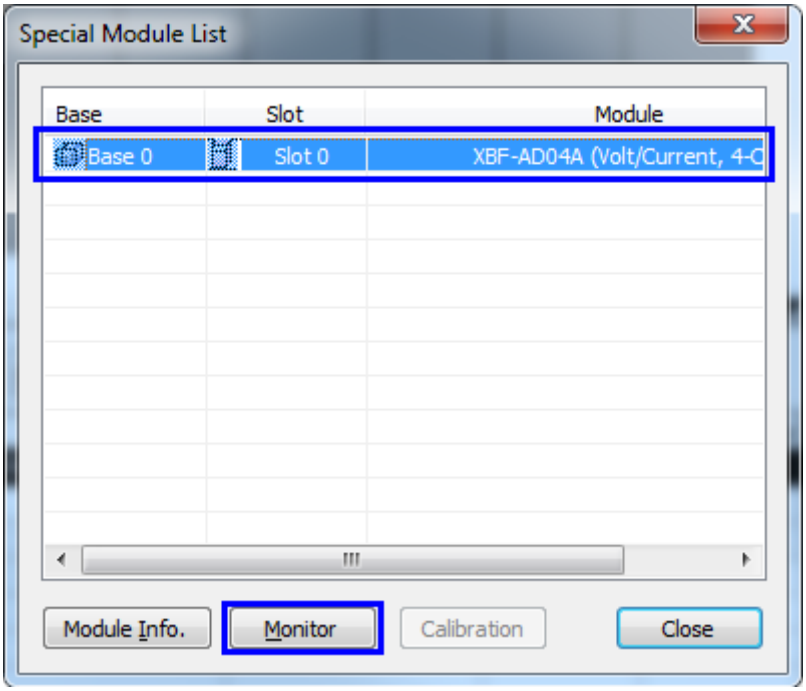

(4) Double click I/O parameter on the project tree and see if XBF-AD04A (or a special module you wish to use) is displayed normally. In this window, you can check the extension module configuration read from the module or configure the extension module in a desired configuration. You can set the parameter of the relevant module directly by double clicking the set slot. When you execute Online-Write, the set parameter will be applied to the EtherCAT adapter.



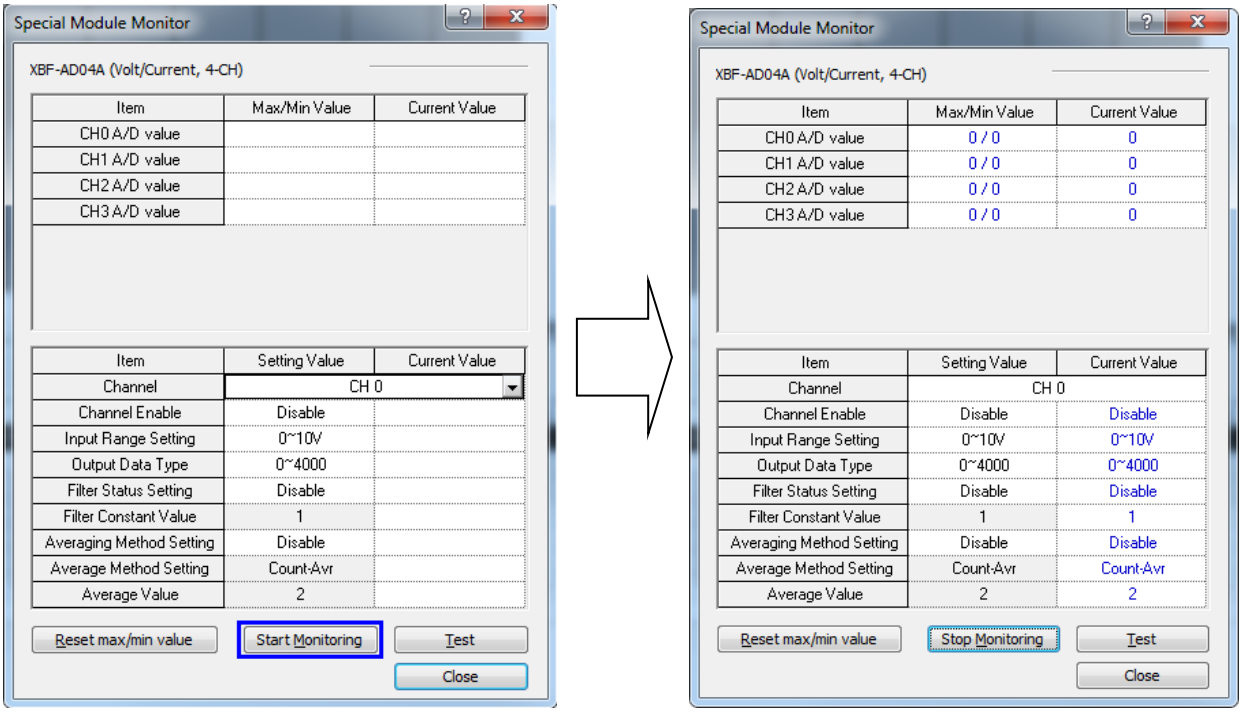
(5) Execute Monitor-Special module monitor from the menu. At this time, in order to carry out the test, the mode of the EtherCAT adapter should be changed to the Stop mode. If the mode of the EtherCAT adapter is Run mode, test cannot be carried out and only monitoring is possible. Before executing the special module monitor for carrying out the test, check if the EtherCAT adapter is in the Stop state. The EtherCAT adapter operates in Run state if the operation state is not changed using XG5000.



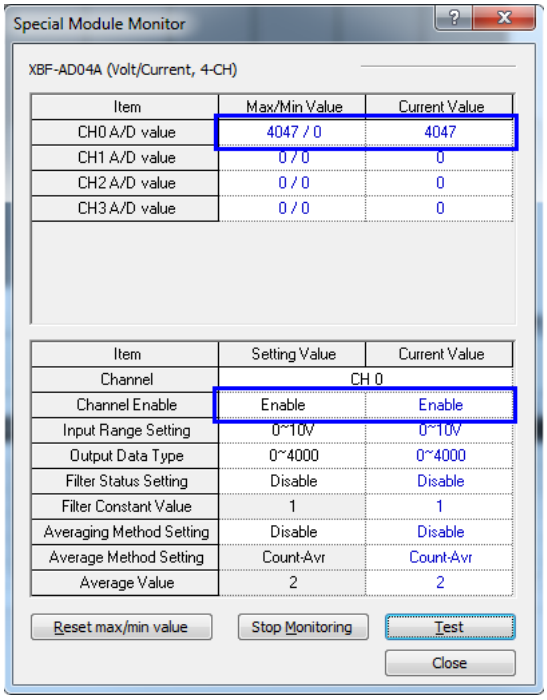

(6) The special module list window will be executed and the set special module will be displayed. Select a module you wish to test and click the Monitor button.



(7) When you click Start Monitoring on the special module monitor window, refresh data will be displayed.




(8) When you change the parameter to a value you wish to test and click Test, the changed parameter will apply and operation will begin. The following example is the case that the operation channel among the parameters of channel 0 is changed to operation and it is checked through refresh data if channel 0 operates.




(9) When the EtherCAT adapter enters Run state, it reads a parameter saved in the non-volatile memory, delivers it to the extension module and begins operation. Therefore, data changed in the test mode will be destroyed when the EtherCAT adapter enters the Run state.

# Chapter 10 Additional Functions

## 10.1 Overview

In this chapter, an explanation of built-in additional functions and the function of XEL-BSSCT (EtherCAT adapter) is provided.

### 10.1.1 Overview of functions

The extension type EtherCAT adapter XEL-BSSCT supports the following additional functions.

| Function | Description |
|---|---|
| Station address setting function | The function to set station address for identification which is not an address assigned automatically by the master |
| EEPROM recovery function | If the status of EEPROM is abnormal, this function notifies and recovers it by itself. |
| Parameter save | This function can apply a parameter which has been used as the SDO service permanently so that operation with the relevant parameter can be done at reboot. |
| Parameter initialization | This function initializes all parameters of the relevant slot. |
| Reset function | This function resets the EtherCAT adapter remotely through the master. |
| Status diagnosis function | This function checks whether an error has occurred in each module or not. |

**Notes**

1) For matters regarding the refresh of the EtherCAT adapter, refer to Chapter 9. Operation Method of the Adapter in this User's Manual.
2) For the extension module function, download and refer to the manual from our homepage (http://www.lselectric.co.kr).

## 10.2 Station address setting function

The station address of EtherCAT is used for the device identification. XEL-BSSCT supports the Explicit ID method and the Station Address method as the device identification method. In LS ELECTRIC Co., Ltd.'s EtherCAT adapter XEL-BSSCT, the Explicit ID and the Station Address operate separately. Each device identification station address can be set as follows.

| Identification method | Setting method |
|---|---|
| Station Address | Station Address Change Command of the master |
| | XG5000's station address parameter |
| Explicit ID | Adjust the rotary switch |

### 10.2.1 Explicit Device Identification (Explicit ID)

Explicit Device Identification is the station address set by the external rotary switch placed on the front of the product. The rotary switch is classified by tens and units places, and it is written as a decimal number. This station address is convenient since the ID of the relevant slave can be seen intuitively. No. 0 to No. 99 can be set for Explicit ID. However, it is recommended to set and use station address from No. 1 to No. 99 except for No. 0 for clear setting of an station address.

### 10.2.2 Configured Station Address

Configured Station Address is the slave identification address saved in EEPROM. EEPROM's Station Address can be changed through X5000's station address setting or the master’s station address setting. However, the station address changed from the master only operates if XG5000's set station address value is 0. If the parameter is downloaded by entering a value which is not 0 for the station address in XG5000, the station address of the parameter will overwrite the station address changed from the master at reboot. It is recommended to set the station address except for No. 0 for clear setting.

## 10.3 EEPROM recovery function

If EEPROM write is not restricted by the master, EEPROM may be altered by various causes. When this function is used, EEPROM's data forgery will be checked and recovered when the power is supplied to the adapter again or the adapter is reset. Error recovery is classified into three types.

### 10.3.1 Data structure of EEPROM

The data structure of EEPROM is configured as follows.

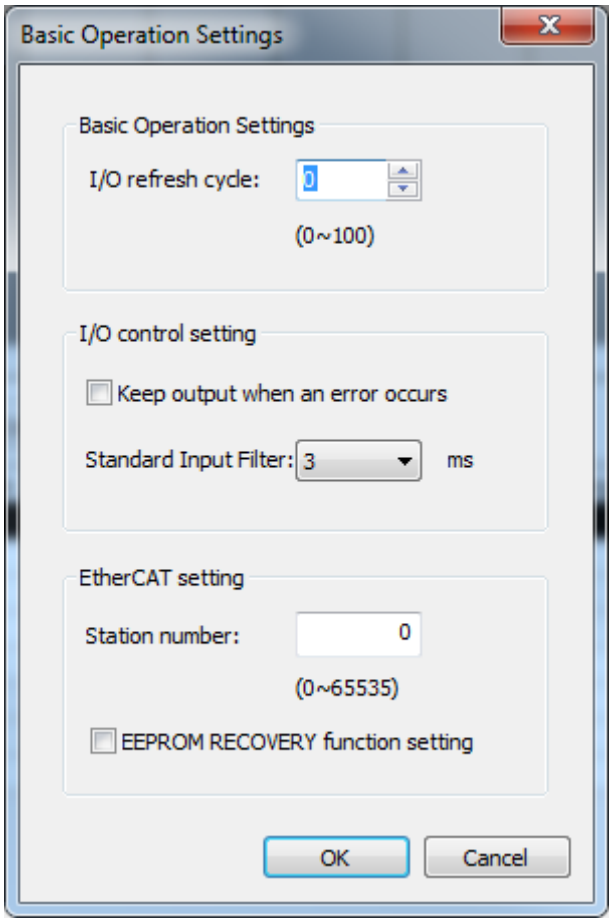
| Content |
|---|
| Slave Controller Configuration Area |
| Vendor ID |
| Product Codes |
| Revision Number |
| Serial Number |
| MailBox Boot Strap Config |
| MailBox Configuration |
| EEPROM Size in Kbit - 1 |
| Version Information |
| Category Strings |
| Category Generals |
| Category FMMU |
| Category SyncManager |
| Category Tx-/RxPDO for each PDO |

### 10.3.2 Setting EEPROM recovery function

EEPROM's recovery function can be enabled by downloading the parameter through XG5000 or SDO parameter setting through the master.

(1) Enabling the recovery function using XG5000

Open the EtherCAT adapter project and execute the basic parameter. Put a check mark on [Set EEPROM RECOVERY function] among the basic parameter items and download the parameter.




(2) Enabling the recovery function using the SDO service of the master

Set 1 for EEPROM_RECOVERY_MODE of [Basic parameter of EtherCAT adapter] in index [3000:06] among the slave CoE service items of the master. However, after the function is set through the master, the parameter should be saved permanently using the parameter SAVE function.

| Flag | Area | Description |
|---|---|---|
| _EEPROM_RECOVERY_MODE | - | Enable/disable recovery mode |

### 10.3.3 EEPROM recovery type

EEPROM's recovery is processed separately into three types according to the level of data damage.

(1) Critical error recovery

When a critical error has occurred, the whole data of EEPROM will be rewritten.At this time, data that becomes the standard is imported from data saved permanently in the OS to prevent forgery.

The case where a critical error occurs is a situation in which the Micro Controller and the EtherCAT Slave Controller cannot communicate with each other normally due to the forgery of [Slave Controller Configuration Area] occurs.If this error occurs, the EtherCAT function cannot be used.

(2) CRC value error recovery

The CRC value error recovery function loads controller setting from EEPROM when the EtherCAT Slave Controller boots up, and if CRC data is incorrect at this time, it will be judged as an error.

In such a case, the CRC value error recovery function operates, calculates the CRC value again and writes on only the CRC value area again.

(3) Recovery of general data error

For a general data error, it is the case that an error occurs in all parts except for items (1) and (2) above. Since this error is not critical to the operation but it may affect the operation, carry out the recovery from data saved in the OS permanently for preventing forgery.

### 10.3.4 EEPROM recovery diagnosis

If recovery is necessary or recovery is carried out due to EEPROM error, a flag is provided in order to notify the user. The flag is displayed even if EEPROM recovery function is not used, so if an error has occurred and an EEPROM error is suspected, it can be checked through this flag.

| Flag | Area | Value | Description |
|---|---|---|---|
| _EEPROM_STATUS | %FW143 | - | Word-type flag that allows the user to check the status of the EEPROM comprehensively |
| _EEPROM_RECOVERY_MODE | %FX2288 | 1 | EEPROM recovery mode is enabled. |
| | | 0 | EEPROM recovery mode is disabled. |
| _EEPROM_RECOVERY_EXECUTED | %FX2289 | 1 | Data error has occurred when booting and the EEPROM recovery has been carried out. |
| | | 0 | There is no data error or the recovery mode is disabled. |
| _EEPROM_PRIMARY_DATA_ERR | %FX2290 | 1 | Abnormal data exists among critical data of EEPROM. |
| | | 0 | Main data of EEPROM is normal. |
| _EEPROM_GENERAL_DATA_ERR | %FX2291 | 1 | Abnormal data exists among general data of EEPROM. |
| | | 0 | General data of EEPROM is normal. |
| _EEPROM_CRC_DATA_ERR | %FX2292 | 1 | An error exists in CRC data of EEPROM. |
| | | 0 | CRC data of EEPROM is normal. |

### 10.3.5 Constraint condition

For data errors except for CRC value error, basic data saved in the OS for preventing forgery is used for recovery. Therefore, if the revision number of ESI(EtherCAT Slave Information) used currently for the EtherCAT master is different from the OS version of the EtherCAT adapter, communication may be unavailable. Match the ESI version or the OS version to be compatible.

## 10.4 Saving parameter

A parameter can be changed immediately through the SDO service of the master, but it is saved in volatile memory, so when the adapter is reset or the power is supplied again, all parameters set through the SDO will be deleted and the parameters backed up permanently will be loaded again. Therefore, if you wish to back up a parameter set as SDO permanently, you need to save the parameter.You can save the parameter set as the SDO service by entering ‘SAVE’ or ‘save’ on the Save parameter index in the index 1010 among the objects of the slave.

Notes

1) If the parameter cannot be saved for each slot, when the SAVE command is given, all parameters will be saved at the same time.
2) XG5000 has no Save parameter flag.
3) If a parameter is downloaded to XG5000, it will be saved in non-volatile memory, so SAVE is not necessary.
4) For relevant contents, refer to Chapter 9 of this user's manual.

## 10.5 Parameter initialization

Even if actions such as changing or saving a parameter permanently have been carried out, all parameters can be initialized using the parameter initialization function. In the parameter initialization, parameters will be written in the non-volatile memory that is preserved permanently, so a separate save process is not necessary. When the parameter initialization is carried out, initialized parameters will be loaded even if the system is reset or the power is supplied again. Parameter initialization can be applied for each slot, and it can be carried out through the following XG5000 flag or the SDO service.

### 10.5.1 XG5000 Flag

| Flag | Area | Description |
|---|---|---|
| _PARAM_INIT_SLT_0 | %FX2320 | Initializes the parameter of No. 0 slot |
| _PARAM_INIT_SLT_1 | %FX2321 | Initializes the parameter of No. 1 slot |
| _PARAM_INIT_SLT_2 | %FX2322 | Initializes the parameter of No. 2 slot |
| _PARAM_INIT_SLT_3 | %FX2323 | Initializes the parameter of No. 3 slot |
| _PARAM_INIT_SLT_4 | %FX2324 | Initializes the parameter of No. 4 slot |
| _PARAM_INIT_SLT_5 | %FX2325 | Initializes the parameter of No. 5 slot |
| _PARAM_INIT_SLT_6 | %FX2326 | Initializes the parameter of No. 6 slot |
| _PARAM_INIT_SLT_7 | %FX2327 | Initializes the parameter of No. 7 slot |

### 10.5.2 EtherCAT SDO Service

| Name | Area | Description |
|---|---|---|
| _PARAM_INIT_SLT_0 | 2040:0A | Initializes the parameter of No. 0 slot |
| _PARAM_INIT_SLT_1 | 2040:0B | Initializes the parameter of No. 1 slot |
| _PARAM_INIT_SLT_2 | 2040:0C | Initializes the parameter of No. 2 slot |
| _PARAM_INIT_SLT_3 | 2040:0D | Initializes the parameter of No. 3 slot |
| _PARAM_INIT_SLT_4 | 2040:0E | Initializes the parameter of No. 4 slot |
| _PARAM_INIT_SLT_5 | 2040:0F | Initializes the parameter of No. 5 slot |
| _PARAM_INIT_SLT_6 | 2040:10 | Initializes the parameter of No. 6 slot |
| _PARAM_INIT_SLT_7 | 2040:11 | Initializes the parameter of No. 7 slot |

## 10.6 Reset Function

If it is necessary to reset the EtherCAT slave, it can be reset through the SDO service without separate XG5000 connection. This reset is the function at the same level as the reset function in XG5000. This is the method to enter a character in order to prevent reset by simple incorrect input. When 'RSET' is entered on Write Only area, it will be reset immediately.

| Name | Area | Description |
|---|---|---|
| _RESET_ADT | 2040:2B | EtherCAT Adapter Overall Reset |

## 10.7 Status diagnosis function

If it is difficult to check the detailed error for all slots every time, the error status of the relevant slot can be judged through the status diagnosis flag. If an error has occurred on the slot, the relevant flag will be 'ON'. For detailed error diagnosis, check XG5000 or the error code for each module.

### 10.7.1 XG5000 Flag

| Name | Area | Description |
|---|---|---|
| _EXT_ERR_FLAG_0SLT | %FX2336 | An error occurred at No. 0 slot |
| _EXT_ERR_FLAG_1SLT | %FX2337 | An error occurred at No. 1 slot |
| _EXT_ERR_FLAG_2SLT | %FX2338 | An error occurred at No. 2 slot |
| _EXT_ERR_FLAG_3SLT | %FX2339 | An error occurred at No. 3 slot |
| _EXT_ERR_FLAG_4SLT | %FX2340 | An error occurred at No. 4 slot |
| _EXT_ERR_FLAG_5SLT | %FX2341 | An error occurred at No. 5 slot |
| _EXT_ERR_FLAG_6SLT | %FX2342 | An error occurred at No. 6 slot |
| _EXT_ERR_FLAG_7SLT | %FX2343 | An error occurred at No. 7 slot |

### 10.7.2 EtherCAT SDO Service

| Name | Area | Description |
|---|---|---|
| _EXT_ERR_FLAG_0SLT | 2040:1A | An error occurred at No. 0 slot |
| _EXT_ERR_FLAG_1SLT | 2040:1B | An error occurred at No. 1 slot |
| _EXT_ERR_FLAG_2SLT | 2040:1C | An error occurred at No. 2 slot |
| _EXT_ERR_FLAG_3SLT | 2040:1D | An error occurred at No. 3 slot |
| _EXT_ERR_FLAG_4SLT | 2040:1E | An error occurred at No. 4 slot |
| _EXT_ERR_FLAG_5SLT | 2040:1F | An error occurred at No. 5 slot |
| _EXT_ERR_FLAG_6SLT | 2040:20 | An error occurred at No. 6 slot |
| _EXT_ERR_FLAG_7SLT | 2040:21 | An error occurred at No. 7 slot |

### 10.7.3 EtherCAT PDO Service

An error flag is also provided as PDO in order to be updated always without separate access to CoE from the master.

| PDO Name | Description |
|---|---|
| _EXT_ERR_FLAG_0SLT | An error occurred at No. 0 slot |
| _EXT_ERR_FLAG_1SLT | An error occurred at No. 1 slot |
| _EXT_ERR_FLAG_2SLT | An error occurred at No. 2 slot |
| _EXT_ERR_FLAG_3SLT | An error occurred at No. 3 slot |
| _EXT_ERR_FLAG_4SLT | An error occurred at No. 4 slot |
| _EXT_ERR_FLAG_5SLT | An error occurred at No. 5 slot |
| _EXT_ERR_FLAG_6SLT | An error occurred at No. 6 slot |
| _EXT_ERR_FLAG_7SLT | An error occurred at No. 7 slot |

# Chapter 11 Example of EtherCAT Usage

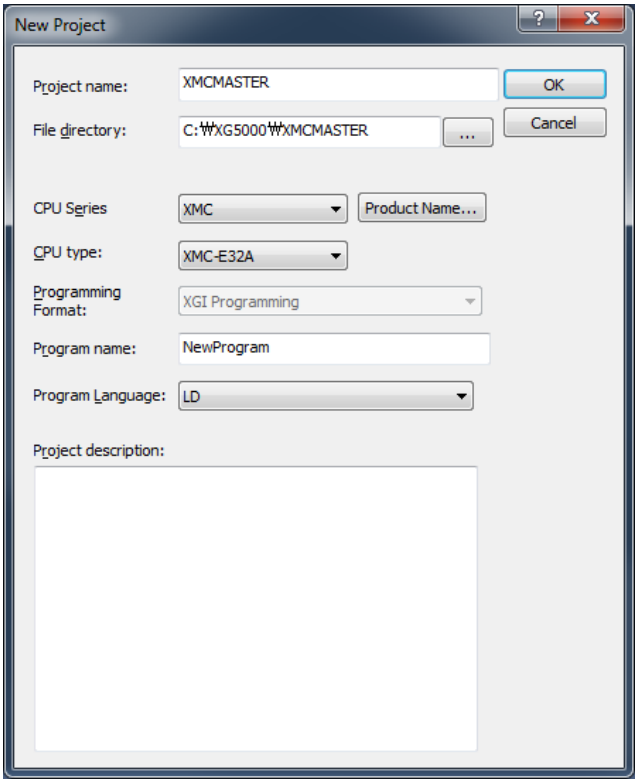
## 11.1 Overview

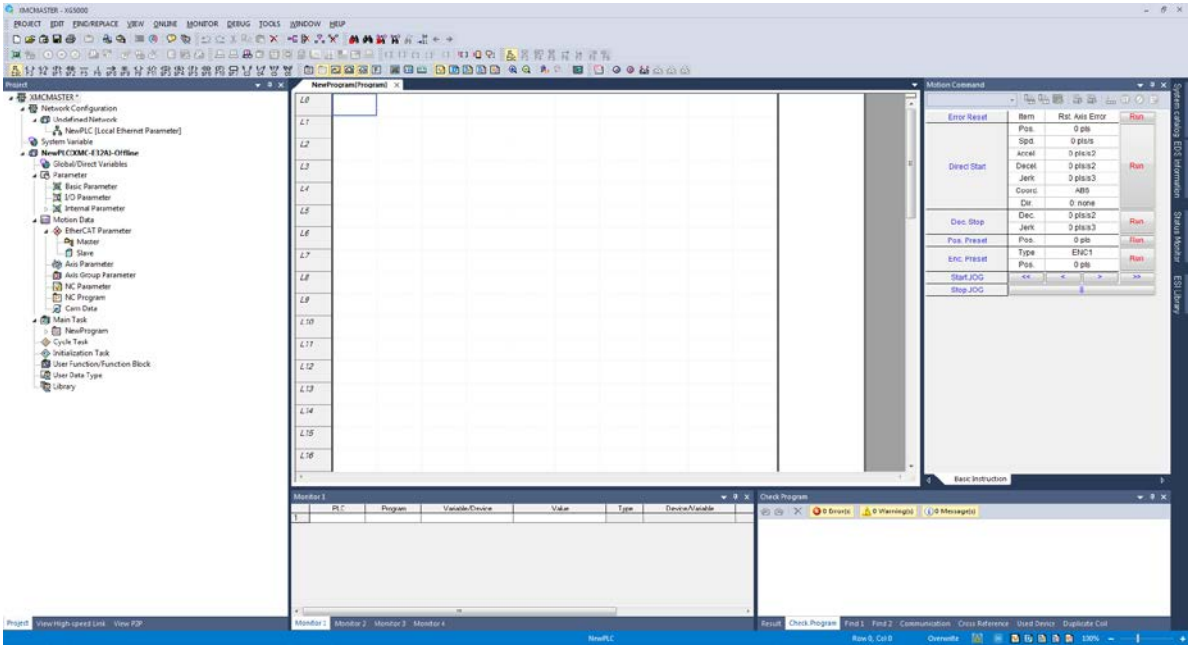
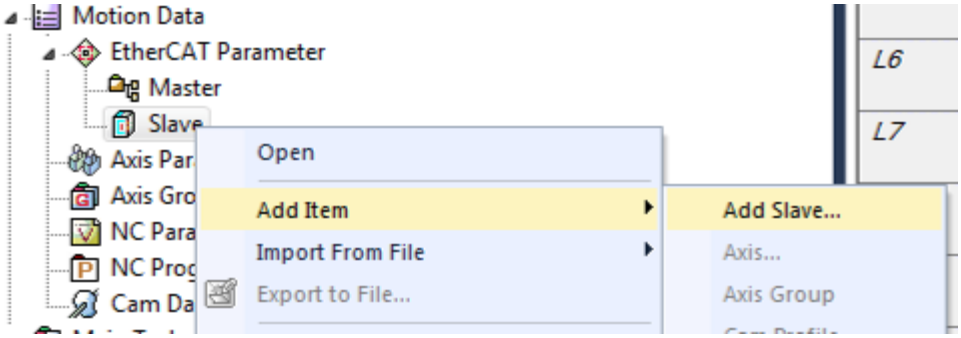
In this chapter, an explanation of an example of usage to configure the network by connecting the EtherCAT master and the EtherCAT adapter (hereinafter referred to as the EtherCAT adapter) is provided. Follow this example and learn how to configure the EtherCAT network and use the product. In this example, XMC-E32A which is our EtherCAT master product and Beckhoff's TwinCAT Master.

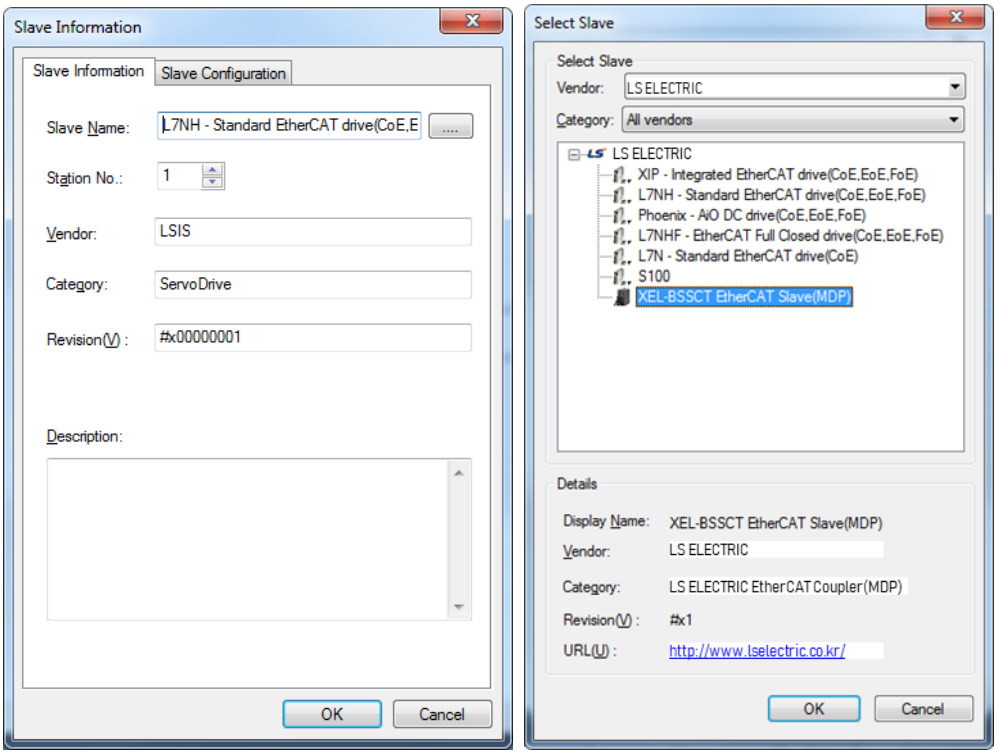
## 11.2 Example of network configuration using XMC-E32A

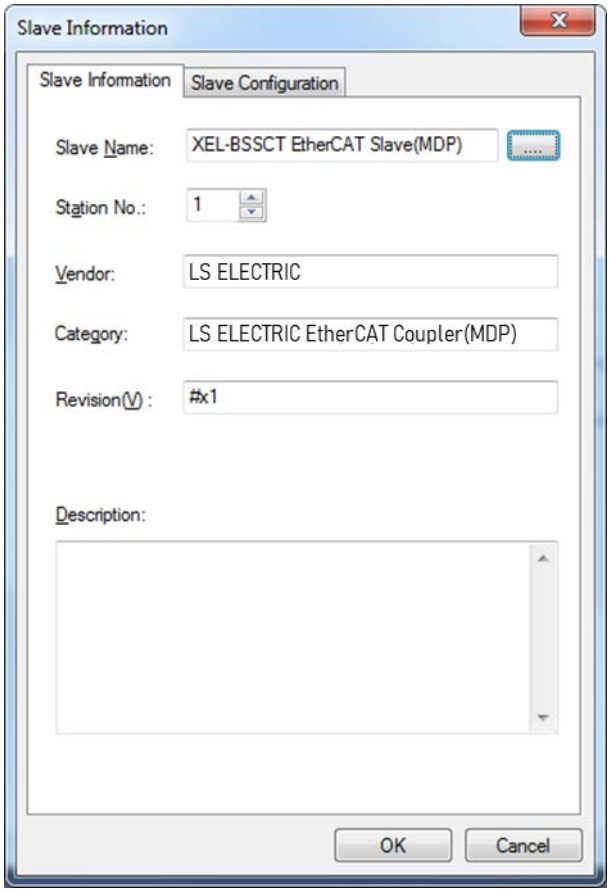
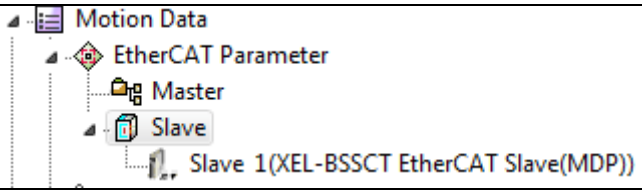
The example of basic usage to configure the network using XMC-E32A which is our EtherCAT master product and the EtherCAT adapter is explained. In the example, the XBE-TN32A output module is mounted and used on the EtherCAT adapter.

### 11.2.1 Configuration of XMC-E32A master

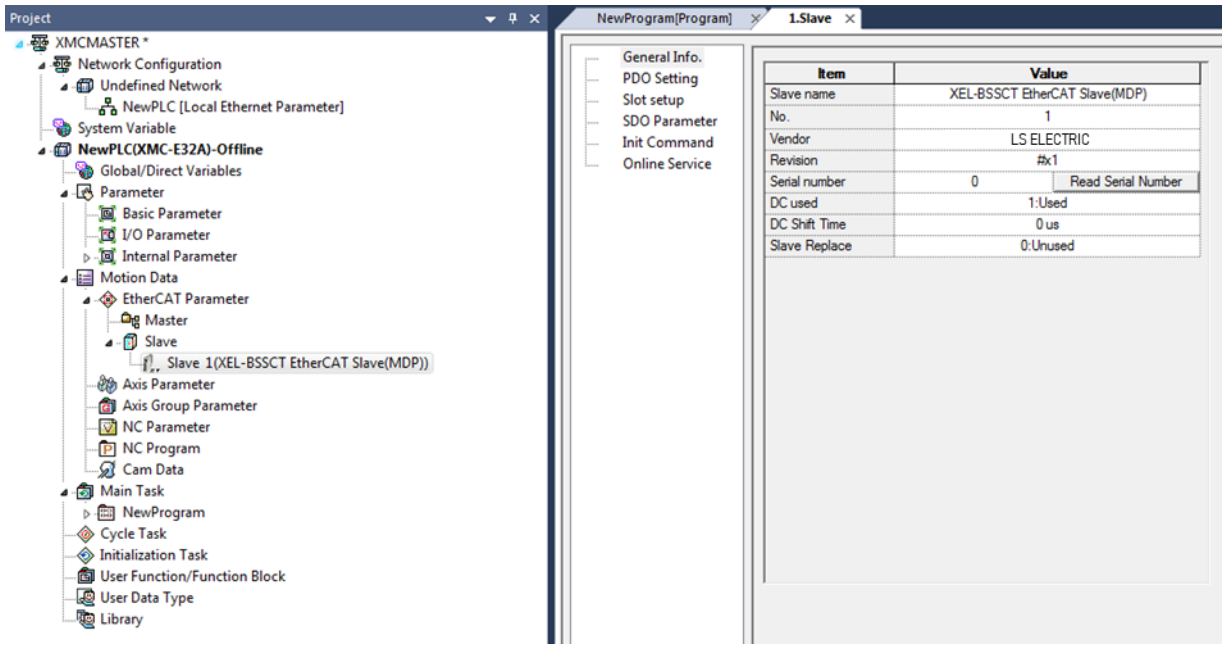
| | |
|---|---|
| 1 |  |
| | (1) Select [Project] → [New Project].<br>(2) Specify the project name and the file location.<br>(3) Select [XMC] for [CPU Series] and select [XMC-E32A/C] for [CPU Type].<br>(4) Check each item and if there is no abnormality, press OK to complete the creation of a new project finally. |

| | |
|---|---|
| 2 |  <br>(1) When a new project has been created, the above screen will be displayed.<br>※ The screen may vary according to the XG5000 window setting of the user, and layout can be initialized through [Window] → [Reset the layout of window] on the top menu bar. |
| 3 |  <br>(1) Expand the [Motion Data] tree on the left project tab.<br>(2) Expand the [EtherCAT Parameter] tree.<br>(3) Press the [Slave] item with the right mouse button and select [Add Item] → [Add Slave...]. |

| | |
|---|---|
| 4 |  |
| | (1) Click the [....] Button on the right side of [Slave Name] in the [Slave Information] window with the left mouse button.<br>(2) Select LS ELECTRIC for the supplier from the Select Slave screen.<br>(3) Select EtherCAT Adapter EtherCAT Slave(MDP) and press OK to finish.<br><br>※ If the EtherCAT adapter is not displayed, install the latest XG5000 or download the latest ESI file of the EtherCAT adapter from the archives of our homepage to the EtherCATXML folder in the folder where XG5000 is installed and execute XG5000 again and check. |

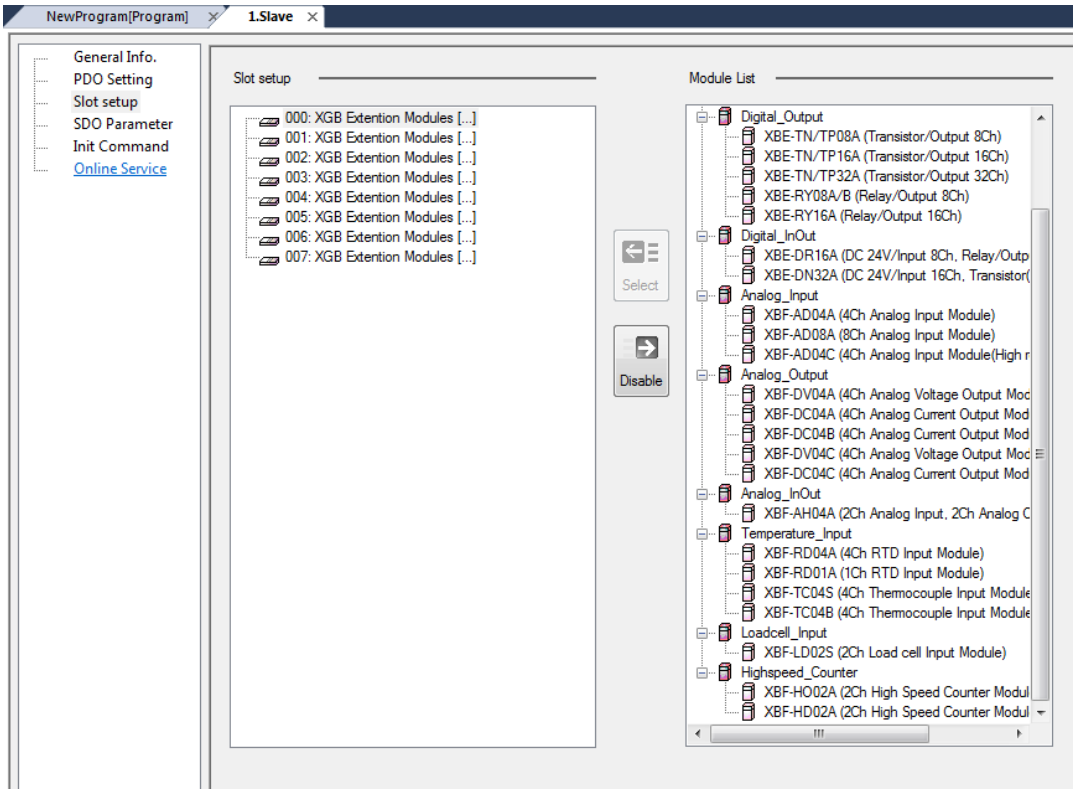
| | |
|---|---|
| 5 |  |
| | (1) Check if the slave name has been changed to EtherCAT Adapter EtherCAT Slave(MDP).<br>(2) Enter the value set for the rotary switch of the EtherCAT adapter on the Station Address field.<br><br>※ XMC-E32A only supplies Explicit ID identification. |
| 6 |  |
| | (1) If the slave has been added normally, it will be stated as shown above. |

**7**



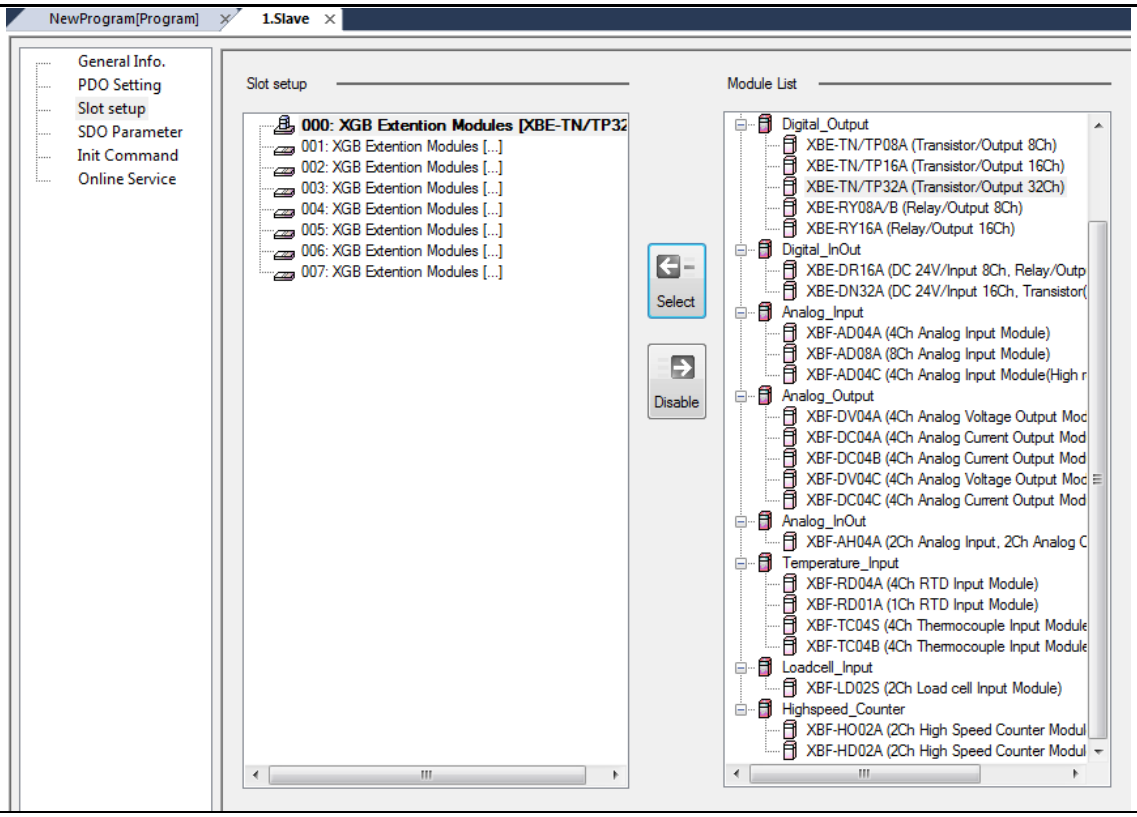

(1) Double click the EtherCAT adapter.
(2) The slave tab will be created on the right side.

**8**



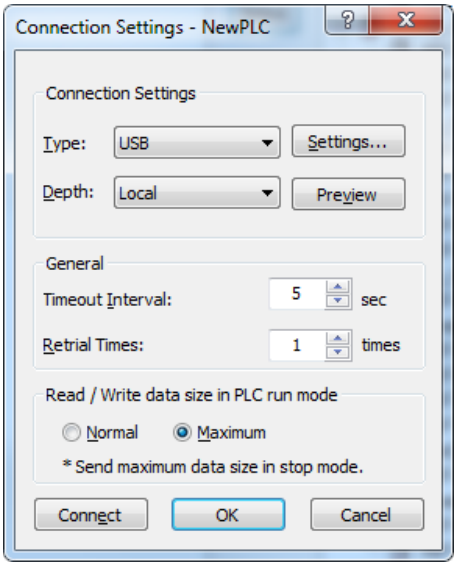

(1) Select the [Set Slot] menu from the menus on the created slave tab.
(2) The window for setting slots from 000 to 007 will be created.
(3) In the example, only XBE-TN32A is mounted on No. 0 slot, so insert XBE-TN32A to No. 0 slot.
(4) If a different configuration is used, complete the slot information with the same configuration with the module currently mounted on the EtherCAT adapter.

**9**

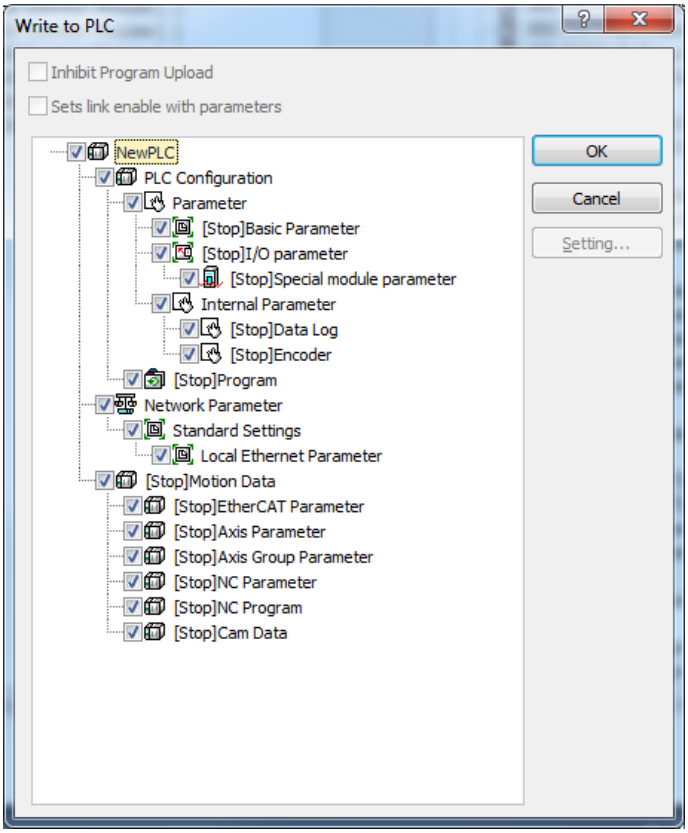
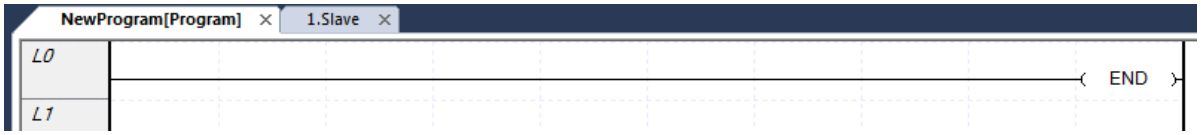



(1) The slot configuration has been completed.

**10**

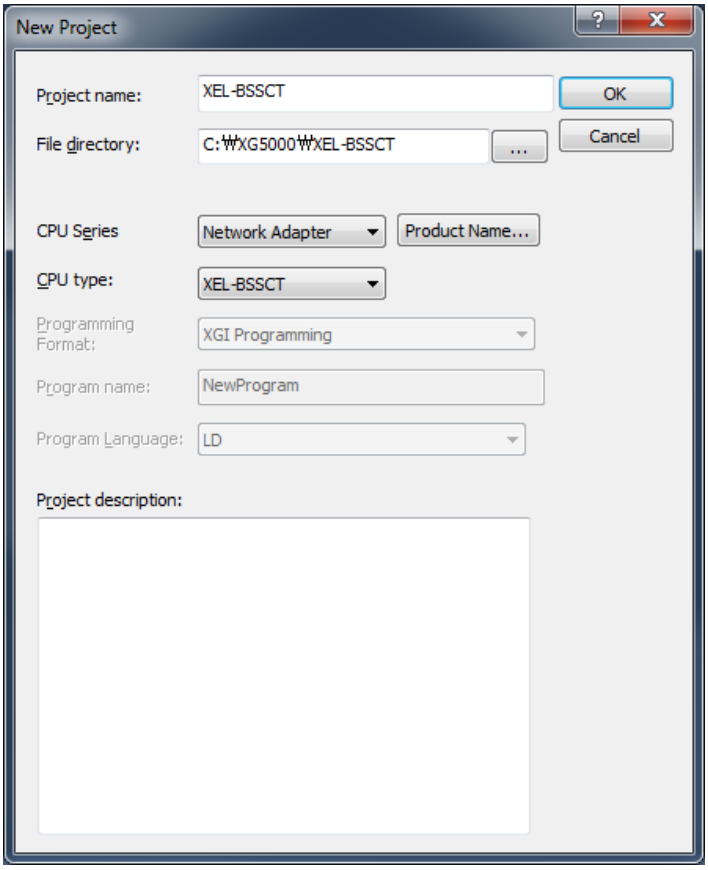
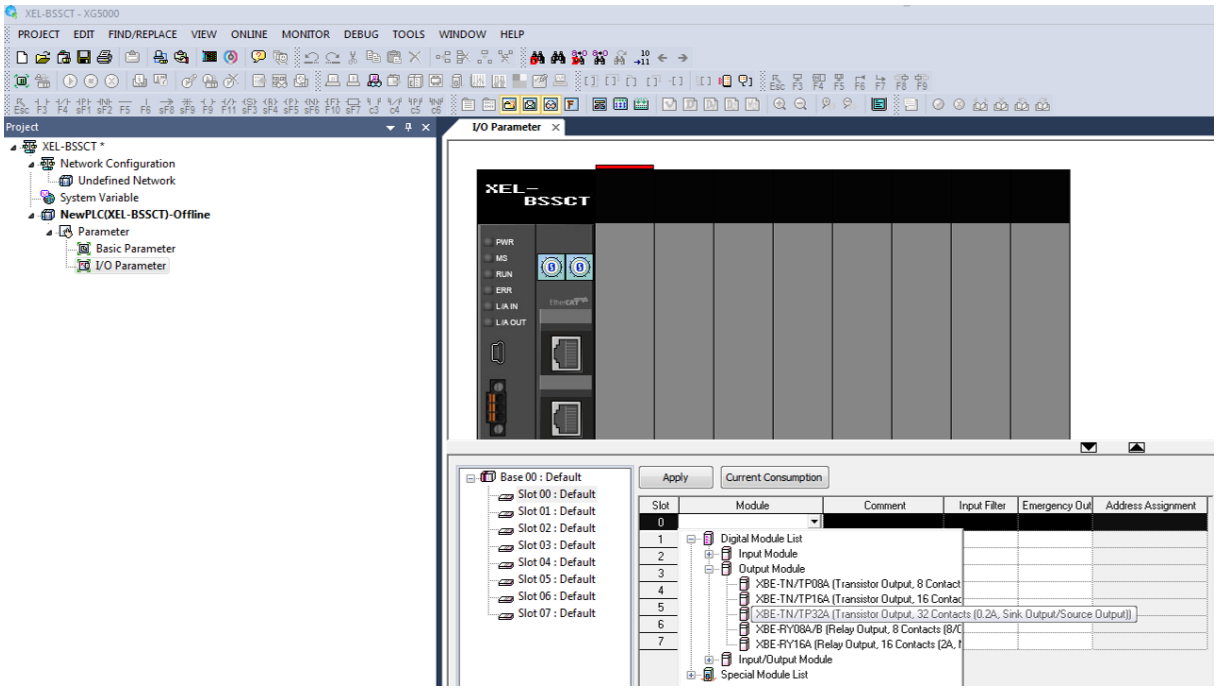


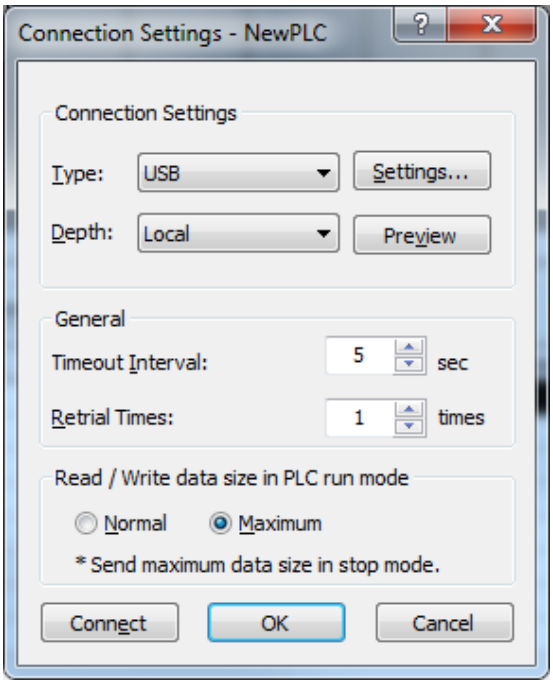

(1) Connect to the master using XG5000 in order to write the set parameters on the master.
(2) Select [Online] → [Connection Settings] from the menu bar and set [USB] and [Local] for the connection option.
(3) When the setting has been completed, connect to the master by pressing Connect.

| | |
|---|---|
| 11 |  <br>  <br>(1) Import the parameter to XMC-E32A through [Online]→[Write] from the top menu bar.<br>(2) The basic preparation process of the master to connect to the slave has been completed.<br><br>※ If a parameter cannot be downloaded, check the program inspection window and solve all errors or warnings. This example has no task program setting, so you can proceed by inserting the End function to the task program. |

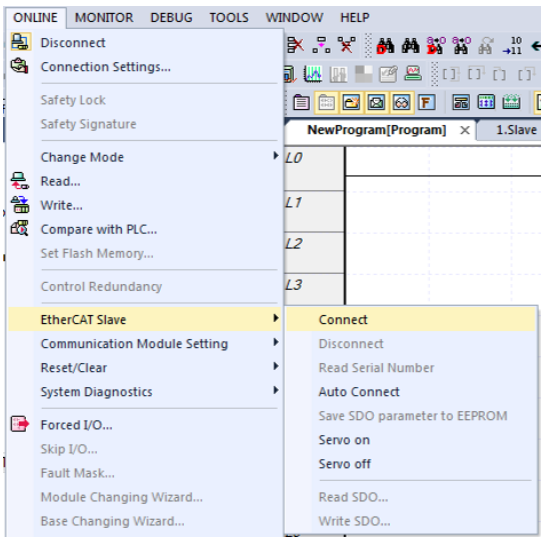
## 11.2.2 Setting of EtherCAT adapter slave

| | |
|---|---|
| 1 | <br>(1) The EtherCAT adapter supports two identification methods.<br>(2) The rotary switch is used as the Explicit ID, and the station address set as the parameter is used as the Station Address.<br>(3) Since XMC only supports the Explicit ID, the station address should set to the rotary switch.<br>(4) Set 01 for the station address. |

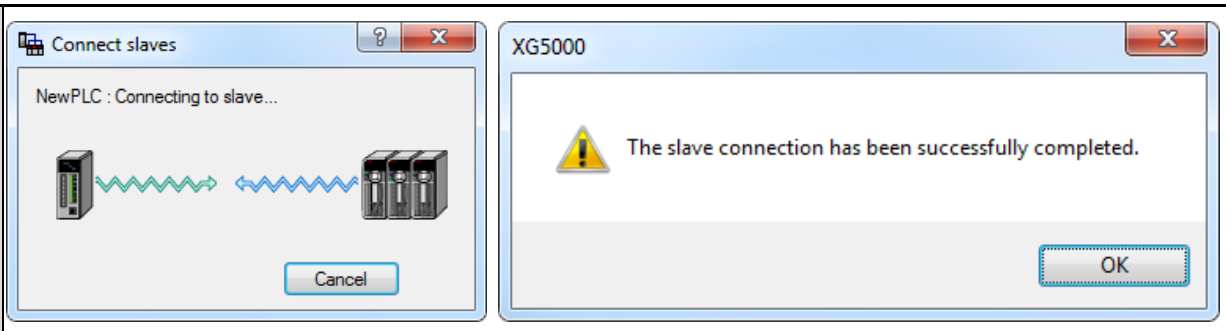
| | |
|---|---|
| 2 |  <br>(1) Execute XG5000.<br>(2) Select [Project] → [New project] from the top menu and create a new project of XEL-BSSCT. |
| 3 |  <br>(1) Open the I/O parameter window and insert XBE-TN32A into No. 0 slot. |

| | |
|---|---|
| 4 |  |
| | (1) Connect to the master using XG5000 in order to write the set parameters on the master.<br>(2) Select [Online] → [Connection Settings] from the menu bar and set [USB] and [Local] for the connection option.<br>(3) When the setting has been completed, connect to XEL-BSSCT by pressing Connect.<br>(4) Write the parameter by pressing [Online] → [Write]. |
| 5 | (1) If additional setting of EtherCAT slave is necessary according to the user's needs, connect the USB cable to the EtherCAT adapter, connect to the XG5000 and carry out setting. In this example, the network configuration is available without separate XG5000 connection and setting, you just need to proceed continuously according to the example. |

### 11.2.3 Connection (Manual Connection)

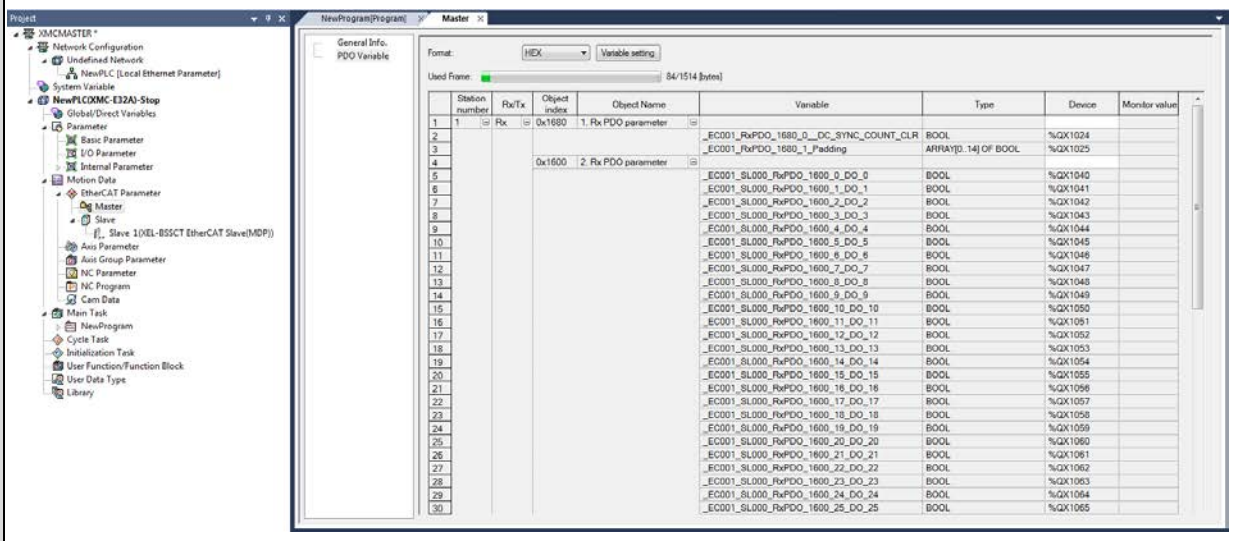
| | |
|---|---|
| 1 |  |
| | (1) Open the XG5000 master project.<br>(2) Connect to the master by pressing [Online] → [Connect] from the top menu.<br>(3) Check if XMC-E32A is in STOP state currently, and if it is in RUN state, switch its state to STOP state.<br>(4) Select [Online] → [EtherCAT slave] → [Connect] from the top menu. |

**2**



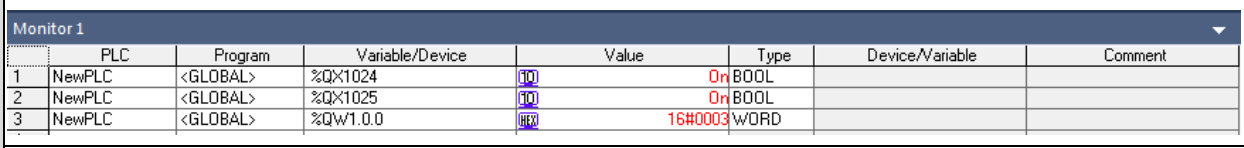

(1) A slave connection pop-up will be displayed, attempting to connect.
(2) When the connection is completed, a pop-up message saying that the connection to the slave has been completed successfully will be displayed as shown above.

**3**



(1) [Double click] the master menu from the left project tab for simple operation check.
(2) The master tab is newly created on the right side. Select [PDO Variable Information].
(3) Check a device is assigned automatically to the RxPDO of the output module.
(4) In this example, the device has been assigned from QX1024 to QX1055.

**4**

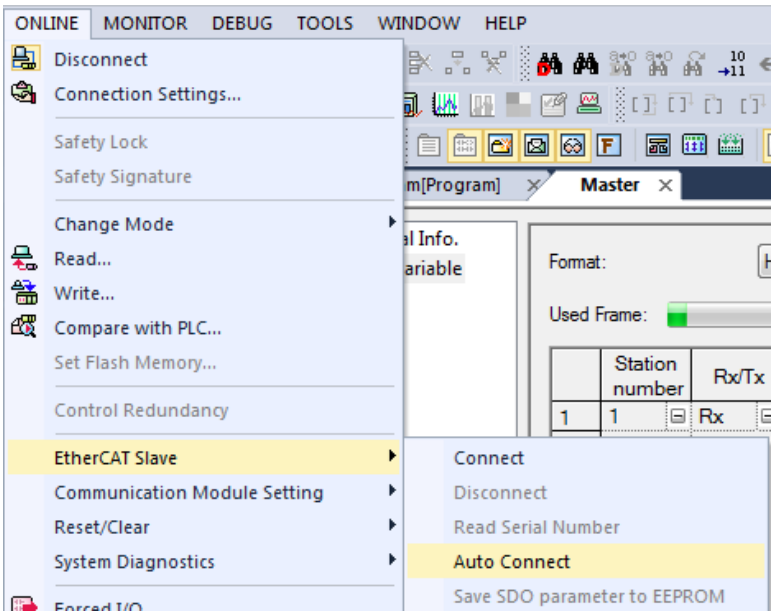
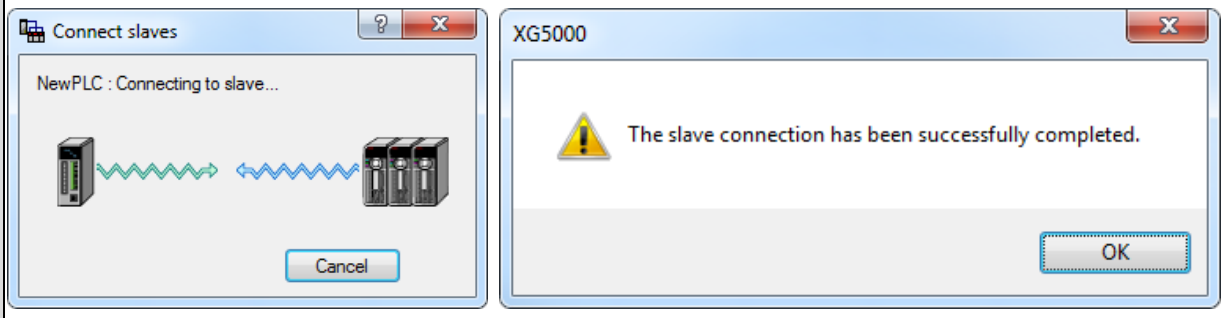


Monitor 1

| | PLC | Program | Variable/Device | Value | Type | Device/Variable | Comment |
|---|---|---|---|---|---|---|---|
| 1 | NewPLC | <GLOBAL> | %QX1024 | On | BOOL | | |
| 2 | NewPLC | <GLOBAL> | %QX1025 | On | BOOL | | |
| 3 | NewPLC | <GLOBAL> | %QW1.0.0 | 16#0003 | WORD | | |

(1) Switch the master to [RUN] mode.
(2) When it is switched to RUN mode, register a device in the variable monitor window at the bottom.
(3) Change the device value on the monitor window to see if the relevant bit is ON for the output module.

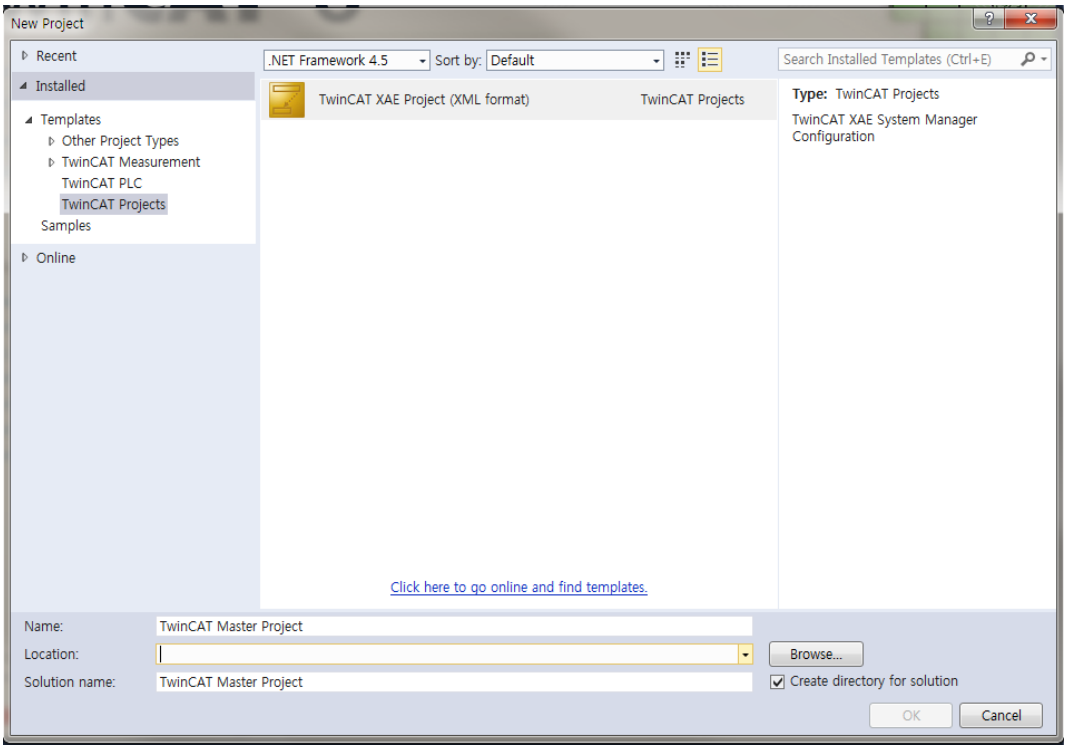
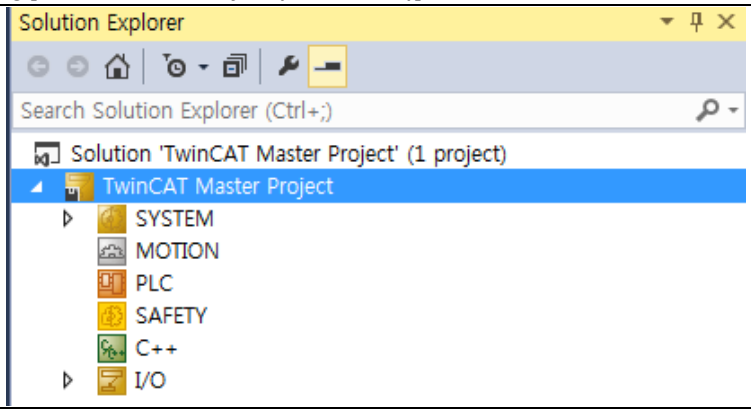
### 11.2.4 Connection (Automatic Connection)

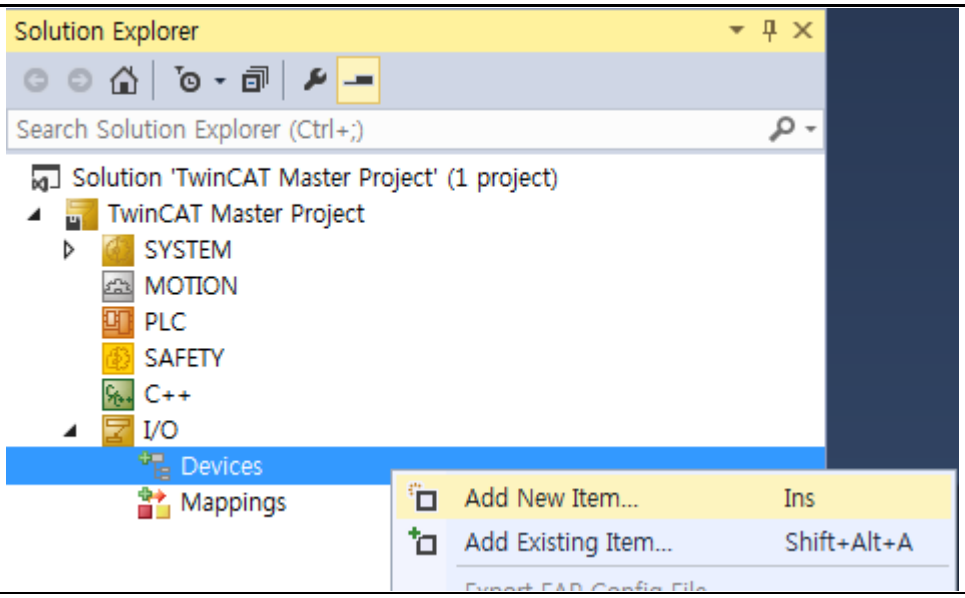
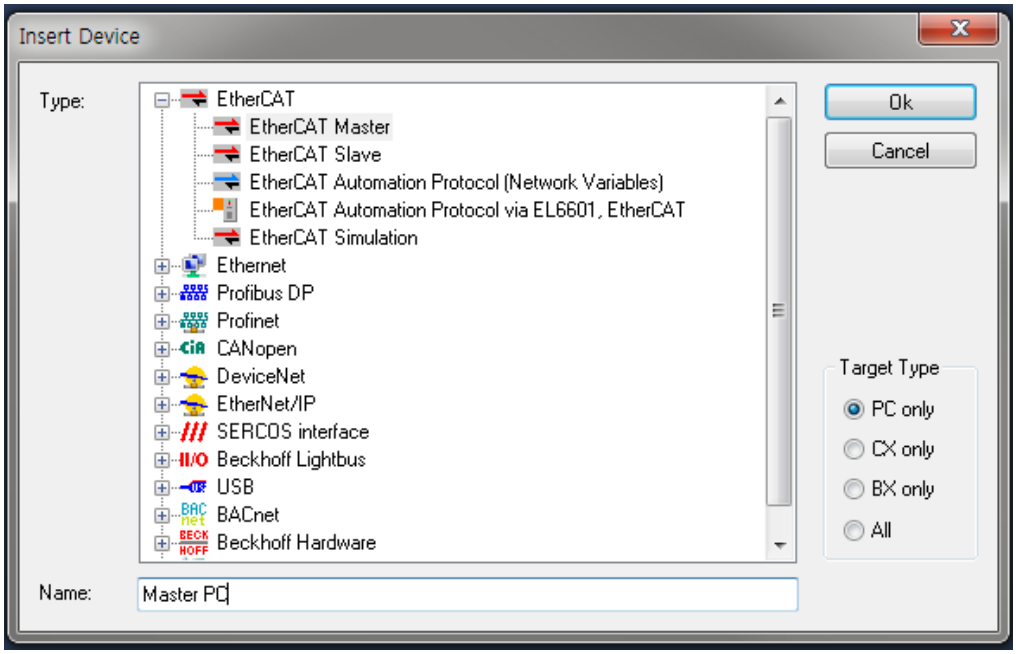
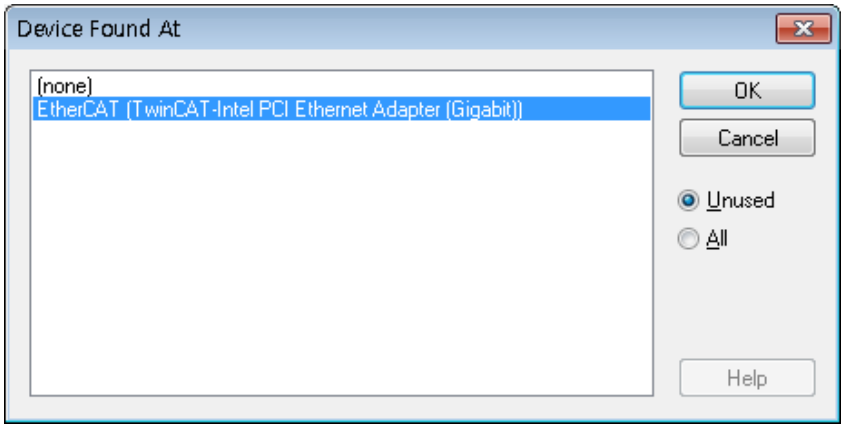
| | |
|---|---|
| 1 |  <br>(1) Automatic connection is carried out on the condition that up to No. 2 in 11.2.1 has been carried out.<br>(2) It is carried out on the condition that the master is connected using the XG5000 while nothing is set related to the slave.<br>(3) Check if the XMC-E32A is in the STOP state, and if it is in the RUN state, change its state to the STOP state.<br>(4) In STOP state, select [Online] → [EtherCAT slave] → [Automatic Connection]. |
| 2 |  <br>(1) A slave connection pop-up will be displayed, attempting to connect.<br>(2) When the connection is completed, a pop-up message saying that the connection to the slave has been completed successfully will be displayed as shown above. |
| 3 | (1) When the connection to the slave has been completed, the slave will be added automatically.<br>(2) In the next step, carry out the process such as manual connection and check if the system operates normally. |

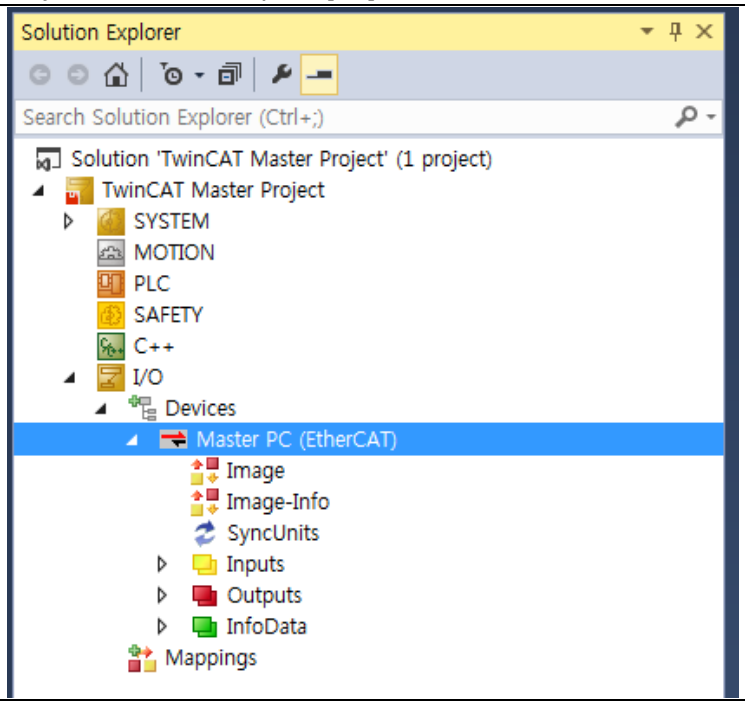
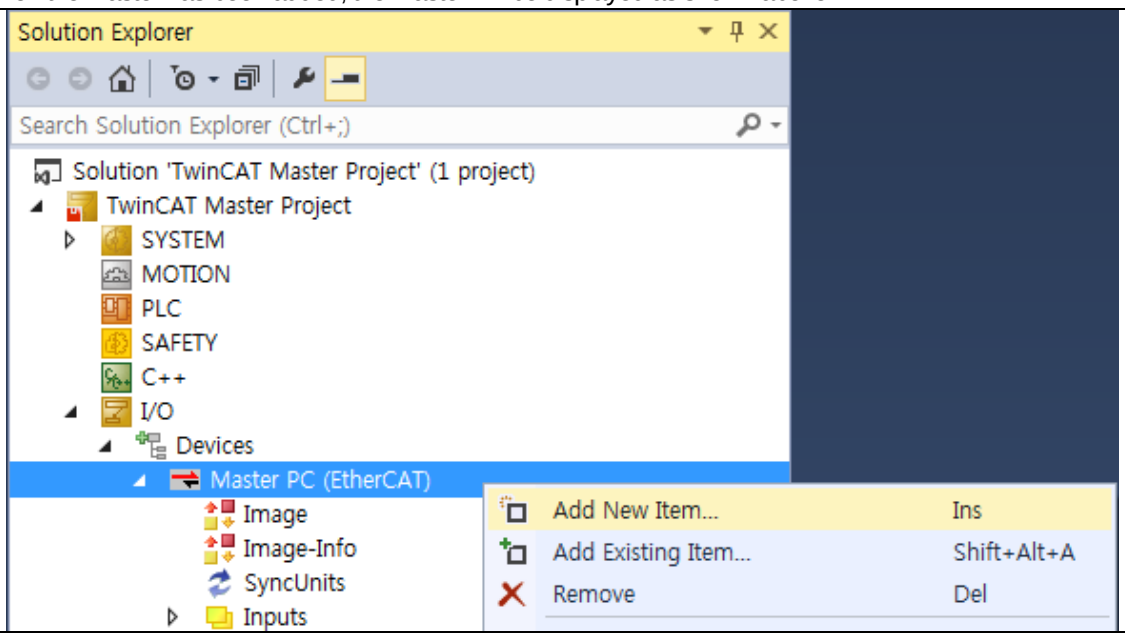
## 11.3 Example of network configuration using TwinCAT

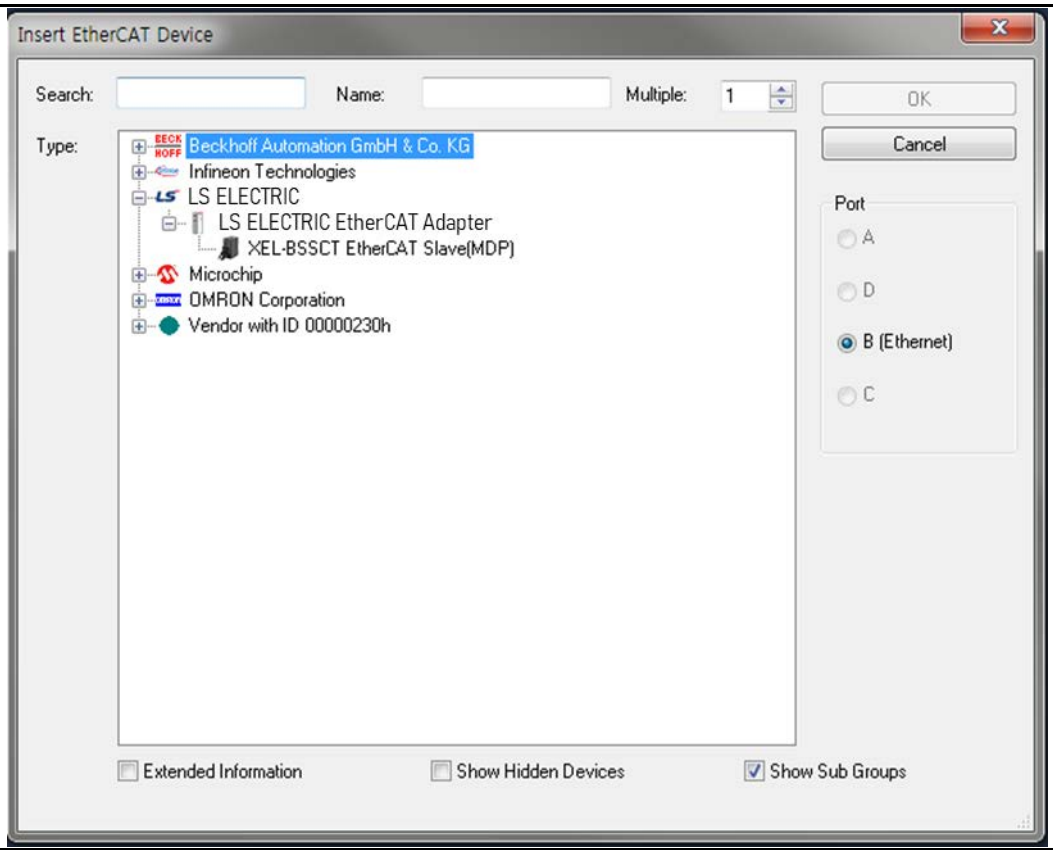
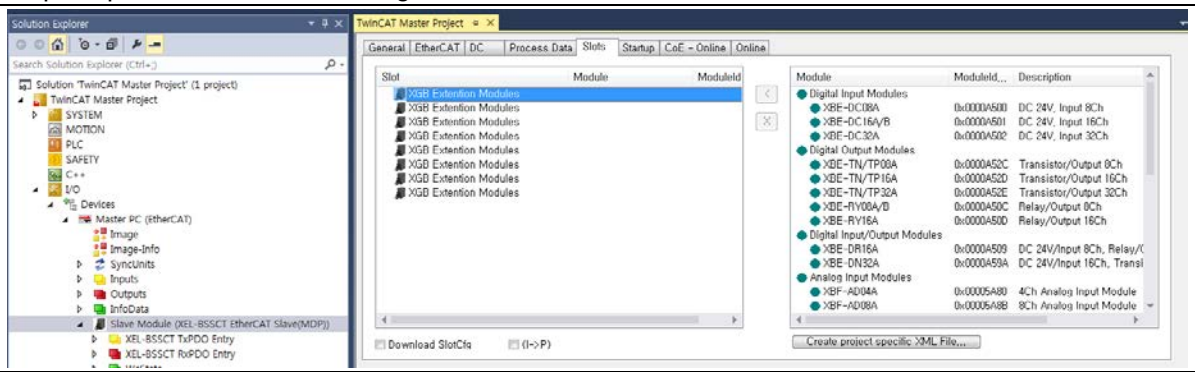
An explanation of a basic usage example to configure the EtherCAT adapter and the EtherCAT network using the Master function of Beckhoff's TwinCAT is provided.

### 11.3.1 Setting of TwinCAT master

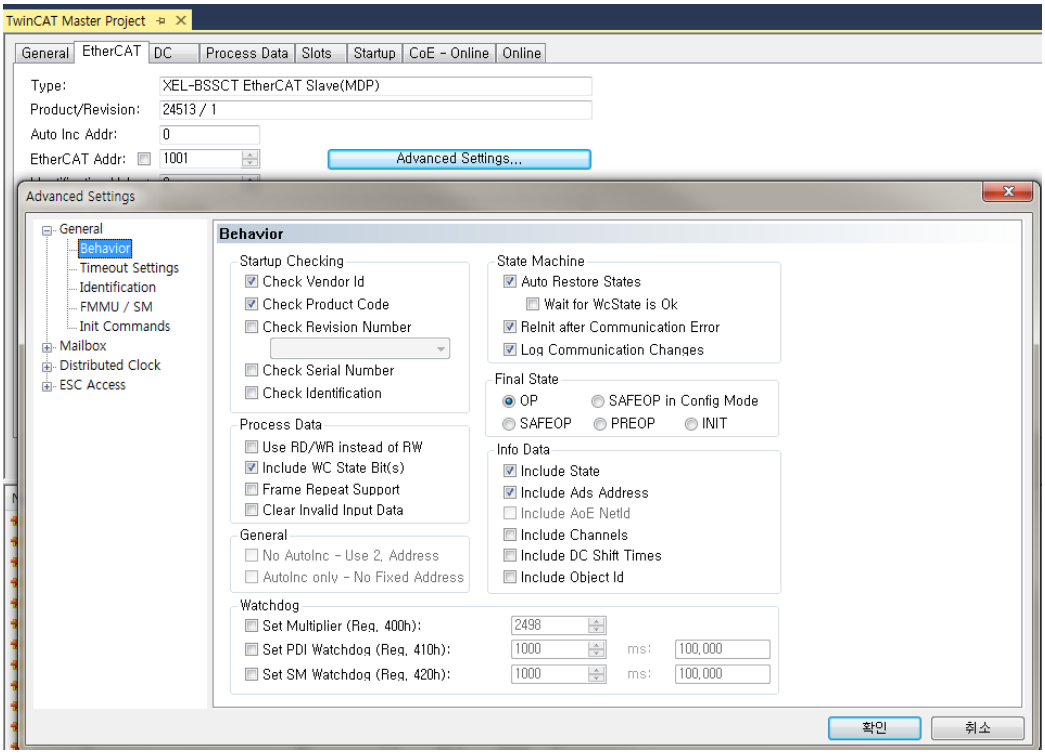
| | |
|---|---|
| 1 |  <br>(1) Execute the installed TwinCAT.<br>(2) Select [FILE] → [NEW] → [Project] from the top menu.<br>(3) When the New Project window is created, select [TwinCAT Projects].<br>(4) Create a project using [TwinCAT XAE Project (XML format)]. |
| 2 |  <br>(1) When a new project is created, the solution explorer structure will be created as shown below. |

| | |
|---|---|
| 3 |  <br>(1) Expand the [I/O] tree.<br>(2) Click [Devices] below [I/O] with the right mouse button and select [Add New Item]. |
| 4 |  <br>(1) In order to operate as the master, select EtherCAT Master and press [OK]. |
| 5 |  <br>(1) This is the screen for selecting which Ethernet interface to use for EtherCAT Master communication. |

| | |
|---|---|
| | (2) Select the network card you wish to use and press [OK]. |
| 6 |  |
| | (1) When the master has been added, the master will be displayed as shown above. |
| 7 |  |
| | (1) To add a slave, click EtherCAT master with the right mouse button and select [Add New Item]. |

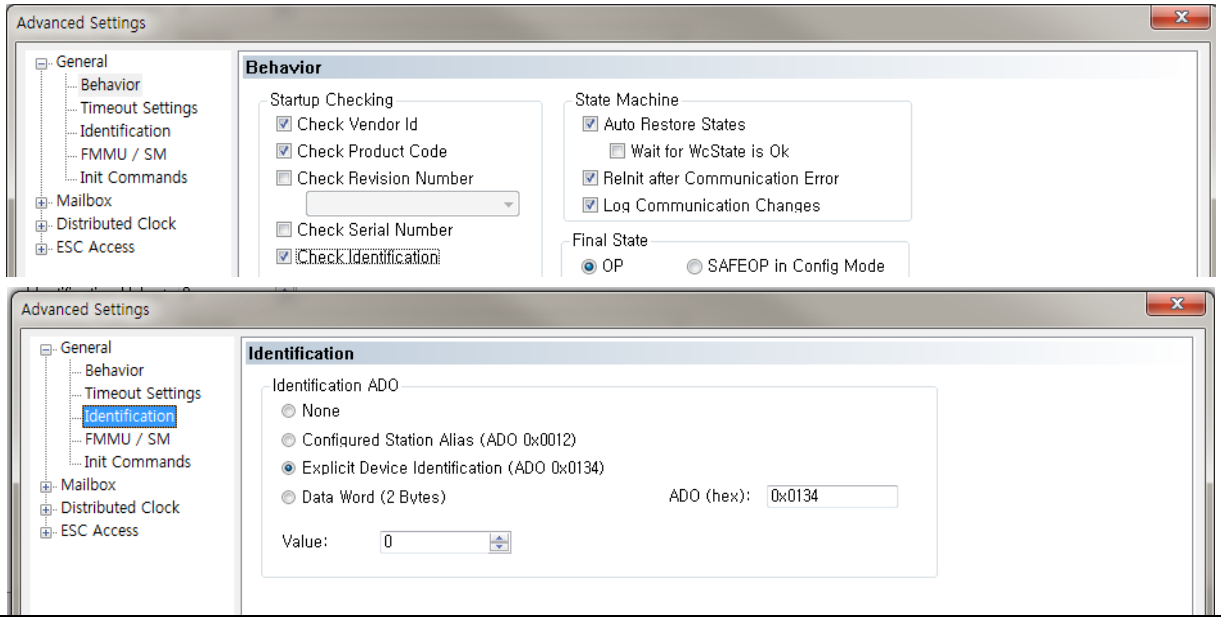
| | |
|---|---|
| 8 |  <br>(1) When the [Insert EtherCAT Device] window is created, select the EtherCAT adapter from the LS ELECTRIC tree and press [OK].<br><br>※ If the EtherCAT adapter is not displayed, download the latest ESI file of theEtherCAT adapter from the download center at our homepage to the following path in the folder where TwinCAT is installed and execute TwinCAT again and check if it is displayed.<br>'Example of path: C:\TwinCAT\3.1\Config\Io\EtherCAT' |
| 9 |  <br>(1) Create the slave tab by [double clicking] the added slave.<br>(2) Move to the slot tab of the created slave tab.<br>(3) In the example, only XBE-TN32A is mounted on No. 0 slot, so insert XBE-TN32A to No. 0 slot.<br>(4) If a different configuration is used, complete the slot information with the same configuration with the module currently mounted on the EtherCAT adapter. |

**10**

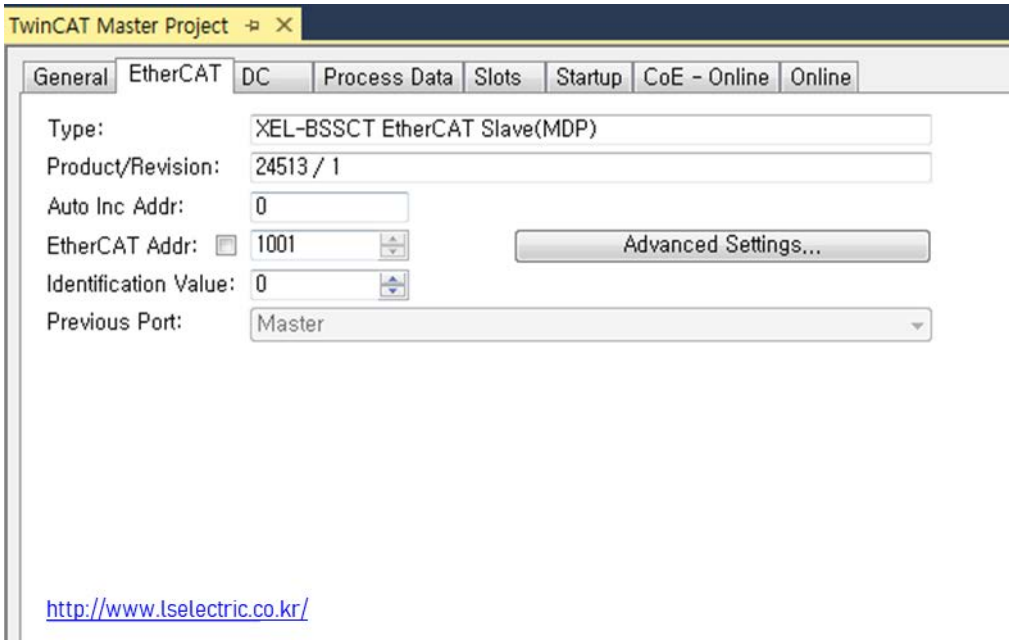
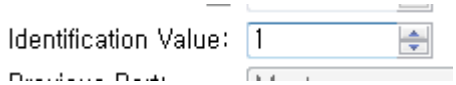



(1) To specify the slave identification method, select the [EtherCAT] tab from the slave screen and execute the Advanced Settings.

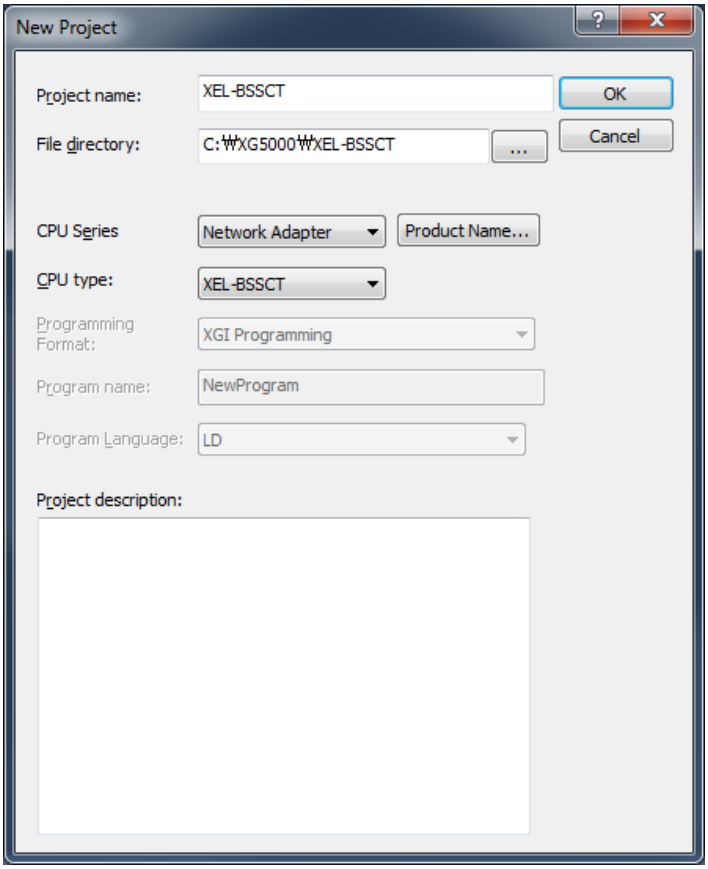
**11**

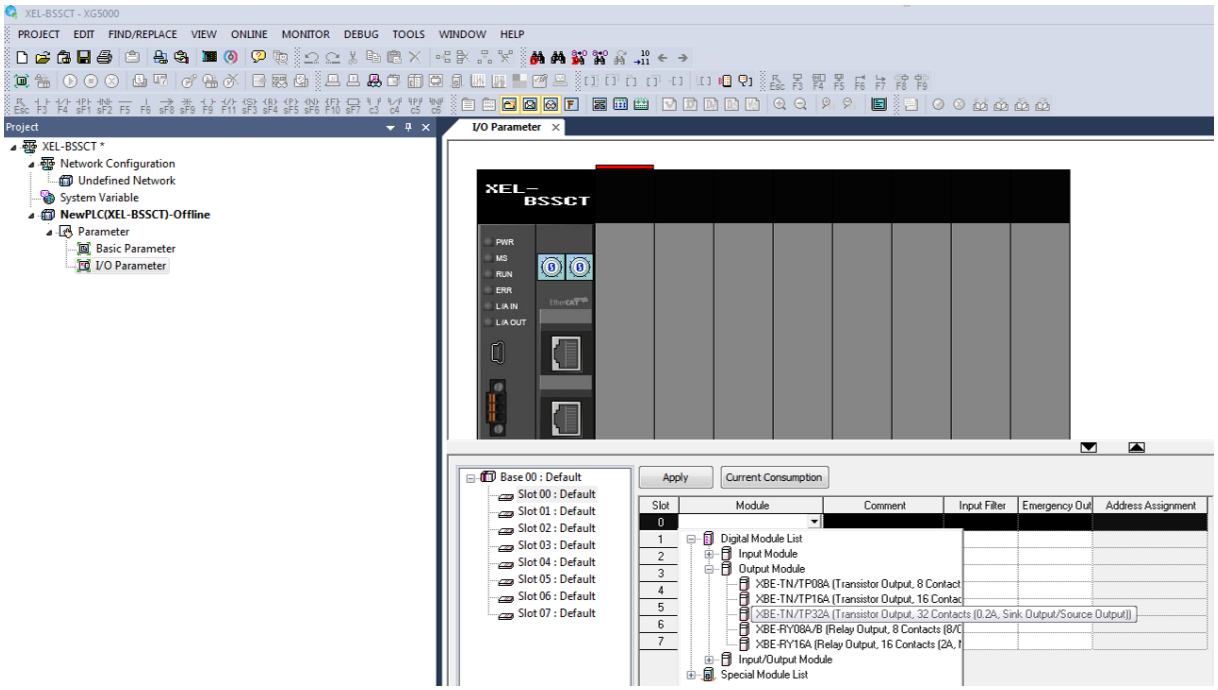
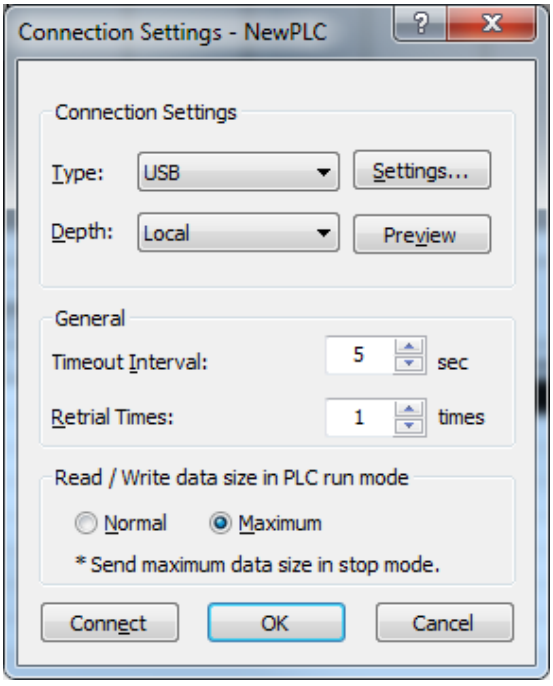



(1) Put a check mark on [Check Identification] from [General] → [Behavior].
(2) Select [Explicit Device Identification] from [General] → [Identification].

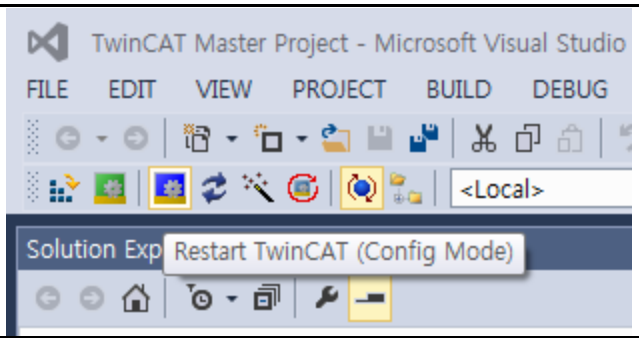
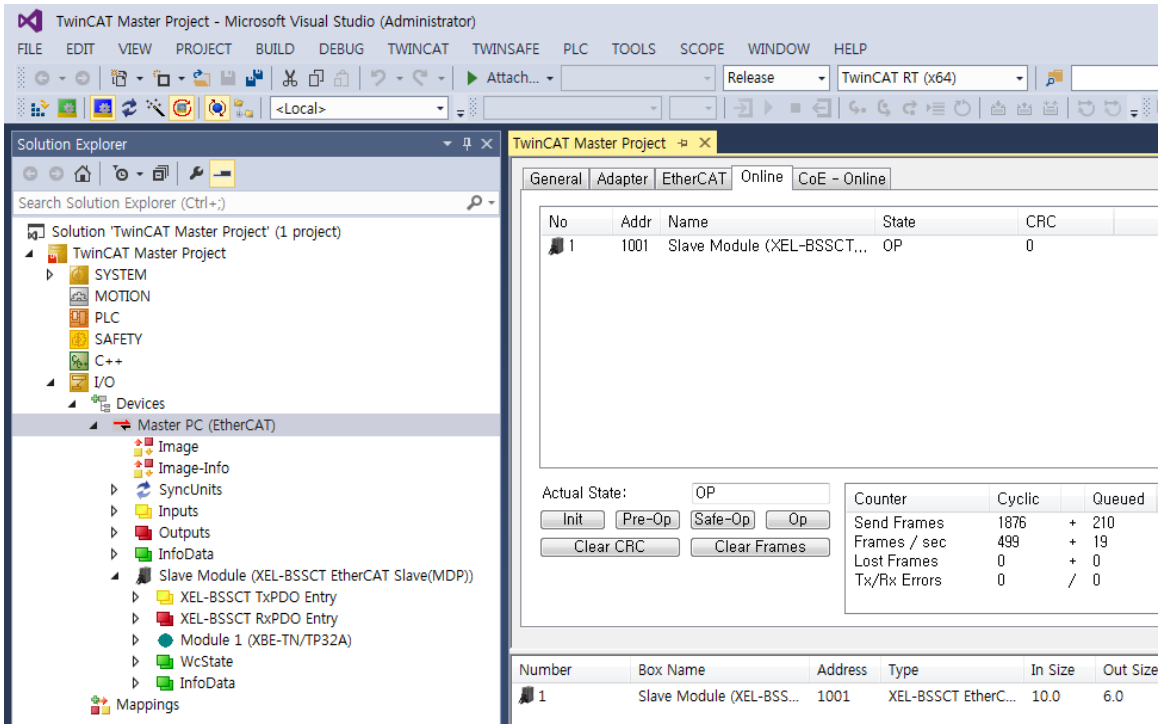
| | |
|---|---|
| 12 |  <br>  |
| | (1) After exiting from Step 11 above by pressing OK, enter 1 for Identification Value on the EtherCAT tab.<br>'1' is the rotary switch value set for the EtherCAT adapter.<br>(2) If the rotary switch value is different, enter the relevant value. |

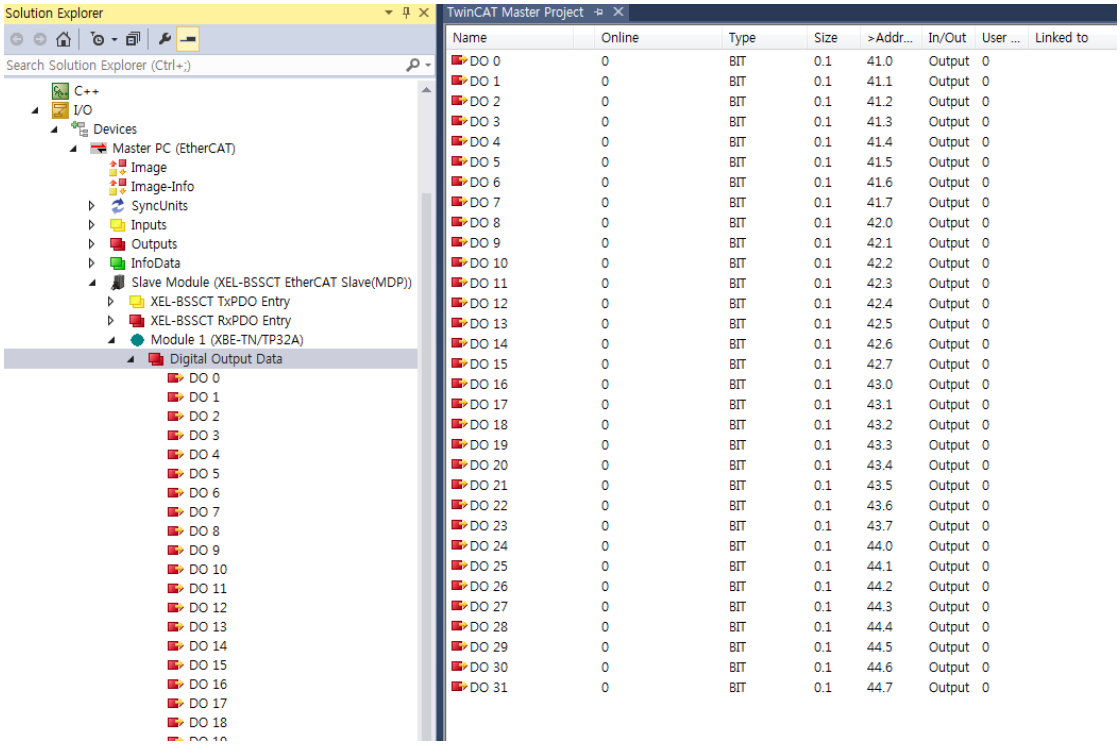
### 11.3.2 Setting of EtherCAT adapter slave

<table>
<tr><td rowspan="2">1</td><td> </td></tr>
<tr><td>(1) The EtherCAT adapter supports two identification methods.<br>(2) The rotary switch is used as the Explicit ID, and the station address set as the parameter is used as the Station Address.<br>(3) Since XMC only supports the Explicit ID, the station address should set to the rotary switch.<br>(4) Set 01 for the station address.</td></tr>
<tr><td rowspan="2">2</td><td> 
</td></tr>
<tr><td>(1) Execute XG5000.<br>(2) Select [Project] → [New project] from the top menu and create a new project of XEL-BSSCT.</td></tr>
</table>

| | |
|---|---|
| 3 |  <br>(1) Open the I/O parameter window and insert XBE-TN32A into No. 0 slot. |
| 4 |  <br>(1) Connect to the master using XG5000 in order to write the set parameters on the master.<br>(2) Select [Online] → [Connection Settings] from the menu bar and set [USB] and [Local] for the connection option.<br>(3) When the setting has been completed, connect to XEL-BSSCT by pressing Connect.<br>(4) Write the parameter by pressing [Online] → [Write]. |
| 5 | (1) If additional setting of EtherCAT slave is necessary according to the user's needs, connect the USB cable to the EtherCAT adapter, connect to the XG5000 and carry out setting. In this example, the network configuration is available without separate XG5000 connection and setting, you just need to proceed continuously according to the example. |

### 11.3.3 Connection

| | |
|---|---|
| 1 |  |
| | (1) Execute Restart TwinCAT from TwinCAT. |
| 2 |  |
| | (2) Check if both the master and the slave are in OP state. |

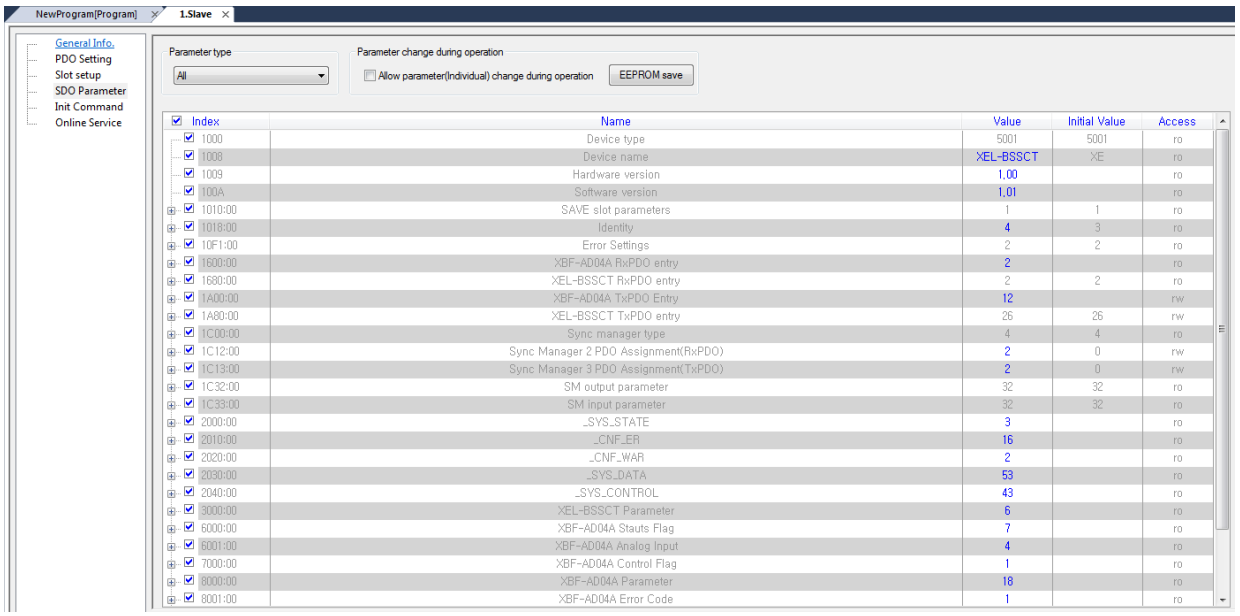
| | |
|---|---|
| 3 |  |
| | (3) In order to check the operation, select RxPDO of the relevant slot, set ‘ON’ for any bit and check if the bit is actually outputted. |

## 11.4 Example of parameter setting through SDO

This is an example of changing a parameter of the extension module through the SDO service.
In this example, an explanation of an example to change the parameter through XMC-E32A is provided.

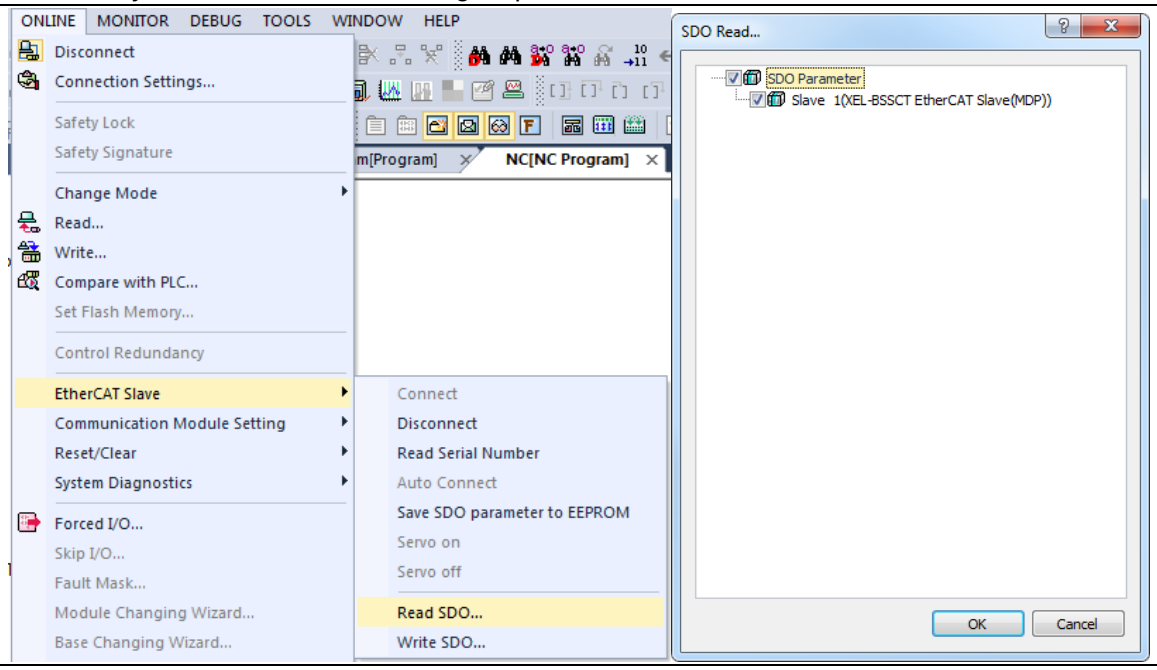
### 11.4.1 Reading the current parameter

**1**

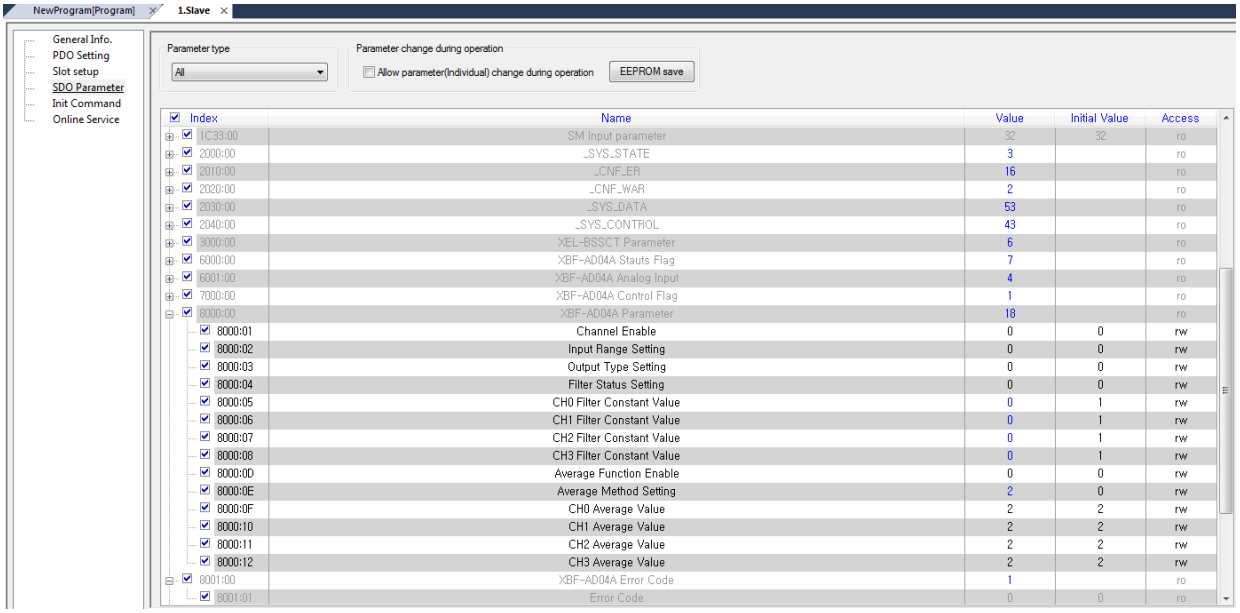



(1) Open [slave] from the master project and check [SDO parameter].
(2) It increases by 10 from index 8000, indicating the parameter of each slot.

**2**

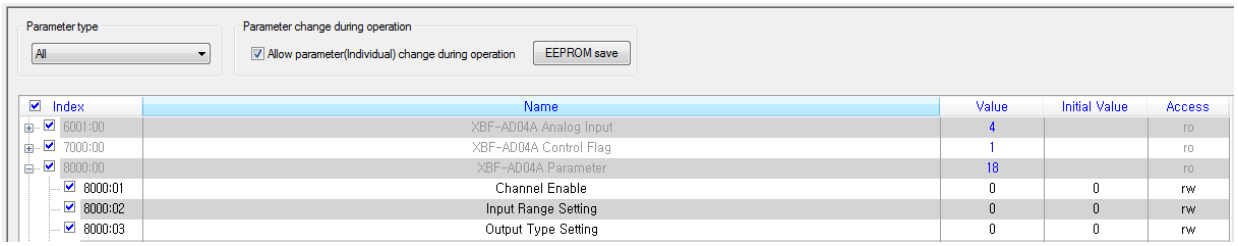



(1) Select [Online] → [EtherCAT slave] → [Read SDO...] from the top menu.

| | |
|---|---|
| 3 |  <br>(1) When reading is completed, the current parameter value on the non-volatile memory for the whole extension will be read. |

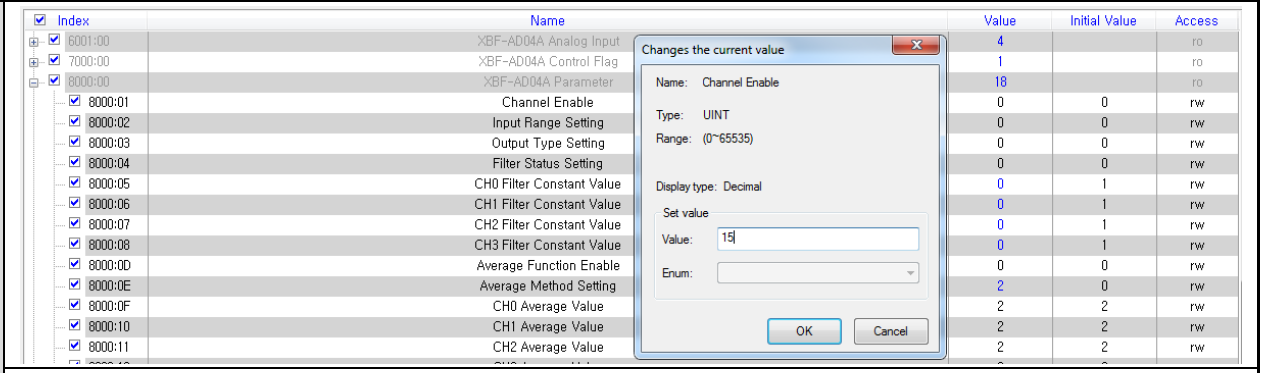
## 11.4.2 Writing a parameter

**1**



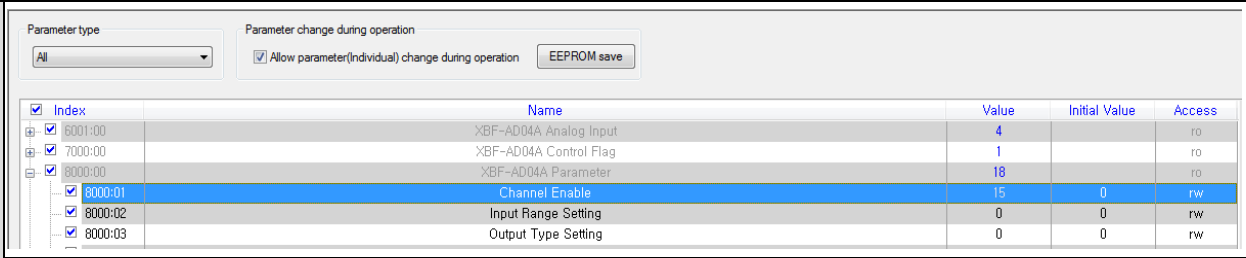

(1) In order to change each parameter separately, put a check mark on Allow parameter (Individual) change during operation.

**2**



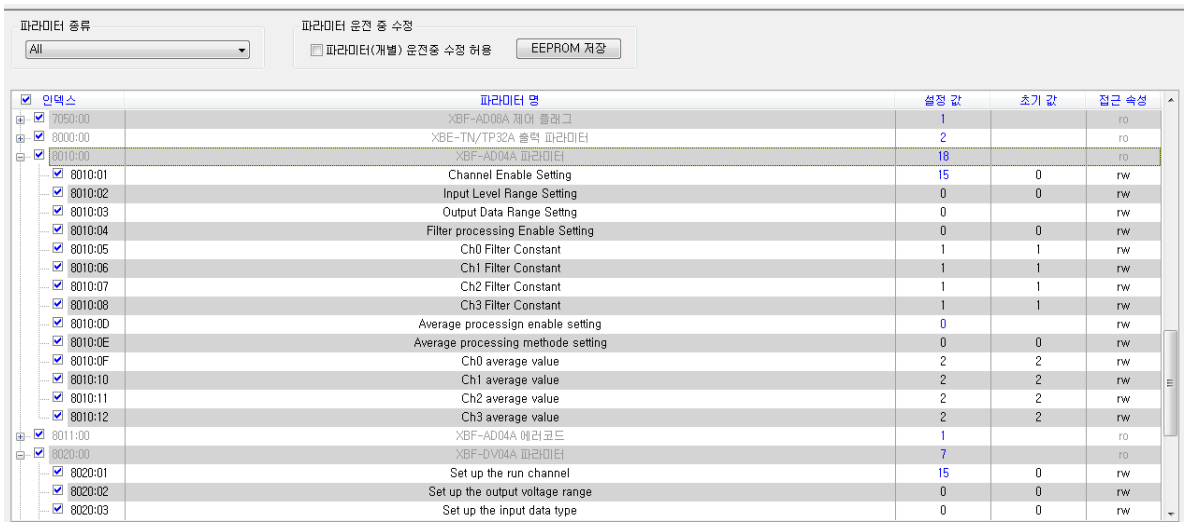

(1) Change the parameter to enable all channels of the XBF-AD04A.
(2) Double click the relevant parameter and enter a decimal number.

**3**

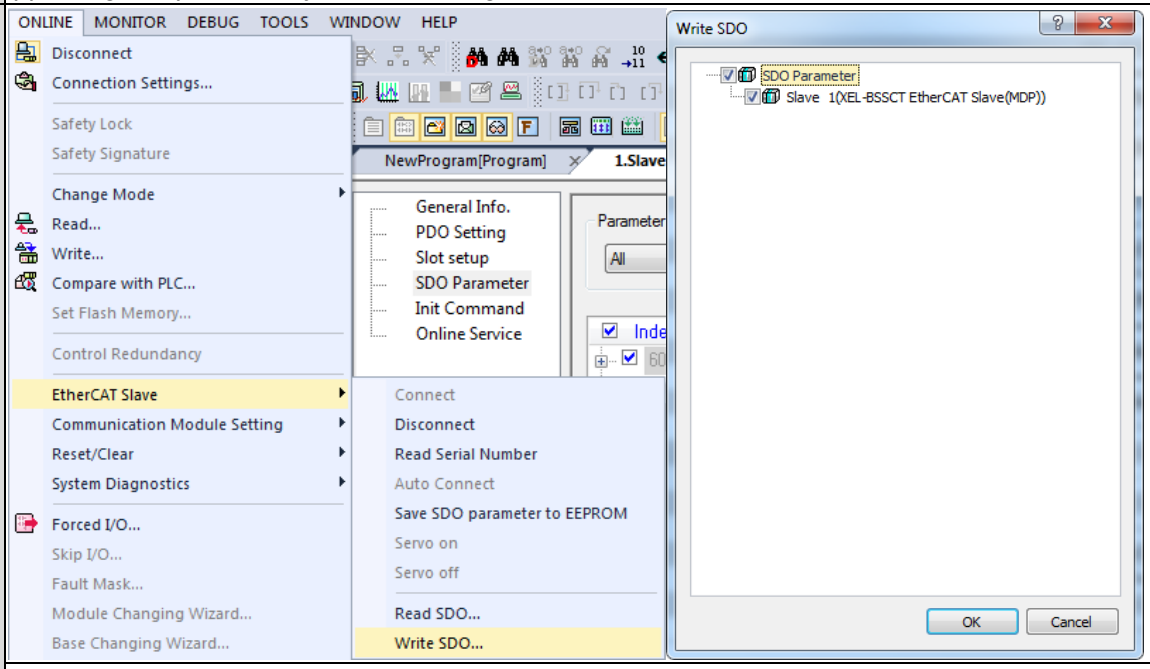



(1) The parameter has been changed to 15, and when the parameter is read in the same way with 11.4.1, 15 will be read.
(2) However, the current parameter is saved in volatile memory, so when the EtherCAT adapter is rebooted, all changed parameters will become volatile.

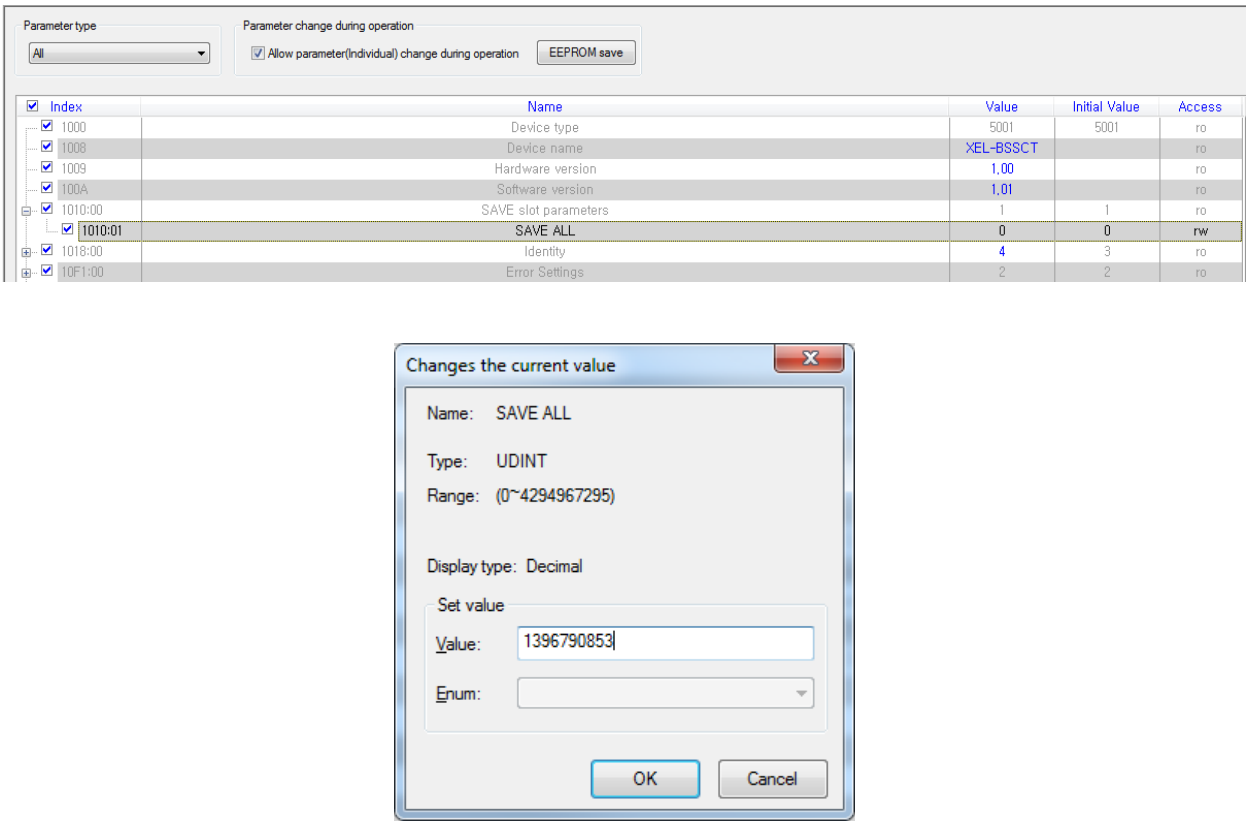
**4**




(1) If you wish to set a number of parameters of the parameter or a number of modules of parameter together,

| | |
|---|---|
| | deselect [Allow parameter (Individual) change during operation].<br>(2) Change the parameters you wish to change. |
| 5 |  |
| | (1) After setting the parameters, execute [Online] → [EtherCAT slave] → [Write SDO...] from the top menu.<br>(2) The relevant parameters are also saved in the volatile area, so when the EtherCAT adapter is rebooted, all parameters will become volatile. |

### 11.4.3 Saving a parameter permanently

| | |
|---|---|
| 1 |  |
| | (1) This is the method to move to a parameter saved in the volatile area to the non-volatile area and save it permanently.<br>(2) Put a check mark on [Allow Edit of Parameter (Separate) Active].<br>(3) Enter ‘save’ or ‘SAVE’ on the SAVE ALL parameter in the index 1010 area.<br>(4) Since a character cannot be entered, enter ‘1396790853’ as a decimal value.<br>(5) Now, if you reboot the EtherCAT adapter, the changed parameter value will be backed up and read permanently. |

# Appendix 1 List of Flags

| Word | Bit | Variable | Function | Description |
|---|---|---|---|---|
| %FW0~1 | %FD0 | _SYS_STATE | State | Indicates the state of PLC. |
| | %FX0 | _RUN | RUN | Indicates the Run state. |
| | %FX1 | _STOP | STOP | Indicates the Stop state. |
| | %FX2 | _ERROR | ERROR | Indicates the Error state. |
| %FW2~3 | %FD1 | _CNF_ER | System error | Reports the critical error state of system. |
| | %FX33 | _IO_TYER | Module type error | Module type does not match. |
| | %FX34 | _IO_DEER | Module detachment error | The module has been detached. |
| | %FX36 | _IO_RWER | Module I/O error | A problem has occurred in module I/O. |
| | %FX37 | _IP_IFER | Module interface error | A problem has occurred in special and communication module interface. |
| | %FX40 | _BPRM_ER | Basic parameter | The basic parameter is abnormal. |
| | %FX41 | _IOPRM_ER | IO parameter | IO configuration parameter is abnormal. |
| | %FX42 | _SPPRM_ER | Special module parameter | The special module parameter is abnormal. |
| | %FX46 | _SWDT_ER | Abnormal termination or failure of CPU | Abnormal failure has occurred in CPU. |
| | %FX53 | _IO_OVER_ER | Extension module excess | The number of extension modules that can be mounted has been exceeded. |
| %FW4~5 | %FD2 | _CNF_WAR | System warning | Reports the light error state of the system. |
| | %FX92 | _CONSTANT_ER | Refresh time excess warning | The processing time is longer than the refresh time. |
| %FW8 | - | _CPU_TYPE | CPU Type | Indicates information regarding the CPU type. |
| %FD5 | | _OS_VER_PATCH | OS version | Indicates OS version. |
| %FD6 | - | _OS_DATE | OS Date | Indicates OS distribution date. |
| %FW14 | - | _SCAN_MAX | Maximum scan time | Indicates the maximum scan time. |
| %FW15 | - | _SCAN_MIN | Minimum scan time | Indicates the minimum scan time. |
| %FW16 | - | _SCAN_CUR | Current scan time | Indicates the current scan time. |
| %FW17 | | _IO_TYER_N | Mismatched slot | Indicates slot No. where module type mismatch has occurred |
| %FW18 | - | _IO_DEER_N | Detached slot | Indicates slot No. where the module detachment has occurred |
| %FW20 | - | _IO_RWER_N | RW error slot | Indicates slot No. where the module read/write error has occurred |
| %FW21 | - | _IP_IFER_N | IF error slot | Indicates slot No. where the module interface error has occurred |
| %FW22 | - | _IO_TYERR | Module type mismatch error | Indicates module type mismatch error. |
| %FW46 | - | _IO_RWER0 | Module RW 0 error | Main base module read/write error |
| %FW54 | - | _IO_IFER_0 | Module IF 0 error | Main base module interface error |
| %FD53 | - | _REF_COUNT | Refresh | Increase when the module refresh is executed. |
| %FD54 | - | _H_REF_ERR_CNT | Abnormal execution of refresh | Increase when the refresh is executed abnormally. |
| %FD55 | - | _H_REF_LIM_CNT | Refresh timeout | Increase in case of refresh timeout |
| %FD56 | - | _REF_NG_CNT | Refresh NG | Increase when the module refresh is abnormal. |
| %FD57 | - | _REF_OK_CNT | Refresh OK | Increase when the module refresh is normal. |
| %FD62 | - | _REFRESH_TIME | Refresh time | Refresh time count setting value |
| %FW142 | - | _EXPLICIT_ID_NUM | Rotary switch value | Explicit ID setting value |

| Word | Bit | Variable | Function | Description |
|---|---|---|---|---|
| %FW143 | - | _EEPROM_STATUS | EEPROM status information | Indicates EEPROM status information |
| | %FX2288 | _EEPROM_RECOVERY_MODE | EEPROM mode setting | Indicates that the EEPROM recovery mode is enabled. |
| | %FX2289 | _EEPROM_RECOVERY_EXECUTED | Execution of EEPROM recovery | Indicates whether or not to execute EEPROM recovery |
| | %FX2290 | _EEPROM_PRIMARY_DATA_ERR | EEPROM primary data | Indicates EEPROM primary data error |
| | %FX2291 | _EEPROM_GENERAL_DATA_ERR | EEPROM general data | Indicates EEPROM general data error |
| | %FX2292 | _EEPROM_CRC_DATA_ERR | EEPROM CRC data | Indicates EEPROM CRC data error |
| %FW144 | - | _USER_WRITE_F | Enables the writing of program | Contact point available in the program |
| | FX2305 | _REFRESH_WR | Initialization of the scan value | Scan value Initialization flag. |
| %FX2320 | | _PARAM_INIT_SLT_0 | Initialization of No. 0 slot parameter | Parameter initialization command flag |
| %FX2321 | | _PARAM_INIT_SLT_1 | Initialization of No. 1 slot parameter | Parameter initialization command flag |
| %FX2322 | | _PARAM_INIT_SLT_2 | Initialization of No. 2 slot parameter | Parameter initialization command flag |
| %FX2323 | | _PARAM_INIT_SLT_3 | Initialization of No. 3 slot parameter | Parameter initialization command flag |
| %FX2324 | | _PARAM_INIT_SLT_4 | Initialization of No. 4 slot parameter | Parameter initialization command flag |
| %FX2325 | | _PARAM_INIT_SLT_5 | Initialization of No. 5 slot parameter | Parameter initialization command flag |
| %FX2326 | | _PARAM_INIT_SLT_6 | Initialization of No. 6 slot parameter | Parameter initialization command flag |
| %FX2327 | - | _PARAM_INIT_SLT_7 | Initialization of No. 7 slot parameter | Parameter initialization command flag |
| %FX2336 | | _EXT_ERR_FLAG_0SLT | No. 0 slot error flag | Indicates the slot error |
| %FX2337 | | _EXT_ERR_FLAG_1SLT | No. 1 slot error flag | Indicates the slot error |
| %FX2338 | | _EXT_ERR_FLAG_2SLT | No. 2 slot error flag | Indicates the slot error |
| %FX2339 | | _EXT_ERR_FLAG_3SLT | No. 3 slot error flag | Indicates the slot error |
| %FX2340 | | _EXT_ERR_FLAG_4SLT | No. 4 slot error flag | Indicates the slot error |
| %FX2341 | | _EXT_ERR_FLAG_5SLT | No. 5 slot error flag | Indicates the slot error |
| %FX2342 | | _EXT_ERR_FLAG_6SLT | No. 6 slot error flag | Indicates the slot error |
| %FX2343 | | _EXT_ERR_FLAG_7SLT | No. 7 slot error flag | Indicates the slot error |
| %FD75 | - | _ADT_RESET | Adapter reset | Reset command flag |

# Appendix 2 List of Objects

## Appendix 2.1 List of Flag Objects

XEL-BSSCT provides flags that indicate the operation status of the adapter. The following table shows the flags of XEL-BSSCT.

| Index (hex) | SubIndex (hex) | Flag Name | Description | Type | R/W Property |
|---|---|---|---|---|---|
| 2000 | System Status | | | | |
| | 01 | _RUN | Status that data is updated through PDO | bit | R |
| | 02 | _STOP | Status that data is not updated through PDO | bit | R |
| | 03 | _ERROR | An adapter error has occurred. | bit | R |
| 2010 | System error (critical error) | | | | |
| | 02 | _IO_TYER | Module type mismatch error | bit | R |
| | 03 | _IO_DEER | Module detachment error | bit | R |
| | 05 | _IO_RWER | Read and write error of input and output modules (failure) | bit | R |
| | 06 | _IP_IFER | Special/communication module interface error (failure) | bit | R |
| | 08 | _BPRM_ER | Basic parameter error | bit | R |
| | 09 | _IOPRM_ER | IO configuration parameter error | bit | R |
| | 0A | _SPPRM_ER | Special module parameter error | bit | R |
| | 0B | _CPPRM_ER | Communication module parameter error | bit | R |
| | 0D | _SWDT_ER | Abnormal termination or failure of CPU | bit | R |
| | 10 | _IOSIZE_ER | Maximum extension module excess error | bit | R |
| 2020 | System warning | | | | |
| | 02 | _REFRESH_OT_WAR | Refresh time excess warning | bit | R |
| 2030 | System status data | | | | |
| | 02 | _CPU_TYPE | CPU type information | word | R |
| | 03 | _CPU_VER | CPU version No. | word | R |
| | 04 | _OS_VER_PATCH | OS Patch Version | dword | R |
| | 05 | _OS_DATE | OS Date | dword | R |
| | 06 | _REFRESH_MAX | Maximum refresh time | word | R |
| | 07 | _REFRESH_MIN | Minimum refresh time | word | R |
| | 08 | _REFRESH_CUR | Current refresh time | word | R |
| | 09 | _IO_TYER_N | Slot No. where module type mismatch occurred | word | R |
| | 0A | _IO_DEER_N | Slot No. where module detachment occurred | word | R |
| | 0C | _IO_RWER_N | Slot No. where a read and write error of input and output modules occurred | word | R |
| | 0D | _IP_IFER_N | Slot No. where a special/communication module interface error (failure) occurred | word | R |
| | 25 | __H_REF_CNT | Increase when the module refresh is executed. | UDINT | R |
| | 26 | __H_REF_ERR_CNT | Increase when the module refresh is carried out | UDINT | R |

| | | | | | |
|---|---|---|---|---|---|
| | | | abnormally. | | |
| | 27 | __H_REF_LIM_CNT | Increase when the module refresh is carried out abnormally.<br>(TIME OUT) | UDINT | R |
| | 28 | __H_REF_NG_CNT | Increase when the module refresh is carried out abnormally. | UDINT | R |
| | 29 | __H_REF_OK_CNT | Increase when the module refresh is carried out normally. | UDINT | R |
| | 31 | _EXPLICIT_ID_NUMBER | Rotary switch station No. information (Explicit ID) | word | R |
| | 32 | _EEPROM_RECOVERY_MODE | EEPROM recovery mode is set. | bit | R |
| | 33 | _EEPROM_RECOVERY_EXECUTED | EEPROM recovery is executed. | bit | R |
| | 34 | _EEPROM_PRIMARY_DATA_ERR | Critical error of EEPROM data | bit | R |
| | 35 | _EEPROM_GENERAL_DATA_ERR | General error of EEPROM data | bit | R |
| | 36 | _EEPROM_CRC_DATA_ERR | EEPROM CRC data error | bit | R |
| 2040 | System control and extension module error status flag | | | | |
| | 02 | _REFRESH_WR | Refresh time has been initialized. | bit | R/W |
| | 03 | _DC_SYNC_COUNT_CLR | DC Sync count has been cleared. | bit | W |
| | 0A | _PARAM_INIT_SLT_0 | Slot 0 parameter has been initialized. | bit | R/W |
| | 0B | _PARAM_INIT_SLT_1 | Slot 1 parameter has been initialized. | bit | R/W |
| | 0C | _PARAM_INIT_SLT_2 | Slot 2 parameter has been initialized. | bit | R/W |
| | 0D | _PARAM_INIT_SLT_3 | Slot 3 parameter has been initialized | bit | R/W |
| | 0E | _PARAM_INIT_SLT_4 | Slot 4 parameter has been initialized. | bit | R/W |
| | 0F | _PARAM_INIT_SLT_5 | Slot 5 parameter has been initialized. | bit | R/W |
| | 10 | _PARAM_INIT_SLT_6 | Slot 6 parameter has been initialized. | bit | R/W |
| | 11 | _PARAM_INIT_SLT_7 | Slot 7 parameter has been initialized. | bit | R/W |
| | 1A | _EXT_ERR_FLAG_0SLT | Slot 0 error flag | bit | R |
| | 1B | _EXT_ERR_FLAG_1SLT | Slot 1 error flag | bit | R |
| | 1C | _EXT_ERR_FLAG_2SLT | Slot 2 error flag | bit | R |
| | 1E | _EXT_ERR_FLAG_3SLT | Slot 3 error flag | bit | R |
| | 1F | _EXT_ERR_FLAG_4SLT | Slot 4 error flag | bit | R |
| | 20 | _EXT_ERR_FLAG_5SLT | Slot 5 error flag | bit | R |
| | 21 | _EXT_ERR_FLAG_6SLT | Slot 6 error flag | bit | R |
| | 2B | _EXT_ERR_FLAG_7SLT | Slot 7 error flag | bit | R |

## Appendix 2.2 List of Parameter Objects

Extension modules including XEL-BSSCT have parameters for setting. For the detailed explanation of each parameter, refer to the user's manual of each parameter. The following are parameter objects.

**(1) XEL-BSSCT Parameter Objects**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 3000 | 01 | 01 | REFRESH_PERIOD_TIME | Refresh time (Multiples of DC Sync0 time) | 16 | R/W |
| | 02 | 02 | ERROR_MODE_OUTPUT_PARAMETER | Set hold of output from the digital output module in error status | 16 | R/W |
| | 03 | 03 | STANDARD_INPUT_FILTER_TIME | Standard input filter | 16 | R/W |
| | 05 | 05 | ETHERCAT_ALIAS_NUMBER | EtherCAT node address (parameter) | 16 | R/W |
| | 06 | 06 | EEPROM_RECOVERY_MODE | Recovery mode in case of EEPROM data error | 16 | R/W |

**(2) XBE-DC08A Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | Input Filter | Input filter | 16 | R/W |

**(3) XBE-DC16A/B Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | Input Filter | Input filter | 16 | R/W |

**(4) XBE-DC32A Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | Input Filter | Input filter | 16 | R/W |

**(5) XBE-TN/TP08A Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 02 | 02 | Emergency Out Mode | Output hold/disable setting | 16 | R/W |

**(6) XBE-TN/TP16A Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 02 | 02 | Emergency Out Mode | Output hold/disable setting | 16 | R/W |

**(7) XBE-TN/TP32A Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 02 | 02 | Emergency Out Mode | Output hold/disable setting | 16 | R/W |

**(8) XBE-RY08A/B Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 02 | 02 | Emergency Out Mode | Output hold/disable setting | 16 | R/W |

**(9) XBE-RY16A Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 02 | 02 | Emergency Out Mode | Output hold/disable setting | 16 | R/W |

**(10) XBE-DR16A Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | Input Filter | Input filter | 16 | R/W |
| | 02 | 02 | Emergency Out Mode | Output hold/disable setting | 16 | R/W |

**(11) XBE-DN32A Parameter Object**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | Input Filter | Input filter | 16 | R/W |
| | 02 | 02 | Emergency Out Mode | Output hold/disable setting | 16 | R/W |

**(12) XBF-AD04A**

**1) List of Parameter Objects**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Input Range Setting | Input range setting | 16 | R/W |
| | 03 | 03 | 2 | Output Type Setting | Output data type setting | 16 | R/W |
| | 04 | 04 | 3 | Filter Status Setting | Filter process setting | 16 | R/W |
| | 05 | 05 | 4 | Ch0 Filter Constant Value | Filter constant value setting for channel 0 | 16 | R/W |
| | 06 | 06 | 5 | Ch1 Filter Constant Value | Filter constant value setting for channel 1 | 16 | R/W |
| | 07 | 07 | 6 | Ch2 Filter Constant Value | Filter constant value setting for channel 2 | 16 | R/W |
| | 08 | 08 | 7 | Ch3 Filter Constant Value | Filter constant value setting for channel 3 | 16 | R/W |
| | 0D | 13 | 12 | Average Function Enable | Average process setting | 16 | R/W |
| | 0E | 14 | 13 | Average Method Setting | Average process method setting | 16 | R/W |
| | 0F | 15 | 14 | Ch0 Average Value | Average value setting for channel 0 | 16 | R/W |
| | 10 | 16 | 15 | Ch1 Average Value | Average value setting for channel 1 | 16 | R/W |
| | 11 | 17 | 16 | Ch2 Average Value | Average value setting for channel 2 | 16 | R/W |
| | 12 | 18 | 17 | Ch3 Average Value | Average value setting for channel 3 | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 22 | Error code | Error information | 16 | R |

**2) List of Parameter Settings**

<table>
<tr><th rowspan="2">Parameter Name</th><th colspan="16">Bit</th><th rowspan="2">Settings</th></tr>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>Channel Enable</td><td colspan="12">-</td><td>CH3</td><td>CH2</td><td>CH1</td><td>CH0</td><td>Bit Off (0): Stop<br>Bit On (1): Run</td></tr>
<tr><td>Input Range Setting</td><td colspan="8">-</td><td colspan="2">CH3</td><td colspan="2">CH2</td><td colspan="2">CH1</td><td colspan="2">CH0</td><td>00: 0 ~ 10V(4 ~ 20mA)<br>01: 0 ~ 20mA<br>10: 4 ~ 20mA</td></tr>
<tr><td>Output Type Setting</td><td colspan="8">-</td><td colspan="2">CH3</td><td colspan="2">CH2</td><td colspan="2">CH1</td><td colspan="2">CH0</td><td>00: 0 ~ 4000<br>01: -2000 ~ 2000<br>10: Precise value<br>11: 0 ~ 1000<br>- in case of precise value<br>0 ~ 10V: 0 ~ 1000<br>4 ~ 20 ㎃: 400 ~ 2000<br>0 ~ 20 ㎃: 0 ~ 2000</td></tr>
<tr><td>Filter Status Setting</td><td colspan="12">-</td><td>CH3</td><td>CH2</td><td>CH1</td><td>CH0</td><td>Bit On (1): Filter used<br>Bit Off (0): Filter not used</td></tr>
<tr><td>Ch0 Filter Constant Value</td><td colspan="16">CH0</td><td rowspan="4">Filter Constant: 1~99</td></tr>
<tr><td>Ch1 Filter Constant Value</td><td colspan="16">CH1</td></tr>
<tr><td>Ch2 Filter Constant Value</td><td colspan="16">CH2</td></tr>
<tr><td>Ch3 Filter Constant Value</td><td colspan="16">CH3</td></tr>
<tr><td>Average Function Enable</td><td colspan="12">-</td><td>CH3</td><td>CH2</td><td>CH1</td><td>CH0</td><td>Bit Off (0): Average not used<br>Bit On (1): Average used</td></tr>
<tr><td>Average Method Setting</td><td colspan="8">-</td><td colspan="2">CH3</td><td colspan="2">CH2</td><td colspan="2">CH1</td><td colspan="2">CH0</td><td>00: Count average<br>01: Time average</td></tr>
<tr><td>Ch0 Average Value</td><td colspan="16">CH0</td><td rowspan="4">In case of count average: 2~64000<br>In case of time average: 4~16000</td></tr>
<tr><td>Ch1 Average Value</td><td colspan="16">CH1</td></tr>
<tr><td>Ch2 Average Value</td><td colspan="16">CH2</td></tr>
<tr><td>Ch3 Average Value</td><td colspan="16">CH3</td></tr>
<tr><td>Error code</td><td colspan="16">-</td><td>0: Normal operation<br>50#: Filter constant value setting range exceeded<br>60#: Time average setting range exceeded<br>70#: Count average setting range exceeded<br>80# Analog input range setting error</td></tr>
</table>

**(13) XBF-AD08A**

**1) List of Parameter Objects**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Input Range Setting (Ch0~Ch3) | Input range setting (Channel 0 ~ Channel 3) | 16 | R/W |
| | 03 | 03 | 2 | Input Range Setting (Ch4~Ch7) | Input range setting (Channel 4 ~ Channel 7) | 16 | R/W |
| | 04 | 04 | 3 | Output Type Setting | Output data type setting | 16 | R/W |
| | 05 | 05 | 4 | Ch0 Filter Constant Value | Filter constant value setting for channel 0 | 16 | R/W |
| | 06 | 06 | 5 | Ch1 Filter Constant Value | Filter constant value setting for channel 1 | 16 | R/W |
| | 07 | 07 | 6 | Ch2 Filter Constant Value | Filter constant value setting for channel 2 | 16 | R/W |
| | 08 | 08 | 7 | Ch3 Filter Constant Value | Filter constant value setting for channel 3 | 16 | R/W |
| | 09 | 09 | 8 | Ch4 Filter Constant Value | Filter constant value setting for channel 4 | 16 | R/W |
| | 0A | 10 | 9 | Ch5 Filter Constant Value | Filter constant value setting for channel 5 | 16 | R/W |
| | 0B | 11 | 10 | Ch6 Filter Constant Value | Filter constant value setting for channel 6 | 16 | R/W |
| | 0C | 12 | 11 | Ch7 Filter Constant Value | Filter constant value setting for channel 7 | 16 | R/W |
| | 0D | 13 | 12 | Average Method Setting | Average process method setting | 16 | R/W |
| | 0E | 14 | 13 | Ch0 Average Value | Average value setting for channel 0 | 16 | R/W |
| | 0F | 15 | 14 | Ch1 Average Value | Average value setting for channel 1 | 16 | R/W |
| | 10 | 16 | 15 | Ch2 Average Value | Average value setting for channel 2 | 16 | R/W |
| | 11 | 17 | 16 | Ch3 Average Value | Average value setting for channel 3 | 16 | R/W |
| | 12 | 18 | 17 | Ch4 Average Value | Average value setting for channel 4 | 16 | R/W |
| | 13 | 19 | 18 | Ch5 Average Value | Average value setting for channel 5 | 16 | R/W |
| | 14 | 20 | 19 | Ch6 Average Value | Average value setting for channel 6 | 16 | R/W |
| | 15 | 21 | 20 | Ch7 Average Value | Average value setting for channel 7 | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 21 | Error code | Error information | 16 | R |

**2) List of Parameter Settings**

<table>
<tr><th rowspan="2">Parameter Name</th><th colspan="16">Bit</th><th rowspan="2">Settings</th></tr>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>Channel Enable</td><td colspan="8">-</td><td>CH7</td><td>CH6</td><td>CH5</td><td>CH4</td><td>CH3</td><td>CH2</td><td>CH1</td><td>CH0</td><td>Bit Off (0): Stop<br>Bit On (1): Run</td></tr>
<tr><td>Input Range Setting (Ch0~Ch3)</td><td colspan="4">CH3</td><td colspan="4">CH2</td><td colspan="4">CH1</td><td colspan="4">CH0</td><td rowspan="2">0000 : 4 ~ 20 ㎃<br>0001 : 0 ~ 20 ㎃<br>0010 : 1 ~ 5 V<br>0011 : 0 ~ 5 V<br>0100 : 0 ~ 10 V</td></tr>
<tr><td>Input Range Setting (Ch4~Ch7)</td><td colspan="4">CH7</td><td colspan="4">CH6</td><td colspan="4">CH5</td><td colspan="4">CH4</td></tr>
<tr><td>Output Type Setting</td><td colspan="2">CH7</td><td colspan="2">CH6</td><td colspan="2">CH5</td><td colspan="2">CH4</td><td colspan="2">CH3</td><td colspan="2">CH2</td><td colspan="2">CH1</td><td colspan="2">CH0</td><td>00 : 0 ~ 4000<br>01 : -2000 ~ 2000<br>10 : Precise value<br>11 : 0 ~ 1000<br>- in case of precise value<br>4 ~ 20 ㎃: 400 ~ 2000<br>0 ~ 20 ㎃: 0 ~ 2000<br>1 ~ 5 V: 100 ~ 500<br>0 ~ 5 V: 0 ~ 500<br>0 ~ 10 V: 0 ~ 1000</td></tr>
<tr><td>Ch0 Filter Constant Value</td><td colspan="16">CH0</td><td rowspan="8">Filter Constant: 0, 4~64000</td></tr>
<tr><td>Ch1 Filter Constant Value</td><td colspan="16">CH1</td></tr>
<tr><td>Ch2 Filter Constant Value</td><td colspan="16">CH2</td></tr>
<tr><td>Ch3 Filter Constant Value</td><td colspan="16">CH3</td></tr>
<tr><td>Ch4 Filter Constant Value</td><td colspan="16">CH4</td></tr>
<tr><td>Ch5 Filter Constant Value</td><td colspan="16">CH5</td></tr>
<tr><td>Ch6 Filter Constant Value</td><td colspan="16">CH6</td></tr>
<tr><td>Ch7 Filter Constant Value</td><td colspan="16">CH7</td></tr>
<tr><td>Average Method Setting</td><td colspan="2">CH7</td><td colspan="2">CH6</td><td colspan="2">CH5</td><td colspan="2">CH4</td><td colspan="2">CH3</td><td colspan="2">CH2</td><td colspan="2">CH1</td><td colspan="2">CH0</td><td>00: Sampling process<br>01: Time average process<br>10: Count average process<br>11: Moving average process</td></tr>
<tr><td>Ch0 Average Value</td><td colspan="16">CH0</td><td rowspan="8">Time average: 4 ~ 16000 [ms]<br>Count average: 2 ~ 64000 [Count]<br>Moving average: 2 ~ 100 [EA]</td></tr>
<tr><td>Ch1 Average Value</td><td colspan="16">CH1</td></tr>
<tr><td>Ch2 Average Value</td><td colspan="16">CH2</td></tr>
<tr><td>Ch3 Average Value</td><td colspan="16">CH3</td></tr>
<tr><td>Ch4 Average Value</td><td colspan="16">CH4</td></tr>
<tr><td>Ch5 Average Value</td><td colspan="16">CH5</td></tr>
<tr><td>Ch6 Average Value</td><td colspan="16">CH6</td></tr>
<tr><td>Ch7 Average Value</td><td colspan="16">CH7</td></tr>
<tr><td>Error code</td><td colspan="16">-</td><td>0: Normal operation<br>10#: Channel range setting error<br>20#: Channel filter value setting error<br>30#: Average value setting error</td></tr>
</table>

### (14) XBF-AD04C

#### 1) List of Parameter Objects

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Input Range Setting | Input range setting | 16 | R/W |
| | 04 | 04 | 3 | Output Type Setting | Output data type setting | 16 | R/W |
| | 05 | 05 | 4 | Ch0 Filter Constant Value | Filter constant value setting for channel 0 | 16 | R/W |
| | 06 | 06 | 5 | Ch1 Filter Constant Value | Filter constant value setting for channel 1 | 16 | R/W |
| | 07 | 07 | 6 | Ch2 Filter Constant Value | Filter constant value setting for channel 2 | 16 | R/W |
| | 08 | 08 | 7 | Ch3 Filter Constant Value | Filter constant value setting for channel 3 | 16 | R/W |
| | 0D | 13 | 12 | Average Method Setting | Average process setting | 16 | R/W |
| | 0E | 14 | 13 | Ch0 Average Value | Average value setting for channel 0 | 16 | R/W |
| | 0F | 15 | 14 | Ch1 Average Value | Average value setting for channel 1 | 16 | R/W |
| | 10 | 16 | 15 | Ch2 Average Value | Average value setting for channel 2 | 16 | R/W |
| | 11 | 17 | 16 | Ch3 Average Value | Average value setting for channel 3 | 16 | R/W |
| | 16 | 22 | 21 | Hold Last Value | Valid converted value hold setting | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 22 | Error code | Error information | 16 | R |

**2) List of Parameter Settings**

<table>
<tr><th rowspan="2">Parameter Name</th><th colspan="16">Bit</th><th rowspan="2">Settings</th></tr>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>Channel Enable</td><td colspan="12">-</td><td>CH3</td><td>CH2</td><td>CH1</td><td>CH0</td><td>Bit Off (0): Stop<br>Bit On (1): Run</td></tr>
<tr><td>Input Range Setting</td><td colspan="3">CH3</td><td colspan="3">CH2</td><td colspan="4">CH1</td><td colspan="4">CH0</td><td>0000 : 4 ~ 20 ㎃<br>0001 : 0 ~ 20 ㎃<br>0010 : 1 ~ 5 V<br>0011 : 0 ~ 5 V<br>0100 : 0 ~ 10 V<br>0101 : -10 ~ 10V</td></tr>
<tr><td>Output Type Setting</td><td colspan="8">-</td><td colspan="2">CH3</td><td colspan="2">CH2</td><td colspan="2">CH1</td><td colspan="2">CH0</td><td>00: 0 ~ 16000<br>01: -8000 ~ 8000<br>10: Precise value<br>11: 0 ~ 10000<br>- in case of precise value<br>4 ~ 20 ㎃: 4000 ~ 20000<br>0 ~ 20 ㎃: 0 ~ 20000<br>1 ~ 5V : 1000 ~ 5000<br>0 ~ 5V : 0 ~ 5000<br>0 ~ 10V : 0 ~ 10000<br>-10 ~ 10V : -10000 ~ 10000</td></tr>
<tr><td>Ch0 Filter Constant Value</td><td colspan="16">CH0</td><td rowspan="4">Filter Constant: 0, 4 ~ 64000[㎳]</td></tr>
<tr><td>Ch1 Filter Constant Value</td><td colspan="16">CH1</td></tr>
<tr><td>Ch2 Filter Constant Value</td><td colspan="16">CH2</td></tr>
<tr><td>Ch3 Filter Constant Value</td><td colspan="16">CH3</td></tr>
<tr><td>Average Method Setting</td><td colspan="8">-</td><td colspan="2">CH3</td><td colspan="2">CH2</td><td colspan="2">CH1</td><td colspan="2">CH0</td><td>00: Sampling process<br>01: Time average process<br>10: Count average process</td></tr>
<tr><td>Ch0 Average Value</td><td colspan="16">CH0</td><td rowspan="4">Time average: 4~16000[㎳]<br>In case of count average: 2~64000[Count]</td></tr>
<tr><td>Ch1 Average Value</td><td colspan="16">CH1</td></tr>
<tr><td>Ch2 Average Value</td><td colspan="16">CH2</td></tr>
<tr><td>Ch3 Average Value</td><td colspan="16">CH3</td></tr>
<tr><td>Hold Last Value</td><td colspan="12">-</td><td>CH3</td><td>CH2</td><td>CH1</td><td>CH0</td><td>Bit Off (0): Stop<br>Bit On (1): Enable</td></tr>
<tr><td>Error code</td><td colspan="16">-</td><td>0: Normal operation<br>10#: Channel range setting error<br>20#: Channel filter value setting error<br>30#: Average value setting error</td></tr>
</table>

### (15) XBF-DV04A

#### 1) List of Parameter Objects

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Output Range Setting | Output range setting | 16 | R/W |
| | 03 | 03 | 2 | Input Type Setting | Input data type setting | 16 | R/W |
| | 04 | 04 | 3 | CH0 Output Type Setting | Output status setting for channel 0 | 16 | R/W |
| | 05 | 05 | 4 | CH1 Output Type Setting | Output status setting for channel 1 | 16 | R/W |
| | 06 | 06 | 5 | CH2 Output Type Setting | Output status setting for channel 2 | 16 | R/W |
| | 07 | 07 | 6 | CH3 Output Type Setting | Output status setting for channel 3 | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 11 | CH0 Error Code | Error information of channel 0 | 16 | R |
| | 02 | 02 | 12 | CH1 Error Code | Error information of channel 1 | 16 | R |
| | 03 | 03 | 13 | CH2 Error Code | Error information of channel 2 | 16 | R |
| | 04 | 04 | 14 | CH3 Error Code | Error information of channel 3 | 16 | R |

#### 2) List of Parameter Settings

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| Output Range Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00 : 0 ~ 10V |
| Input Type Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 0 ~ 4000<br>01: -2000 ~ 2000<br>10: 0 ~ 1000<br>11: 0 ~ 1000 |
| CH0 Output Type Setting | - | | | | | | | | | | | | | | CH0 | | 00: Output the previous value<br>01: Output the minimum value<br>10: Output the middle value<br>11: Output the maximum value |
| CH1 Output Type Setting | - | | | | | | | | | | | | | | CH1 | | |
| CH2 Output Type Setting | - | | | | | | | | | | | | | | CH2 | | |
| CH3 Output Type Setting | - | | | | | | | | | | | | | | CH3 | | |
| CH0 Error Code | CH0 | | | | | | | | | | | | | | | | 0: Normal operation<br>31#: Parameter range excess error<br>41#: Digital input value range excess error |
| CH1 Error Code | CH1 | | | | | | | | | | | | | | | | |
| CH2 Error Code | CH2 | | | | | | | | | | | | | | | | |
| CH3 Error Code | CH3 | | | | | | | | | | | | | | | | |

**(16) XBF-DC04A**

**1) List of Parameter Objects**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Output Range Setting | Output range setting | 16 | R/W |
| | 03 | 03 | 2 | Input Type Setting | Input data type setting | 16 | R/W |
| | 04 | 04 | 3 | CH0 Output Type Setting | Output status setting for channel 0 | 16 | R/W |
| | 05 | 05 | 4 | CH1 Output Type Setting | Output status setting for channel 1 | 16 | R/W |
| | 06 | 06 | 5 | CH2 Output Type Setting | Output status setting for channel 2 | 16 | R/W |
| | 07 | 07 | 6 | CH3 Output Type Setting | Output status setting for channel 3 | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 11 | CH0 Error Code | Error information of channel 0 | 16 | R |
| | 02 | 02 | 12 | CH1 Error Code | Error information of channel 1 | 16 | R |
| | 03 | 03 | 13 | CH2 Error Code | Error information of channel 2 | 16 | R |
| | 04 | 04 | 14 | CH3 Error Code | Error information of channel 3 | 16 | R |

**2) List of Parameter Settings**

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| Output Range Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00 : 4 ~ 20㎃<br>01 : 0 ~ 20㎃ |
| Input Type Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 0 ~ 4000<br>01: -2000 ~ 2000<br>10: Precise value<br>11: 0 ~ 1000<br>- in case of precise value<br>4 ~ 20 ㎃: 400 ~ 2000<br>0 ~ 20 ㎃: 0 ~ 2000 |
| CH0 Output Type Setting | - | | | | | | | | | | | | | | CH0 | | 00: Output the previous value<br>01: Output the minimum value<br>10: Output the middle value<br>11: Output the maximum value |
| CH1 Output Type Setting | - | | | | | | | | | | | | | | CH1 | | |
| CH2 Output Type Setting | - | | | | | | | | | | | | | | CH2 | | |
| CH3 Output Type Setting | - | | | | | | | | | | | | | | CH3 | | |
| CH0 Error Code | CH0 | | | | | | | | | | | | | | | | 0: Normal operation<br>31#: Parameter range excess error<br>41#: Digital input value range excess error |
| CH1 Error Code | CH1 | | | | | | | | | | | | | | | | |
| CH2 Error Code | CH2 | | | | | | | | | | | | | | | | |
| CH3 Error Code | CH3 | | | | | | | | | | | | | | | | |

### (17) XBF-DC04B

#### 1) List of Parameter Objects

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Output Range Setting | Output range setting | 16 | R/W |
| | 03 | 03 | 2 | Input Type Setting | Input data type setting | 16 | R/W |
| | 04 | 04 | 3 | CH0 Output Type Setting | Output status setting for channel 0 | 16 | R/W |
| | 05 | 05 | 4 | CH1 Output Type Setting | Output status setting for channel 1 | 16 | R/W |
| | 06 | 06 | 5 | CH2 Output Type Setting | Output status setting for channel 2 | 16 | R/W |
| | 07 | 07 | 6 | CH3 Output Type Setting | Output status setting for channel 3 | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 11 | CH0 Error Code | Error information of channel 0 | 16 | R |
| | 02 | 02 | 12 | CH1 Error Code | Error information of channel 1 | 16 | R |
| | 03 | 03 | 13 | CH2 Error Code | Error information of channel 2 | 16 | R |
| | 04 | 04 | 14 | CH3 Error Code | Error information of channel 3 | 16 | R |

#### 2) List of Parameter Settings

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| Output Range Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00 : 0 ~ 1.2㎃ |
| Input Type Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 0 ~ 4000<br>01: -2000 ~ 2000<br>10: 0 ~ 1200<br>11: 0 ~ 1000 |
| CH0 Output Type Setting | - | | | | | | | | | | | | | | CH0 | | 00: Output the previous value<br>01: Output the minimum value<br>10: Output the middle value<br>11: Output the maximum value |
| CH1 Output Type Setting | - | | | | | | | | | | | | | | CH1 | | |
| CH2 Output Type Setting | - | | | | | | | | | | | | | | CH2 | | |
| CH3 Output Type Setting | - | | | | | | | | | | | | | | CH3 | | |
| CH0 Error Code | CH0 | | | | | | | | | | | | | | | | 0: Normal operation<br>31#: Parameter range excess error<br>41#: Digital input value range excess error |
| CH1 Error Code | CH1 | | | | | | | | | | | | | | | | |
| CH2 Error Code | CH2 | | | | | | | | | | | | | | | | |
| CH3 Error Code | CH3 | | | | | | | | | | | | | | | | |

**(18) XBF-DV04C**

**1) List of Parameter Objects**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Output Range Setting | Output range setting | 16 | R/W |
| | 03 | 03 | 2 | Input Type Setting | Input data type setting | 16 | R/W |
| | 04 | 04 | 3 | CH0 Output Type Setting | Output status setting for channel 0 | 16 | R/W |
| | 05 | 05 | 4 | CH1 Output Type Setting | Output status setting for channel 1 | 16 | R/W |
| | 06 | 06 | 5 | CH2 Output Type Setting | Output status setting for channel 2 | 16 | R/W |
| | 07 | 07 | 6 | CH3 Output Type Setting | Output status setting for channel 3 | 16 | R/W |
| | 0C | 12 | 11 | Interpolation Method Setting | Interpolation method setting | 16 | R/W |
| | 0D | 13 | 12 | Interpolation Time Setting | Interpolation time setting | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 13 | CH0 Error Code | Error information of channel 0 | 16 | R |
| | 02 | 02 | 14 | CH1 Error Code | Error information of channel 1 | 16 | R |
| | 03 | 03 | 15 | CH2 Error Code | Error information of channel 2 | 16 | R |
| | 04 | 04 | 16 | CH3 Error Code | Error information of channel 3 | 16 | R |
| | 05 | 05 | 17 | CH0 Interpolation Data | Interpolation value of channel 0 | 16 | R |
| | 06 | 06 | 18 | CH1 Interpolation Data | Interpolation value of channel 1 | 16 | R |
| | 07 | 07 | 19 | CH2 Interpolation Data | Interpolation value of channel 2 | 16 | R |
| | 08 | 08 | 20 | CH3 Interpolation Data | Interpolation value of channel 3 | 16 | R |

**2) List of Parameter Settings**

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| Output Range Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 1 ~ 5V<br>01: 0 ~ 5V<br>10: 0 ~ 10V<br>11: -10 ~ 10V |
| Input Type Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 0 ~ 16000<br>01: -8000 ~ 8000<br>10: Precise value<br>11: 0 ~ 10000<br>- in case of precise value<br>1 ~ 5V: 1000 ~ 5000<br>0 ~ 5V: 0 ~ 5000<br>0 ~ 10V: 0 ~ 10000<br>-10 ~ 10V: -10000 ~ 10000 |
| CH0 Output Type Setting | - | | | | | | | | | | | | | | CH0 | | 00: Output the previous value<br>01: Output the minimum value<br>10: Output the middle value<br>11: Output the maximum value |
| CH1 Output Type Setting | - | | | | | | | | | | | | | | CH1 | | |
| CH2 Output Type Setting | - | | | | | | | | | | | | | | CH2 | | |
| CH3 Output Type Setting | - | | | | | | | | | | | | | | CH3 | | |
| Interpolation Method Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: Disable<br>01: Linear Interpolation<br>10: S-shaped Interpolation |
| Interpolation Time Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 10 [ms]<br>01: 100 [ms]<br>10: 1 [s]<br>11: 60 [s] |
| CH0 Error Code | CH0 | | | | | | | | | | | | | | | | 0: Normal operation<br>31#: Parameter range excess error<br>41#: Digital input value range excess error<br>51#: Interpolation method setting range excess error |
| CH1 Error Code | CH1 | | | | | | | | | | | | | | | | |
| CH2 Error Code | CH2 | | | | | | | | | | | | | | | | |
| CH3 Error Code | CH3 | | | | | | | | | | | | | | | | |
| CH0 Interpolation Data | CH0 | | | | | | | | | | | | | | | | Interpolation value of channel 0 |
| CH1 Interpolation Data | CH1 | | | | | | | | | | | | | | | | Interpolation value of channel 1 |
| CH2 Interpolation Data | CH2 | | | | | | | | | | | | | | | | Interpolation value of channel 2 |
| CH3 Interpolation Data | CH3 | | | | | | | | | | | | | | | | Interpolation value of channel 3 |

**(19) XBF-DC04C**

**1) List of Parameter Objects**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Output Range Setting | Output range setting | 16 | R/W |
| | 03 | 03 | 2 | Input Type Setting | Input data type setting | 16 | R/W |
| | 04 | 04 | 3 | CH0 Output Type Setting | Output status setting for channel 0 | 16 | R/W |
| | 05 | 05 | 4 | CH1 Output Type Setting | Output status setting for channel 1 | 16 | R/W |
| | 06 | 06 | 5 | CH2 Output Type Setting | Output status setting for channel 2 | 16 | R/W |
| | 07 | 07 | 6 | CH3 Output Type Setting | Output status setting for channel 3 | 16 | R/W |
| | 0C | 12 | 11 | Interpolation Method Setting | Interpolation method setting | 16 | R/W |
| | 0D | 13 | 12 | Interpolation Time Setting | Interpolation time setting | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 13 | CH0 Error Code | Error information of channel 0 | 16 | R |
| | 02 | 02 | 14 | CH1 Error Code | Error information of channel 1 | 16 | R |
| | 03 | 03 | 15 | CH2 Error Code | Error information of channel 2 | 16 | R |
| | 04 | 04 | 16 | CH3 Error Code | Error information of channel 3 | 16 | R |
| | 05 | 05 | 17 | CH0 Interpolation Data | Interpolation value of channel 0 | 16 | R |
| | 06 | 06 | 18 | CH1 Interpolation Data | Interpolation value of channel 1 | 16 | R |
| | 07 | 07 | 19 | CH2 Interpolation Data | Interpolation value of channel 2 | 16 | R |
| | 08 | 08 | 20 | CH3 Interpolation Data | Interpolation value of channel 3 | 16 | R |

**2) List of Parameter Settings**

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| Output Range Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 4 ~ 20㎃<br>01: 0 ~ 20㎃ |
| Input Type Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 0 ~ 16000<br>01: -8000 ~ 8000<br>10: Precise value<br>11: 0 ~ 10000<br>- in case of precise value<br>4 ~ 20㎃: 4000 ~ 20000<br>0 ~ 20㎃: 0 ~ 20000 |
| CH0 Output Type Setting | - | | | | | | | | | | | | | | CH0 | | 00: Output the previous value<br>01: Output the minimum value<br>10: Output the middle value<br>11: Output the maximum value |
| CH1 Output Type Setting | - | | | | | | | | | | | | | | CH1 | | |
| CH2 Output Type Setting | - | | | | | | | | | | | | | | CH2 | | |
| CH3 Output Type Setting | - | | | | | | | | | | | | | | CH3 | | |
| Interpolation Method Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: Disable<br>01: Linear Interpolation<br>10: S-shaped Interpolation |
| Interpolation Time Setting | - | | | | | | | | CH3 | | CH2 | | CH1 | | CH0 | | 00: 10 [ms]<br>01: 100 [ms]<br>10: 1 [s]<br>11: 60 [s] |
| CH0 Error Code | CH0 | | | | | | | | | | | | | | | | 0: Normal operation<br>31#: Parameter range excess error<br>41#: Digital input value range excess error<br>51#: Interpolation method setting range excess error |
| CH1 Error Code | CH1 | | | | | | | | | | | | | | | | |
| CH2 Error Code | CH2 | | | | | | | | | | | | | | | | |
| CH3 Error Code | CH3 | | | | | | | | | | | | | | | | |
| CH0 Interpolation Data | CH0 | | | | | | | | | | | | | | | | Interpolation value of channel 0 |
| CH1 Interpolation Data | CH1 | | | | | | | | | | | | | | | | Interpolation value of channel 1 |
| CH2 Interpolation Data | CH2 | | | | | | | | | | | | | | | | Interpolation value of channel 2 |
| CH3 Interpolation Data | CH3 | | | | | | | | | | | | | | | | Interpolation value of channel 3 |

**(20) XBF-AH04A**

**1) List of Parameter Objects**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | AD/DA Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | AD Input/ DA Output Range Setting | Input/output range setting | 16 | R/W |
| | 03 | 03 | 2 | AD Output/DA Input Data Type Setting | Input/output data type setting | 16 | R/W |
| | 04 | 04 | 3 | AD0 Filter Constant Value | Filter constant value setting for input channel 0 | 16 | R/W |
| | 05 | 05 | 4 | AD1 Filter Constant Value | Filter constant value setting for input channel 1 | 16 | R/W |
| | 06 | 06 | 5 | Average Method Setting | Average process method setting | 16 | R/W |
| | 07 | 07 | 6 | AD0 Average Value | Average value setting for input channel 0 | 16 | R/W |
| | 08 | 08 | 7 | AD1 Average Value | Average value setting for input channel 1 | 16 | R/W |
| | 09 | 09 | 8 | Analog Output Type Setting | Channel output status setting | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 9 | Error code | Error information | 16 | R |

**2) List of Parameter Settings**

<table>
<tr><th rowspan="2">Parameter Name</th><th colspan="16">Bit</th><th rowspan="2">Settings</th></tr>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>AD/DA Channel Enable</td><td colspan="12">-</td><td>DA CH1</td><td>DA CH0</td><td>AD CH1</td><td>AD CH0</td><td>Bit Off (0): Stop<br>Bit On (1): Run</td></tr>
<tr><td>AD Input/<br>DA Output Range Setting</td><td colspan="4">DA CH1</td><td colspan="4">DA CH0</td><td colspan="4">AD CH1</td><td colspan="4">AD CH0</td><td>0000 : 4 ~ 20 ㎃<br>0001 : 0 ~ 20 ㎃<br>0010 : 1 ~ 5 V<br>0011 : 0 ~ 5 V<br>0100 : 0 ~ 10 V</td></tr>
<tr><td>AD Output/<br>DA Input Data Type Setting</td><td colspan="4">DA CH1</td><td colspan="4">DA CH0</td><td colspan="4">AD CH1</td><td colspan="4">AD CH0</td><td>0000 : 0 ~ 4000<br>0001 : -2000 ~ 2000<br>0010 : Precise value<br>0011 : 0 ~ 1000<br>- in case of precise value<br>4 ~ 20 ㎃: 400 ~ 2000<br>0 ~ 20 ㎃: 0 ~ 2000<br>1 ~ 5 V: 100 ~ 500<br>0 ~ 5 V: 0 ~ 500<br>0 ~ 10 V: 0 ~ 1000</td></tr>
<tr><td>AD0 Filter Constant Value</td><td colspan="16">AD CH0</td><td rowspan="2">0, 4~64000</td></tr>
<tr><td>AD1 Filter Constant Value</td><td colspan="16">AD CH1</td></tr>
<tr><td>Average Method Setting</td><td colspan="8">-</td><td colspan="4">AD CH1</td><td colspan="4">AD CH0</td><td>0000: Sampling process<br>0001: Time average process<br>0010: Count average process<br>0011: Moving average process</td></tr>
<tr><td>AD0 Average Value</td><td colspan="16">AD CH0</td><td rowspan="2">Time average: 4 ~ 16000 [ms]<br>Count average: 2 ~ 64000 [Count]<br>Moving average: 2 ~ 100 [EA]</td></tr>
<tr><td>AD1 Average Value</td><td colspan="16">AD CH1</td></tr>
<tr><td>Analog Output Type Setting</td><td colspan="8">-</td><td colspan="4">DA CH1</td><td colspan="4">DA CH0</td><td>0000: Output the previous value<br>0001: Output the minimum value<br>0010: Output the middle value<br>0011: Output the maximum value</td></tr>
<tr><td>Error code</td><td colspan="16">-</td><td>0: Normal operation<br>10#: Input range setting error<br>20#: Input data type setting error<br>30#: Input filter value setting error<br>40#: Input average process setting error<br>50#: Input average value setting error<br>60#: Output range setting error<br>70#: Output status setting error<br>80#: Output input value range excess error</td></tr>
</table>

**(21) XBF-RD04A**

**1) List of Parameter Objects**

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | CH0 Sensor Type Setting | Sensor type setting for channel 0 | 16 | R/W |
| | 03 | 03 | 2 | CH1 Sensor Type Setting | Sensor type setting for channel 1 | 16 | R/W |
| | 04 | 04 | 3 | CH2 Sensor Type Setting | Sensor type setting for channel 2 | 16 | R/W |
| | 05 | 05 | 4 | CH3 Sensor Type Setting | Sensor type setting for channel 3 | 16 | R/W |
| | 06 | 06 | 5 | Temperature Unit Setting | Temperature display unit setting | 16 | R/W |
| | 07 | 07 | 6 | CH0 Filter Constant Value | Filter constant value setting for channel 0 | 16 | R/W |
| | 08 | 08 | 7 | CH1 Filter Constant Value | Filter constant value setting for channel 1 | 16 | R/W |
| | 09 | 09 | 8 | CH2 Filter Constant Value | Filter constant value setting for channel 2 | 16 | R/W |
| | 0A | 10 | 9 | CH3 Filter Constant Value | Filter constant value setting for channel 3 | 16 | R/W |
| | 13 | 19 | 18 | Scaling Enable | Scaling setting | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 68 | CH0 Disconnection Info | Disconnection information of channel 0 | 16 | R |
| | 02 | 02 | 69 | CH1 Disconnection Info | Disconnection information of channel 1 | 16 | R |
| | 03 | 03 | 70 | CH2 Disconnection Info | Disconnection information of channel 2 | 16 | R |
| | 04 | 04 | 71 | CH3 Disconnection Info | Disconnection information of channel 3 | 16 | R |

**2) List of Parameter Settings**

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| CH0 Sensor Type Setting | CH0 | | | | | | | | | | | | | | | | 0: PT100<br>1: JPT100 |
| CH1 Sensor Type Setting | CH1 | | | | | | | | | | | | | | | | |
| CH2 Sensor Type Setting | CH2 | | | | | | | | | | | | | | | | |
| CH3 Sensor Type Setting | CH3 | | | | | | | | | | | | | | | | |
| Temperature Unit Setting | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Celsius<br>Bit On (1): Fahrenheit |
| CH0 Filter Constant Value | CH0 | | | | | | | | | | | | | | | | 0, 160~64000 |
| CH1 Filter Constant Value | CH1 | | | | | | | | | | | | | | | | |
| CH2 Filter Constant Value | CH2 | | | | | | | | | | | | | | | | |
| CH3 Filter Constant Value | CH3 | | | | | | | | | | | | | | | | |
| Scaling Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Disable<br>Bit On (1): Enable |
| CH0 Disconnection Info | CH0 | | | | | | | | | | | | | | | | 0: Normal<br>1: Sensor A disconnection<br>2: Sensor B disconnection |
| CH1 Disconnection Info | CH1 | | | | | | | | | | | | | | | | |
| CH2 Disconnection Info | CH2 | | | | | | | | | | | | | | | | |
| CH3 Disconnection Info | CH3 | | | | | | | | | | | | | | | | |

### (22) XBF-RD01A

#### 1) List of Parameter Objects

| Index(hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | CH0 Sensor Type Setting | Sensor type setting for channel 0 | 16 | R/W |
| | 06 | 06 | 5 | Temperature Unit Setting | Temperature display unit setting | 16 | R/W |
| | 07 | 07 | 6 | CH0 Filter Constant Value | Filter constant value setting for channel 0 | 16 | R/W |
| | 13 | 19 | 18 | Scaling Enable | Scaling setting | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 68 | CH0 Disconnection Info | Disconnection information of channel 0 | 16 | R |

#### 2) List of Parameter Settings

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| CH0 Sensor Type Setting | CH0 | | | | | | | | | | | | | | | | 0: PT100<br>1: JPT100 |
| Temperature Unit Setting | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Celsius<br>Bit On (1): Fahrenheit |
| CH0 Filter Constant Value | CH0 | | | | | | | | | | | | | | | | 0, 160~64000 |
| Scaling Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Disable<br>Bit On (1): Enable |
| CH0 Disconnection Info | CH0 | | | | | | | | | | | | | | | | 0: Normal<br>1: Sensor A disconnection<br>2: Sensor B disconnection |

**(23) XBF-TC04B**

**1) List of Parameter Objects**

| Index (hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | CH0 Sensor Type Setting | Sensor type setting for channel 0 | 16 | R/W |
| | 03 | 03 | 2 | CH1 Sensor Type Setting | Sensor type setting for channel 1 | 16 | R/W |
| | 04 | 04 | 3 | CH2 Sensor Type Setting | Sensor type setting for channel 2 | 16 | R/W |
| | 05 | 05 | 4 | CH3 Sensor Type Setting | Sensor type setting for channel 3 | 16 | R/W |
| | 06 | 06 | 5 | Temp. Unit Setting | Channel temperature display unit setting | 16 | R/W |
| | 07 | 07 | 6 | CH0 Filter Constant Value | Filter constant value setting for channel 0 | 16 | R/W |
| | 08 | 08 | 7 | CH1 Filter Constant Value | Filter constant value setting for channel 1 | 16 | R/W |
| | 09 | 09 | 8 | CH2 Filter Constant Value | Filter constant value setting for channel 2 | 16 | R/W |
| | 0A | 10 | 9 | CH3 Filter Constant Value | Filter constant value setting for channel 3 | 16 | R/W |
| | 0B | 11 | 10 | CH0 Average Method Setting | Average process setting for channel 0 | 16 | R/W |
| | 0C | 12 | 11 | CH1 Average Method Setting | Average process setting for channel 1 | 16 | R/W |
| | 0D | 13 | 12 | CH2 Average Method Setting | Average process setting for channel 2 | 16 | R/W |
| | 0E | 14 | 13 | CH3 Average Method Setting | Average process setting for channel 3 | 16 | R/W |
| | 0F | 15 | 14 | CH0 Average Data | Average value setting for channel 0 | 16 | R/W |
| | 10 | 16 | 15 | CH1 Average Data | Average value setting for channel 1 | 16 | R/W |
| | 11 | 17 | 16 | CH2 Average Data | Average value setting for channel 2 | 16 | R/W |
| | 12 | 18 | 17 | CH3 Average Data | Average value setting for channel 3 | 16 | R/W |
| | 13 | 19 | 18 | Scaling Type Setting | Scaling process type setting | 16 | R/W |
| | 14 | 20 | 19 | CH0 Scaling Min. Value | Scaling minimum value setting for channel 0 | 16 | R/W |
| | 15 | 21 | 20 | CH0 Scaling Max. Value | Scaling maximum value setting for channel 0 | 16 | R/W |
| | 16 | 22 | 21 | CH1 Scaling Min. Value | Scaling minimum value setting for channel 1 | 16 | R/W |
| | 17 | 23 | 22 | CH1 Scaling Max. Value | Scaling maximum value setting for channel 1 | 16 | R/W |
| | 18 | 24 | 23 | CH2 Scaling Min. Value | Scaling minimum value setting for channel 2 | 16 | R/W |
| | 19 | 25 | 24 | CH2 Scaling Max. Value | Scaling maximum value setting for channel 2 | 16 | R/W |
| | 1A | 26 | 25 | CH3 Scaling Min. Value | Scaling minimum value setting for channel 3 | 16 | R/W |
| | 1B | 27 | 26 | CH3 Scaling Max. Value | Scaling maximum value setting for channel 3 | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 27 | CH0 Error Code | Error information of channel 0 | 16 | R |
| | 02 | 02 | 28 | CH1 Error Code | Error information of channel 1 | 16 | R |
| | 03 | 03 | 29 | CH2 Error Code | Error information of channel 2 | 16 | R |
| | 04 | 04 | 30 | CH3 Error Code | Error information of channel 3 | 16 | R |
| | 05 | 05 | 31 | CH0 Cold Junction Compensation Temp. Data | Cold junction compensation temperature of channel 0 | 16 | R |
| | 06 | 06 | 32 | CH1 Cold Junction Compensation Temp. Data | Cold junction compensation temperature of channel 1 | 16 | R |
| | 07 | 07 | 33 | CH2 Cold Junction Compensation Temp. Data | Cold junction compensation temperature of channel 2 | 16 | R |
| | 08 | 08 | 34 | CH3 Cold Junction Compensation Temp. Data | Cold junction compensation temperature of channel 3 | 16 | R |

**2) List of Parameter Settings**

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| CH0 Sensor Type Setting | CH0 | | | | | | | | | | | | | | | | 0: K Type, 1: J Type<br>2: T Type, 3: R Type<br>4: 0 ~ 100㎃ |
| CH1 Sensor Type Setting | CH1 | | | | | | | | | | | | | | | | |
| CH2 Sensor Type Setting | CH2 | | | | | | | | | | | | | | | | |
| CH3 Sensor Type Setting | CH3 | | | | | | | | | | | | | | | | |
| Temp. Unit Setting | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Celsius<br>Bit On (1): Fahrenheit |
| CH0 Filter Constant Value | CH0 | | | | | | | | | | | | | | | | 0, 200~64000 |
| CH1 Filter Constant Value | CH1 | | | | | | | | | | | | | | | | |
| CH2 Filter Constant Value | CH2 | | | | | | | | | | | | | | | | |
| CH3 Filter Constant Value | CH3 | | | | | | | | | | | | | | | | |
| CH0 Average Method Setting | CH0 | | | | | | | | | | | | | | | | 0: Sampling<br>1: Time average<br>2: Count average<br>3: Moving average |
| CH1 Average Method Setting | CH1 | | | | | | | | | | | | | | | | |
| CH2 Average Method Setting | CH2 | | | | | | | | | | | | | | | | |
| CH3 Average Method Setting | CH3 | | | | | | | | | | | | | | | | |
| CH0 Average Data | CH0 | | | | | | | | | | | | | | | | Time average: 400~60000ms<br>Count average: 2~64000 times<br>Moving average: 2~100EA |
| CH1 Average Data | CH1 | | | | | | | | | | | | | | | | |
| CH2 Average Data | CH2 | | | | | | | | | | | | | | | | |
| CH3 Average Data | CH3 | | | | | | | | | | | | | | | | |
| Scaling Type Setting | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Sign<br>Bit On (1): No Sign |
| CH0 Scaling Min. Value | CH0 | | | | | | | | | | | | | | | | Minimum Value<br>Sign -32768~[Maximum-1]<br>No Sign 0~[Maximum-1]<br><br>Maximum Value<br>Sign [Minimum+1]~32767<br>No Sign [Minimum+1]~655535 |
| CH0 Scaling Max. Value | CH0 | | | | | | | | | | | | | | | | |
| CH1 Scaling Min. Value | CH1 | | | | | | | | | | | | | | | | |
| CH1 Scaling Max. Value | CH1 | | | | | | | | | | | | | | | | |
| CH2 Scaling Min. Value | CH2 | | | | | | | | | | | | | | | | |
| CH2 Scaling Max. Value | CH2 | | | | | | | | | | | | | | | | |
| CH3 Scaling Min. Value | CH3 | | | | | | | | | | | | | | | | |
| CH3 Scaling Max. Value | CH3 | | | | | | | | | | | | | | | | |
| CH0 Error Code | CH0 | | | | | | | | | | | | | | | | Bit 0 : Sensor type setting error<br>Bit 1 : Filter constant value setting error<br>Bit 2: Average process method setting error<br>Bit 3: Time average value setting error<br>Bit 4: Count average value setting error<br>Bit 5: Moving average value setting error<br>Bit 6: Scaling range setting error |
| CH1 Error Code | CH1 | | | | | | | | | | | | | | | | |
| CH2 Error Code | CH2 | | | | | | | | | | | | | | | | |
| CH3 Error Code | CH3 | | | | | | | | | | | | | | | | |

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| CH0 Cold Junction Compensation Temp. Data | CH0 | | | | | | | | | | | | | | | | Cold junction compensation temperature of channel 0 |
| CH1 Cold Junction Compensation Temp. Data | CH1 | | | | | | | | | | | | | | | | Cold junction compensation temperature of channel 1 |
| CH2 Cold Junction Compensation Temp. Data | CH2 | | | | | | | | | | | | | | | | Cold junction compensation temperature of channel 2 |
| CH3 Cold Junction Compensation Temp. Data | CH3 | | | | | | | | | | | | | | | | Cold junction compensation temperature of channel 3 |

### (24) XBF-TC04S

#### 1) List of Parameter Objects

| Index (hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | CH0 Sensor Type Setting | Sensor type setting for channel 0 | 16 | R/W |
| | 03 | 03 | 2 | CH1 Sensor Type Setting | Sensor type setting for channel 1 | 16 | R/W |
| | 04 | 04 | 3 | CH2 Sensor Type Setting | Sensor type setting for channel 2 | 16 | R/W |
| | 05 | 05 | 4 | CH3 Sensor Type Setting | Sensor type setting for channel 3 | 16 | R/W |
| | 06 | 06 | 5 | Temp. Unit Setting | Channel temperature display unit setting | 16 | R/W |
| | 07 | 07 | 6 | CH0 Filter Constant Value | Filter constant value setting for channel 0 | 16 | R/W |
| | 08 | 08 | 7 | CH1 Filter Constant Value | Filter constant value setting for channel 1 | 16 | R/W |
| | 09 | 09 | 8 | CH2 Filter Constant Value | Filter constant value setting for channel 2 | 16 | R/W |
| | 0A | 10 | 9 | CH3 Filter Constant Value | Filter constant value setting for channel 3 | 16 | R/W |
| | 0B | 11 | 10 | CH0 Average Method Setting | Average process setting for channel 0 | 16 | R/W |
| | 0C | 12 | 11 | CH1 Average Method Setting | Average process setting for channel 1 | 16 | R/W |
| | 0D | 13 | 12 | CH2 Average Method Setting | Average process setting for channel 2 | 16 | R/W |
| | 0E | 14 | 13 | CH3 Average Method Setting | Average process setting for channel 3 | 16 | R/W |
| | 0F | 15 | 14 | CH0 Average Data | Average value setting for channel 0 | 16 | R/W |
| | 10 | 16 | 15 | CH1 Average Data | Average value setting for channel 1 | 16 | R/W |
| | 11 | 17 | 16 | CH2 Average Data | Average value setting for channel 2 | 16 | R/W |
| | 12 | 18 | 17 | CH3 Average Data | Average value setting for channel 3 | 16 | R/W |
| | 13 | 19 | 18 | Scaling Type Setting | Scaling process type setting | 16 | R/W |
| | 14 | 20 | 19 | CH0 Scaling Min. Value | Scaling minimum value setting for channel 0 | 16 | R/W |
| | 15 | 21 | 20 | CH0 Scaling Max. Value | Scaling maximum value setting for channel 0 | 16 | R/W |
| | 16 | 22 | 21 | CH1 Scaling Min. Value | Scaling minimum value setting for channel 1 | 16 | R/W |
| | 17 | 23 | 22 | CH1 Scaling Max. Value | Scaling maximum value setting for channel 1 | 16 | R/W |
| | 18 | 24 | 23 | CH2 Scaling Min. Value | Scaling minimum value setting for channel 2 | 16 | R/W |
| | 19 | 25 | 24 | CH2 Scaling Max. Value | Scaling maximum value setting for channel 2 | 16 | R/W |
| | 1A | 26 | 25 | CH3 Scaling Min. Value | Scaling minimum value setting for channel 3 | 16 | R/W |
| | 1B | 27 | 26 | CH3 Scaling Max. Value | Scaling maximum value setting for channel 3 | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 27 | CH0 Error Code | Error information of channel 0 | 16 | R |
| | 02 | 02 | 28 | CH1 Error Code | Error information of channel 1 | 16 | R |
| | 03 | 03 | 29 | CH2 Error Code | Error information of channel 2 | 16 | R |
| | 04 | 04 | 30 | CH3 Error Code | Error information of channel 3 | 16 | R |
| | 05 | 05 | 31 | CH0 Cold Junction Compensation Temp. Data | Cold junction compensation temperature of channel 0 | 16 | R |
| | 06 | 06 | 32 | CH1 Cold Junction Compensation Temp. Data | Cold junction compensation temperature of channel 1 | 16 | R |
| | 07 | 07 | 33 | CH2 Cold Junction Compensation Temp. Data | Cold junction compensation temperature of channel 2 | 16 | R |
| | 08 | 08 | 34 | CH3 Cold Junction Compensation Temp. Data | Cold junction compensation temperature of channel 3 | 16 | R |

**2) List of Parameter Settings**

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Channel Enable | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Stop<br>Bit On (1): Run |
| CH0 Sensor Type Setting | CH0 | | | | | | | | | | | | | | | | 0: K Type, 1: J Type<br>2: T Type, 3: R Type |
| CH1 Sensor Type Setting | CH1 | | | | | | | | | | | | | | | | |
| CH2 Sensor Type Setting | CH2 | | | | | | | | | | | | | | | | |
| CH3 Sensor Type Setting | CH3 | | | | | | | | | | | | | | | | |
| Temp. Unit Setting | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Celsius<br>Bit On (1): Fahrenheit |
| CH0 Filter Constant Value | CH0 | | | | | | | | | | | | | | | | 0, 200~64000 |
| CH1 Filter Constant Value | CH1 | | | | | | | | | | | | | | | | |
| CH2 Filter Constant Value | CH2 | | | | | | | | | | | | | | | | |
| CH3 Filter Constant Value | CH3 | | | | | | | | | | | | | | | | |
| CH0 Average Method Setting | CH0 | | | | | | | | | | | | | | | | 0: Sampling<br>1: Time average<br>2: Count average<br>3: Moving average |
| CH1 Average Method Setting | CH1 | | | | | | | | | | | | | | | | |
| CH2 Average Method Setting | CH2 | | | | | | | | | | | | | | | | |
| CH3 Average Method Setting | CH3 | | | | | | | | | | | | | | | | |
| CH0 Average Data | CH0 | | | | | | | | | | | | | | | | Time average: 400~60000ms<br>Count average: 2~64000 times<br>Moving average: 2~100EA |
| CH1 Average Data | CH1 | | | | | | | | | | | | | | | | |
| CH2 Average Data | CH2 | | | | | | | | | | | | | | | | |
| CH3 Average Data | CH3 | | | | | | | | | | | | | | | | |
| Scaling Type Setting | - | | | | | | | | | | | | CH3 | CH2 | CH1 | CH0 | Bit Off (0): Sign<br>Bit On (1): No Sign |
| CH0 Scaling Min. Value | CH0 | | | | | | | | | | | | | | | | Minimum Value<br>Sign -32768~[Maximum-1]<br>No Sign 0~[Maximum-1]<br><br>Maximum Value<br>Sign [Minimum+1]~32767<br>No Sign [Minimum+1]~655535 |
| CH0 Scaling Max. Value | CH0 | | | | | | | | | | | | | | | | |
| CH1 Scaling Min. Value | CH1 | | | | | | | | | | | | | | | | |
| CH1 Scaling Max. Value | CH1 | | | | | | | | | | | | | | | | |
| CH2 Scaling Min. Value | CH2 | | | | | | | | | | | | | | | | |
| CH2 Scaling Max. Value | CH2 | | | | | | | | | | | | | | | | |
| CH3 Scaling Min. Value | CH3 | | | | | | | | | | | | | | | | |
| CH3 Scaling Max. Value | CH3 | | | | | | | | | | | | | | | | |
| CH0 Error Code | CH0 | | | | | | | | | | | | | | | | Bit 0 : Sensor type setting error<br>Bit 1 : Filter constant value setting error<br>Bit 2: Average process method setting error<br>Bit 3: Time average value setting error<br>Bit 4: Count average value setting error<br>Bit 5: Moving average value setting error<br>Bit 6: Scaling range setting error |
| CH1 Error Code | CH1 | | | | | | | | | | | | | | | | |
| CH2 Error Code | CH2 | | | | | | | | | | | | | | | | |
| CH3 Error Code | CH3 | | | | | | | | | | | | | | | | |

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| CH0 Cold Junction Compensation Temp. Data | CH0 | | | | | | | | | | | | | | | | Cold junction compensation temperature of channel 0 |
| CH1 Cold Junction Compensation Temp. Data | CH1 | | | | | | | | | | | | | | | | Cold junction compensation temperature of channel 1 |
| CH2 Cold Junction Compensation Temp. Data | CH2 | | | | | | | | | | | | | | | | Cold junction compensation temperature of channel 2 |
| CH3 Cold Junction Compensation Temp. Data | CH3 | | | | | | | | | | | | | | | | Cold junction compensation temperature of channel 3 |

**(25) XBF-LD02S**

**1) List of Parameter Objects**

| Index (hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | Channel Enable | Active channel setting | 16 | R/W |
| | 02 | 02 | 1 | Weighing Mode/Zero Backup Mode | Weighing mode/zero backup setting | 16 | R/W |
| | 03 | 03 | 2 | CH0 Free Fall Compensation Cycle | Free fall compensation cycle of input channel 0 | 16 | R/W |
| | 04 | 04 | 3 | CH1 Free Fall Compensation Cycle | Free fall compensation cycle of input channel 1 | 16 | R/W |
| | 05 | 05 | 4 | CH0 Free Fall Coefficient | Free fall coefficient of input channel 0 | 16 | R/W |
| | 06 | 06 | 5 | CH1 Free Fall Coefficient | Free fall coefficient of input channel 1 | 16 | R/W |
| | 07 | 07 | 6 | CH0 Averaging Mode Setting | Average process setting for input channel 0 | 16 | R/W |
| | 08 | 08 | 7 | CH1 Averaging Mode Setting | Average process setting for input channel 1 | 16 | R/W |
| | 09 | 09 | 8 | CH0 Moving Average Value | Moving average value of input channel 0 | 16 | R/W |
| | 0A | 10 | 9 | CH1 Moving Average Value | Moving average value of input channel 1 | 16 | R/W |
| | 0B | 11 | 10 | CH0 Count Average Value | Count average value of input channel 0 | 16 | R/W |
| | 0C | 12 | 11 | CH1 Count Average Value | Count average value of input channel 1 | 16 | R/W |
| | 0D | 13 | 12 | CH0 Time Average Value | Time average value of input channel 0 | 16 | R/W |
| | 0E | 14 | 13 | CH1 Time Average Value | Time average value of input channel 1 | 16 | R/W |
| | 0F | 15 | 14 | CH0 Stable Range Value | Stable judgment range of input channel 0 | 16 | R/W |
| | 10 | 16 | 15 | CH1 Stable Range Value | Stable judgment range of input channel 1 | 16 | R/W |
| | 11 | 17 | 16 | CH0 Stable Time Value | Stable judgment time of input channel 0 | 16 | R/W |
| | 12 | 18 | 17 | CH1 Stable Time Value | Stable judgment time of input channel 1 | 16 | R/W |
| | 13 | 19 | 18 | CH0 Zero Tracking Range Value | Zero tracking range of input channel 0 | 16 | R/W |
| | 14 | 20 | 19 | CH1 Zero Tracking Range Value | Zero tracking range of input channel 1 | 16 | R/W |
| | 15 | 21 | 20 | CH0 Zero Tracking Time Value | Zero tracking time of input channel 0 | 16 | R/W |
| | 16 | 22 | 21 | CH1 Zero Tracking Time Value | Zero tracking time of input channel 1 | 16 | R/W |
| | 17 | 23 | 22 | CH0 Near Zero Range Value | Near zero range of input channel 0 | 16 | R/W |
| | 18 | 24 | 23 | CH1 Near Zero Range Value | Near zero range of input channel 1 | 16 | R/W |
| | 19 | 25 | 24 | Sampling Cycle/Alarm Setting | Sampling cycle/alarm setting | 16 | R/W |
| | 1A | 26 | 25 | Near Zero Input Range | Near zero setting | 16 | R/W |
| | 1B | 27 | 26 | CH0 Gross Weight HH Value(Lower) | Gross weight HH vValue (Lower) of input channel 0 | 16 | R/W |
| | 1C | 28 | 27 | CH0 Gross Weight HH Value(Upper) | Gross weight HH value (Upper) of input channel 0 | 16 | R/W |
| | 1D | 29 | 28 | CH0 Gross Weight H Value(Lower) | Gross weight H value (Lower) of input channel 0 | 16 | R/W |
| | 1E | 30 | 29 | CH0 Gross Weight H Value(Upper) | Gross weight H value (Upper) of input channel 0 | 16 | R/W |
| | 1F | 31 | 30 | CH0 Gross Weight L Value(Lower) | Gross weight L value (Lower) of input channel 0 | 16 | R/W |
| | 20 | 32 | 31 | CH0 Gross Weight L Value(Upper) | Gross weight L value (Upper) of input channel 0 | 16 | R/W |
| | 21 | 33 | 32 | CH0 Gross Weight LL Value (Lower) | Gross weight LL value (Lower) of input channel 0 | 16 | R/W |
| | 22 | 34 | 33 | CH0 Gross Weight LL Value (Upper) | Gross weight LL value (Upper) of input channel 0 | 16 | R/W |
| | 23 | 35 | 34 | CH1 Gross Weight HH Value(Lower) | Gross weight HH value (Lower) of input channel 1 | 16 | R/W |
| | 24 | 36 | 35 | CH1 Gross Weight HH Value(Upper) | Gross weight HH value (Upper) of input channel 1 | 16 | R/W |
| | 25 | 37 | 36 | CH1 Gross Weight H Value(Lower) | Gross weight H value (Lower) of input channel 1 | 16 | R/W |

| Index (hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| | 26 | 38 | 37 | CH1 Gross Weight H Value(Upper) | Gross weight H value (Upper) of input channel 1 | 16 | R/W |
| | 27 | 39 | 38 | CH1 Gross Weight L Value(Lower) | Gross weight L value (Lower) of input channel 1 | 16 | R/W |
| | 28 | 40 | 39 | CH1 Gross Weight L Value(Upper) | Gross weight L value (Upper) of input channel 1 | 16 | R/W |
| | 29 | 41 | 40 | CH1 Gross Weight LL Value (Lower) | Gross weight LL value (Lower) of input channel 1 | 16 | R/W |
| | 2A | 42 | 41 | CH1 Gross Weight LL Value (Upper) | Gross weight LL value (Upper) of input channel 1 | 16 | R/W |
| | 2B | 43 | 42 | CH0 Final Gross Weight Value(Lower) | Final set gross weight value (Lower) of input channel 0 | 16 | R/W |
| | 2C | 44 | 43 | CH0 Final Gross Weight Value(Upper) | Final set gross weight value (Upper) of input channel 0 | 16 | R/W |
| | 2D | 45 | 44 | CH0 Step 1 Gross Weight Value(Lower) | Step 1 gross weight value (Lower) of input channel 0 | 16 | R/W |
| | 2E | 46 | 45 | CH0 Step 1 Gross Weight Value(Upper) | Step 1 gross weight value (Upper) of input channel 0 | 16 | R/W |
| | 2F | 47 | 46 | CH0 Step 2 Gross Weight Value(Lower) | Step 2 gross weight value (Lower) of input channel 0 | 16 | R/W |
| | 30 | 48 | 47 | CH0 Step 2 Gross Weight Value(Upper) | Step 2 gross weight value (Upper) of input channel 0 | 16 | R/W |
| | 31 | 49 | 48 | CH0 Free Fall Weight Value(Lower) | Free fall weight value (Lower) of input channel 0 | 16 | R/W |
| | 32 | 50 | 49 | CH0 Free Fall Weight Value(Upper) | Free fall weight value (Upper) of input channel 0 | 16 | R/W |
| | 33 | 51 | 50 | CH0 Weight Lack Value | Weight lack value of input channel 0 | 16 | R/W |
| | 34 | 52 | 51 | CH0 Weight Over Value | Weight over value of input channel 0 | 16 | R/W |
| | 35 | 53 | 52 | CH1 Final Gross Weight Value(Lower) | Final set gross weight value (Lower) of input channel 1 | 16 | R/W |
| | 36 | 54 | 53 | CH1 Final Gross Weight Value(Upper) | Final set gross weight value (Upper) of input channel 1 | 16 | R/W |
| | 37 | 55 | 54 | CH1 Step 1 Gross Weight Value (Lower) | Step 1 gross weight value (Lower) of input channel 1 | 16 | R/W |
| | 38 | 56 | 55 | CH1 Step 1 Gross Weight Value (Upper) | Step 1 gross weight value (Upper) of input channel 1 | 16 | R/W |
| | 39 | 57 | 56 | CH1 Step 2 Gross Weight Value (Lower) | Step 2 gross weight value (Lower) of input channel 1 | 16 | R/W |
| | 3A | 58 | 57 | CH1 Step 2 Gross Weight Value (Upper) | Step 2 gross weight value (Upper) of input channel 1 | 16 | R/W |
| | 3B | 59 | 58 | CH1 Free Fall Weight Value(Lower) | Free fall weight value (Lower) of input channel 1 | 16 | R/W |
| | 3C | 60 | 59 | CH1 Free Fall Weight Value(Upper) | Free fall weight value (Upper) of input channel 1 | 16 | R/W |
| | 3D | 61 | 60 | CH1 Weight Lack Value | Weight lack value of input channel 1 | 16 | R/W |
| | 3E | 62 | 61 | CH1 Weight Over Value | Weight over value of input channel 1 | 16 | R/W |
| | 3F | 63 | 62 | CH0 Maximum Capacity(Lower) | Maximum load cell capacity (Lower) of input channel 0 | 16 | R/W |
| | 40 | 64 | 63 | CH0 Maximum Capacity(Upper) | Maximum load cell capacity (Upper) of input channel 0 | 16 | R/W |
| | 41 | 65 | 64 | CH0 Standard Capacity(Lower) | Standard load cell capacity (Lower) of input channel 0 | 16 | R/W |
| | 42 | 66 | 65 | CH0 Standard Capacity(Upper) | Standard load cell capacity (Upper) of input channel 0 | 16 | R/W |

| Index (hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| | 43 | 67 | 66 | CH0 Unit Setting | Calibration parameter CH0 (Specification of unit) of input channel 0 | 16 | R/W |
| | 44 | 68 | 67 | CH0 Scale Setting | Calibration parameter CH0 (Specification of scale) of input channel 0 | 16 | R/W |
| | 45 | 69 | 68 | CH0 Decimal Point Setting | Calibration parameter CH0 (Decimal Point) of input channel 0 | 16 | R/W |
| | 46 | 70 | 69 | CH0 Sensitivity Value | Load cell sensitivity value (mV/V) of input channel 0 | 16 | R/W |
| | 47 | 71 | 70 | CH1 Maximum Capacity(Lower) | Maximum load cell capacity (Lower) of input channel 1 | 16 | R/W |
| | 48 | 72 | 71 | CH1 Maximum Capacity(Upper) | Maximum load cell capacity (Upper) of input channel 1 | 16 | R/W |
| | 49 | 73 | 72 | CH1 Standard Capacity(Lower) | Standard load cell capacity (Lower) of input channel 1 | 16 | R/W |
| | 4A | 74 | 73 | CH1 Standard Capacity(Upper) | Standard load cell capacity (Upper) of input channel 1 | 16 | R/W |
| | 4B | 75 | 74 | CH1 Unit Setting | Calibration parameter CH1 (Specification of unit) of input channel 1 | 16 | R/W |
| | 4C | 76 | 75 | CH1 Scale Setting | Calibration parameter CH1 (Specification of scale) of input channel 1 | 16 | R/W |
| | 4D | 77 | 76 | CH1 Decimal Point Setting | Calibration parameter CH1 (Decimal Point) of input channel 1 | 16 | R/W |
| | 4E | 78 | 77 | CH1 Sensitivity Value | Load cell sensitivity value (mV/V) of input channel 1 | 16 | R |
| 80x1 (x: Slot No.) | 01 | 01 | 78 | Error | Error information | 16 | R |
| | 02 | 02 | 79 | CH0 Internal AD DATA(low) | Internal AD value (low) of input channel 0 | 16 | R |
| | 03 | 03 | 80 | CH0 Internal AD DATA(high) | Internal AD value (high) of input channel 0 | 16 | R |
| | 04 | 04 | 81 | CH1 Internal AD DATA(low) | Internal AD value (low) of input channel 1 | 16 | R |
| | 05 | 05 | 82 | CH1 Internal AD DATA(high) | Internal AD value (high) of input channel 1 | 16 | R |
| | 06 | 06 | 83 | Calibration Value Backup Setting | Calibration value internal parameter backup command | 16 | R/W |

**2) List of Parameter Settings**

<table>
<tr><th rowspan="2">Parameter Name</th><th colspan="16">Bit</th><th rowspan="2">Settings</th></tr>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>Channel Enable</td><td colspan="14">-</td><td>CH1</td><td>CH0</td><td>Bit Off (0): Stop<br>Bit On (1): Run</td></tr>
<tr><td>Weighing Mode/Zero Backup Mode</td><td colspan="3">CH1 Zero Backup</td><td colspan="3">CH0 Zero Backup</td><td colspan="4">CH1 Weighing</td><td colspan="4">CH0 Weighing</td><td colspan="2">Zero backup mode<br>0: Disable<br>1: Unable (calibration standard)<br>2: Unable (Operation standard)<br>Measurement mode<br>0:Simple measurement<br>1:Supply (simple comparison)<br>2:Supply (Sequence comparison)<br>3:Discharge (simple comparison)<br>4:Discharge (Sequence comparison)</td></tr>
<tr><td>CH0 Free Fall Compensation Cycle</td><td colspan="12">-</td><td colspan="4">CH0</td><td colspan="2" rowspan="2">0: Disable free fall compensation<br>1~9</td></tr>
<tr><td>CH1 Free Fall Compensation Cycle</td><td colspan="12">-</td><td colspan="4">CH1</td></tr>
<tr><td>CH0 Free Fall Coefficient</td><td colspan="12">-</td><td colspan="4">CH0</td><td colspan="2" rowspan="2">0:1<br>1:1/4<br>2:2/4<br>3:3/4</td></tr>
<tr><td>CH1 Free Fall Coefficient</td><td colspan="12">-</td><td colspan="4">CH1</td></tr>
<tr><td>CH0 Averaging Mode Setting</td><td colspan="12">-</td><td colspan="4">CH0</td><td colspan="2" rowspan="2">0: Moving average<br>1: Moving/count average<br>2. Moving/time average</td></tr>
<tr><td>CH1 Averaging Mode Setting</td><td colspan="12">-</td><td colspan="4">CH1</td></tr>
<tr><td>CH0 Moving Average Value</td><td colspan="8">-</td><td colspan="8">CH0</td><td colspan="2" rowspan="2">0 ~ 9 [2^0 ~ 2^9 ]</td></tr>
<tr><td>CH1 Moving Average Value</td><td colspan="8">-</td><td colspan="8">CH1</td></tr>
<tr><td>CH0 Count Average Value</td><td colspan="16">CH0</td><td colspan="2" rowspan="2">1 ~ 999 [Count]</td></tr>
<tr><td>CH1 Count Average Value</td><td colspan="16">CH1</td></tr>
<tr><td>CH0 Time Average Value</td><td colspan="8">-</td><td colspan="8">CH0</td><td colspan="2" rowspan="2">1 ~ 99 [0.1s]</td></tr>
<tr><td>CH1 Time Average Value</td><td colspan="8">-</td><td colspan="8">CH1</td></tr>
<tr><td>CH0 Stable Range Value</td><td colspan="16">CH0</td><td colspan="2" rowspan="2">0 ~ 999 [Scale]</td></tr>
<tr><td>CH1 Stable Range Value</td><td colspan="16">CH1</td></tr>
<tr><td>CH0 Stable Time Value</td><td colspan="8">-</td><td colspan="8">CH0</td><td colspan="2" rowspan="2">0 ~ 99 [0.1s]</td></tr>
<tr><td>CH1 Stable Time Value</td><td colspan="8">-</td><td colspan="8">CH1</td></tr>
<tr><td>CH0 Zero Tracking Range Value</td><td colspan="8">-</td><td colspan="8">CH0</td><td colspan="2" rowspan="2">0, 1 ~ 99 [Scale]</td></tr>
<tr><td>CH1 Zero Tracking Range Value</td><td colspan="8">-</td><td colspan="8">CH1</td></tr>
<tr><td>CH0 Zero Tracking Time Value</td><td colspan="8">-</td><td colspan="8">CH0</td><td colspan="2" rowspan="2">0 ~ 99 [0.1s]</td></tr>
<tr><td>CH1 Zero Tracking Time Value</td><td colspan="8">-</td><td colspan="8">CH1</td></tr>
<tr><td>CH0 Near Zero Range Value</td><td colspan="8">-</td><td colspan="8">CH0</td><td colspan="2" rowspan="2">1 ~ 99 [%]</td></tr>
<tr><td>CH1 Near Zero Range Value</td><td colspan="8">-</td><td colspan="8">CH1</td></tr>
<tr><td>Sampling Cycle/Alarm Setting</td><td colspan="4">CH1 Sampling Cycle</td><td colspan="4">CH0 Sampling Cycle</td><td colspan="8">-</td><td>CH1</td><td>CH0</td><td>Sampling cycle<br>0: 400Hz<br>1: 200Hz<br>2: 50Hz<br>3: 20Hz<br>Sequence alarm<br>0: Disable<br>1: Enable</td></tr>
</table>

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Near Zero Input Range | CH1 | | | | | | | | CH0 | | | | | | | | 0 ~ 99 |
| CH0 Gross Weight HH Value(Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH0 Gross Weight HH Value(Upper) | | | | | | | | | | | | | | | | | |
| CH0 Gross Weight H Value(Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999<br>Gross Weight L Value ~ HH Value |
| CH0 Gross Weight H Value(Upper) | | | | | | | | | | | | | | | | | |
| CH0 Gross Weight L Value(Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999<br>Gross Weight LL Value ~ H Value |
| CH0 Gross Weight L Value(Upper) | | | | | | | | | | | | | | | | | |
| CH0 Gross Weight LL Value (Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999<br>0 ~ Gross Weight L Value |
| CH0 Gross Weight LL Value (Upper) | | | | | | | | | | | | | | | | | |
| CH1 Gross Weight HH Value(Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH1 Gross Weight HH Value(Upper) | | | | | | | | | | | | | | | | | |
| CH1 Gross Weight H Value(Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999<br>Gross Weight L Value ~ HH Value |
| CH1 Gross Weight H Value(Upper) | | | | | | | | | | | | | | | | | |
| CH1 Gross Weight L Value(Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999<br>Gross Weight LL Value ~ H Value |
| CH1 Gross Weight L Value(Upper) | | | | | | | | | | | | | | | | | |
| CH1 Gross Weight LL Value (Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999<br>0 ~ Gross Weight L Value |
| CH1 Gross Weight LL Value (Upper) | | | | | | | | | | | | | | | | | |
| CH0 Final Gross Weight Value (Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH0 Final Gross Weight Value (Upper) | | | | | | | | | | | | | | | | | |
| CH0 Step 1 Gross Weight Value (Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH0 Step 1 Gross Weight Value (Upper) | | | | | | | | | | | | | | | | | |
| CH0 Step 2 Gross Weight Value (Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH0 Step 2 Gross Weight Value (Upper) | | | | | | | | | | | | | | | | | |
| CH0 Free Fall Weight Value(Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH0 Free Fall Weight Value(Upper) | | | | | | | | | | | | | | | | | |
| CH0 Weight Lack Value | CH0 | | | | | | | | | | | | | | | | 0 ~ 9,999 |
| CH0 Weight Over Value | CH0 | | | | | | | | | | | | | | | | 0 ~ 9,999 |
| CH1 Final Gross Weight Value (Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH1 Final Gross Weight Value (Upper) | | | | | | | | | | | | | | | | | |
| CH1 Step 1 Gross Weight Value (Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH1 Step 1 Gross Weight Value (Upper) | | | | | | | | | | | | | | | | | |
| CH1 Step 2 Gross Weight Value (Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH1 Step 2 Gross Weight Value (Upper) | | | | | | | | | | | | | | | | | |

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| CH1 Free Fall Weight Value(Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH1 Free Fall Weight Value(Upper) | | | | | | | | | | | | | | | | | |
| CH1 Weight Lack Value | CH1 | | | | | | | | | | | | | | | | 0 ~ 9,999 |
| CH1 Weight Over Value | CH1 | | | | | | | | | | | | | | | | 0 ~ 9,999 |
| CH0 Maximum Capacity(Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH0 Maximum Capacity(Upper) | | | | | | | | | | | | | | | | | |
| CH0 Standard Capacity(Lower) | CH0 | | | | | | | | | | | | | | | | 0 ~ Standard Load Cell Capacity |
| CH0 Standard Capacity(Upper) | | | | | | | | | | | | | | | | | |
| CH0 Unit Setting | CH0 | | | | | | | | | | | | | | | | 0x6B67: Kg<br>0x0067: g<br>0x0074: t |
| CH0 Scale Setting | - | | | | | | | | | | | | CH0 | | | | 0000 : 1 (default)<br>0001 : 2<br>0010 : 5<br>0011 : 10 |
| CH0 Decimal Point Setting | - | | | | | | | | | | | | CH0 | | | | 0000 : 1 (default)<br>0001 : 0.1<br>0010 : 0.01<br>0011 : 0.001 |
| CH0 Sensitivity Value | CH0 | | | | | | | | | | | | | | | | 0 ~ 60000 [mV/V]<br>Enter five decimal places<br>Ex) 2.2mV/V = 22000 |
| CH1 Maximum Capacity(Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ 999,999 |
| CH1 Maximum Capacity(Upper) | | | | | | | | | | | | | | | | | |
| CH1 Standard Capacity(Lower) | CH1 | | | | | | | | | | | | | | | | 0 ~ Standard Load Cell Capacity |
| CH1 Standard Capacity(Upper) | | | | | | | | | | | | | | | | | |
| CH1 Unit Setting | CH1 | | | | | | | | | | | | | | | | 0x6B67: Kg<br>0x0067: g<br>0x0074: t |
| CH1 Scale Setting | - | | | | | | | | | | | | CH1 | | | | 0000 : 1 (default)<br>0001 : 2<br>0010 : 5<br>0011 : 10 |
| CH1 Decimal Point Setting | - | | | | | | | | | | | | CH1 | | | | 0000 : 1 (default)<br>0001 : 0.1<br>0010 : 0.01<br>0011 : 0.001 |
| CH1 Sensitivity Value | CH1 | | | | | | | | | | | | | | | | 0 ~ 60000 [mV/V]<br>Enter five decimal places<br>Ex) 2.2mV/V = 22000 |

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Error | - | | | | | | | | | | | | | | | | 0: Normal operation<br>100: External power error<br>11#: ADC defect<br>12#: Wiring status error<br>13#: Initial zero setting error<br>20#: Calibration zero setting error<br>21#: Calibration span setting error<br>22#: Calibration resolution excess error<br>23#: Calibration internal resolution error<br>24#: Calibration request flag setting error<br>30#: Zero setting error<br>31#: Tare setting error<br>32#: Maximum weight excess error<br>40#: Near zero setting error<br>41#: Stable judgment range setting error<br>42#: Stable judgment time setting error<br>43#: Zero tracking range setting error<br>44#: Zero tracking time setting error<br>45#: Moving average process setting error<br>46#: Count average process setting error<br>47#: Time average process setting error<br>48#: Warning upper/lower limit setting error<br>49#: Step 1 and Step 2 free fall setting error<br>#: Input channel No. |
| CH0 Internal AD DATA(low) | CH0 | | | | | | | | | | | | | | | | Internal AD value (low) of input channel 0 |
| CH0 Internal AD DATA(high) | | | | | | | | | | | | | | | | | Internal AD value (high) of input channel 0 |
| CH1 Internal AD DATA(low) | CH1 | | | | | | | | | | | | | | | | Internal AD value (low) of input channel 1 |
| CH1 Internal AD DATA(high) | | | | | | | | | | | | | | | | | Internal AD value (high) of input channel 1 |
| Calibration Value Backup Setting | CH1 | | | | | | | | CH0 | | | | | | | | Calibration value internal parameter backup command<br>0x66: Read internal parameter<br>0x99: Write internal parameter |

### (26) XBF-HO02A/HD02A

#### 1) List of Parameter Objects

| Index (hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| 80x0 (x: Slot No.) | 01 | 01 | 0 | CH0 Counter Mode Setting | Counter mode setting for channel 0 | 16 | R/W |
| | 02 | 02 | 1 | CH0 Pulse Mode Setting | Pulse input mode setting for channel 0 | 16 | R/W |
| | 03 | 03 | 2 | CH0 Preset Value Lower | Preset value setting for channel 0 | 16 | R/W |
| | 04 | 04 | 3 | CH0 Preset Value Upper | | 16 | R/W |
| | 05 | 05 | 4 | CH0 Ring Count Min. Value Lower | Minimum ring count value of channel 0 | 16 | R/W |
| | 06 | 06 | 5 | CH0 Ring Count Min. Value Upper | | 16 | R/W |
| | 07 | 07 | 6 | CH0 Ring Count Max. Value Lower | Maximum ring count value of channel 0 | 16 | R/W |
| | 08 | 08 | 7 | CH0 Ring Count Max. Value Upper | | 16 | R/W |
| | 09 | 09 | 8 | CH0 Compare 0 Type Setting | Comparison output 0 mode of channel 0 | 16 | R/W |
| | 0A | 10 | 9 | CH0 Compare 1 Type Setting | Comparison output 1 mode of channel 0 | 16 | R/W |
| | 0B | 11 | 10 | CH0 Compare 0 Min. Value Lower | Comparison output 0 minimum setting value of channel 0 | 16 | R/W |
| | 0C | 12 | 11 | CH0 Compare 0 Min. Value Upper | | 16 | R/W |
| | 0D | 13 | 12 | CH0 Compare 0 Max. Value Lower | Comparison output 0 maximum setting value of channel 0 | 16 | R/W |
| | 0E | 14 | 13 | CH0 Compare 0 Max. Value Upper | | 16 | R/W |
| | 0F | 15 | 14 | CH0 Compare 1 Min. Value Lower | Comparison output 1 minimum setting value of channel 0 | 16 | R/W |
| | 10 | 16 | 15 | CH0 Compare 1 Min. Value Upper | | 16 | R/W |
| | 11 | 17 | 16 | CH0 Compare 1 Max. Value Lower | Comparison output 1 maximum setting value of channel 0 | 16 | R/W |
| | 12 | 18 | 17 | CH0 Compare 1 Max. Value Upper | | 16 | R/W |
| | 13 | 19 | 18 | CH0 Auxiliary Mode Setting | Auxiliary function mode of channel 0 | 16 | R/W |
| | 14 | 20 | 19 | CH0 Time Value | Section setting value [ms] of channel 0 | 16 | R/W |
| | 15 | 21 | 20 | CH0 Pulses Per Revolution Value | Number of pulses per revolution of channel 0 | 16 | R/W |
| | 16 | 22 | 21 | CH0 Frequency Unit Setting | Frequency display mode of channel 0 | 16 | R/W |
| | 17 | 23 | 22 | CH0 Active Level Setting | Pulse input level of channel 0 | 16 | R/W |
| | 18 | 24 | 23 | CH0 Compare Output Status Setting | Output status setting for channel 0 | 16 | R/W |
| | 1A | 26 | 25 | CH1 Counter Mode Setting | Counter mode setting for channel 1 | 16 | R/W |
| | 1B | 27 | 26 | CH1 Pulse Mode Setting | Pulse input mode setting for channel 1 | 16 | R/W |
| | 1C | 28 | 27 | CH1 Preset Value Lower | Preset value setting for channel 1 | 16 | R/W |
| | 1D | 29 | 28 | CH1 Preset Value Upper | | 16 | R/W |
| | 1E | 30 | 29 | CH1 Ring Count Min. Value Lower | Minimum ring count value of channel 1 | 16 | R/W |
| | 1F | 31 | 30 | CH1 Ring Count Min. Value Upper | | 16 | R/W |
| | 20 | 32 | 31 | CH1 Ring Count Max. Value Lower | Maximum ring count value of channel 1 | 16 | R/W |
| | 21 | 33 | 32 | CH1 Ring Count Max. Value Upper | | 16 | R/W |
| | 22 | 34 | 33 | CH1 Compare 0 Type Setting | Comparison output 0 mode of channel 1 | 16 | R/W |
| | 23 | 35 | 34 | CH1 Compare 1 Type Setting | Comparison output 1 mode of channel 1 | 16 | R/W |
| | 24 | 36 | 35 | CH1 Compare 0 Min. Value Lower | Comparison output 0 minimum setting | 16 | R/W |

| Index (hex) | SubIndex (hex) | SubIndex (dec) | Module Area Address | Parameter Name | Description | Bit size | R/W Property |
|---|---|---|---|---|---|---|---|
| | 25 | 37 | 36 | CH1 Compare 0 Min. Value Upper | value of channel 1 | 16 | R/W |
| | 26 | 38 | 37 | CH1 Compare 0 Max. Value Lower | Comparison output 0 maximum setting value of channel 1 | 16 | R/W |
| | 27 | 39 | 38 | CH1 Compare 0 Max. Value Upper | | 16 | R/W |
| | 28 | 40 | 39 | CH1 Compare 1 Min. Value Lower | Comparison output 1 minimum setting value of channel 1 | 16 | R/W |
| | 29 | 41 | 40 | CH1 Compare 1 Min. Value Upper | | 16 | R/W |
| | 2A | 42 | 41 | CH1 Compare 1 Max. Value Lower | Comparison output 1 maximum setting value pf channel 1 | 16 | R/W |
| | 2B | 43 | 42 | CH1 Compare 1 Max. Value Upper | | 16 | R/W |
| | 2C | 44 | 43 | CH1 Auxiliary Mode Setting | Auxiliary function mode of channel 1 | 16 | R/W |
| | 2D | 45 | 44 | CH1 Time Value | Section setting value [ms] of channel 1 | 16 | R/W |
| | 2E | 46 | 45 | CH1 Pulses Per Revolution Value | Number of pulses per revolution of channel 1 | 16 | R/W |
| | 2F | 47 | 46 | CH1 Frequency Unit Setting | Frequency display mode of channel 1 | 16 | R/W |
| | 30 | 48 | 47 | CH1 Active Level Setting | Pulse input level of channel 1 | 16 | R/W |
| | 31 | 49 | 48 | CH1 Compare Output Status Setting | Output status setting for channel 1 | 16 | R/W |
| 80x1 (x: Slot No.) | 01 | 01 | 51 | Error code | Error information | 16 | R |

**2) List of Parameter Settings**

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| CH0 Counter Mode Setting | CH0 | | | | | | | | | | | | | | | | 0: Linear count, 1: Ring count |
| CH0 Pulse Mode Setting | CH0 | | | | | | | | | | | | | | | | 0: 2-phase 1-multiplication<br>1: 2-phase 2-multiplication<br>2: 2-phase 4-multiplication<br>3: CW/CCW<br>4: 1-phase 1-input 1-multiplication<br>5: 1-phase 1-input 2-multiplication<br>6: 1-phase 2-input 1-multiplication<br>7: 1-phase 2-input 2-multiplication |
| CH0 Preset Value Lower | CH0 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH0 Preset Value Upper | | | | | | | | | | | | | | | | | |
| CH0 Ring Count Min. Value Lower | CH0 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH0 Ring Count Min. Value Upper | | | | | | | | | | | | | | | | | |
| CH0 Ring Count Max. Value Lower | CH0 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH0 Ring Count Max. Value Upper | | | | | | | | | | | | | | | | | |
| CH0 Compare 0 Type Setting | CH0 | | | | | | | | | | | | | | | | 0: < Reference value for comparison<br>1: ≤ Reference value for comparison<br>2: = Reference value for comparison<br>3: ≥ Reference value for comparison<br>4: ≥ Reference value for comparison<br>5: Min. Comparison Value ≤ Current Value ≤ Max. Comparison Value<br>6: Min. Comparison Value ≥ Current Value Current Value ≥ Max. Comparison Value |
| CH0 Compare 1 Type Setting | CH0 | | | | | | | | | | | | | | | | |
| CH0 Compare 0 Min. Value Lower | CH0 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH0 Compare 0 Min. Value Upper | | | | | | | | | | | | | | | | | |
| CH0 Compare 0 Max. Value Lower | CH0 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH0 Compare 0 Max. Value Upper | | | | | | | | | | | | | | | | | |
| CH0 Compare 1 Min. Value Lower | CH0 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH0 Compare 1 Min. Value Upper | | | | | | | | | | | | | | | | | |
| CH0 Compare 1 Max. Value Lower | CH0 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH0 Compare 1 Max. Value Upper | | | | | | | | | | | | | | | | | |
| CH0 Auxiliary Mode Setting | CH0 | | | | | | | | | | | | | | | | 0: Do not use auxiliary functions<br>1: Clear count<br>2: Latch count<br>3: Count section<br>4: Measure input frequency<br>5: Measure revolution count per unit time<br>6: Disable count |
| CH0 Time Value | CH0 | | | | | | | | | | | | | | | | 0 ~ 60,000 |
| CH0 Pulses Per Revolution Value | CH0 | | | | | | | | | | | | | | | | 0 ~ 60,000 |
| CH0 Frequency Unit Setting | CH0 | | | | | | | | | | | | | | | | 0: 1Hz, 1: 10Hz, 2: 100Hz<br>3: 1000Hz(=1KHz) |
| CH0 Active Level Setting | CH0 | | | | | | | | | | | | | | | | 0: Low Active, 1: High Active |
| CH0 Compare Output Status Setting | CH0 | | | | | | | | | | | | | | | | 0: Disable Output, 1: Enable Output |

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| CH1 Counter Mode Setting | CH1 | | | | | | | | | | | | | | | | 0: Linear count, 1: Ring count |
| CH1 Pulse Mode Setting | CH1 | | | | | | | | | | | | | | | | 0: 2-phase 1-multiplication<br>1: 2-phase 2-multiplication<br>2: 2-phase 4-multiplication<br>3: CW/CCW<br>4: 1-phase 1-input 1-multiplication<br>5: 1-phase 1-input 2-multiplication<br>6: 1-phase 2-input 1-multiplication<br>7: 1-phase 2-input 2-multiplication |
| CH1 Preset Value Lower | CH1 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH1 Preset Value Upper | | | | | | | | | | | | | | | | | |
| CH1 Ring Count Min. Value Lower | CH1 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH1 Ring Count Min. Value Upper | | | | | | | | | | | | | | | | | |
| CH1 Ring Count Max. Value Lower | CH1 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH1 Ring Count Max. Value Upper | | | | | | | | | | | | | | | | | |
| CH1 Compare 0 Type Setting | CH1 | | | | | | | | | | | | | | | | 0: < Reference value for comparison<br>1: ≤ Reference value for comparison<br>2: = Reference value for comparison<br>3: ≥ Reference value for comparison<br>4: ≥ Reference value for comparison<br>5: Min. Comparison Value ≤ Current Value ≤ Max. Comparison Value<br>6: Min. Comparison Value ≥ Current Value Current Value ≥ Max. Comparison Value |
| CH1 Compare 1 Type Setting | CH1 | | | | | | | | | | | | | | | | |
| CH1 Compare 0 Min. Value Lower | CH1 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH1 Compare 0 Min. Value Upper | | | | | | | | | | | | | | | | | |
| CH1 Compare 0 Max. Value Lower | CH1 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH1 Compare 0 Max. Value Upper | | | | | | | | | | | | | | | | | |
| CH1 Compare 1 Min. Value Lower | CH1 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH1 Compare 1 Min. Value Upper | | | | | | | | | | | | | | | | | |
| CH1 Compare 1 Max. Value Lower | CH1 | | | | | | | | | | | | | | | | -2,147,483,648 ~ 2,147,483,647 |
| CH1 Compare 1 Max. Value Upper | | | | | | | | | | | | | | | | | |
| CH1 Auxiliary Mode Setting | CH1 | | | | | | | | | | | | | | | | 0: Do not use auxiliary functions<br>1: Clear count<br>2: Latch count<br>3: Count section<br>4: Measure input frequency<br>5: Measure revolution count per unit time<br>6: Disable count |
| CH1 Time Value | CH1 | | | | | | | | | | | | | | | | 0 ~ 60,000 |
| CH1 Pulses Per Revolution Value | CH1 | | | | | | | | | | | | | | | | 0 ~ 60,000 |
| CH1 Frequency Unit Setting | CH1 | | | | | | | | | | | | | | | | 0: 1Hz, 1: 10Hz, 2: 100Hz<br>3: 1000Hz(=1KHz) |
| CH1 Active Level Setting | CH1 | | | | | | | | | | | | | | | | 0: Low Active, 1: High Active |
| CH1 Compare Output Status Setting | CH1 | | | | | | | | | | | | | | | | 0: Disable Output, 1: Enable Output |

| Parameter Name | Bit | | | | | | | | | | | | | | | | Settings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Error code | - | | | | | | | | | | | | | | | | 10: Module error (ASIC reset error)<br>11: Module error (ASIC memory error)<br>12: Module error (ASIC register error)<br>#20: Count type setting error<br>#21: Pulse input type setting error<br>#22: Auxiliary function type setting error<br>#23: Auxiliary function unit time setting error<br>#24: Comparison output 0 type setting error<br>#25: Comparison output 1 type setting error<br>#26: Preset value setting error<br>#27: Ring count range setting error<br>(Min. ring count value ≥ max. value)<br>#28: Comparison output 0 min. comparison value setting error<br>#29: Comparison output 0 max. comparison value setting error<br>#30: Comparison output 0 range setting error<br>(Min. comparison value > max. comparison value)<br>#31: Comparison output 1 min. comparison value setting error<br>#32: Comparison output 1 max. comparison value setting error<br>#33: Comparison output 1 range setting error<br>(Min. comparison value > max. comparison value)<br>#34: Pulse value per 1 revolution range setting error<br>#35: Frequency input unit range setting error<br>#36: Hold comparison output when stopping the basic unit Parameter error |

## Appendix 2.3 PDO List

**XEL-BSSCT PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XEL-BSSCT | TxPDO (0x1A80) | 2000:01 | _RUN | BIT |
| | | 2000:03 | _ERROR | BIT |
| | | 2010:02 | _IO_TYER | BIT |
| | | 2010:03 | _IO_DEER | BIT |
| | | 2010:05 | _IO_RWER | BIT |
| | | 2010:06 | _IP_IFER | BIT |
| | | 2010:08 | _BPRM_ER | BIT |
| | | 2010:09 | _IOPRM_ER | BIT |
| | | 2010:0A | _SPPRM_ER | BIT |
| | | 2010:0B | _CPPRM_ER | BIT |
| | | 2010:0D | _SWDT_ER | BIT |
| | | 2010:10 | _IOSIZE_ER | BIT |
| | | 2020:02 | _REFRESH_OT_WAR | BIT |
| | | 2040:1A | _EXT_ERR_FLAG_0SLT | BIT |
| | | 2040:1B | _EXT_ERR_FLAG_1SLT | BIT |
| | | 2040:1C | _EXT_ERR_FLAG_2SLT | BIT |
| | | 2040:1D | _EXT_ERR_FLAG_3SLT | BIT |
| | | 2040:1E | _EXT_ERR_FLAG_4SLT | BIT |
| | | 2040:1F | _EXT_ERR_FLAG_5SLT | BIT |
| | | 2040:20 | _EXT_ERR_FLAG_6SLT | BIT |
| | | 2040:21 | _EXT_ERR_FLAG_7SLT | BIT |
| | | 2030:06 | _REFRESH_MAX | word |
| | | 2030:07 | _REFRESH_MIN | word |
| | | 2030:08 | _REFRESH_CUR | word |
| | RxPDO (0x1680) | 2040:03 | _DC_SYNC_COUNT_CLR | BIT |

**XBE-DC08A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-DC08A | TxPDO (0x1A0x) X: Slot No. | 60x0:01(x: Slot No.) | DI 0 | BIT |
| | | 60x0:02 | DI 1 | BIT |
| | | 60x0:03 | DI 2 | BIT |
| | | 60x0:04 | DI 3 | BIT |
| | | 60x0:05 | DI 4 | BIT |
| | | 60x0:06 | DI 5 | BIT |
| | | 60x0:07 | DI 6 | BIT |
| | | 60x0:08 | DI 7 | BIT |

**XBE-DC16A/B PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-DC16A/B | TxPDO (0x1A0x) X: Slot No. | 60x0:01(x: Slot No.) | DI 0 | BIT |
| | | 60x0:02 | DI 1 | BIT |
| | | 60x0:03 | DI 2 | BIT |
| | | 60x0:04 | DI 3 | BIT |
| | | 60x0:05 | DI 4 | BIT |
| | | 60x0:06 | DI 5 | BIT |
| | | 60x0:07 | DI 6 | BIT |
| | | 60x0:08 | DI 7 | BIT |
| | | 60x0:09 | DI 8 | BIT |
| | | 60x0:0A | DI 9 | BIT |
| | | 60x0:0B | DI 10 | BIT |
| | | 60x0:0C | DI 11 | BIT |
| | | 60x0:0D | DI 12 | BIT |
| | | 60x0:0E | DI 13 | BIT |
| | | 60x0:0F | DI 14 | BIT |
| | | 60x0:10 | DI 15 | BIT |

**XBE-DC32A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-DC32A | TxPDO (0x1A0x) X: Slot No. | 60x0:01(x: Slot No.) | DI 0 | BIT |
| | | 60x0:02 | DI 1 | BIT |
| | | 60x0:03 | DI 2 | BIT |
| | | 60x0:04 | DI 3 | BIT |
| | | 60x0:05 | DI 4 | BIT |
| | | 60x0:06 | DI 5 | BIT |
| | | 60x0:07 | DI 6 | BIT |
| | | 60x0:08 | DI 7 | BIT |
| | | 60x0:09 | DI 8 | BIT |
| | | 60x0:0A | DI 9 | BIT |
| | | 60x0:0B | DI 10 | BIT |
| | | 60x0:0C | DI 11 | BIT |
| | | 60x0:0D | DI 12 | BIT |
| | | 60x0:0E | DI 13 | BIT |
| | | 60x0:0F | DI 14 | BIT |
| | | 60x0:10 | DI 15 | BIT |
| | | 60x0:11 | DI 16 | BIT |
| | | 60x0:12 | DI 17 | BIT |
| | | 60x0:13 | DI 18 | BIT |
| | | 60x0:14 | DI 19 | BIT |
| | | 60x0:15 | DI 20 | BIT |
| | | 60x0:16 | DI 21 | BIT |
| | | 60x0:17 | DI 22 | BIT |
| | | 60x0:18 | DI 23 | BIT |
| | | 60x0:19 | DI 24 | BIT |
| | | 60x0:1A | DI 25 | BIT |
| | | 60x0:1B | DI 26 | BIT |
| | | 60x0:1C | DI 27 | BIT |
| | | 60x0:1D | DI 28 | BIT |
| | | 60x0:1E | DI 29 | BIT |
| | | 60x0:1F | DI 30 | BIT |
| | | 60x0:20 | DI 31 | BIT |

**XBE-TN/TP08A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-TN/TP08A | RxPDO (0x160x) X: Slot No. | 70x0:01(x: Slot No.) | DO 0 | BIT |
| | | 70x0:02 | DO 1 | BIT |
| | | 70x0:03 | DO 2 | BIT |
| | | 70x0:04 | DO 3 | BIT |
| | | 70x0:05 | DO 4 | BIT |
| | | 70x0:06 | DO 5 | BIT |
| | | 70x0:07 | DO 6 | BIT |
| | | 70x0:08 | DO 7 | BIT |

**XBE-TN/TP16A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-TN/TP16A | RxPDO (0x160x) X: Slot No. | 70x0:01(x: Slot No.) | DO 0 | BIT |
| | | 70x0:02 | DO 1 | BIT |
| | | 70x0:03 | DO 2 | BIT |
| | | 70x0:04 | DO 3 | BIT |
| | | 70x0:05 | DO 4 | BIT |
| | | 70x0:06 | DO 5 | BIT |
| | | 70x0:07 | DO 6 | BIT |
| | | 70x0:08 | DO 7 | BIT |
| | | 70x0:09 | DO 8 | BIT |
| | | 70x0:0A | DO 9 | BIT |
| | | 70x0:0B | DO 10 | BIT |
| | | 70x0:0C | DO 11 | BIT |
| | | 70x0:0D | DO 12 | BIT |
| | | 70x0:0E | DO 13 | BIT |
| | | 70x0:0F | DO 14 | BIT |
| | | 70x0:10 | DO 15 | BIT |

**XBE-TN/TP32A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-TN/TP32A | RxPDO (0x160x) X: Slot No. | 70x0:01(x: Slot No.) | DO 0 | BIT |
| | | 70x0:02 | DO 1 | BIT |
| | | 70x0:03 | DO 2 | BIT |
| | | 70x0:04 | DO 3 | BIT |
| | | 70x0:05 | DO 4 | BIT |
| | | 70x0:06 | DO 5 | BIT |
| | | 70x0:07 | DO 6 | BIT |
| | | 70x0:08 | DO 7 | BIT |
| | | 70x0:09 | DO 8 | BIT |
| | | 70x0:0A | DO 9 | BIT |
| | | 70x0:0B | DO 10 | BIT |
| | | 70x0:0C | DO 11 | BIT |
| | | 70x0:0D | DO 12 | BIT |
| | | 70x0:0E | DO 13 | BIT |
| | | 70x0:0F | DO 14 | BIT |
| | | 70x0:10 | DO 15 | BIT |
| | | 70x0:11 | DO 16 | BIT |
| | | 70x0:12 | DO 17 | BIT |
| | | 70x0:13 | DO 18 | BIT |
| | | 70x0:14 | DO 19 | BIT |
| | | 70x0:15 | DO 20 | BIT |
| | | 70x0:16 | DO 21 | BIT |
| | | 70x0:17 | DO 22 | BIT |
| | | 70x0:18 | DO 23 | BIT |
| | | 70x0:19 | DO 24 | BIT |
| | | 70x0:1A | DO 25 | BIT |
| | | 70x0:1B | DO 26 | BIT |
| | | 70x0:1C | DO 27 | BIT |
| | | 70x0:1D | DO 28 | BIT |
| | | 70x0:1E | DO 29 | BIT |
| | | 70x0:1F | DO 30 | BIT |
| | | 70x0:20 | DO 31 | BIT |

**XBE-RY08A/B PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-RY08A/B | RxPDO (0x160x) X: Slot No. | 70x0:01(x: Slot No.) | DO 0 | BIT |
| | | 70x0:02 | DO 1 | BIT |
| | | 70x0:03 | DO 2 | BIT |
| | | 70x0:04 | DO 3 | BIT |
| | | 70x0:05 | DO 4 | BIT |
| | | 70x0:06 | DO 5 | BIT |
| | | 70x0:07 | DO 6 | BIT |
| | | 70x0:08 | DO 7 | BIT |

**XBE-RY16A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-RY16A | RxPDO (0x160x) X: Slot No. | 70x0:01(x: Slot No.) | DO 0 | BIT |
| | | 70x0:02 | DO 1 | BIT |
| | | 70x0:03 | DO 2 | BIT |
| | | 70x0:04 | DO 3 | BIT |
| | | 70x0:05 | DO 4 | BIT |
| | | 70x0:06 | DO 5 | BIT |
| | | 70x0:07 | DO 6 | BIT |
| | | 70x0:08 | DO 7 | BIT |
| | | 70x0:09 | DO 8 | BIT |
| | | 70x0:0A | DO 9 | BIT |
| | | 70x0:0B | DO 10 | BIT |
| | | 70x0:0C | DO 11 | BIT |
| | | 70x0:0D | DO 12 | BIT |
| | | 70x0:0E | DO 13 | BIT |
| | | 70x0:0F | DO 14 | BIT |
| | | 70x0:10 | DO 15 | BIT |

**XBE-DR16A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-DR16A | TxPDO (0x1A0x) X: Slot No. | 60x0:01(x: Slot No.) | DI 0 | BIT |
| | | 60x0:02 | DI 1 | BIT |
| | | 60x0:03 | DI 2 | BIT |
| | | 60x0:04 | DI 3 | BIT |
| | | 60x0:05 | DI 4 | BIT |
| | | 60x0:06 | DI 5 | BIT |
| | | 60x0:07 | DI 6 | BIT |
| | | 60x0:08 | DI 7 | BIT |
| | RxPDO (0x160x) X: Slot No. | 70x0:01(x: Slot No.) | DO 0 | BIT |
| | | 70x0:02 | DO 1 | BIT |
| | | 70x0:03 | DO 2 | BIT |
| | | 70x0:04 | DO 3 | BIT |
| | | 70x0:05 | DO 4 | BIT |
| | | 70x0:06 | DO 5 | BIT |
| | | 70x0:07 | DO 6 | BIT |
| | | 70x0:08 | DO 7 | BIT |

**XBE-DN32A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Data Type |
|---|---|---|---|---|
| XBE-DN32A | TxPDO (0x1A0x) X: Slot No. | 60x0:01(x: Slot No.) | DI 0 | BIT |
| | | 60x0:02 | DI 1 | BIT |
| | | 60x0:03 | DI 2 | BIT |
| | | 60x0:04 | DI 3 | BIT |
| | | 60x0:05 | DI 4 | BIT |
| | | 60x0:06 | DI 5 | BIT |
| | | 60x0:07 | DI 6 | BIT |
| | | 60x0:08 | DI 7 | BIT |
| | | 60x0:09 | DI 8 | BIT |
| | | 60x0:0A | DI 9 | BIT |
| | | 60x0:0B | DI 10 | BIT |
| | | 60x0:0C | DI 11 | BIT |
| | | 60x0:0D | DI 12 | BIT |
| | | 60x0:0E | DI 13 | BIT |
| | | 60x0:0F | DI 14 | BIT |
| | | 60x0:10 | DI 15 | BIT |
| | RxPDO (0x160x) X: Slot No. | 70x0:01(x: Slot No.) | DO 0 | BIT |
| | | 70x0:02 | DO 1 | BIT |
| | | 70x0:03 | DO 2 | BIT |
| | | 70x0:04 | DO 3 | BIT |
| | | 70x0:05 | DO 4 | BIT |
| | | 70x0:06 | DO 5 | BIT |
| | | 70x0:07 | DO 6 | BIT |
| | | 70x0:08 | DO 7 | BIT |
| | | 70x0:09 | DO 8 | BIT |
| | | 70x0:0A | DO 9 | BIT |
| | | 70x0:0B | DO 10 | BIT |
| | | 70x0:0C | DO 11 | BIT |
| | | 70x0:0D | DO 12 | BIT |
| | | 70x0:0E | DO 13 | BIT |
| | | 70x0:0F | DO 14 | BIT |
| | | 70x0:10 | DO 15 | BIT |

**XBF-AD04A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-AD04A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | Error Flag | Module error | BIT |
| | | 60x0:03 | Ready Flag | Module ready | BIT |
| | | 60x0:04 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:05 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:06 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:07 | CH3 Activation Status | Channel 3 is active | BIT |
| | | 60x1:01 | CH0 Digital Output Data | Converted value of channel 0 | word |
| | | 60x1:02 | CH1 Digital Output Data | Converted value of channel 1 | word |
| | | 60x1:03 | CH2 Digital Output Data | Converted value of channel 2 | word |
| | | 60x1:04 | CH3 Digital Output Data | Converted value of channel 3 | word |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | Error Clear Request | Error clear request | BIT |

**XBF-AD08A PDO List**

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-AD08A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | Module Error | Module error | BIT |
| | | 60x0:03 | Module Ready | Module ready | BIT |
| | | 60x0:04 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:05 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:06 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:07 | CH3 Activation Status | Channel 3 is active | BIT |
| | | 60x0:08 | CH4 Activation Status | Channel 4 is active | BIT |
| | | 60x0:09 | CH5 Activation Status | Channel 5 is active | BIT |
| | | 60x0:0A | CH6 Activation Status | Channel 6 is active | BIT |
| | | 60x0:0B | CH7 Activation Status | Channel 7 is active | BIT |
| | | 60x0:0C | CH0 Error | Channel 0 error | BIT |
| | | 60x0:0D | CH1 Error | Channel 1 error | BIT |
| | | 60x0:0E | CH2 Error | Channel 2 error | BIT |
| | | 60x0:0F | CH3 Error | Channel 3 error | BIT |
| | | 60x0:10 | CH4 Error | Channel 4 error | BIT |
| | | 60x0:11 | CH5 Error | Channel 5 error | BIT |
| | | 60x0:12 | CH6 Error | Channel 6 error | BIT |
| | | 60x0:13 | CH7 Error | Channel 7 error | BIT |
| | | 60x2:01 | CH0 Disconnection Flag | Disconnection detected from channel 0 | BIT |
| | | 60x2:02 | CH1 Disconnection Flag | Disconnection detected from channel 1 | BIT |
| | | 60x2:03 | CH2 Disconnection Flag | Disconnection detected from channel 2 | BIT |
| | | 60x2:04 | CH3 Disconnection Flag | Disconnection detected from channel 3 | BIT |
| | | 60x2:05 | CH4 Disconnection Flag | Disconnection detected from channel 4 | BIT |
| | | 60x2:06 | CH5 Disconnection Flag | Disconnection detected from channel 5 | BIT |
| | | 60x2:07 | CH6 Disconnection Flag | Disconnection detected from channel 6 | BIT |
| | | 60x2:08 | CH7 Disconnection Flag | Disconnection detected from channel 7 | BIT |
| | | 60x1:01 | CH0 Digital Output Data | Converted value of channel 0 | word |
| | | 60x1:02 | CH1 Digital Output Data | Converted value of channel 1 | word |
| | | 60x1:03 | CH2 Digital Output Data | Converted value of channel 2 | word |
| | | 60x1:04 | CH3 Digital Output Data | Converted value of channel 3 | word |
| | | 60x1:05 | CH4 Digital Output Data | Converted value of channel 4 | word |
| | | 60x1:06 | CH5 Digital Output Data | Converted value of channel 5 | word |
| | | 60x1:07 | CH6 Digital Output Data | Converted value of channel 6 | word |
| | | 60x1:08 | CH7 Digital Output Data | Converted value of channel 7 | word |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | Error Clear Request | Error clear request | BIT |

**XBF-AD04C PDO List**

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-AD04C | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | Module Error | Module error | BIT |
| | | 60x0:03 | Module Ready | Module ready | BIT |
| | | 60x0:04 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:05 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:06 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:07 | CH3 Activation Status | Channel 3 is active | BIT |
| | | 60x0:09 | CH0 Error | Channel 0 error | BIT |
| | | 60x0:0A | CH1 Error | Channel 1 error | BIT |
| | | 60x0:0B | CH2 Error | Channel 2 error | BIT |
| | | 60x0:0C | CH3 Error | Channel 3 error | BIT |
| | | 60x2:01 | CH0 Disconnection Flag | Disconnection detected from channel 0 | BIT |
| | | 60x2:02 | CH1 Disconnection Flag | Disconnection detected from channel 1 | BIT |
| | | 60x2:03 | CH2 Disconnection Flag | Disconnection detected from channel 2 | BIT |
| | | 60x2:04 | CH3 Disconnection Flag | Disconnection detected from channel 3 | BIT |
| | | 60x2:06 | CH0 Upper Alarm | Channel 0 Upper Alarm | BIT |
| | | 60x2:07 | CH1 Upper Alarm | Channel 1 Upper Alarm | BIT |
| | | 60x2:08 | CH2 Upper Alarm | Channel 2 Upper Alarm | BIT |
| | | 60x2:09 | CH3 Upper Alarm | Channel 3 Upper Alarm | BIT |
| | | 60x2:0B | CH0 Lower Alarm | Channel 0 Lower Alarm | BIT |
| | | 60x2:0C | CH1 Lower Alarm | Channel 1 Lower Alarm | BIT |
| | | 60x2:0D | CH2 Lower Alarm | Channel 2 Lower Alarm | BIT |
| | | 60x2:0E | CH3 Lower Alarm | Channel 3 Lower Alarm | BIT |
| | | 60x1:01 | CH0 Digital Output Data | Converted value of channel 0 | word |
| | | 60x1:02 | CH1 Digital Output Data | Converted value of channel 1 | word |
| | | 60x1:03 | CH2 Digital Output Data | Converted value of channel 2 | word |
| | | 60x1:04 | CH3 Digital Output Data | Converted value of channel 3 | word |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | Error Clear Request | Error clear request | BIT |

**XBF-DV04A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-DV04A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Error | Channel 0 error | BIT |
| | | 60x0:02 | CH1 Error | Channel 1 error | BIT |
| | | 60x0:03 | CH2 Error | Channel 2 error | BIT |
| | | 60x0:04 | CH3 Error | Channel 3 error | BIT |
| | | 60x0:06 | Ready Flag | Module ready | BIT |
| | | 60x0:07 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:08 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:09 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:0A | CH3 Activation Status | Channel 3 is active | BIT |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 | CH0 Output Enable | Output status setting for channel 0 | BIT |
| | | 70x0:02 | CH1 Output Enable | Output status setting for channel 1 | BIT |
| | | 70x0:03 | CH2 Output Enable | Output status setting for channel 2 | BIT |
| | | 70x0:04 | CH3 Output Enable | Output status setting for channel 3 | BIT |
| | | 70x1:01 | CH0 Digital Input Value | Input value of channel 0 | word |
| | | 70x1:02 | CH1 Digital Input Value | Input value of channel 1 | word |
| | | 70x1:03 | CH2 Digital Input Value | Input value of channel 2 | word |
| | | 70x1:04 | CH3 Digital Input Value | Input value of channel 3 | word |

**XBF-DC04A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-DC04A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Error | Channel 0 error | BIT |
| | | 60x0:02 | CH1 Error | Channel 1 error | BIT |
| | | 60x0:03 | CH2 Error | Channel 2 error | BIT |
| | | 60x0:04 | CH3 Error | Channel 3 error | BIT |
| | | 60x0:06 | Ready Flag | Module ready | BIT |
| | | 60x0:07 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:08 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:09 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:0A | CH3 Activation Status | Channel 3 is active | BIT |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 | CH0 Output Enable | Output status setting for channel 0 | BIT |
| | | 70x0:02 | CH1 Output Enable | Output status setting for channel 1 | BIT |
| | | 70x0:03 | CH2 Output Enable | Output status setting for channel 2 | BIT |
| | | 70x0:04 | CH3 Output Enable | Output status setting for channel 3 | BIT |
| | | 70x1:01 | CH0 Digital Input Value | Input value of channel 0 | word |
| | | 70x1:02 | CH1 Digital Input Value | Input value of channel 1 | word |
| | | 70x1:03 | CH2 Digital Input Value | Input value of channel 2 | word |
| | | 70x1:04 | CH3 Digital Input Value | Input value of channel 3 | word |

**XBF-DC04B PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-DC04B | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Error | Channel 0 error | BIT |
| | | 60x0:02 | CH1 Error | Channel 1 error | BIT |
| | | 60x0:03 | CH2 Error | Channel 2 error | BIT |
| | | 60x0:04 | CH3 Error | Channel 3 error | BIT |
| | | 60x0:06 | Ready Flag | Module ready | BIT |
| | | 60x0:07 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:08 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:09 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:0A | CH3 Activation Status | Channel 3 is active | BIT |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | CH0 Output Enable | Output status setting for channel 0 | BIT |
| | | 70x0:02 | CH1 Output Enable | Output status setting for channel 1 | BIT |
| | | 70x0:03 | CH2 Output Enable | Output status setting for channel 2 | BIT |
| | | 70x0:04 | CH3 Output Enable | Output status setting for channel 3 | BIT |
| | | 70x1:01 | CH0 Digital Input Value | Input value of channel 0 | word |
| | | 70x1:02 | CH1 Digital Input Value | Input value of channel 1 | word |
| | | 70x1:03 | CH2 Digital Input Value | Input value of channel 2 | word |
| | | 70x1:04 | CH3 Digital Input Value | Input value of channel 3 | word |

**XBF-DV04C PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-DV04C | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Error | Channel 0 error | BIT |
| | | 60x0:02 | CH1 Error | Channel 1 error | BIT |
| | | 60x0:03 | CH2 Error | Channel 2 error | BIT |
| | | 60x0:04 | CH3 Error | Channel 3 error | BIT |
| | | 60x0:06 | Ready Flag | Module ready | BIT |
| | | 60x0:07 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:08 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:09 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:0A | CH3 Activation Status | Channel 3 is active | BIT |
| | | 60x0:0C | CH0 Interpolation Status | Interpolation output in progress in channel 0 | BIT |
| | | 60x0:0D | CH1 Interpolation Status | Interpolation output in progress in channel 1 | BIT |
| | | 60x0:0E | CH2 Interpolation Status | Interpolation output in progress in channel 2 | BIT |
| | | 60x0:0F | CH3 Interpolation Status | Interpolation output in progress in channel 3 | BIT |
| | | 60x0:10 | CH0 Disconnection flag | Output disconnection detected from channel 0 | BIT |
| | | 60x0:11 | CH1 Disconnection flag | Output disconnection detected from channel 1 | BIT |
| | | 60x0:12 | CH2 Disconnection flag | Output disconnection detected from channel 2 | BIT |
| | | 60x0:13 | CH3 Disconnection flag | Output disconnection detected from channel 3 | BIT |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | CH0 Output Enable | Output status setting for channel 0 | BIT |
| | | 70x0:02 | CH1 Output Enable | Output status setting for channel 1 | BIT |
| | | 70x0:03 | CH2 Output Enable | Output status setting for channel 2 | BIT |
| | | 70x0:04 | CH3 Output Enable | Output status setting for channel 3 | BIT |
| | | 70x1:01 | CH0 Digital Input Value | Input value of channel 0 | word |
| | | 70x1:02 | CH1 Digital Input Value | Input value of channel 1 | word |
| | | 70x1:03 | CH2 Digital Input Value | Input value of channel 2 | word |
| | | 70x1:04 | CH3 Digital Input Value | Input value of channel 3 | word |

**XBF-DC04C PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-DC04C | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Error | Channel 0 error | BIT |
| | | 60x0:02 | CH1 Error | Channel 1 error | BIT |
| | | 60x0:03 | CH2 Error | Channel 2 error | BIT |
| | | 60x0:04 | CH3 Error | Channel 3 error | BIT |
| | | 60x0:06 | Ready Flag | Module ready | BIT |
| | | 60x0:07 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:08 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:09 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:0A | CH3 Activation Status | Channel 3 is active | BIT |
| | | 60x0:0C | CH0 Interpolation Status | Interpolation output in progress in channel 0 | BIT |
| | | 60x0:0D | CH1 Interpolation Status | Interpolation output in progress in channel 1 | BIT |
| | | 60x0:0E | CH2 Interpolation Status | Interpolation output in progress in channel 2 | BIT |
| | | 60x0:0F | CH3 Interpolation Status | Interpolation output in progress in channel 3 | BIT |
| | | 60x0:10 | CH0 Disconnection flag | Output disconnection detected from channel 0 | BIT |
| | | 60x0:11 | CH1 Disconnection flag | Output disconnection detected from channel 1 | BIT |
| | | 60x0:12 | CH2 Disconnection flag | Output disconnection detected from channel 2 | BIT |
| | | 60x0:13 | CH3 Disconnection flag | Output disconnection detected from channel 3 | BIT |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | CH0 Output Enable | Output status setting for channel 0 | BIT |
| | | 70x0:02 | CH1 Output Enable | Output status setting for channel 1 | BIT |
| | | 70x0:03 | CH2 Output Enable | Output status setting for channel 2 | BIT |
| | | 70x0:04 | CH3 Output Enable | Output status setting for channel 3 | BIT |
| | | 70x1:01 | CH0 Digital Input Value | Input value of channel 0 | word |
| | | 70x1:02 | CH1 Digital Input Value | Input value of channel 1 | word |
| | | 70x1:03 | CH2 Digital Input Value | Input value of channel 2 | word |
| | | 70x1:04 | CH3 Digital Input Value | Input value of channel 3 | word |

**XBF-AH04A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-AH04A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | Error Flag | Module error | BIT |
| | | 60x0:03 | Ready Flag | Module ready | BIT |
| | | 60x0:04 | AD0 Activation Status | Input channel 0 is active | BIT |
| | | 60x0:05 | AD1 Activation Status | Input channel 1 is active | BIT |
| | | 60x0:06 | DA0 Activation Status | Output Channel0 is active | BIT |
| | | 60x0:07 | DA1 Activation Status | Output Channel1 is active | BIT |
| | | 60x0:08 | AD0 Disconnection flag | Disconnection detected from input channel 0 | BIT |
| | | 60x0:09 | AD1 Disconnection flag | Disconnection detected from input channel 1 | BIT |
| | | 60x0:0B | AD0 Error code | Input channel 0 error | BIT |
| | | 60x0:0C | AD1 Error code | Input channel 1 error | BIT |
| | | 60x0:0D | DA0 Error code | Output Channel 0 error | BIT |
| | | 60x0:0E | DA1 Error code | Output Channel 1 error | BIT |
| | | 60x1:01 | AD0 Digital Output Data | Converted value of input channel 0 | word |
| | | 60x1:02 | AD1 Digital Output Data | Converted value of input channel 1 | word |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | DA0 Output Enable | Output status setting for channel 0 | BIT |
| | | 70x0:02 | DA1 Output Enable | Output status setting for channel 1 | BIT |
| | | 70x1:01 | DA0 Digital Input Data | Input value of output channel 0 | word |
| | | 70x1:02 | DA1 Digital Input Data | Input value of output channel 1 | word |

**XBF-RD04A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-RD04A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | Error Flag | Module error | BIT |
| | | 60x0:03 | Ready Flag | Module ready | BIT |
| | | 60x0:04 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:05 | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:06 | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:07 | CH3 Activation Status | Channel 3 is active | BIT |
| | | 60x0:08 | CH0 Disconnection flag | Channel 0 disconnection | BIT |
| | | 60x0:09 | CH1 Disconnection flag | Channel 1 disconnection | BIT |
| | | 60x0:0A | CH2 Disconnection flag | Channel 2 disconnection | BIT |
| | | 60x0:0B | CH3 Disconnection flag | Channel 3 disconnection | BIT |
| | | 60x1:01 | CH0 Temp. Data | Converted temperature value of channel 0 | word |
| | | 60x1:02 | CH1 Temp. Data | Converted temperature value of channel 1 | word |
| | | 60x1:03 | CH2 Temp. Data | Converted temperature value of channel 2 | word |
| | | 60x1:04 | CH3 Temp. Data | Converted temperature value of channel 3 | word |
| | | 60x1:05 | CH0 Scaling Data | Scaling operation value of channel 0 | word |
| | | 60x1:06 | CH1 Scaling Data | Scaling operation value of channel 1 | word |
| | | 60x1:07 | CH2 Scaling Data | Scaling operation value of channel 2 | word |
| | | 60x1:08 | CH3 Scaling Data | Scaling operation value of channel 3 | word |

**XBF-RD01A PDO List**

| Device Name | PDO Type | Index:SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-RD01A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | Error Flag | Module error | BIT |
| | | 60x0:03 | Ready Flag | Module ready | BIT |
| | | 60x0:04 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:08 | CH0 Disconnection flag | Channel 0 disconnection | BIT |
| | | 60x1:01 | CH0 Temp. Data | Converted temperature value of channel 0 | word |
| | | 60x1:05 | CH0 Scaling Data | Scaling operation value of channel 0 | word |

**XBF-TC04B PDO List**

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-TC04B | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Offset/Gain Error Flag | Offset/gain adjustment error in channel 0 | BIT |
| | | 60x0:02 | CH1 Offset/Gain Error Flag | Offset/gain adjustment error in channel 1 | BIT |
| | | 60x0:03 | CH2 Offset/Gain Error Flag | Offset/gain adjustment error in channel 2 | BIT |
| | | 60x0:04 | CH3 Offset/Gain Error Flag | Offset/gain adjustment error in channel 3 | BIT |
| | | 60x0:06 | Offset/Gain Backup Error Flag | Module offset/gain backup error | BIT |
| | | 60x0:07 | H/W Error Flag | Module H/W error | BIT |
| | | 60x0:08 | Ready Flag | Module ready | BIT |
| | | 60x0:09 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:0A | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:0B | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:0C | CH3 Activation Status | Channel 3 is active | BIT |
| | | 60x0:0D | CH0 Disconnection flag | Channel 0 disconnection | BIT |
| | | 60x0:0E | CH1 Disconnection flag | Channel 1 disconnection | BIT |
| | | 60x0:0F | CH2 Disconnection flag | Channel 2 disconnection | BIT |
| | | 60x0:10 | CH3 Disconnection flag | Channel 3 disconnection | BIT |
| | | 60x0:11 | CH0 Error code | Channel 0 setting error | BIT |
| | | 60x0:12 | CH1 Error code | Channel 1 setting error | BIT |
| | | 60x0:13 | CH2 Error code | Channel 2 setting error | BIT |
| | | 60x0:14 | CH3 Error code | Channel 3 setting error | BIT |
| | | 60x1:01 | CH0 Temp. Data | Converted temperature value of channel 0 | word |
| | | 60x1:02 | CH1 Temp. Data | Converted temperature value of channel 1 | word |
| | | 60x1:03 | CH2 Temp. Data | Converted temperature value of channel 2 | word |
| | | 60x1:04 | CH3 Temp. Data | Converted temperature value of channel 3 | word |
| | | 60x1:05 | CH0 Scaling Data | Scaling operation value of channel 0 | word |
| | | 60x1:06 | CH1 Scaling Data | Scaling operation value of channel 1 | word |
| | | 60x1:07 | CH2 Scaling Data | Scaling operation value of channel 2 | word |
| | | 60x1:08 | CH3 Scaling Data | Scaling operation value of channel 3 | word |
| | | 60x1:09 | CH0 Temp. Min. Data | Min. converted temperature value of channel 0 | word |
| | | 60x1:0A | CH0 Temp. Max. Data | Max. converted temperature value of channel 0 | word |
| | | 60x1:0B | CH1 Temp. Min. Data | Min. converted temperature value of channel 1 | word |
| | | 60x1:0C | CH1 Temp. Max. Data | Max. converted temperature value of channel 1 | word |
| | | 60x1:0D | CH2 Temp. Min. Data | Min. converted temperature value of channel 2 | word |
| | | 60x1:0E | CH2 Temp. Max. Data | Max. converted temperature value of channel 2 | word |
| | | 60x1:0F | CH3 Temp. Min. Data | Min. converted temperature value of channel 3 | word |
| | | 60x1:10 | CH3 Temp. Max. Data | Max. converted temperature value of channel 3 | word |

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-TC04B | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | CH0 Max./Min. Search Enable | Enable/disable max./min. value search function for channel 0 | BIT |
| | | 70x0:02 | CH1 Max./Min. Search Enable | Enable/disable max./min. value search function for channel 1 | BIT |
| | | 70x0:03 | CH2 Max./Min. Search Enable | Enable/disable max./min. value search function for channel 2 | BIT |
| | | 70x0:04 | CH3 Max./Min. Search Enable | Enable/disable max./min. value search function for channel 3 | BIT |
| | | 70x0:06 | CH0 Cold Junction Compensation Enable | Enable/disable cold junction compensation function for channel 0 | BIT |
| | | 70x0:07 | CH1 Cold Junction Compensation Enable | Enable/disable cold junction compensation function for channel 1 | BIT |
| | | 70x0:08 | CH2 Cold Junction Compensation Enable | Enable/disable cold junction compensation function for channel 2 | BIT |
| | | 70x0:09 | CH3 Cold Junction Compensation Enable | Enable/disable cold junction compensation function for channel 3 | BIT |

**XBF-TC04S PDO List**

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-TC04S | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Offset/Gain Error Flag | Offset/gain adjustment error in channel 0 | BIT |
| | | 60x0:02 | CH1 Offset/Gain Error Flag | Offset/gain adjustment error in channel 1 | BIT |
| | | 60x0:03 | CH2 Offset/Gain Error Flag | Offset/gain adjustment error in channel 2 | BIT |
| | | 60x0:04 | CH3 Offset/Gain Error Flag | Offset/gain adjustment error in channel 3 | BIT |
| | | 60x0:06 | Offset/Gain Backup Error Flag | Module offset/gain backup error | BIT |
| | | 60x0:07 | H/W Error Flag | Module H/W error | BIT |
| | | 60x0:08 | Ready Flag | Module ready | BIT |
| | | 60x0:09 | CH0 Activation Status | Channel 0 is active | BIT |
| | | 60x0:0A | CH1 Activation Status | Channel 1 is active | BIT |
| | | 60x0:0B | CH2 Activation Status | Channel 2 is active | BIT |
| | | 60x0:0C | CH3 Activation Status | Channel 3 is active | BIT |
| | | 60x0:0D | CH0 Disconnection flag | Channel 0 disconnection | BIT |
| | | 60x0:0E | CH1 Disconnection flag | Channel 1 disconnection | BIT |
| | | 60x0:0F | CH2 Disconnection flag | Channel 2 disconnection | BIT |
| | | 60x0:10 | CH3 Disconnection flag | Channel 3 disconnection | BIT |
| | | 60x0:11 | CH0 Error code | Channel 0 setting error | BIT |
| | | 60x0:12 | CH1 Error code | Channel 1 setting error | BIT |
| | | 60x0:13 | CH2 Error code | Channel 2 setting error | BIT |
| | | 60x0:14 | CH3 Error code | Channel 3 setting error | BIT |
| | | 60x1:01 | CH0 Temp. Data | Converted temperature value of channel 0 | word |
| | | 60x1:02 | CH1 Temp. Data | Converted temperature value of channel 1 | word |
| | | 60x1:03 | CH2 Temp. Data | Converted temperature value of channel 2 | word |
| | | 60x1:04 | CH3 Temp. Data | Converted temperature value of channel 3 | word |
| | | 60x1:05 | CH0 Scaling Data | Scaling operation value of channel 0 | word |
| | | 60x1:06 | CH1 Scaling Data | Scaling operation value of channel 1 | word |
| | | 60x1:07 | CH2 Scaling Data | Scaling operation value of channel 2 | word |
| | | 60x1:08 | CH3 Scaling Data | Scaling operation value of channel 3 | word |
| | | 60x1:09 | CH0 Temp. Min. Data | Minimum converted temperature value of channel 0 | word |
| | | 60x1:0A | CH0 Temp. Max. Data | Maximum converted temperature value of channel 0 | word |
| | | 60x1:0B | CH1 Temp. Min. Data | Minimum converted temperature value of channel 1 | word |
| | | 60x1:0C | CH1 Temp. Max. Data | Maximum converted temperature value of channel 1 | word |
| | | 60x1:0D | CH2 Temp. Min. Data | Minimum converted temperature value of channel 2 | word |
| | | 60x1:0E | CH2 Temp. Max. Data | Maximum converted temperature value of channel 2 | word |
| | | 60x1:0F | CH3 Temp. Min. Data | Minimum converted temperature value of channel 3 | word |
| | | 60x1:10 | CH3 Temp. Max. Data | Maximum converted temperature value of channel 3 | word |

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | CH0 Max./Min. Search Enable | Enable/disable max./min. value search function for channel 0 | BIT |
| | | 70x0:02 | CH1 Max./Min. Search Enable | Enable/disable max./min. value search function for channel 1 | BIT |
| | | 70x0:03 | CH2 Max./Min. Search Enable | Enable/disable max./min. value search function for channel 2 | BIT |
| | | 70x0:04 | CH3 Max./Min. Search Enable | Enable/disable max./min. value search function for channel 3 | BIT |
| | | 70x0:06 | CH0 Cold Junction Compensation Enable | Enable/disable cold junction compensation function for channel 0 | BIT |
| | | 70x0:07 | CH1 Cold Junction Compensation Enable | Enable/disable cold junction compensation function for channel 1 | BIT |
| | | 70x0:08 | CH2 Cold Junction Compensation Enable | Enable/disable cold junction compensation function for channel 2 | BIT |
| | | 70x0:09 | CH3 Cold Junction Compensation Enable | Enable/disable cold junction compensation function for channel 3 | BIT |

**XBF-LD02S PDO List**

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-LD02S | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | Error Flag | Module error | BIT |
| | | 60x0:03 | Module Ready | Module ready | BIT |
| | | 60x0:04 | CH0 Run Status | Channel 0 is active | BIT |
| | | 60x0:05 | CH1 Run Status | Channel 1 is active | BIT |
| | | 60x0:07 | CH0 Calibration Status | Channel 0 calibration mode | BIT |
| | | 60x0:08 | CH1 Calibration Status | Channel 1 calibration mode | BIT |
| | | 60x0:0A | CH0 Error | Channel 0 error | BIT |
| | | 60x0:0B | CH1 Error | Channel 1 error | BIT |
| | | 60x0:0C | CH0 Stable Status | Stable status of channel 0 | BIT |
| | | 60x0:0D | CH1 Stable Status | Stable status of channel 1 | BIT |
| | | 60x0:0E | CH0 Zero Status | Zero status of channel 0 | BIT |
| | | 60x0:0F | CH1 Zero Status | Zero status of channel 1 | BIT |
| | | 60x0:10 | CH0 Weighing Complete Status | Channel 0 weighing complete status | BIT |
| | | 60x0:11 | CH1 Weighing Complete Status | Channel 1 weighing complete status | BIT |
| | | 60x0:12 | CH0 Step 1 Status | Step 1 status of channel 0 | BIT |
| | | 60x0:13 | CH0 Step 2 Status | Step 2 status of channel 0 | BIT |
| | | 60x0:14 | CH0 Step 3 Status | Step 3 status of channel 0 | BIT |
| | | 60x0:15 | CH0 Lack Status | Lack status of channel 0 | BIT |
| | | 60x0:16 | CH0 Over Status | Over status of channel 0 | BIT |
| | | 60x0:17 | CH1 Step 1 Status | Step 1 status of channel 1 | BIT |
| | | 60x0:18 | CH1 Step 2 Status | Step 2 status of channel 1 | BIT |
| | | 60x0:19 | CH1 Step 3 Status | Step 3 status of channel 1 | BIT |
| | | 60x0:1A | CH1 Lack Status | Lack status of channel 1 | BIT |
| | | 60x0:1B | CH1 Over Status | Over status of channel 1 | BIT |
| | | 60x0:1C | CH0 Zero Calibration Status | Channel 0 zero calibration complete | BIT |
| | | 60x0:1D | CH1 Zero Calibration Status | Channel 1 zero calibration complete | BIT |
| | | 60x0:1E | CH0 Span Calibration Status | Channel 0 span calibration complete | BIT |
| | | 60x0:1F | CH1 Span Calibration Status | Channel 1 span calibration complete | BIT |
| | | 60x0:20 | CH0 Save Complete Flag | Channel 0 calibration save complete | BIT |
| | | 60x0:21 | CH1 Save Complete Flag | Channel 1 calibration save complete | BIT |
| | | 60x0:22 | CH0 Equivalent Calibration Status | Channel 0 equivalent circuit calibration complete | BIT |
| | | 60x0:23 | CH1 Equivalent Calibration Status | Channel 1 equivalent circuit calibration complete | BIT |
| | | 60x0:25 | CH0 Zero Setting Status | Zero setting status of channel 0 | BIT |
| | | 60x0:26 | CH1 Zero Setting Status | Zero setting status of channel 1 | BIT |
| | | 60x0:27 | CH0 Zero Reset Status | Zero reset status of channel 0 | BIT |
| | | 60x0:28 | CH1 Zero Reset Status | Zero reset status of channel 1 | BIT |
| | | 60x0:29 | CH0 Tare Setting Status | Tare setting status of channel 0 | BIT |

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| | | 60x0:2A | CH1 Tare Setting Status | Tare setting status of channel 1 | BIT |
| | | 60x0:2B | CH0 Output Hold Status | Output hold status of channel 0 | BIT |
| | | 60x0:2C | CH1 Output Hold Status | Output hold status of channel 1 | BIT |
| | | 60x0:2D | CH0 Min./Max. Hold Status | Maximum/minimum hold status of channel 0 | BIT |
| | | 60x0:2E | CH1 Min./Max. Hold Status | Maximum/minimum hold status of channel 1 | BIT |
| | | 60x0:2F | CH0 Near Zero Status | Near zero status of channel 0 | BIT |
| | | 60x0:30 | CH1 Near Zero Status | Near zero status of channel 1 | BIT |
| | | 60x0:31 | CH0 Gross Weight Negative Status | Gross weight negative status of channel 0 | BIT |
| | | 60x0:32 | CH1 Gross Weight Negative Status | Gross weight negative status of channel 1 | BIT |
| | | 60x0:33 | CH0 Net Weight Negative Status | Net weight negative status of channel 0 | BIT |
| | | 60x0:34 | CH1 Net Weight Negative Status | Net weight negative status of channel 1 | BIT |
| | | 60x0:35 | CH0 Upper Alarm | Upper alarm occurred from channel 0 | BIT |
| | | 60x0:36 | CH1 Upper Alarm | Upper alarm occurred from channel 1 | BIT |
| | | 60x0:37 | CH0 Lower Alarm | Lower alarm occurred from channel 0 | BIT |
| | | 60x0:38 | CH1 Lower Alarm | Lower alarm occurred from channel 1 | BIT |
| | | 60x0:3A | CH0 High High Status | High high status of channel 0 | BIT |
| | | 60x0:3B | CH0 High Status | High status of channel 0 | BIT |
| | | 60x0:3C | CH0 Low Status | Low status of channel 0 | BIT |
| | | 60x0:3D | CH0 Low Low Status | Low low status of channel 0 | BIT |
| | | 60x0:3E | CH1 High High Status | High high status of channel 1 | BIT |
| | | 60x0:3F | CH1 High Status | High status of channel 1 | BIT |
| | | 60x0:40 | CH1 Low Status | Low status of channel 1 | BIT |
| | | 60x0:41 | CH1 Low Low Status | Low low status of channel 1 | BIT |
| | | 60x1:01 | CH0 Gross Weight Data(Lower) | Gross weight value (Lower) of channel 0 | word |
| | | 60x1:02 | CH0 Gross Weight Data(Upper) | Gross weight value (Upper) of channel 0 | word |
| | | 60x1:03 | CH1 Gross Weight Data(Lower) | Gross weight value (Lower) of channel 1 | word |
| | | 60x1:04 | CH1 Gross Weight Data (Upper) | Gross weight value (Upper) of channel 1 | word |
| | | 60x1:05 | CH0 Tare Weight Data(Lower) | Tare weight value (Lower) of channel 0 | word |
| | | 60x1:06 | CH0 Tare Weight Data(Upper) | Tare weight value (Upper) of channel 0 | word |
| | | 60x1:07 | CH1 Tare Weight Data(Lower) | Tare weight value (Lower) of channel 1 | word |
| | | 60x1:08 | CH1 Tare Weight Data(Upper) | Tare weight value (Upper) of channel 1 | word |
| | | 60x1:09 | CH0 Net Weight Data(Lower) | Net weight value (Lower) of channel 0 | word |
| | | 60x1:0A | CH0 Net Weight Data(Upper) | Net weight value (Upper) of channel 0 | word |
| | | 60x1:0B | CH1 Net Weight Data(Lower) | Net weight value (Lower) of channel 1 | word |
| | | 60x1:0C | CH1 Net Weight Data(Upper) | Net weight value (Upper) of channel 1 | word |
| | | 60x1:0D | CH0 Gross Weight Max. Data(Lower) | Gross weight maximum value (Lower) of channel 0 | word |
| | | 60x1:0E | CH0 Gross Weight Max. Data(Upper) | Gross weight maximum value (Upper) of channel 0 | word |
| | | 60x1:0F | CH0 Gross Weight Min. Data(Lower) | Gross weight minimum value (Lower) of channel 0 | word |
| | | 60x1:10 | CH0 Gross Weight Min. Data(Upper) | Gross weight minimum value (Upper) of channel 0 | word |

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| | | 60x1:11 | CH1 Gross Weight Max. Data(Lower) | Gross weight maximum value (Lower) of channel 1 | word |
| | | 60x1:12 | CH1 Gross Weight Max. Data(Upper) | Gross weight maximum value (Upper) of channel 1 | word |
| | | 60x1:13 | CH1 Gross Weight Min. Data(Lower) | Gross weight minimum value (Lower) of channel 1 | word |
| | | 60x1:14 | CH1 Gross Weight Min. Data(Upper) | Gross weight minimum value (Upper) of channel 1 | word |
| | | 60x1:15 | CH0 Free Fall Data | Current free fall value of channel 0 | word |
| | | 60x1:16 | CH1 Free Fall Data | Current free fall value of channel 1 | word |
| | | 60x1:17 | Error code | Error code | word |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | CH0 1-Point Calibration Request | 1-point calibration mode request for channel 0 | BIT |
| | | 70x0:02 | CH1 1-Point Calibration Request | 1-point calibration mode request for channel 1 | BIT |
| | | 70x0:03 | CH0 2-Point Calibration Request | 2-point calibration mode request for channel 0 | BIT |
| | | 70x0:04 | CH1 2-Point Calibration Request | 2-point calibration mode request for channel 1 | BIT |
| | | 70x0:05 | CH0 Equivalent Calibration Request | 2-point equivalent circuit calibration mode request for channel 0 | BIT |
| | | 70x0:06 | CH1 Equivalent Calibration Request | 2-point equivalent circuit calibration mode request for channel 1 | BIT |
| | | 70x0:08 | CH0 Zero Calibration Request | Zero calibration request for channel 0 | BIT |
| | | 70x0:09 | CH1 Zero Calibration Request | Zero calibration request for channel 1 | BIT |
| | | 70x0:0A | CH0 Span Calibration Request | Span calibration request for channel 0 | BIT |
| | | 70x0:0B | CH1 Span Calibration Request | Span calibration request for channel 1 | BIT |
| | | 70x0:0C | CH0 Save Request | Calibration value save request for channel 0 | BIT |
| | | 70x0:0D | CH1 Save Request | Calibration value save request for channel 1 | BIT |
| | | 70x0:0F | CH0 Zero Setting Request | Zero setting request for channel 0 | BIT |
| | | 70x0:10 | CH1 Zero Setting Request | Zero setting request for channel 1 | BIT |
| | | 70x0:11 | CH0 Zero Reset Request | Zero reset request for channel 0 | BIT |
| | | 70x0:12 | CH1 Zero Reset Request | Zero reset request for channel 1 | BIT |
| | | 70x0:13 | CH0 Tare Setting | Tare setting for channel 0 | BIT |
| | | 70x0:14 | CH1 Tare Setting | Tare setting for channel 1 | BIT |
| | | 70x0:15 | CH0 Output Hold Request | Output hold request for channel 0 | BIT |
| | | 70x0:16 | CH1 Output Hold Request | Output hold request for channel 1 | BIT |
| | | 70x0:17 | CH0 Min./Max. Hold Request | Maximum/minimum hold request for channel 0 | BIT |
| | | 70x0:18 | CH1 Min./Max. Hold Request | Maximum/minimum hold request for channel 1 | BIT |
| | | 70x0:19 | CH0 Sequential Control Request | Sequential control request for channel 0 | BIT |
| | | 70x0:1A | CH1 Sequential Control Request | Sequential control request for channel 1 | BIT |
| | | 70x0:1B | CH0 Tare Release Request | Tare release request for channel 0 | BIT |
| | | 70x0:1C | CH1 Tare Release Request | Tare release request for channel 1 | BIT |

**XBF-HO02A PDO List**

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-HO02A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Count Direction Status | Count addition/subtraction status of channel 0 | BIT |
| | | 60x0:02 | CH0 Preset Ext. Input Flag | External preset input detected from channel 0 | BIT |
| | | 60x0:04 | CH0 Carry Flag | Carry detected from channel 0 | BIT |
| | | 60x0:05 | CH0 Borrow Flag | Borrow detected from channel 0 | BIT |
| | | 60x0:06 | CH0 Auxiliary Function Status | Auxiliary function in use in channel 0 | BIT |
| | | 60x0:07 | CH0 Compare 0 Output Status | Comparison output 0 status of channel 0 | BIT |
| | | 60x0:08 | CH0 Compare 1 Output Status | Comparison output 1 status of channel 0 | BIT |
| | | 60x0:0A | CH0 Error Flag | Error detected from channel 0 | BIT |
| | | 60x0:0B | Module Ready | Module operation preparation complete | BIT |
| | | 60x0:0C | CH1 Count Direction Status | Count addition/subtraction status of channel 1 | BIT |
| | | 60x0:0D | CH1 Preset Ext. Input Flag | External preset input detected from channel 1 | BIT |
| | | 60x0:0F | CH1 Carry Flag | Carry detected from channel 1 | BIT |
| | | 60x0:10 | CH1 Borrow Flag | Borrow detected from channel 1 | BIT |
| | | 60x0:11 | CH1 Auxiliary Function Status | Auxiliary function in use in channel 1 | BIT |
| | | 60x0:12 | CH1 Compare 0 Output Status | Comparison output 0 status of channel 1 | BIT |
| | | 60x0:13 | CH1 Compare 1 Output Status | Comparison output 1 status of channel 1 | BIT |
| | | 60x0:15 | CH1 Error Flag | Error detected from channel 1 | BIT |
| | | 60x1:01 | CH0 Count Data | Current count of channel 0 | dword |
| | | 60x1:02 | CH0 Latch Count Data | Count latch of channel 0 | dword |
| | | 60x1:03 | CH0 Sampling Count Data | Section count of channel 0 | dword |
| | | 60x1:04 | CH0 Input Frequency Data | Input frequency of channel 0 | dword |
| | | 60x1:05 | CH0 Rev./Unit Time Data | Revolution count per unit time of channel 0 | dword |
| | | 60x1:06 | CH1 Count Data | Current count of channel 1 | dword |
| | | 60x1:07 | CH1 Latch Count Data | Count latch of channel 1 | dword |
| | | 60x1:08 | CH1 Sampling Count Data | Section count of channel 1 | dword |
| | | 60x1:09 | CH1 Input Frequency Data | Input frequency of channel 1 | dword |
| | | 60x1:0A | CH1 Rev./Unit Time Data | Revolution count per unit time of channel 1 | dword |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | CH0 Enable Counter | Enable count for channel 0 | BIT |
| | | 70x0:02 | CH0 Preset Enable | Enable preset for channel 0 | BIT |
| | | 70x0:03 | CH0 Count Direction Select | Select addition/subtraction count for channel 0 | BIT |
| | | 70x0:04 | CH0 Auxiliary Function Request | Enable auxiliary function for channel 0 | BIT |
| | | 70x0:05 | CH0 Enable Compare Function | Enable comparison for channel 0 | BIT |
| | | 70x0:06 | CH0 Enable Compare Output Signal | Enable comparison result output for channel 0 | BIT |
| | | 70x0:07 | CH0 Compare 0 EQUAL Reset | Reset comparison output 0 equal (=) for channel 0 | BIT |
| | | 70x0:08 | CH0 Compare 1 EQUAL Reset | Reset comparison output 1 equal (=) for channel 0 | BIT |
| | | 70x0:0A | CH0 Carry/Borrow Reset Request | Reset carry/borrow for channel 0 | BIT |
| | | 70x0:0B | CH0 Preset Ext. Input Enable | Select external preset for channel 0 | BIT |

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| | | 70x0:0C | CH0 Enable Aux-Func Ext. Input | Select external auxiliary function for channel 0 | BIT |
| | | 70x0:0D | CH0 Preset Ext. Input Reset Request | Reset external preset detection for channel 0 | BIT |
| | | 70x0:0F | CH1 Enable Counter | Enable count for channel 1 | BIT |
| | | 70x0:10 | CH1 Preset Enable | Enable preset for channel 1 | BIT |
| | | 70x0:11 | CH1 Count Direction Select | Select addition/subtraction count for channel 1 | BIT |
| | | 70x0:12 | CH1 Auxiliary Function Request | Enable auxiliary function for channel 1 | BIT |
| | | 70x0:13 | CH1 Enable Compare Function | Enable comparison for channel 1 | BIT |
| | | 70x0:14 | CH1 Enable Compare Output Signal | Enable comparison result output for channel 1 | BIT |
| | | 70x0:15 | CH1 Compare 0 EQUAL Reset | Reset comparison output 0 equal (=) for channel 1 | BIT |
| | | 70x0:16 | CH1 Compare 1 EQUAL Reset | Reset comparison output 1 equal (=) for channel 1 | BIT |
| | | 70x0:18 | CH1 Carry/Borrow Reset Request | Reset carry/borrow for channel 1 | BIT |
| | | 70x0:19 | CH1 Preset Ext. Input Enable | Select external preset for channel 1 | BIT |
| | | 70x0:1A | CH1 Enable Aux-Func Ext. Input | Select external auxiliary function for channel 1 | BIT |
| | | 70x0:1B | CH1 Preset Ext. Input Reset Request | Reset external preset detection for channel 1 | BIT |

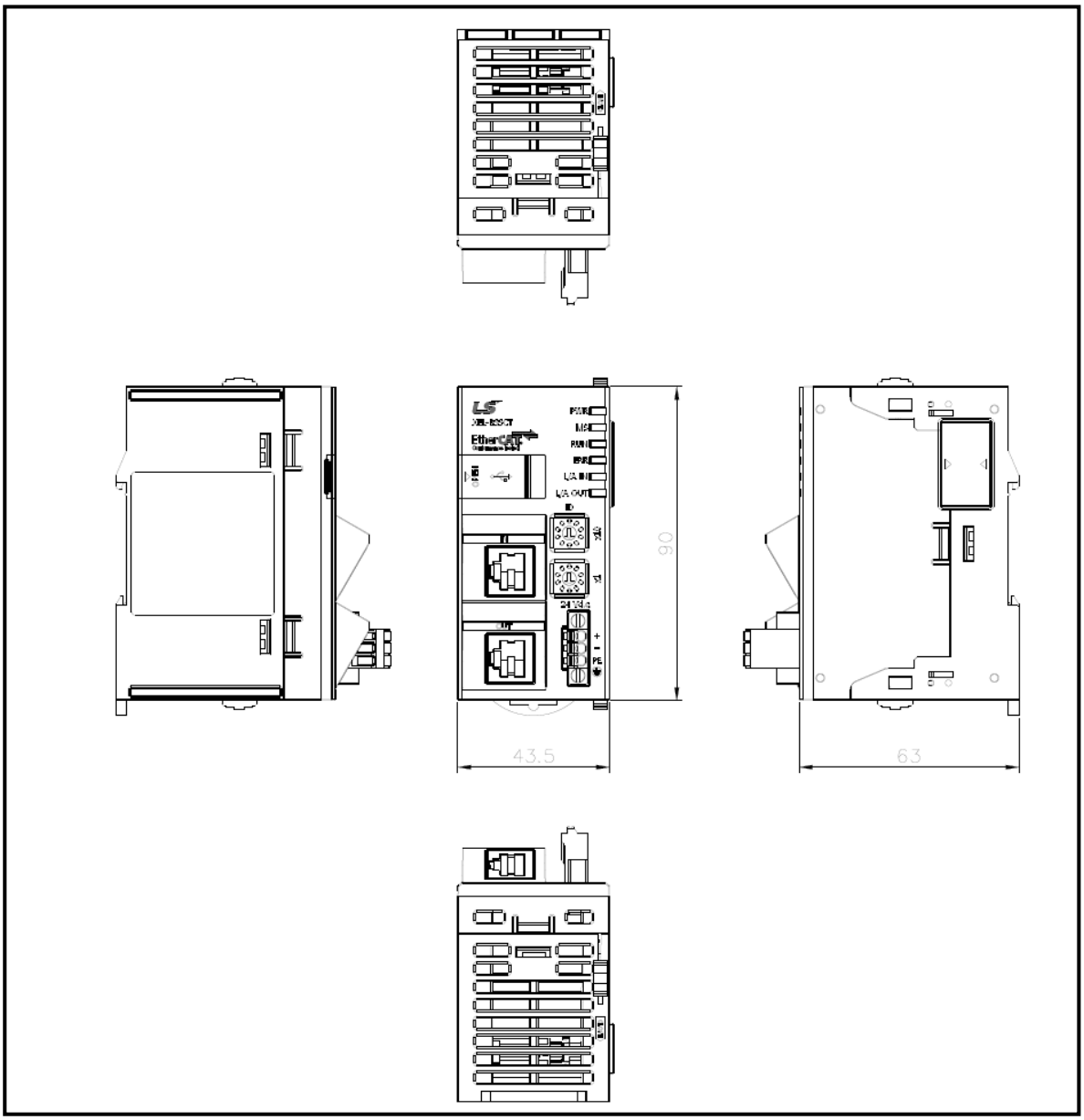
**XBF-HD02A PDO List**

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| XBF-HO02A | TxPDO (0x1A0x) X: Slot No. | 60x0:01 (x: Slot No.) | CH0 Count Direction Status | Count addition/subtraction status of channel 0 | BIT |
| | | 60x0:02 | CH0 Preset Ext. Input Flag | External preset input detected from channel 0 | BIT |
| | | 60x0:04 | CH0 Carry Flag | Carry detected from channel 0 | BIT |
| | | 60x0:05 | CH0 Borrow Flag | Borrow detected from channel 0 | BIT |
| | | 60x0:06 | CH0 Auxiliary Function Status | Auxiliary function in use in channel 0 | BIT |
| | | 60x0:07 | CH0 Compare 0 Output Status | Comparison output 0 status of channel 0 | BIT |
| | | 60x0:08 | CH0 Compare 1 Output Status | Comparison output 1 status of channel 0 | BIT |
| | | 60x0:0A | CH0 Error Flag | Error detected from channel 0 | BIT |
| | | 60x0:0B | Module Ready | Module operation preparation complete | BIT |
| | | 60x0:0C | CH1 Count Direction Status | Count addition/subtraction status of channel 1 | BIT |
| | | 60x0:0D | CH1 Preset Ext. Input Flag | External preset input detected from channel 1 | BIT |
| | | 60x0:0F | CH1 Carry Flag | Carry detected from channel 1 | BIT |
| | | 60x0:10 | CH1 Borrow Flag | Borrow detected from channel 1 | BIT |
| | | 60x0:11 | CH1 Auxiliary Function Status | Auxiliary function in use in channel 1 | BIT |
| | | 60x0:12 | CH1 Compare 0 Output Status | Comparison output 0 status of channel 1 | BIT |
| | | 60x0:13 | CH1 Compare 1 Output Status | Comparison output 1 status of channel 1 | BIT |
| | | 60x0:15 | CH1 Error Flag | Error detected from channel 1 | BIT |
| | | 60x1:01 | CH0 Count Data | Current count of channel 0 | dword |
| | | 60x1:02 | CH0 Latch Count Data | Count latch of channel 0 | dword |
| | | 60x1:03 | CH0 Sampling Count Data | Section count of channel 0 | dword |
| | | 60x1:04 | CH0 Input Frequency Data | Input frequency of channel 0 | dword |
| | | 60x1:05 | CH0 Rev./Unit Time Data | Revolution count per unit time of channel 0 | dword |
| | | 60x1:06 | CH1 Count Data | Current count of channel 1 | dword |
| | | 60x1:07 | CH1 Latch Count Data | Count latch of channel 1 | dword |
| | | 60x1:08 | CH1 Sampling Count Data | Section count of channel 1 | dword |
| | | 60x1:09 | CH1 Input Frequency Data | Input frequency of channel 1 | dword |
| | | 60x1:0A | CH1 Rev./Unit Time Data | Revolution count per unit time of channel 1 | dword |
| | RxPDO (0x160x) X: Slot No. | 70x0:01 (x: Slot No.) | CH0 Enable Counter | Enable count for channel 0 | BIT |
| | | 70x0:02 | CH0 Preset Enable | Enable preset for channel 0 | BIT |
| | | 70x0:03 | CH0 Count Direction Select | Select addition/subtraction count for channel 0 | BIT |
| | | 70x0:04 | CH0 Auxiliary Function Request | Enable auxiliary function for channel 0 | BIT |
| | | 70x0:05 | CH0 Enable Compare Function | Enable comparison for channel 0 | BIT |
| | | 70x0:06 | CH0 Enable Compare Output Signal | Enable comparison result output for channel 0 | BIT |
| | | 70x0:07 | CH0 Compare 0 EQUAL Reset | Reset comparison output 0 equal (=) for channel 0 | BIT |
| | | 70x0:08 | CH0 Compare 1 EQUAL Reset | Reset comparison output 1 equal (=) for channel 0 | BIT |
| | | 70x0:0A | CH0 Carry/Borrow Reset Request | Reset carry/borrow for channel 0 | BIT |
| | | 70x0:0B | CH0 Preset Ext. Input Enable | Select external preset for channel 0 | BIT |

| Device Name | PDO Type | Index: SubIndex | Item Name | Description | Data Type |
|---|---|---|---|---|---|
| | | 70x0:0C | CH0 Enable Aux-Func Ext. Input | Select external auxiliary function for channel 0 | BIT |
| | | 70x0:0D | CH0 Preset Ext. Input Reset Request | Reset external preset detection for channel 0 | BIT |
| | | 70x0:0F | CH1 Enable Counter | Enable count for channel 1 | BIT |
| | | 70x0:10 | CH1 Preset Enable | Enable preset for channel 1 | BIT |
| | | 70x0:11 | CH1 Count Direction Select | Select addition/subtraction count for channel 1 | BIT |
| | | 70x0:12 | CH1 Auxiliary Function Request | Enable auxiliary function for channel 1 | BIT |
| | | 70x0:13 | CH1 Enable Compare Function | Enable comparison for channel 1 | BIT |
| | | 70x0:14 | CH1 Enable Compare Output Signal | Enable comparison result output for channel 1 | BIT |
| | | 70x0:15 | CH1 Compare 0 EQUAL Reset | Reset comparison output 0 equal (=) for channel 1 | BIT |
| | | 70x0:16 | CH1 Compare 1 EQUAL Reset | Reset comparison output 1 equal (=) for channel 1 | BIT |
| | | 70x0:18 | CH1 Carry/Borrow Reset Request | Reset carry/borrow for channel 1 | BIT |
| | | 70x0:19 | CH1 Preset Ext. Input Enable | Select external preset for channel 1 | BIT |
| | | 70x0:1A | CH1 Enable Aux-Func Ext. Input | Select external auxiliary function for channel 1 | BIT |
| | | 70x0:1B | CH1 Preset Ext. Input Reset Request | Reset external preset detection for channel 1 | BIT |

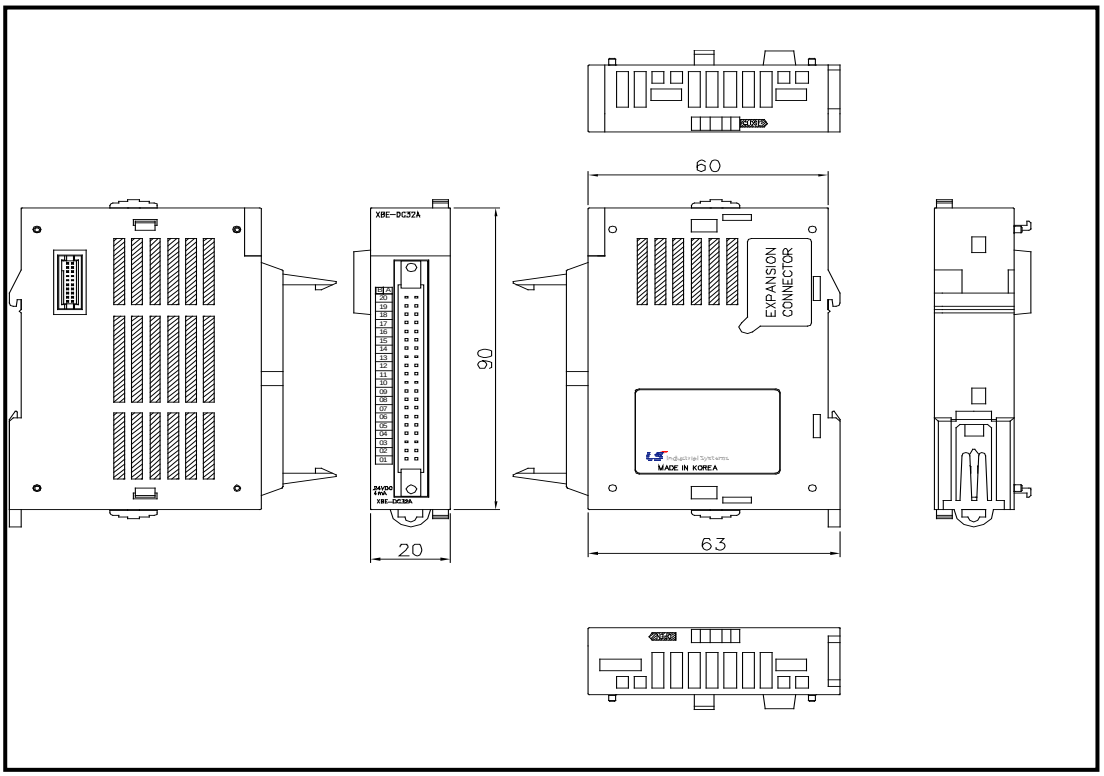
# Appendix 3 Dimension (unit: mm)

(1) XEL-BSSCT

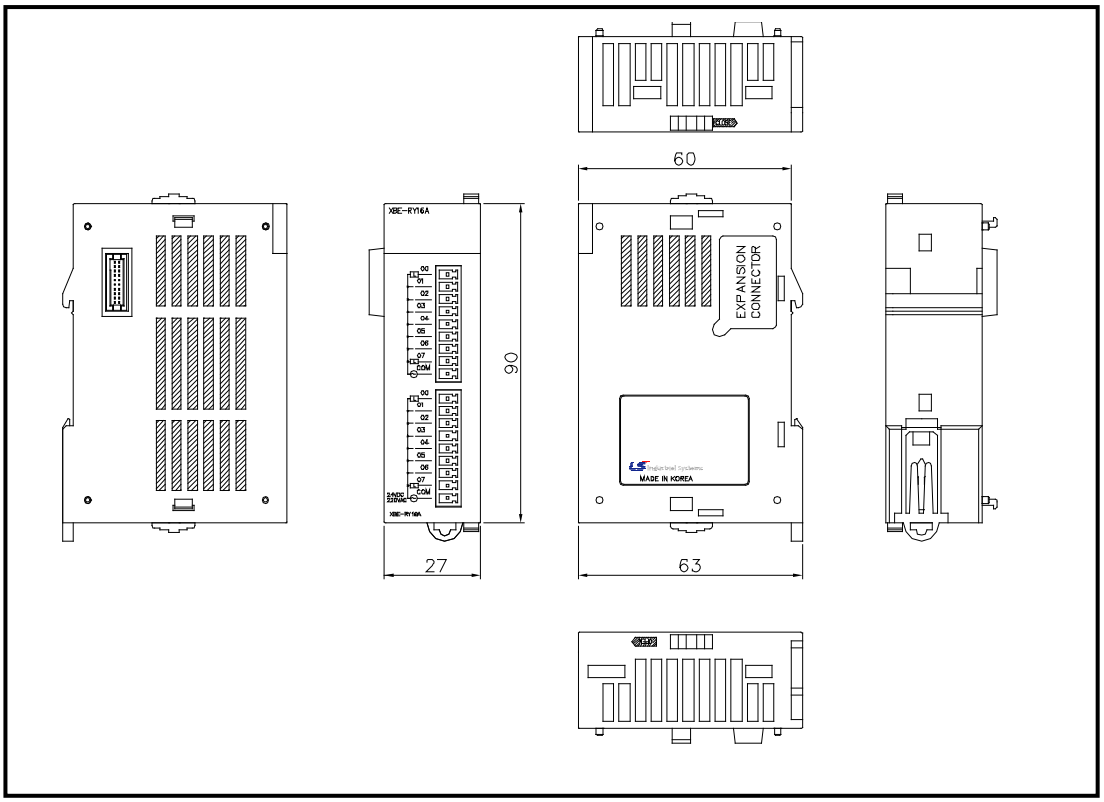


(2) Digital Input/Output module

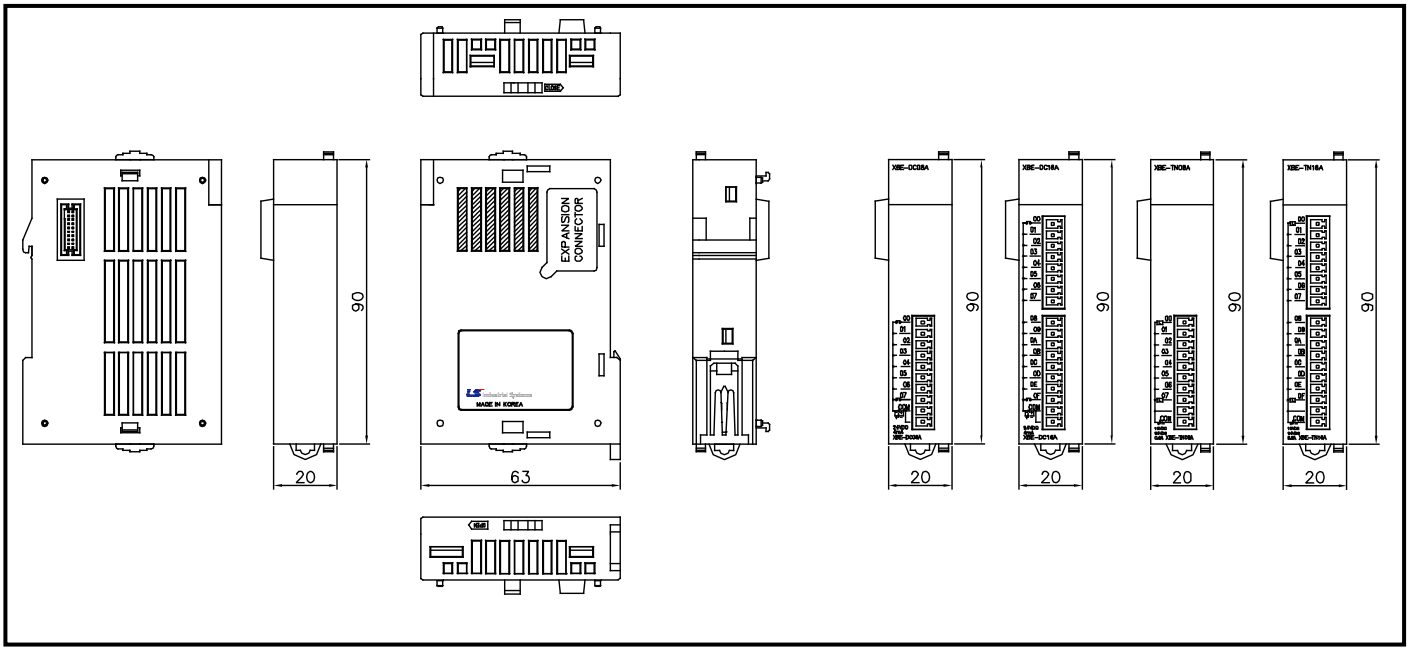
-. XBE-DC32A, XBE-TR32A



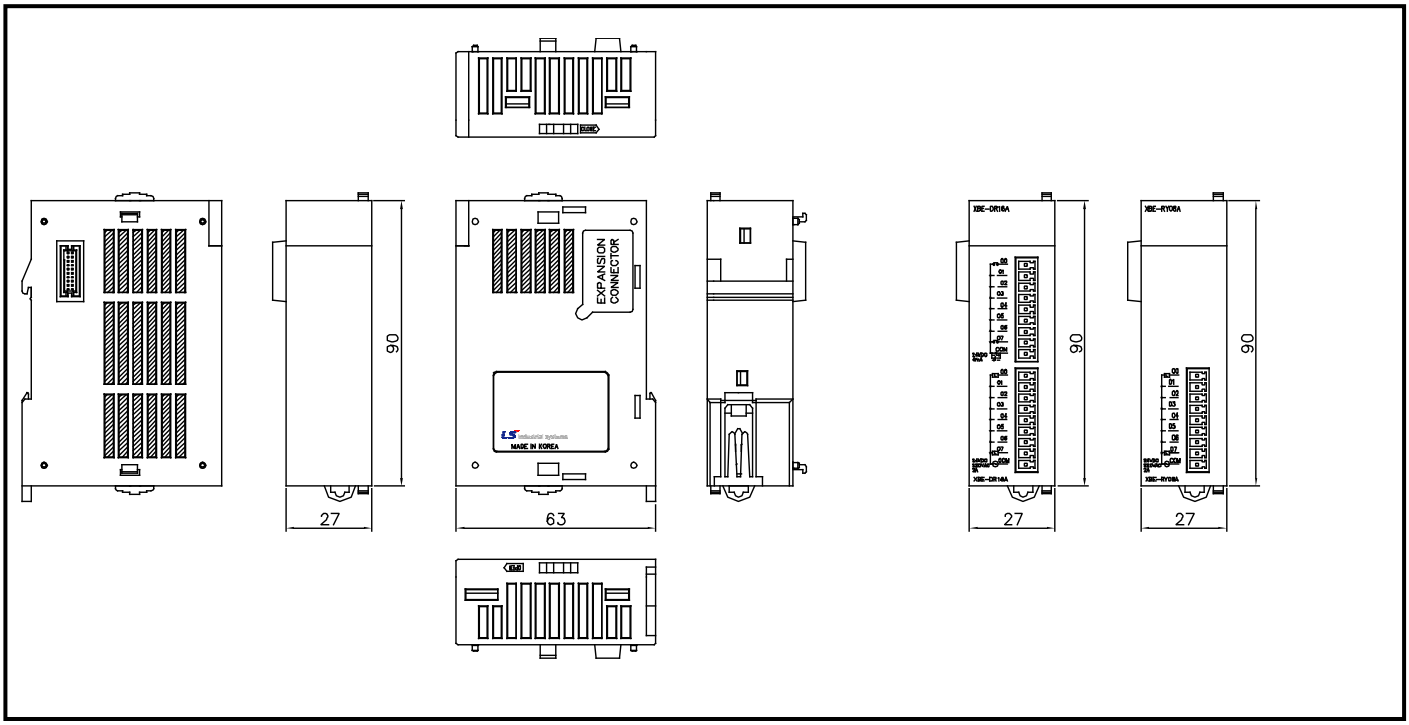

-. XBE-RY16A



-. XBE-DC08A, XBE-DC16A, XBE-TN08A, XBE-TN16A




-. XBE-DR16A, XBE-RY08A



## Warranty

1. Warranty Period

The product you purchased will be guaranteed for 18 months from the date of manufacturing.

2. Scope of Warranty

Any trouble or defect occurring for the above-mentioned period will be partially replaced or repaired. However, please note the following cases will be excluded from the scope of warranty.

(1) Any trouble attributable to unreasonable condition, environment or handling otherwise specified in the manual,
(2) Any trouble attributable to others' products,
(3) If the product is modified or repaired in any other place not designated by the company,
(4) Due to unintended purposes
(5) Owing to the reasons unexpected at the level of the contemporary science and technology when delivered.
(6) Not attributable to the company; for instance, natural disasters or fire

3. Since the above warranty is limited to PLC unit only, make sure to use the product considering the safety for system configuration or applications.

## Environmental Policy

LS ELECTRIC Co., Ltd supports and observes the environmental policy as below.

### Environmental Management

LS ELECTRIC considers the environmental preservation as the preferential management subject and every staff of LS ELECTRIC use the reasonable endeavors for the pleasurably environmental preservation of the earth.

### About Disposal

LS ELECTRIC PLC unit is designed to protect the environment. For the disposal, separate aluminum, iron and synthetic resin (cover) from the product as they are reusable.

www.ls-electric.com

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