

MiSUMi

Motorized Drum Driver Controller

with Hall Driver (N2 Type, 1:2)

Quick Start Guide

Ver1.0

Version Change Record

Version	Time	Description
V1.0	2025/07/01	First Edition

Table of Contents

1. Professional Terminology.....	4
2. Basic Functions.....	4
3. Compatible Drum Specifications.....	5
4. Power Supply Requirements.....	5
5. Debugging Instructions.....	6
5.1 Hardware.....	6
5.2 Software.....	6
6. Operating Example.....	6
6.1 Software Selection.....	6
6.2 Parameter Settings.....	8
6.3 Object Dictionary Access Methods.....	10
6.4 Introduction to Read/Write Object Dictionary.....	11
6.5 Using the Object Dictionary for Read and Write Operations.....	12
7. Object Dictionary.....	14
7.1 Service Data Object (SDO)...	
7.2 Process Data Objects TXPDO.....	14
8. Dimensions and Installation.....	15
9. Operating Environment.....	15

1. Professional Terminology

1. Brushless DC Motor: A brushless DC motor consists of a permanent magnet rotor and a stator with windings. This type of motor offers advantages such as simple structure, high reliability, good stability, high efficiency, and strong adaptability, leading to its widespread application.
2. Hall sensor: A device installed inside the motor to provide feedback on the rotor position signal.
3. PNP: Active high, general power supply range: 15~30V
4. NPN: Active low, general power supply range: 0~0.8V
5. DIP: A DIP switch used to change the operating status of the drum manually.
6. Digital signal: A signal representing discrete values, controlled using I/O points.
7. Analog signal: A signal representing continuously varying physical quantities, controlled by analog voltage or current to achieve stepless speed control.
8. Braking Resistor: A component used to dissipate regenerative energy during motor braking, converting the back electromotive force (regenerative energy) generated when the motor stops into heat energy to prevent potential damage.
9. EXT: External interface, external access.
10. LED: Light Emitting Diode, used to indicate the status of the drive system.

2. Basic Functions

- Speed closed-loop operation
- 15-step DIP switch speed control
- Stepless speed control via 2.3-10 V analog voltage
- 4-step digital speed control
- 16-step acceleration/deceleration time adjustment
- Two-wire forward/reverse operation
- Electronic brake function / servo brake switching
- Dual LED status display
- Fault Output Function
- Built-in braking resistor
- Switchable PNP/NPN I/O input control
- 24V/48V fast switching
- Speed control priority: DIP switch speed control (digital control) takes precedence over stepless speed control (analog control)

3. Compatible Drum Specifications

Rated voltage of the drum	Voltage Range (V)	Rated Power (W)	Rated Current (A)	Starting Current (A)
DC 24V	20~26	35	2.5±0.5	6.25±0.5
		50	3.2±0.5	8±0.5
		80	4.5±0.5	11.25±0.5
DC 48V	40~52	35	1.3±0.5	3.25±0.5
		50	1.6±0.5	4±0.5
		80	2.3±0.5	5.75±0.5

4. Power Supply Requirements

Drum Power	Required Switching Power Supply	Suggested wire diameter	Suggested wire length
35W	≥80W	0.75mm ² (4A)	≤12 meters
50W	≥120W	0.75mm ² (4A)	≤9 meters
80W	≥200W	1mm ² (6A)	≤9 meters

***Note: In multi-drum applications, a higher-power power supply is recommended. Try to avoid using a single power supply at its limit. For example:**

For 35 W motorized drums, a 450 W power supply can support 9 to 11 drums when the drums are started sequentially. As a guideline, the power supply can be selected at 1.2 to 1.5 times the total rated power of the motorized drums.

5. Debugging Instructions

5.1 Hardware

- 1) One PLC: Must support functional safety standard IEC61508 certification and cybersecurity standard IEC62443-4-1 certification. Hardware must support IEC 61131-2 certification (Programmable Controller Hardware Requirements). Interfaces must support real-time EtherCAT frame processing (cycle $\leq 125\mu\text{s}$), with redundant network design and industrial-grade temperature range supporting $-40^{\circ}\text{C} \sim 80^{\circ}\text{C}$. This specification uses Inovance AM522 as an example;
- 2) Several MISUMI 24 V or 48 V Hall-sensor motorized drums;
- 3) One MISUMI ZWG24_D3_N2_F0 drum bus control card;
- 4) Several RJ45 connector Ethernet cables;
- 5) Several photoelectric sensors.

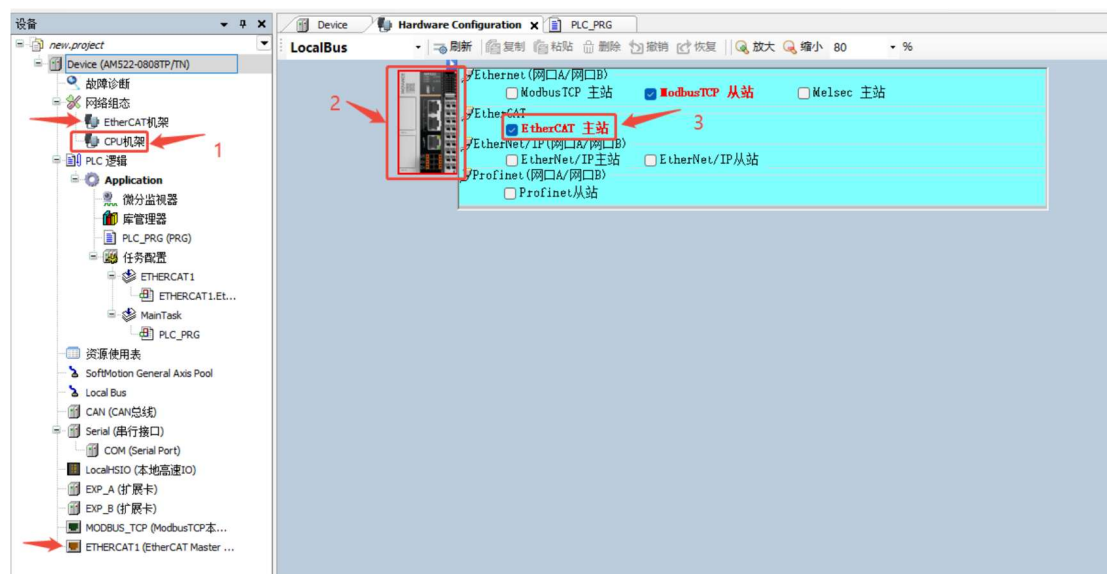
5.2 Software

PLC programming software. This manual uses Inovance InoProShop PLC programming software.

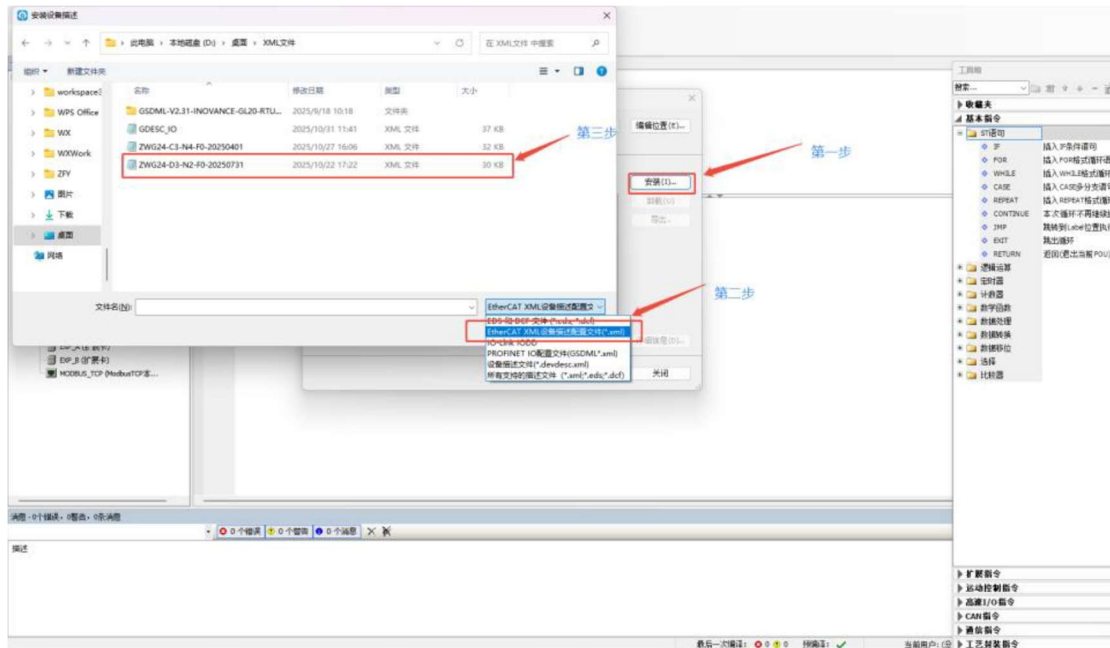
6. Operating Example

6.1 Software Selection

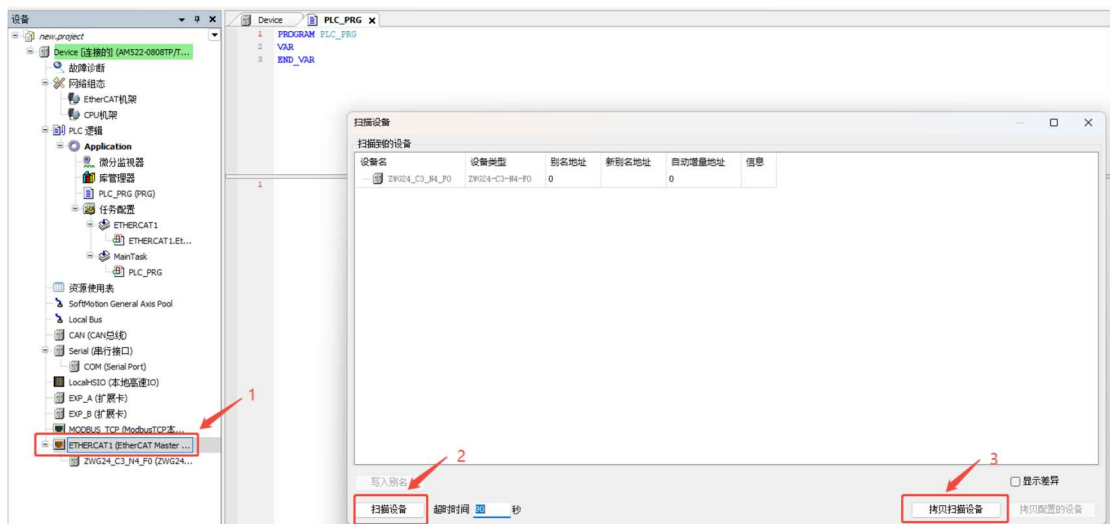
The following example uses Inovance InoProShop software and an AM522 PLC. First, locate the CPU rack on the left, double-click the PLC, and check the EtherCAT master station. The EtherCAT rack and ETHERCAT1 will then appear.



In the top navigation bar of the software, go to Tools > Device Library to open it. On the opened Device Library page, click Install to pop up the local file library. In the dropdown box, select the EtherCAT XML device description file extension option, then locate and open the "ZWG24 D3 N2 F0.XML" file. The operation is shown in the figure below.



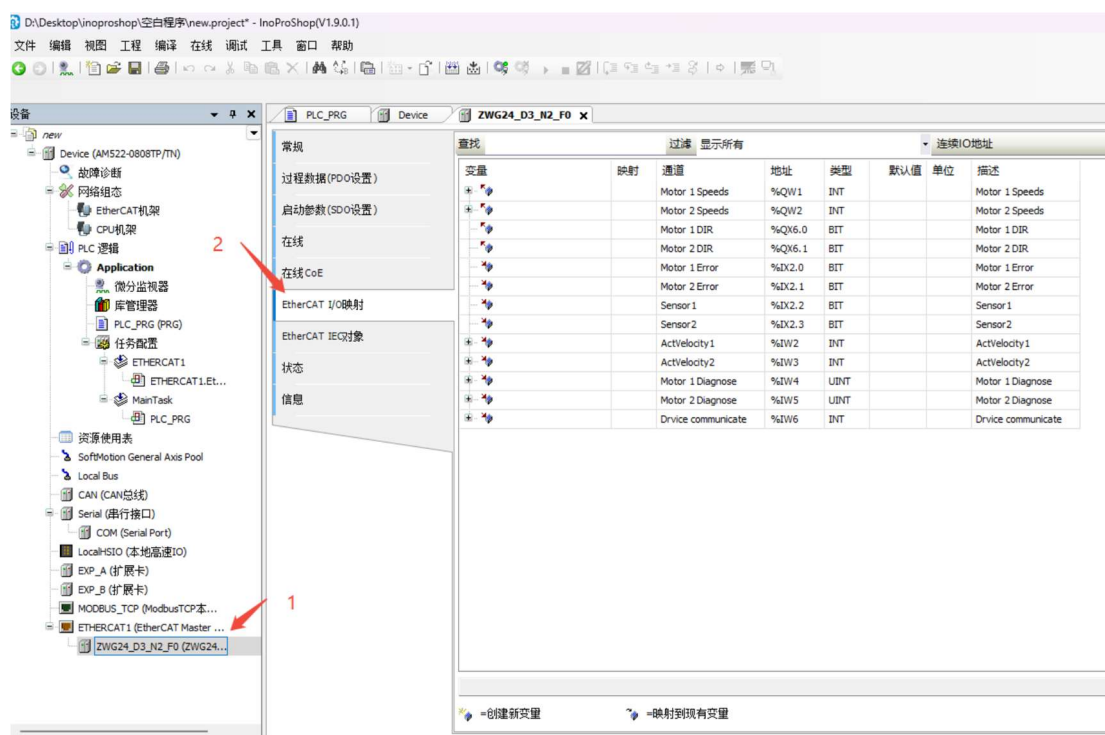
After importing the device description XML file, right-click ETHERCAT1 to select Scan Devices. In the pop-up window, click Scan Devices. Once scanned, click Copy Scanned Device. (If scanning fails, check whether the IN and OUT ports are distinguished.)



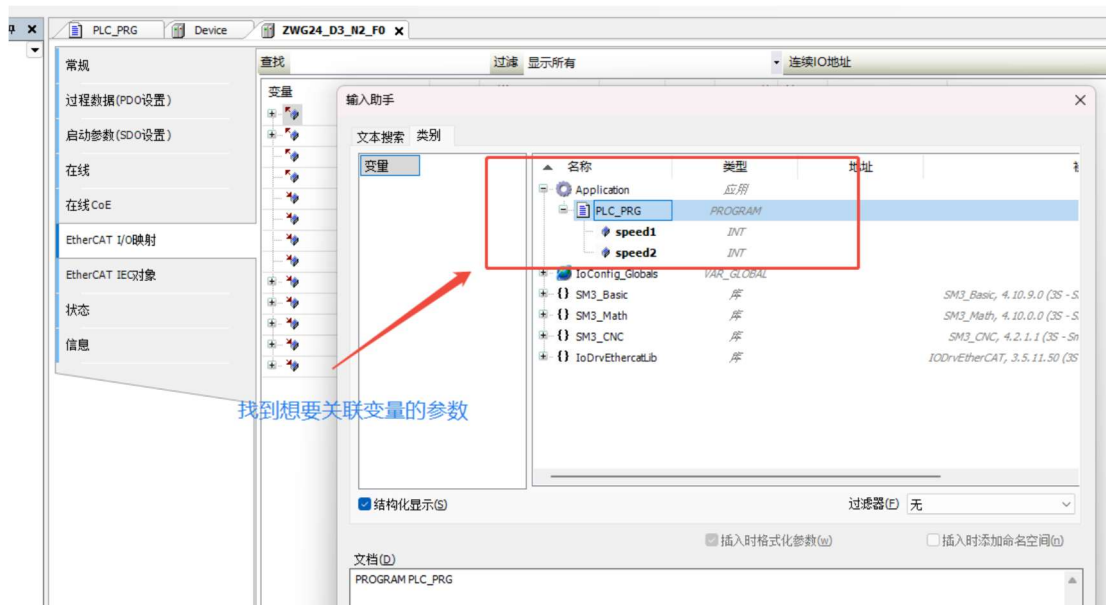
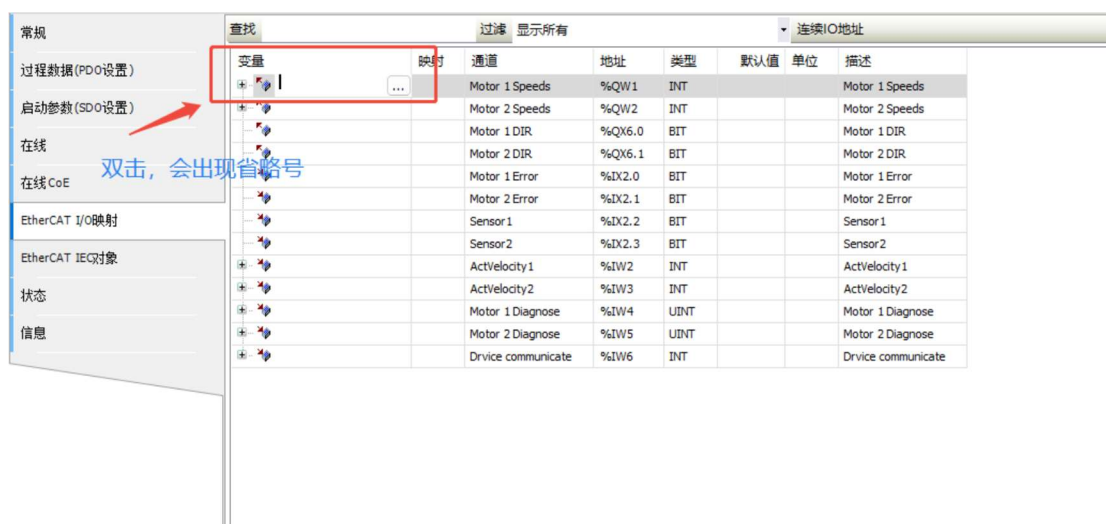
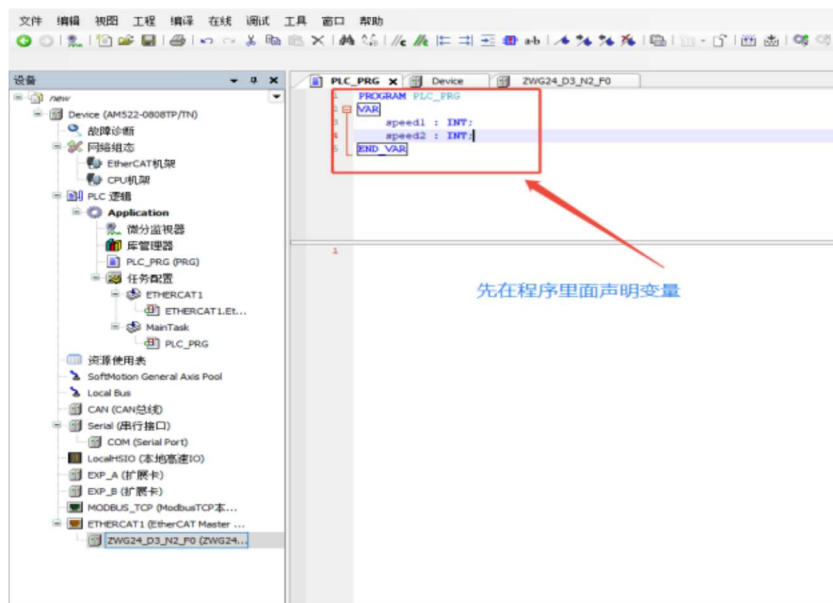
6.2 Parameter Configuration

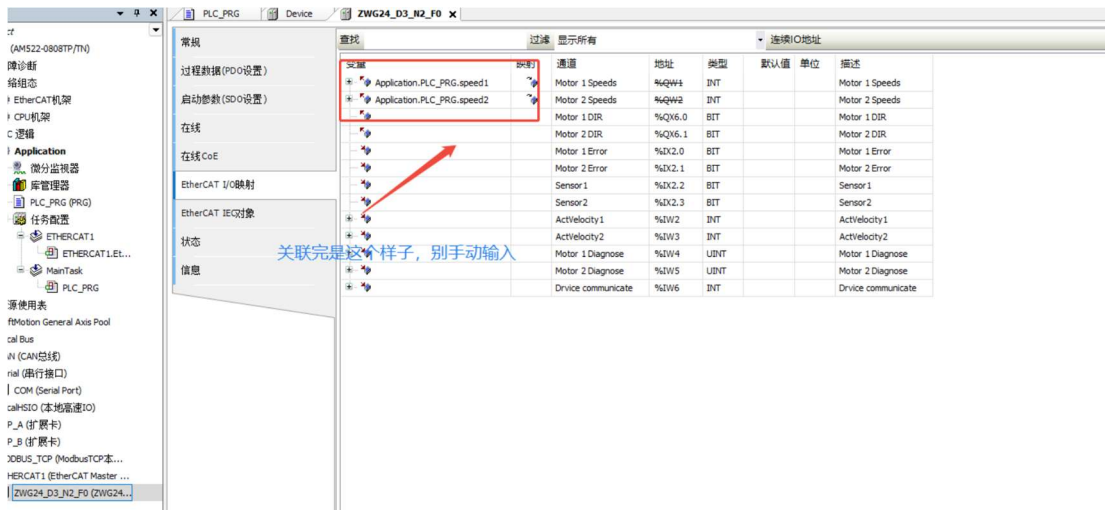
Double-click the drum bus control card (ZWG24_D3_N2_F0) and open the EtherCAT I/O Mapping page.

Multiple parameter channels are available for controlling drum operation. To use them in the program, create corresponding variables and map them to these channels, as shown below.

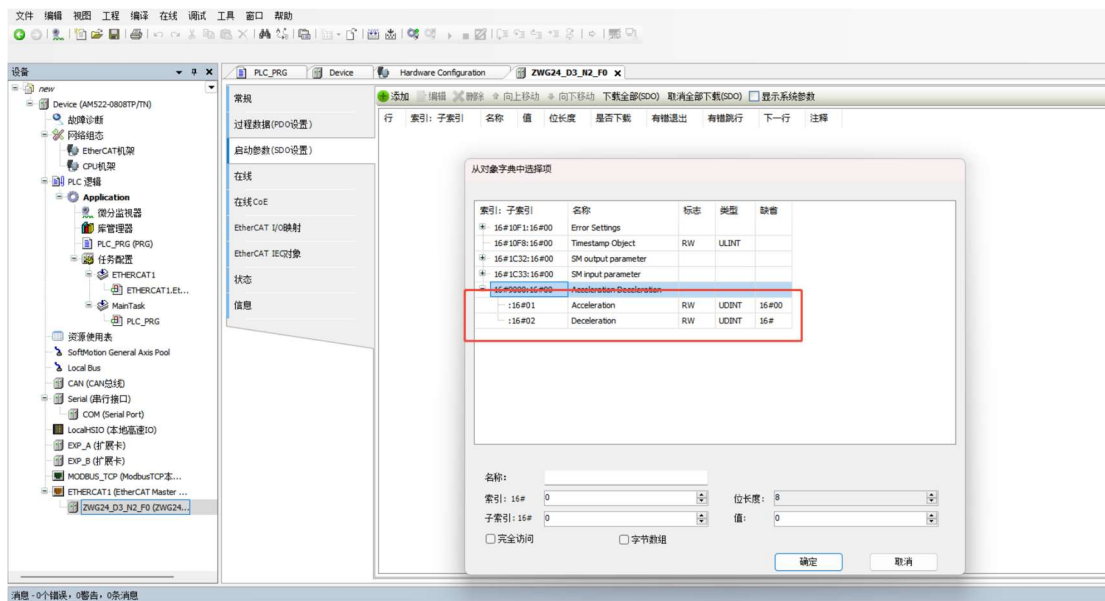


First, create the required variables in the program and then map them. Double-click the blank field in the EtherCAT I/O Mapping page that you want to assign, click the ellipsis button, and select the corresponding variable. By reading and writing these variables, the input/output values of the bus control card can be exchanged, linking the status of each channel to the actual application program, as shown below.





SDO configuration: Double-click the drum bus control card and select “Startup Parameter SDO”. The startup parameters of the drum bus control card include acceleration (ACC) and deceleration (DEC). Click “Add” at the top, locate index 16#9000 in the object dictionary, and add sub-indexes 16#01 and 16#02. After configuration, download the program to the PLC for commissioning.



6.3 Object Dictionary Access Methods

Object dictionary read/write overview: The function blocks ETC_CO_SdoRead, ETC_CO_SdoRead4, ETC_CO_SdoReadDWord, and ETC_CO_SdoRead_Access are used to read the object dictionary of EtherCAT slave devices.

There are also four function blocks for writing to the object dictionary, including ETC_CO_SdoWrite, ETC_CO_SdoWrite4, ETC_CO_SdoWriteDWord, and ETC_CO_SdoWrite_Access.

The main differences between these read function blocks are listed below. The write function blocks are similar.

ETC_CO_SdoRead can read the value of an object dictionary by byte count and supports reading object dictionaries larger than 4 bytes;

ETC_CO_SdoRead4 can only read object dictionary entries of 4 bytes or less;

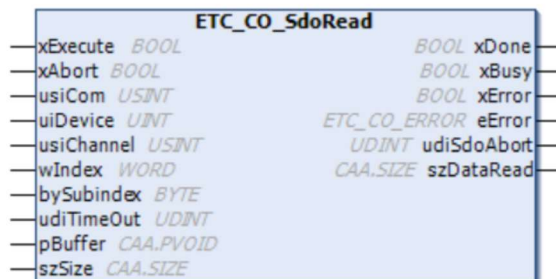
The object dictionary value read by ETC_CO_SdoReadDWord is converted to the DWORD data type;

ETC_CO_SdoRead_Access can read the values of all sub-indexes of an object dictionary index at once.

6.4 Introduction to Read/Write Object Dictionary

This section mainly introduces the following two function blocks, which are sufficient for typical application requirements.

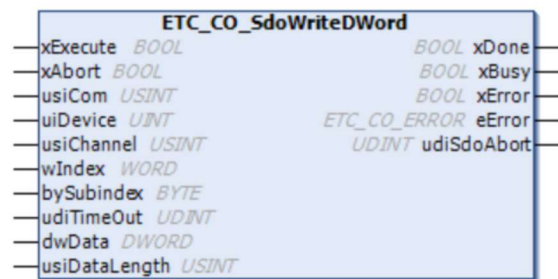
1) ETC_CO_SdoRead:



Key Parameter Description

"Input"	xExecute	Execute on rising edge
	xAbsort	If this parameter is set to 'TRUE', the current read process will be terminated.
	usiCom	Number of EtherCAT master stations: If only one EtherCAT master station is used, usiCom is '1'. When using multiple master stations, the first master station is '1', the second is '2', and so on.
	uiDevice	Physical address of the slave
	usiChannel	Reserved for future expansion, currently unused
	wIndex	Parameter index in the object dictionary
	bySubIndex	Sub-indexes of parameters in the object dictionary
	udiTimeOut	Timeout (in milliseconds). If the parameter is not read within this time, an error message will be displayed.
	pBuffer	Pointer to the data buffer, which is the storage area for data after successful parameter passing
"Output"	szSize	Size of the data buffer (see above: pBuffer), in bytes
	xDone	Parameter read success flag
	xBusy	Parameter reading flag
	xError	Read error flag
	udiSdoAbort	When the device check fails
	szDataRead	Number of bytes read; maximum szSize (see input parameters)

2) ETC_CO_SdoWriteD: The key parameters are similar to those of the read function block.



6.5 Usage of Read/Write Object Dictionary

1) Define storage area

```

1 PROGRAM PLC_PRG
2   VAR
3
4     Sdo_ACC          : ARRAY[1..4] OF BYTE;
5     Sdo_DEC          : ARRAY[1..4] OF BYTE;
6     ETC_CO_SdoRead4_0 : ETC_CO_SdoRead4;
7     ETC_CO_SdoRead_0  : ETC_CO_SdoRead;
8     ETC_CO_SdoWriteD  : ETC_CO_SdoWriteDWord;
9     SW0: BOOL;
10    SW1: BOOL;
11  ;
12 END_VAR

```

定义储存区域

2) Write the function block program

This example shows how to read the acceleration and deceleration values from the SDO of the bus control card. Double-click the drum bus control card and locate the slave address under General.



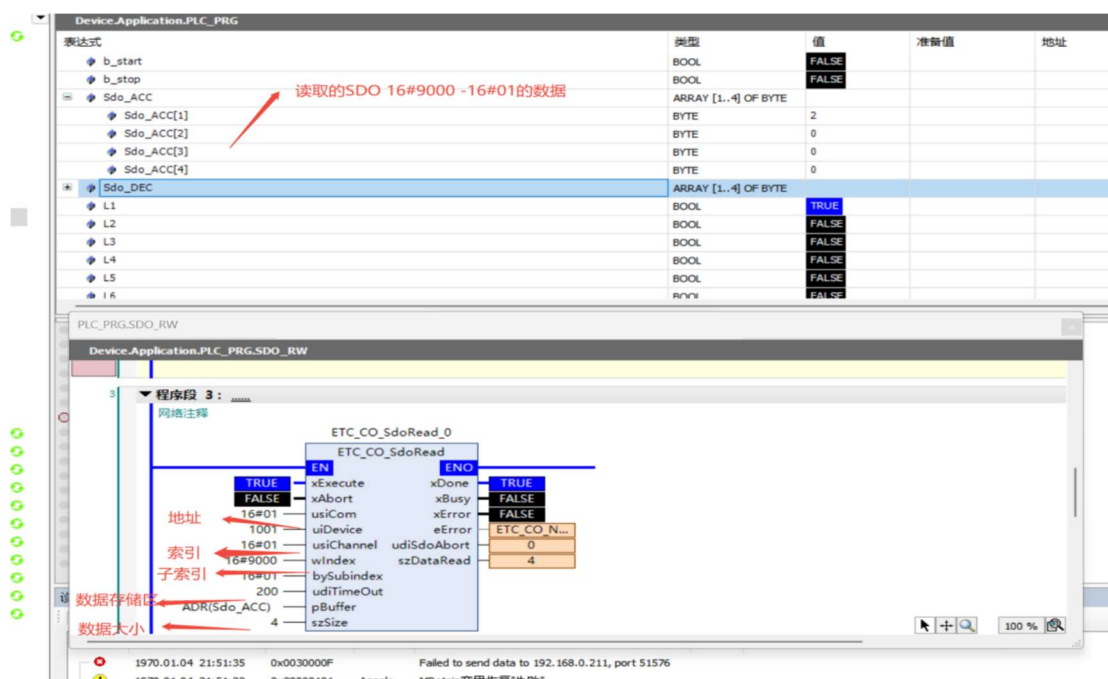
The screenshot shows the EtherCAT configuration interface. The left sidebar contains a tree view with the following items: 常规 (General), 过程数据(PDO设置) (Process Data (PDO Settings)), 启动参数(SDO设置) (Startup Parameters (SDO Settings)), 在线 (Online), 在线 CoE (Online CoE), EtherCAT I/O映射 (EtherCAT I/O Mapping), EtherCAT IEC对象 (EtherCAT IEC Objects), 状态 (Status), and 信息 (Information). The '常规' (General) tab is selected. The '地址' (Address) section is highlighted with a red box, showing '自动增量地址' (Automatic Incremental Address) set to 0 and '从站地址' (Slave Address) set to 1001. The '额外的' (Additional) section contains checkboxes for '使能专家设置' (Enable Expert Settings) and '选项' (Options), with a note '可在主站“总览”界面设置使能' (Can be enabled in the master's 'Overview' interface). The '分布式时钟' (Distributed Clock) section is expanded, showing '从站别名' (Slave Alias) set to '禁止' (Prohibit). Other options include '配置站点别名 (ADO 0x0012)' (Configure Station Alias (ADO 0x0012)) set to 1001, '显示设备标识 (ADO 0x0134)' (Display Device Identifier (ADO 0x0134)), and '数据字 (2 字节)' (Data Word (2 Bytes)) set to 0.

Set the Acceleration at subindex 16#01 of index 16#9000 to 2 during initialization as follows:

常规									
过程数据(PDO设置)									
启动参数(SDO设置)									
在线									
在线CoE									
EtherCAT I/O映射									
EtherCAT IEC对象									
状态									
信息									

行	索引: 子索引	名称	值	位长度	是否下载	有错误退出	有错误跳行	下一行	注释
1	16#9000:16#01	Acceleration	2	32	☒	☐	☐	0	
2	16#9000:16#02	Deceleration	2	32	☒	☐	☐	0	

Then read the value using the function block.



读取的SDO 16#9000 -16#01的数据

地址 16#01

索引 16#01

子索引 16#01

数据存储器地址 ADR(Sdo_ACC)

数据大小 4

Write SDO data: Write the acceleration value in the SDO online as 5, and then read it back.



地址 16#01

索引 16#01

子索引 16#01

写入SDO数据, 这里举例写入SDO 索引16#9000, 16#1中加速度5

数据大小 4

PLC_PRG.SDO_RW

Device: Application.PLC_PRG.SDO_RW

Dec_Set 200
1
1

udiTimeOut
dwData
udiDataLength

程序段 3:

网络注释

ETC_CO_SdoRead_0

ETC_CO_SdoRead

EN

TRUE
FALSE
16#01
1001
16#01
16#9000
16#01

xExecute
xAbort
uiCom
uiDevice
uiChannel
wIndex
bySubindex

ENO

TRUE
FALSE
FALSE
ETC_CO_N...
0
4

xDone
xBusy
xError
eError
udiSdoAbort
szDataRead

25 mSpeed3 0 :=Speed_3 0 ;
26 mSpeed4 0 :=Speed_4 0 ;

读到的数据

7. Object Dictionary

7.1 Service Data Object (SDO)

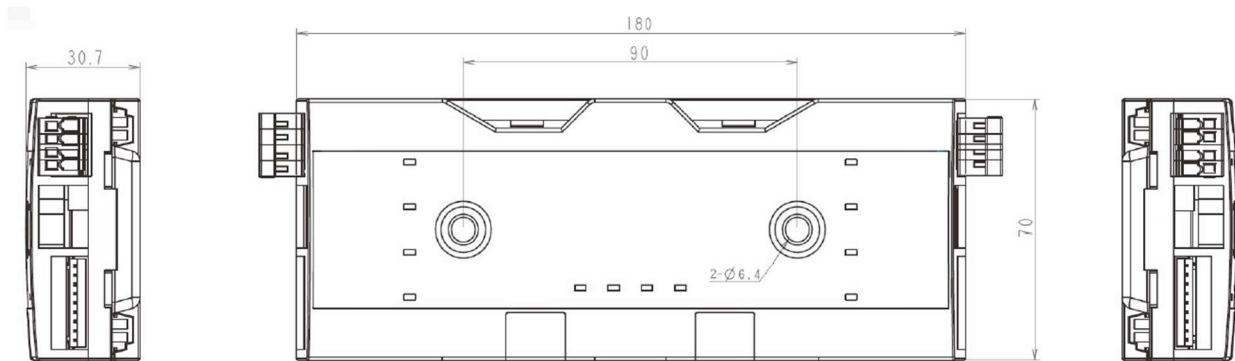
Index	Sub-index	"Name"	Data Type	Valid Data Range	Access Attribute	"Description"
9000H	01H	Acceleration	Unsigned16	0-255	R/w	8-speed acceleration: 1:100ms 2: 250ms 3: 500ms 4: 660ms 5: 1s 6: 1s250ms 7: 1s450ms 8: 2s Default: 500ms
	02H	Deceleration	Unsigned16	0-255	R/w	8-speed acceleration: 1:100ms 2: 250ms 3: 500ms 4: 660ms 5: 1s 6: 1s250ms 7: 1s450ms 8: 2s Default: 500ms

7.2 Process Data Object (TXPDO)

Index	Sub-index	"Name"	Data Type	Valid Data Range	Access Attribute	"Description"
1601H	01H	Motor1 Speed	Int	0-32767	R/w	Speed setting value
1601H	02H	Motor2 Speed	Int	0-32767	R/w	Speed setting value
1602H	01H	Motor1 Dir	Bit	0-1	R/w	Direction setting value
1602H	02H	Motor2 Dir	Bit	0-1	R/w	Direction setting value
1A00H	01H	Motor1 Error	Bit	0-1	Ro	Read motor error status
1A00H	02H	Motor2 Error	Bit	0-1	Ro	Read motor error status
1A01H	01H	Sensor1	Bit	0-1	Ro	Sensor Status Read
1A01H	02H	Sensor2	Bit	0-1	Ro	Sensor Status Read
1A02H	01H	ActVelocity1	Int	0-32767	Ro	Analog input value reading
1A02H	02H	ActVelocity2	Int	0-32767	Ro	Analog input value reading
1A03H	01H	Motor1 Diagnose	Uint	0-32767	Ro	Control card status read: 1000: Motor control undervoltage 1010: Motor control overvoltage 1020: Control card undervoltage 1030: Overvoltage of control card
1A03H	02H	Motor2 Diagnose	Uint	0-32767	Ro	Control card status read: 1000: Motor control undervoltage 1010: Motor control overvoltage 1020: Control card undervoltage 1030: Overvoltage of control card

1A04H	01H	Device Communication	int	0-32767	Ro	EtherCAT status: 00: EtherCAT communication abnormal or not connected 01: EtherCAT communication pre-operational state 10: EtherCAT communication normal
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8. Dimensions and Installation



9. Operating Environment

Operating environment temperature	0°C~+55°C
Operating environment humidity	10%~85% (non-condensing)
Transportation and storage temperature	-40°C to +85°C
Vibration	2G or lower

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