DF20-C-EC
Adapter
User Manual

V2.0.2

2025.01.13

Version update notes:

date	Version	describe
2023/3/28	v1.0.0	Initial release
2023/12/16	v1.0.1	Added DF20-M-8AI-U-4, DF20-M-8AI-I-5, DF20-M-8AO-U-4, DF20-M-8AO-I-5
2024/7/10	v1.0.2	The technical parameters of the coupler and extended IO were modified and checked; IO added DF20-M-4DO-R /DF20-M-2CNT-EL-5 /DF20-M-2CNT-EL-4/DF20-M-2PWM/DF20-M-1COM-232/485/422;
2024/8/21	v2.0.0	Added routines for using DF20-M-2CNT-EL-5 /DF20-M-2CNT-EL-4/DF20-M-2PWM/DF20-M-1COM-232/485/422 in CODESYS, and corrected description errors and wiring diagram errors for DF20-M-2RTD-PT/DF20-M-4RTD-PT/DF20-M-8AI-U-4/DF20-M-8AI-I-5
2024/9/13	v2.0.1	Added DF20-M-4IOL module; added DF20-M-4IOL usage routines in CODESYS
2024/9/29	v2.0.2	Improve the wiring diagram of DF20-M-2CNT-EL-5 and DF20-M-2CNT-EL-4

Table of contents

1 Product Overview

- The distributed remote IO system consists of a network adapter module and an expansion IO module.
- The network adapter module is responsible for fieldbus communication and realizes communication connection with the master station controller.

Select the corresponding bus module according to the communication interface of the system. The mainstream industrial communication protocols include EtherCAT, ProfiNET, Profibus-DP, Modbus/TCP, EtherNet/IP, etc.

- The expansion IO module is responsible for connecting to the input and output sensors on site. The input IO module collects various signals on site and transmits them through the internal

The controller reads and processes the data from the adapter through the field bus, and then writes the output data to the network adapter. The network adapter then writes the output data to the output IO module through the internal bus, thereby realizing the control of the device.

- The expansion IO modules are divided into 9 categories: digital input module, digital output module, digital input and output mixed module, analog

Analog input module, analog output module, temperature input module, pressure sensor input module, pulse counting module, auxiliary module, etc.

- The network adapter and the expansion IO module can be freely combined according to the needs of the site. Distributed

IO modules can achieve lower cost requirements.

- This manual mainly describes the use of EtherCAT series distributed IO.

1.1 Product Features

- It occupies few nodes, one node has one EtherCAT adapter, and the adapter can expand up to 31 IO modules.
- Flexible configuration, multiple types of IO modules can be combined arbitrarily.
- Easy to use, each IO has an independent functional module, which can be directly loaded into the configuration system according to the actual topology structure, making configuration easy.

Easy to get started.

- The extended IO module has rich functions. The IO module includes digital quantity, analog quantity, temperature, pressure, pulse and other types, which can be flexibly combined and expanded.

It can be applied in different occasions. It has strong compatibility, and the communication interface of the adapter complies with the EtherCAT communication standard, and supports mainstream EtherCAT master stations such as TwinCAT, Codesys, OMRON, and Trio.

- Support module parameter configuration.
- Supports error diagnosis, the adapter is marked with an error indicator light, and each module also supports a fault alarm function, making detection and maintenance simple and convenient.

1.2 Product Installation and Removal

- When the module is installed, the DIN rail lock at the bottom of the module can be safely and reliably installed on the 35 mm DIN rail. In addition, there is a DIN rail lock on the left side of the adapter.

A manual clip is used to lock the guide rail. When installing the module, you need to align it with the notch, push the module toward the DIN clip in the direction of the arrow, and place the module on the DIN guide rail.

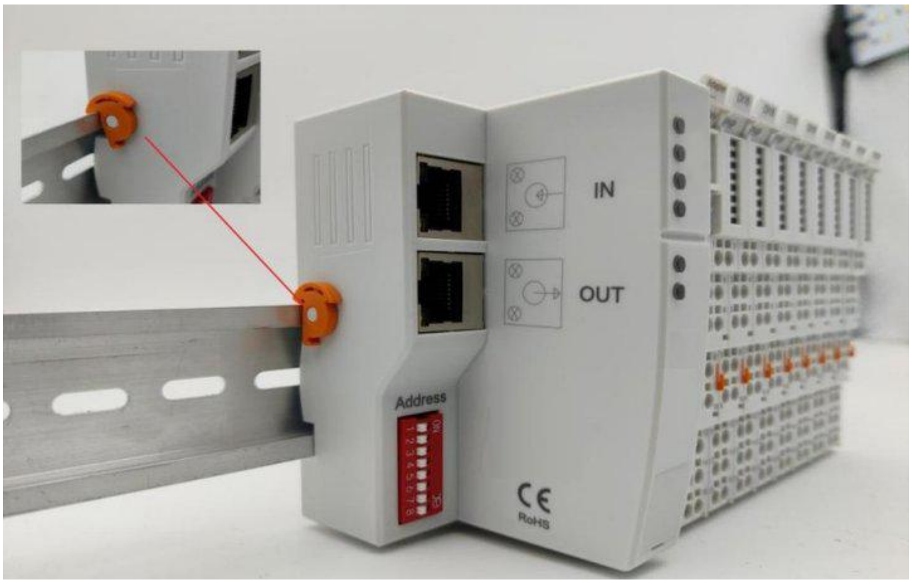


Figure 1-1

- When disassembling a module, first remove all signal cables or power cables from the module, then pull the latch in the direction of the arrow (the yellow part in the figure below).

When removing the adapter module, you also need to open the rail lock counterclockwise.

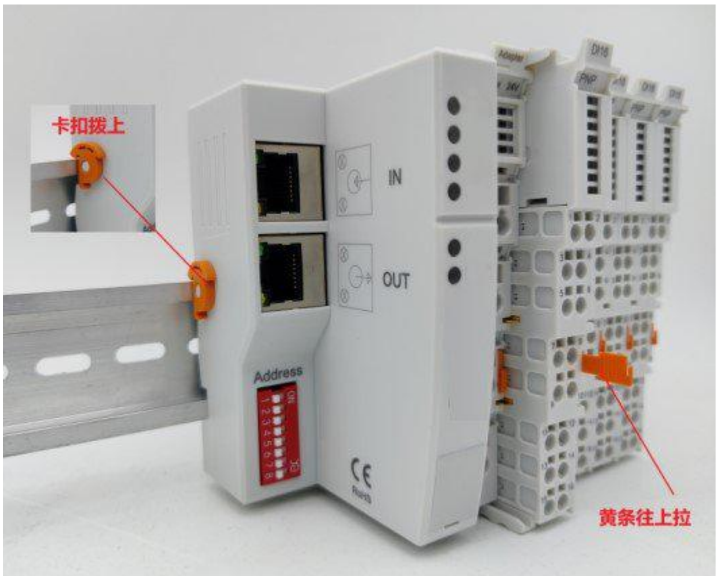


Figure 1-2

1.3 Product installation dimensions

- Adapter module installation dimensions: 100mm × 48mm × 67mm
- IO module installation size: 100mm × 12mm × 67mm / 100mm × 24mm × 67mm

1.4 Grounding protection

- There is a metal spring on the back of the module, which is used to effectively ground the rail. The metal spring and the grounding PE of the adapter module are connected internally.

Yes.

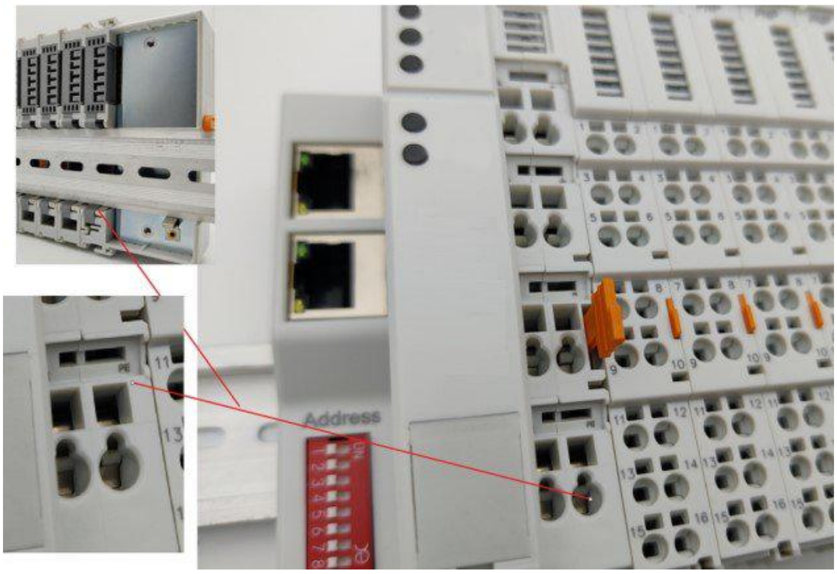


Figure 1-3

2 Network adapters

➢ DF20-C-EC network adapter supports standard EtherCAT device communication. The adapter has two EtherCAT bus interfaces and supports

MRP media redundancy can realize ring network redundancy function of mainstream EtherCAT master stations such as TwinCAT, Codesys, OMRON, Trio, ACS, etc. It takes up little space, has high speed, convenient wiring and simple configuration.

2.1 Adapter Technical Parameters

Adapter technical parameters		
Product Model	DF20-C-EC	
Bus protocol	EtherCAT	
Number of slaves	According to the master station settings	
Data transmission medium	Category 5 twisted pair	
Transmission distance	100m (station distance)	
Bus speed	100Mbps	
Bus interface	2*RJ45	
System Power	Power Input	24V DC (18~36V)
	Power Output	5V DC/2A
Common power supply	24V DC (±20%)/8A	
Slave Error Diagnosis	support	
Vibration Testing	1g, in accordance with IEC 60068-2-6	
Shock Test	15g, compliant with IEC 60068-2-27	
Electromagnetic compatibility testing	Compliant with EN 61000-4standard	
Protection level	IP20	
Operating temperature	-25～75°C	
Storage temperature	-40°C~+85°C	
Relative humidity	5～95%RH (no condensation)	
Dimensions	100mm × 48mm × 67mm	
Pollution degree	Class 2, in accordance with IEC 61131-2	
Corrosion resistance	Compliant with IEC 60068-2-42 and IEC 60068-2-43 standards	
Operating altitude	0～2000m	

2.2 Adapter Wiring Diagram

➢ The figure shows the adapter wiring diagram. Users need to connect two sets of isolated 24V power supplies to the system power supply according to the wiring diagram.

Input ports (SYS_24V port and SYS_0V port) and common power input ports (Filed_24V port and Filed_0V port). There are two groups of common power input ports, and it is recommended that users connect all of them. In addition, a group of safety ground wires and network communication cables need to be connected.

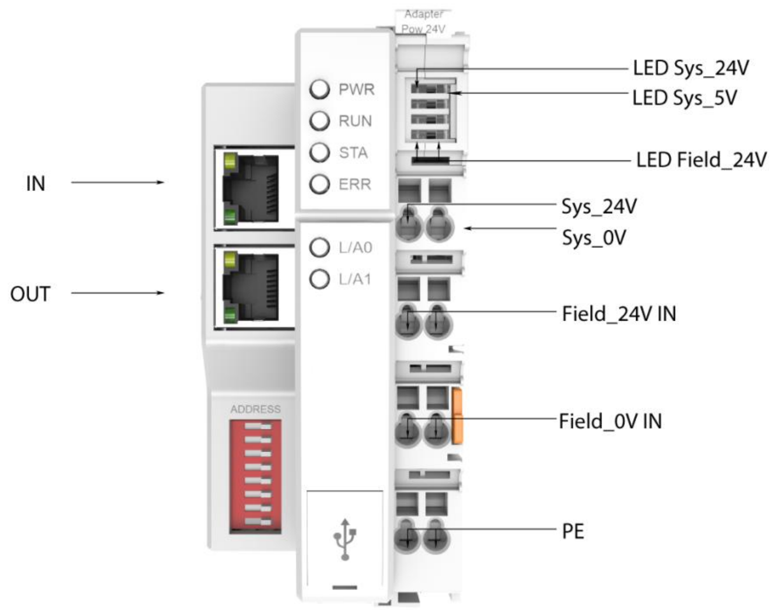


Figure 2-1

2.3 Adapter LED Indicator

serial number	Indicator Lights	illustrate	color	state	meaning
1	PWR	Control power supply	green	Bright	Control power supply is normal
				Destroy	Control power supply is not connected or is faulty
2	RUN	Bus Status	green	Bright	Bus configuration successful
				Destroy	Bus configuration failed
3	STA	Module communication	green	Flash	Module communication is normal
				Off/Still on	Module has no communication
4	ERR	Module failure	red	Bright	Module failure (specific failure information can be queried in PLC)
				Destroy	The module works fine
5	L/A0	Network port 1 link and status	green	Bright	Network connection is normal
				Flash	Network communication work
				Destroy	Network link abnormality
6	L/A1	Network port 2 link and status	green	Bright	Network connection is normal
				Flash	Network communication work
				Destroy	Network link abnormality

2.4 Adapter DIP Switch

- As shown in Figure 2-1, the adapter module has a set of dip switches to set the EtherCAT slave address. ON indicates valid data.8-bit data represents the range of 0~255.

3 Expansion IO Module

- The expansion IO modules are divided into 9 categories: digital input module, digital output module, digital input and output mixed module, analog

Input module, analog output module, temperature input module, pressure sensor input module, encoder/pulse counting module, auxiliary module, etc. Multiple types of IO modules can be combined arbitrarily.

3.1 List of supported IO modules

model	Product Description
DF20-M-8DI-N	8-channel digital input module, NPN
DF20-M-8DI-P	8-channel digital input module, PNP
DF20-M-16DI-N	16-channel digital input module, NPN
DF20-M-16DI-P	16-channel digital input module, PNP
DF20-M-32DI-N	32-channel digital input module, NPN
DF20-M-32DI-P	32-channel digital input module, PNP
DF20-M-8DO-N	8-channel digital output module, NPN
DF20-M-8DO-P	8-channel digital output module, PNP
DF20-M-16DO-N	16-channel digital output module, NPN
DF20-M-16DO-P	16-channel digital output module, PNP
DF20-M-32DO-N	32-channel digital output module, NPN
DF20-M-32DO-P	32-channel digital output module, PNP
DF20-M-4DO-R	4-channel relay output module
DF20-M-8DIO-N	8-channel digital input + 8-channel digital output, NPN
DF20-M-8DIO-P	8-channel digital input + 8-channel digital output, PNP
DF20-M-4AI-U-0	4-channel analog input module, -10V~+10V
DF20-M-4AI-U-1	4-channel analog input module, 0~+10V
DF20-M-4AI-I-2	4-channel analog input module, 0~20mA
DF20-M-4AI-I-3	4-channel analog input module, 4~20mA
DF20-M-4AI-U-4	4-channel analog input voltage type ±10V/0~10V/2~10V/±5V/0~5V/1~5V
DF20-M-4AI-I-5	4-channel analog input current type 0~20mA/4~20mA
DF20-M-8AI-U-4	8-channel analogquantityInput voltage type

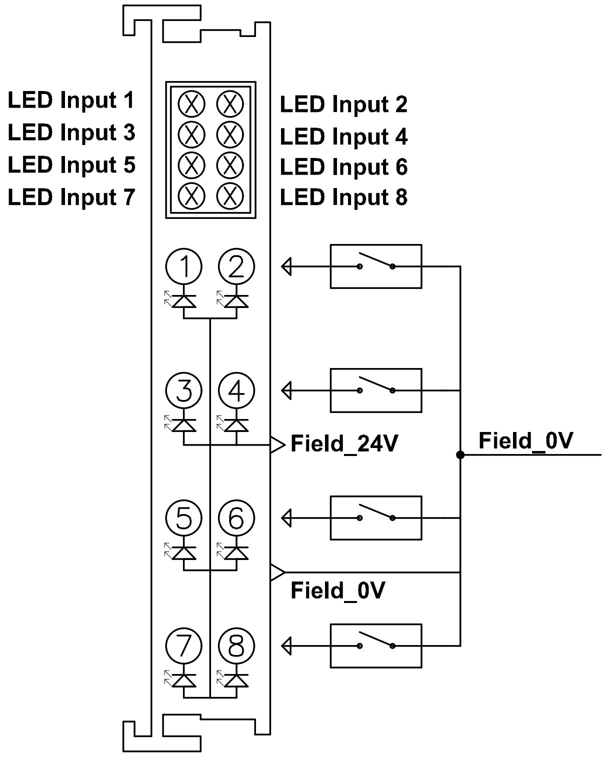
	±10V/0~10V/2~10V/±5V/0~5V/1~5V
DF20-M-8AI-I-5	8-channel analogquantityInput current type 0~20mA/4~20mA
DF20-M-2LC-S-5	2-channel pressure sensor input module
DF20-M-2RTD-PT	2-channel RTD sensor input module
DF20-M-4RTD-PT	4-channel RTD sensor input module
DF20-M-4TC-KETJ	4-channel Thermocouple Sensor Input Module
DF20-M-8TC-KETJ	8-channel Thermocouple Sensor Input Module
DF20-M-4AO-U-0	4-channel analog output module, -10V~+10V
DF20-M-4AO-U-1	4-channel analog output module, 0~+10V
DF20-M-4AO-I-2	4-channel analog output module, 0~20mA
DF20-M-4AO-I-3	4-channel analog output module, 4~20mA
DF20-M-4AO-U-4	4-channel analog output voltage type ±10V/0~10V/2~10V/±5V/0~5V/1~5V
DF20-M-4AO-I-5	4-channel analog output current type 0~20mA/4~20mA
DF20-M-8AO-U-4	8-channel analogquantityOutput voltage type ±10V/0~10V/2~10V/±5V/0~5V/1~5V
DF20-M-8AO-I-5	8-channel analogquantityOutput current type 0~20mA/4~20mA
DF20-M-1CNT-EL-5	Single channel encoder counter module, 5V
DF20-M-1CNT-EL-4	Single channel encoder counter module, 24V
DF20-M-2CNT-PIL-5	2-channel pulse counting module, 5V
DF20-M-2CNT-PIL-4	2-channel pulse counting module, 24V
DF20-M-2CNT-EL-5	2-channel encoder/pulse counting module, 5V
DF20-M-2CNT-EL-4	2-channel encoder/pulse counting module, 24V
DF20-M-2PWM	2-channel pulse output module, 5V
DF20-M-1COM-232/485/422	1-channel RS485/RS232/RS422 serial communication module
DF20-M-4IOL	4-channel IO-Link communication module
DF20-M-DC-UD-5	Power Module

3.2 DF20-M-8DI-N: 8-channel digital input module NPN type

3.2.1 Technical parameters

Electrical parameters	
Number of input channels	8
Input signal type	NPN
Input rated voltage	0V DC
logic"0" signal voltage	>11V DC
logic"1" signal voltage	<5V DC
Typical input current	3mA
System side current	15mA
Input filtering	The default time is 3ms, and the time can be set
Input Impedance	>7.5kΩ
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	$2.5mm^2$
Maximum crimping area of	AWG14
Minimum crimping area of	$0.2mm^2$
Minimum crimping area for	AWG28
Line length	8...9mm

3.2.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED Input No	Status and meaning	LED Input No	Status and meaning
LED Input1	On: Channel 1 input signal is valid Off: Channel 1 input signal is invalid	LED Input2	On: Channel 2 input signal is valid Off: Channel 2 input signal is invalid
LED Input3	On: Channel 3 input signal is valid Off: Channel 3 input signal is invalid	LED Input4	On: Channel 4 input signal is valid Off: Channel 4 input signal is invalid
LED Input5	On: Channel 5 input signal is valid Off: Channel 5 input signal is invalid	LED Input6	On: Channel 6 input signal is valid Off: Channel 6 input signal is invalid
LED Input7	On: Channel 7 input signal is valid Off: Channel 7 input signal is invalid	LED Input8	On: Channel 8 input signal is valid Off: Channel 8 input signal is invalid

3.2.3 Module process data definition

Input data: 2 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	invalid							

Data description:

CH1~CH8: When the corresponding channel input signal is valid, this position is 1, and when the input is invalid, it is 0.

0: Input signal is invalid 1: Input signal is valid

Module PDO switching instructions:

When using the DF20-M-8DI-N module, you can implement the module's bit, array, and byte operations by checking different types of PDO.

3.2.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value range	meaning
	16#4000	1	16bit	UINT	0~40	Filter
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1					

Data description: channel input filter time, unit: ms, default value: 3ms. Correspondence between SDO object write value and filter time

As shown in the table:

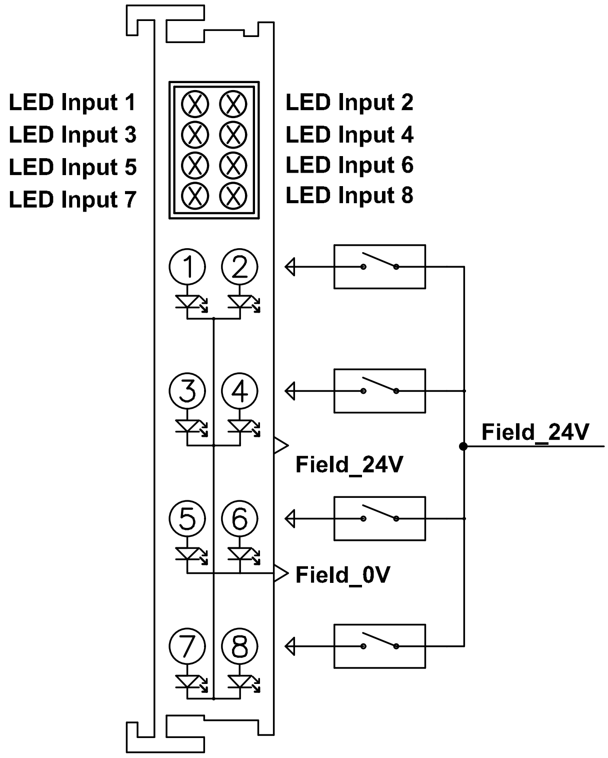
SDO Data	Filter time	SDO Data	Filter time
0	0.2ms	13	13ms
1	1ms	14	14ms
2	2ms	15	15ms
3	3ms	16	16ms
4	4ms	17	17ms
5	5ms	18	18ms
6	6ms	19	19ms
7	7ms	20	20ms
8	8ms	25	25ms
9	9ms	30	30ms
10	10ms	35	35ms
11	11ms	40	40ms
12	12ms		

3.3 DF20-M-8DI-P: 8-channel digital input module PNP type

3.3.1 Technical parameters

Electrical parameters	
Number of input channels	8
Input signal type	PNP
Input rated voltage	24V DC
logic"0" signal voltage	<5V DC
logic"1" signal voltage	>11V DC
Typical input current	3mA
System side current	15mA
Input filtering	The default time is 3ms, and the time can be set
Input Impedance	>7.5kΩ
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.3.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED Input No	Status and meaning	LED Input No	Status and meaning
LED Input1	On: Channel 1 input signal is valid Off: Channel 1 input signal is invalid	LED Input2	On: Channel 2 input signal is valid Off: Channel 2 input signal is invalid
LED Input3	On: Channel 3 input signal is valid Off: Channel 3 input signal is invalid	LED Input4	On: Channel 4 input signal is valid Off: Channel 4 input signal is invalid
LED Input5	On: Channel 5 input signal is valid Off: Channel 5 input signal is invalid	LED Input6	On: Channel 6 input signal is valid Off: Channel 6 input signal is invalid
LED Input7	On: Channel 7 input signal is valid Off: Channel 7 input signal is invalid	LED Input8	On: Channel 8 input signal is valid Off: Channel 8 input signal is invalid

3.3.3 Module process data definition

Input data: 1 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	invalid							

Data description:

CH1~CH8: When the corresponding channel input signal is valid, this position is 1, and when the input is invalid, it is 0.

0: Input signal is invalid

1: Input signal is valid

Module PDO switching instructions:

When using the DF20-M-8DI-P module, you can implement the module's bit, array, and byte operations by checking different types of PDO.

3.3.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value range	meaning
	16#4000	1	16bit	UINT	0~40	Filter
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1					

Data description: Channel input filter time, unit: ms, default value: 3ms. The corresponding relationship between the SDO object write value and the filter time is shown in the table:

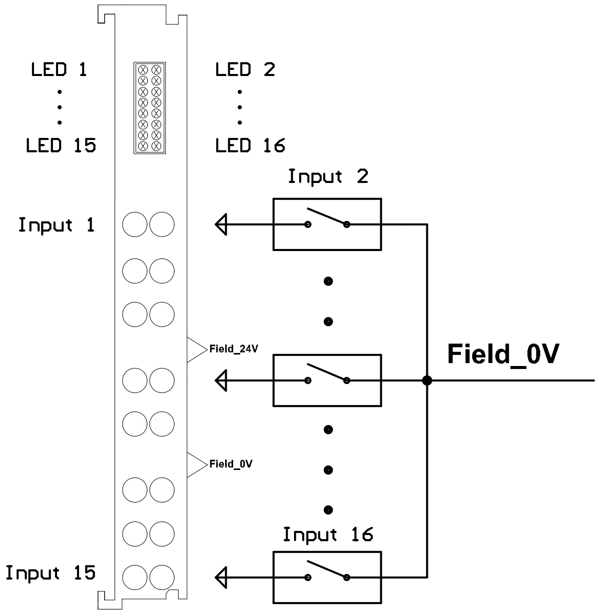
SDO Data	Filter time	SDO Data	Filter time
0	0.2ms	13	13ms
1	1ms	14	14ms
2	2ms	15	15ms
3	3ms	16	16ms
4	4ms	17	17ms
5	5ms	18	18ms
6	6ms	19	19ms
7	7ms	20	20ms
8	8ms	25	25ms
9	9ms	30	30ms
10	10ms	35	35ms
11	11ms	40	40ms
12	12ms		

3.4 DF20-M-16DI-N: 16-channel digital input module NPN type

3.4.1 Technical parameters

Electrical parameters	
Number of input channels	16
Input signal type	NPN
Input rated voltage	0V DC
logic"0" signal voltage	>11V DC
logic"1" signal voltage	<5V DC
Typical input current	3mA
System side current	30mA
Input filtering	Default 3ms, configurable 0.2-40ms
Input Impedance	>7.5kΩ
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.4.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 input signal is valid Off: Channel 1 input signal is invalid	LED2	On: Channel 2 input signal is valid Off: Channel 2 input signal is invalid
LED3	On: Channel 3 input signal is valid Off: Channel 3 input signal is invalid	LED4	On: Channel 4 input signal is valid Off: Channel 4 input signal is invalid
LED5	On: Channel 5 input signal is valid Off: Channel 5 input signal is invalid	LED6	On: Channel 6 input signal is valid Off: Channel 6 input signal is invalid
LED7	On: Channel 7 input signal is valid Off: Channel 7 input signal is invalid	LED8	On: Channel 8 input signal is valid Off: Channel 8 input signal is invalid
LED9	On: Channel 9 input signal is valid Off: Channel 9 input signal is invalid	LED10	On: Channel 10 input signal is valid Off: Channel 10 input signal is invalid
LED11	On: Channel 11 input signal is valid Off: Channel 11 input signal is invalid	LED12	On: Channel 12 input signal is valid Off: Channel 12 input signal is invalid

LED13	On: Channel 13 input signal is valid	LED14	On: Channel 14 input signal is valid
	Off: Channel 13 input signal is invalid		Off: Channel 14 input signal is invalid
LED15	On: Channel 15 input signal is valid	LED16	On: Channel 16 input signal is valid
	Off: Channel 15 input signal is invalid		Off: Channel 16 input signal is invalid

3.4.3 Module process data definition

Input data: 2 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9

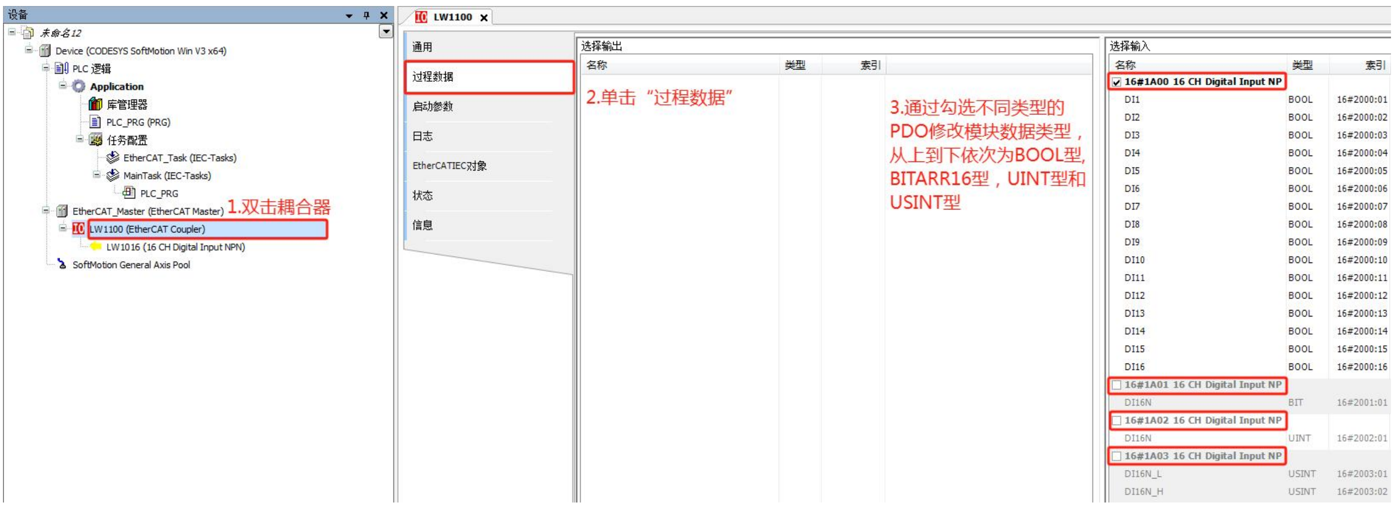
Data description:

CH1~CH16: When the corresponding channel input signal is valid, this position is 1, and when the input is invalid, it is 0.

0: Input signal is invalid

1: Input signal is valid

Module PDO switching instructions:



When using the DF20-M-16DI-N module, you can implement bit, array, word, and byte operations of the module by checking different types of PDO.

3.4.4 Configuration parameter definition

<table>
<tr><td rowspan="2">SDO Configurati</td><td>index</td><td>Sub-</td><td>length</td><td>type</td><td>Value range</td><td>meaning</td></tr>
<tr><td>16#4000</td><td>1</td><td>16bit</td><td>UINT</td><td>0~40</td><td>Filter</td></tr>
<tr><td>Remark</td><td colspan="6">If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1</td></tr>
</table>

Data description: Channel input filter time, unit: ms, default value: 3ms.

The corresponding relationship between the write value of the sub-index 1 object under index 16#4000 and the filter time is shown in the table:

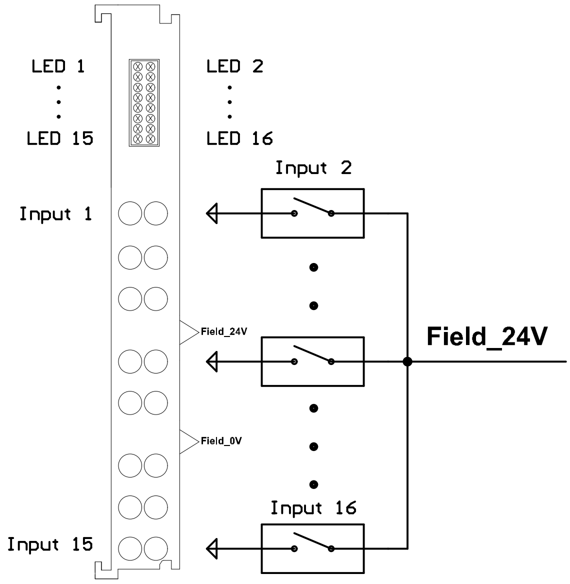
SDO Data	Filter time	SDO Data	Filter time
0	0.2ms	13	13ms
1	1ms	14	14ms
2	2ms	15	15ms
3	3ms	16	16ms
4	4ms	17	17ms
5	5ms	18	18ms
6	6ms	19	19ms
7	7ms	20	20ms
8	8ms	25	25ms
9	9ms	30	30ms
10	10ms	35	35ms
11	11ms	40	40ms
12	12ms		

3.5 DF20-M-16DI-P: 16-channel digital input module PNP type

3.5.1 Technical parameters

Electrical parameters	
Number of input channels	16
Input signal type	PNP
Input rated voltage	24V DC
logic"0" signal voltage	<5V DC
logic"1" signal voltage	>11V DC
Typical input current	3mA
System side current	30mA
Input filtering	The default time is 3ms, and the time can be set
Input Impedance	>7.5kΩ
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.5.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 input signal is valid	LED2	On: Channel 2 input signal is valid
	Off: Channel 1 input signal is invalid		Off: Channel 2 input signal is invalid
LED3	On: Channel 3 input signal is valid	LED4	On: Channel 4 input signal is valid
	Off: Channel 3 input signal is invalid		Off: Channel 4 input signal is invalid
LED5	On: Channel 5 input signal is valid	LED6	On: Channel 6 input signal is valid
	Off: Channel 5 input signal is invalid		Off: Channel 6 input signal is invalid
LED7	On: Channel 7 input signal is valid	LED8	On: Channel 8 input signal is valid
	Off: Channel 7 input signal is invalid		Off: Channel 8 input signal is invalid
LED9	On: Channel 9 input signal is valid	LED10	On: Channel 10 input signal is valid
	Off: Channel 9 input signal is invalid		Off: Channel 10 input signal is invalid
LED11	On: Channel 11 input signal is valid	LED12	On: Channel 12 input signal is valid
	Off: Channel 11 input signal is invalid		Off: Channel 12 input signal is invalid
LED13	On: Channel 13 input signal is	LED14	On: Channel 14 input signal

	valid		is valid
	Off: Channel 13 input signal is invalid		Off: Channel 14 input signal is invalid
LED15	On: Channel 15 input signal is valid	LED16	On: Channel 16 input signal is valid
	Off: Channel 15 input signal is invalid		Off: Channel 16 input signal is invalid

3.5.3 Module process data definition

Input data: 2 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9

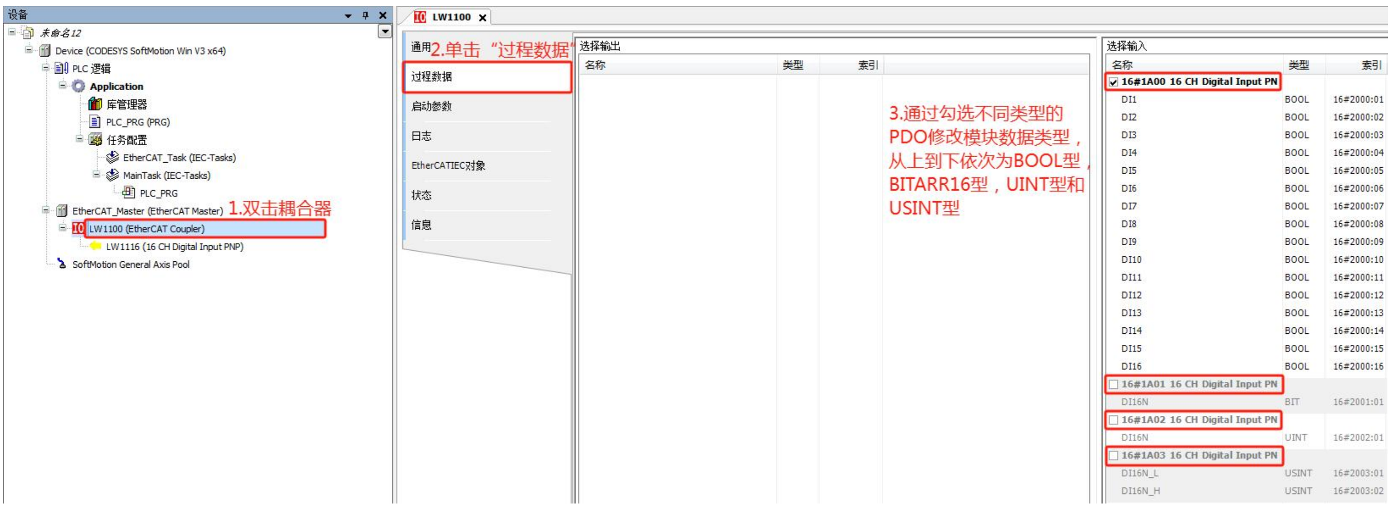
Data description:

CH1~CH16: When the corresponding channel input signal is valid, this position is 1, and when the input is invalid, it is 0.

0: Input signal is invalid

1: Input signal is valid

Module PDO switching instructions:



When using the DF20-M-16DI-P module, you can implement bit, array, word, and byte operations of the module by checking different types of PDO.

3.5.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value range	meaning
	16#4000	1	16bit	UINT	0~40	Filter

Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1

Data description: Channel input filter time, unit: ms, default value: 3ms.

The corresponding relationship between the SDO object write value and the filter time is shown in the table:

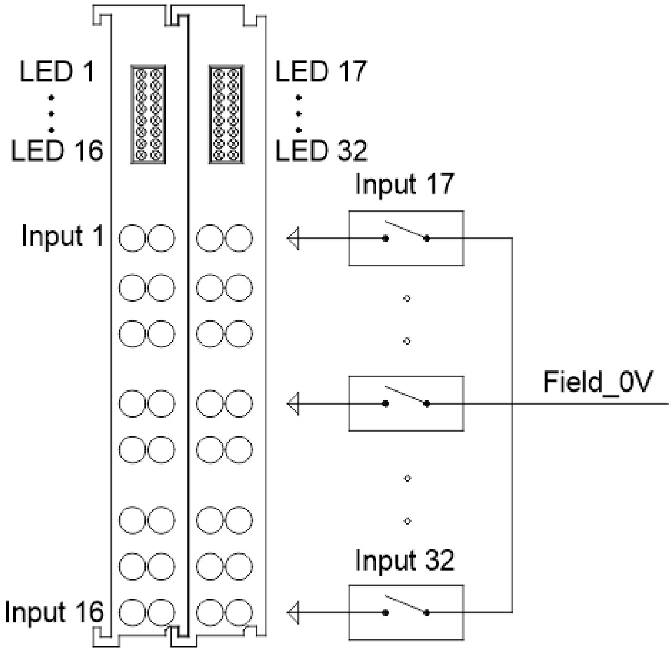
SDO Data	Filter time	SDO Data	Filter time
0	0.2ms	13	13ms
1	1ms	14	14ms
2	2ms	15	15ms
3	3ms	16	16ms
4	4ms	17	17ms
5	5ms	18	18ms
6	6ms	19	19ms
7	7ms	20	20ms
8	8ms	25	25ms
9	9ms	30	30ms
10	10ms	35	35ms
11	11ms	40	40ms
12	12ms		

3.6 DF20-M-32DI-N: 32-channel digital input module NPN type

3.6.1 Technical parameters

Electrical parameters	
Number of input channels	32
Input signal type	NPN
Input rated voltage	0V DC
logic"0" signal voltage	>11V DC
logic"1" signal voltage	<5V DC
Typical input current	3mA
System side current	65mA
Input filtering	The default time is 3ms, and the time can be set
Input Impedance	>7.5kΩ
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.6.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 input signal is valid	LED2	On: Channel 2 input signal is valid
	Off: Channel 1 input signal is invalid		Off: Channel 2 input signal is invalid
LED3	On: Channel 3 input signal is valid	LED4	On: Channel 4 input signal is valid
	Off: Channel 3 input signal is invalid		Off: Channel 4 input signal is invalid
LED5	On: Channel 5 input signal is valid	LED6	On: Channel 6 input signal is valid
	Off: Channel 5 input signal is invalid		Off: Channel 6 input signal is invalid
LED7	On: Channel 7 input signal is valid	LED8	On: Channel 8 input signal is valid
	Off: Channel 7 input signal is invalid		Off: Channel 8 input signal is invalid
LED9	On: Channel 9 input signal is valid	LED10	On: Channel 10 input signal is valid
	Off: Channel 9 input signal is invalid		Off: Channel 10 input signal is invalid
LED11	On: Channel 11 input signal is valid	LED12	On: Channel 12 input signal is valid
	Off: Channel 11 input signal is		Off: Channel 12 input signal

	invalid		is invalid
LED13	On: Channel 13 input signal is valid	LED14	On: Channel 14 input signal is valid
	Off: Channel 13 input signal is invalid		Off: Channel 14 input signal is invalid
LED15	On: Channel 15 input signal is valid	LED16	On: Channel 16 input signal is valid
	Off: Channel 15 input signal is invalid		Off: Channel 16 input signal is invalid
LED17	On: Channel 17 input signal is valid	LED18	On: Channel 18 input signal is valid
	Off: Channel 17 input signal is invalid		Off: Channel 18 input signal is invalid
LED19	On: Channel 19 input signal is valid	LED20	On: Channel 20 input signal is valid
	Off: Channel 19 input signal is invalid		Off: Channel 20 input signal is invalid
LED21	On: Channel 21 input signal is valid	LED22	On: Channel 22 input signal is valid
	Off: Channel 21 input signal is invalid		Off: Channel 22 input signal is invalid
LED23	On: Channel 23 input signal is valid	LED24	On: Channel 24 input signal is valid
	Off: Channel 23 input signal is invalid		Off: Channel 24 input signal is invalid
LED25	On: Channel 25 input signal is valid	LED26	On: Channel 26 input signal is valid
	Off: Channel 25 input signal is invalid		Off: Channel 26 input signal is invalid
LED27	On: Channel 27 input signal is valid	LED28	On: Channel 28 input signal is valid
	Off: Channel 27 input signal is invalid		Off: Channel 28 input signal is invalid
LED29	On: Channel 29 input signal is valid	LED30	On: Channel 30 input signal is valid
	Off: Channel 29 input signal is invalid		Off: Channel 30 input signal is invalid
LED31	On: Channel 31 input signal is valid	LED32	On: Channel 32 input signal is valid
	Off: Channel 31 input signal is invalid		Off: Channel 32 input signal is invalid

3.6.3 Module process data definition

Input data: 4 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9
Byte 2	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH24	CH23	CH22	CH21	CH20	CH19	CH18	CH17
Byte 3	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH32	CH31	CH30	CH29	CH28	CH27	CH26	CH25

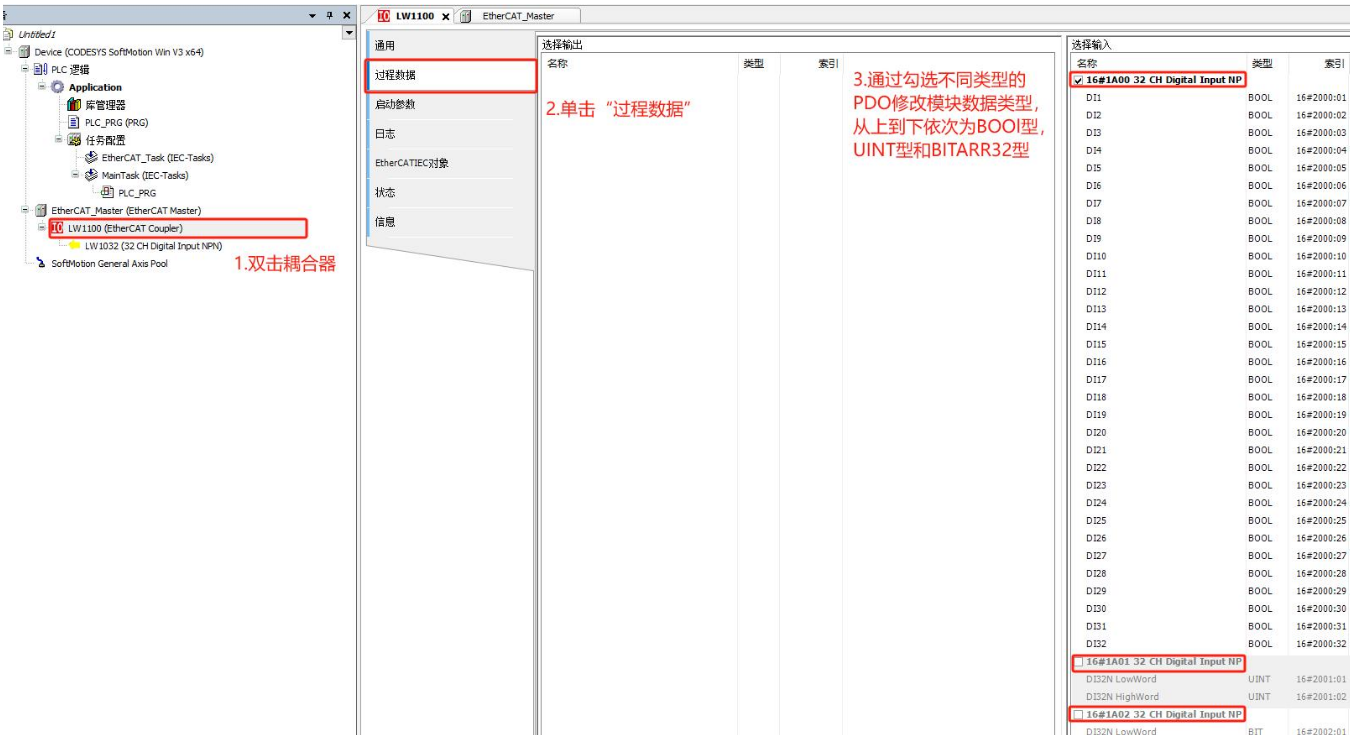
Data description:

CH1~CH32: When the corresponding channel input signal is valid, this position is 1, and when the input is invalid, it is 0.

0: Input signal is invalid

1: Input signal is valid

Module PDO switching instructions:



When using the DF20-M-32DI-N module, you can implement the module's bit, word, and array operations by checking different types of PDO.

3.6.4 Configuration parameter definition

SDO Configuration	index	Sub-index	length	type	Value range	meaning
	16#4000	1	16bit	UINT	0~40	Filter configuration
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on. 16#400x, where x is the card slot position -1					

Data description: Channel input filter time, unit: ms, default value: 3ms.

The corresponding relationship between the write value of the sub-index 1 object under index 16#4000 and the filter time is shown in the table:

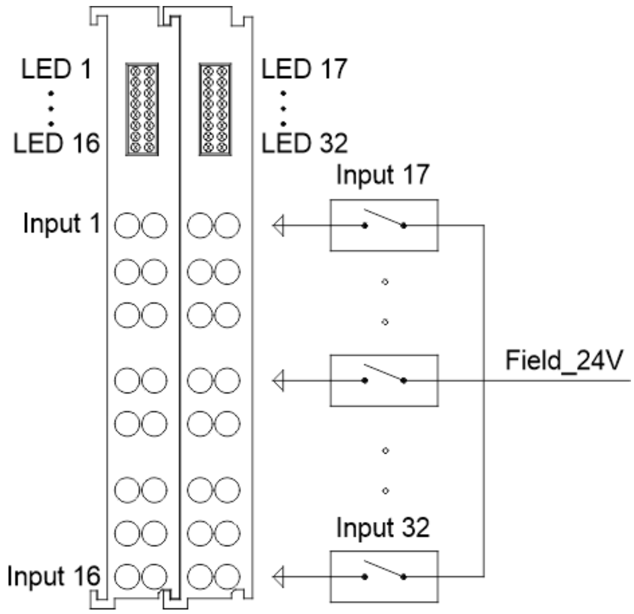
SDO Data	Filter time	SDO Data	Filter time
0	0.2ms	13	13ms
1	1ms	14	14ms
2	2ms	15	15ms
3	3ms	16	16ms
4	4ms	17	17ms
5	5ms	18	18ms
6	6ms	19	19ms
7	7ms	20	20ms
8	8ms	25	25ms
9	9ms	30	30ms
10	10ms	35	35ms
11	11ms	40	40ms
12	12ms		

3.7 DF20-M-32DI-P: 32-channel digital input module PNP type

3.7.1 Technical parameters

Electrical parameters	
Number of input channels	32
Input signal type	PNP
Input rated voltage	24V DC
logic"0" signal voltage	<5V DC
logic"1" signal voltage	>11V DC
Typical input current	3mA
System side current	65mA
Input filtering	The default time is 3ms, and the time can be set
Input Impedance	>7.5kΩ
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75℃
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.7.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 input signal is valid	LED2	On: Channel 2 input signal is valid
	Off: Channel 1 input signal is invalid		Off: Channel 2 input signal is invalid
LED3	On: Channel 3 input signal is valid	LED4	On: Channel 4 input signal is valid
	Off: Channel 3 input signal is invalid		Off: Channel 4 input signal is invalid
LED5	On: Channel 5 input signal is valid	LED6	On: Channel 6 input signal is valid
	Off: Channel 5 input signal is invalid		Off: Channel 6 input signal is invalid
LED7	On: Channel 7 input signal is valid	LED8	On: Channel 8 input signal is valid
	Off: Channel 7 input signal is invalid		Off: Channel 8 input signal is invalid
LED9	On: Channel 9 input signal is valid	LED10	On: Channel 10 input signal is valid
	Off: Channel 9 input signal is invalid		Off: Channel 10 input signal is invalid
LED11	On: Channel 11 input signal is valid	LED12	On: Channel 12 input signal is valid
	Off: Channel 11 input signal is invalid		Off: Channel 12 input signal is invalid

LED13	On: Channel 13 input signal is valid	LED14	On: Channel 14 input signal is valid
	Off: Channel 13 input signal is invalid		Off: Channel 14 input signal is invalid
LED15	On: Channel 15 input signal is valid	LED16	On: Channel 16 input signal is valid
	Off: Channel 15 input signal is invalid		Off: Channel 16 input signal is invalid
LED17	On: Channel 17 input signal is valid	LED18	On: Channel 18 input signal is valid
	Off: Channel 17 input signal is invalid		Off: Channel 18 input signal is invalid
LED19	On: Channel 19 input signal is valid	LED20	On: Channel 20 input signal is valid
	Off: Channel 19 input signal is invalid		Off: Channel 20 input signal is invalid
LED21	On: Channel 21 input signal is valid	LED22	On: Channel 22 input signal is valid
	Off: Channel 21 input signal is invalid		Off: Channel 22 input signal is invalid
LED23	On: Channel 23 input signal is valid	LED24	On: Channel 24 input signal is valid
	Off: Channel 23 input signal is invalid		Off: Channel 24 input signal is invalid
LED25	On: Channel 25 input signal is valid	LED26	On: Channel 26 input signal is valid
	Off: Channel 25 input signal is invalid		Off: Channel 26 input signal is invalid
LED27	On: Channel 27 input signal is valid	LED28	On: Channel 28 input signal is valid
	Off: Channel 27 input signal is invalid		Off: Channel 28 input signal is invalid
LED29	On: Channel 29 input signal is valid	LED30	On: Channel 30 input signal is valid
	Off: Channel 29 input signal is invalid		Off: Channel 30 input signal is invalid
LED31	On: Channel 31 input signal is valid	LED32	On: Channel 32 input signal is valid
	Off: Channel 31 input signal is invalid		Off: Channel 32 input signal is invalid

3.7.3 Module process data definition

Input data: 4 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9
Byte 2	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH24	CH23	CH22	CH21	CH20	CH19	CH18	CH17
Byte 3	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH32	CH31	CH30	CH29	CH28	CH27	CH26	CH25

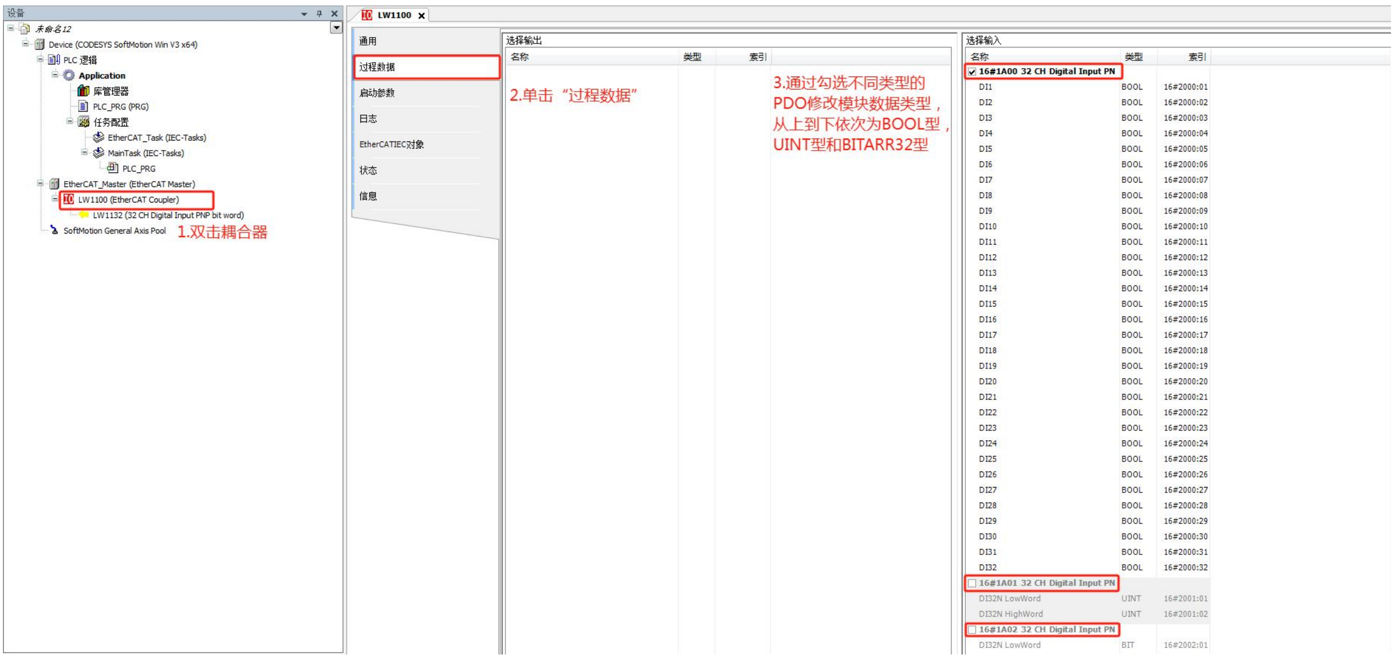
Data description:

CH1~CH32: When the corresponding channel input signal is valid, this position is 1, and when the input is invalid, it is 0.

0: Input signal is invalid

1: Input signal is valid

Module PDO switching instructions:



When using the DF20-M-32DI-P module, you can implement bit, word, and array operations of the module by checking different types of PDO.

3.7.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value range	meaning
	16#4000	1	16bit	UINT	0~40	Filter
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1					

Data description: Channel input filter time, unit: ms, default value: 3ms.

The corresponding relationship between the SDO object write value and the filter time is shown in the table:

SDO Data	Filter time	SDO Data	Filter time
0	0.2ms	13	13ms
1	1ms	14	14ms
2	2ms	15	15ms
3	3ms	16	16ms
4	4ms	17	17ms
5	5ms	18	18ms
6	6ms	19	19ms
7	7ms	20	20ms
8	8ms	25	25ms
9	9ms	30	30ms
10	10ms	35	35ms
11	11ms	40	40ms
12	12ms		

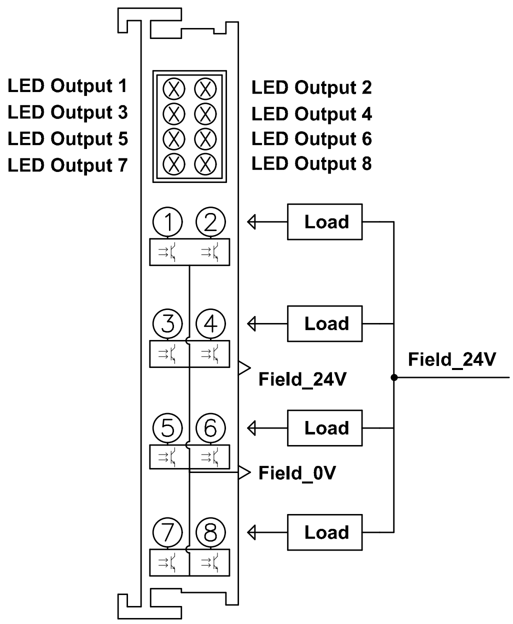
3.8 DF20-M-8DO-N: 8-channel digital output module NPN type

3.8.1 Technical parameters

Electrical parameters	
Number of output channels	8
Output signal type	NPN
logic"0" signal voltage	High impedance
logic"1" signal voltage	0V DC
Maximum output current	0.5A/channel, 3A/module
System side current	50mA
Maximum short circuit	2A
Load Type	Inductive load, resistive load, lamp load
Reverse voltage protection	support
Module failure alarm	support
General parameters	

Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25～75℃
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	$2.5mm^2$
Maximum crimping area of	AWG14
Minimum crimping area of	$0.2mm^2$
Minimum crimping area for	AWG28
Line length	8...9mm

3.8.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED 1	On: Channel 1 output is valid	LED 2	On: Channel 2 output is valid
	Off: Channel 1 output is invalid		Off: Channel 2 output is invalid
LED 3	On: Channel 3 output is valid	LED 4	On: Channel 4 output is valid
	Off: Channel 3 output is		Off: Channel 4 output is

	invalid		invalid
LED 5	On: Channel 5 output is valid	LED 6	On: Channel 6 output is valid
	Off: Channel 3 output is invalid		Off: Channel 6 output is invalid
LED 7	On: Channel 7 output is valid	LED 8	On: Channel 8 output is valid
	Off: Channel 7 output is invalid		Off: Channel 8 output is invalid

3.8.3 Module process data definition

Output data: 2 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	invalid							

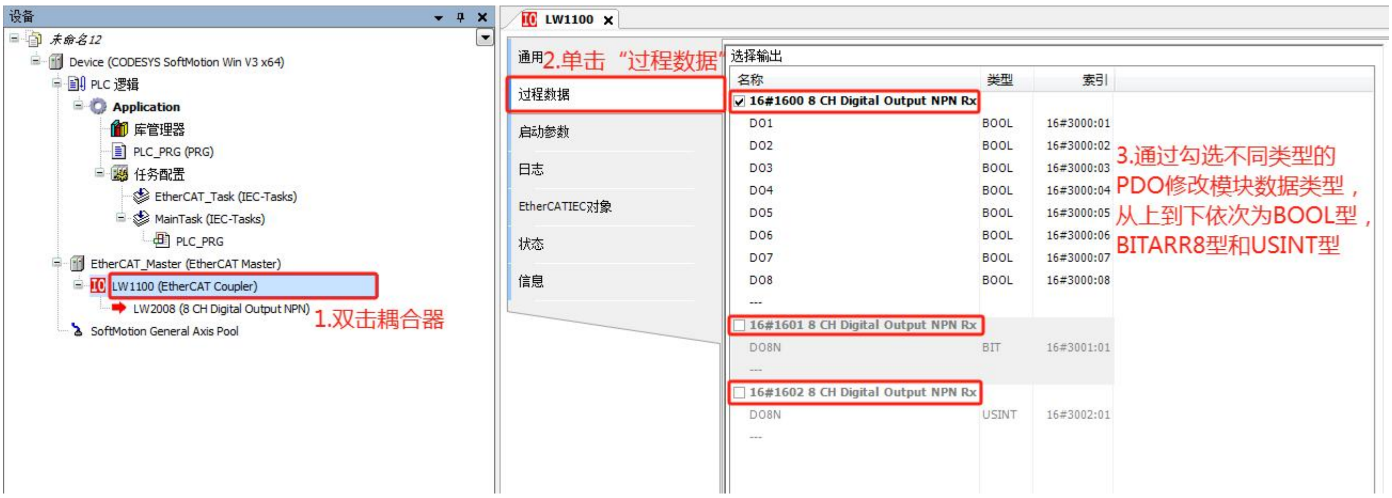
Data description:

CH1~CH8: When this position is 1, the corresponding channel output signal is valid and the output voltage is 0V. When it is 0, the output is invalid and the output voltage is in high impedance state.

0: Output signal is invalid.

1: Output signal is valid.

Module PDO switching instructions:



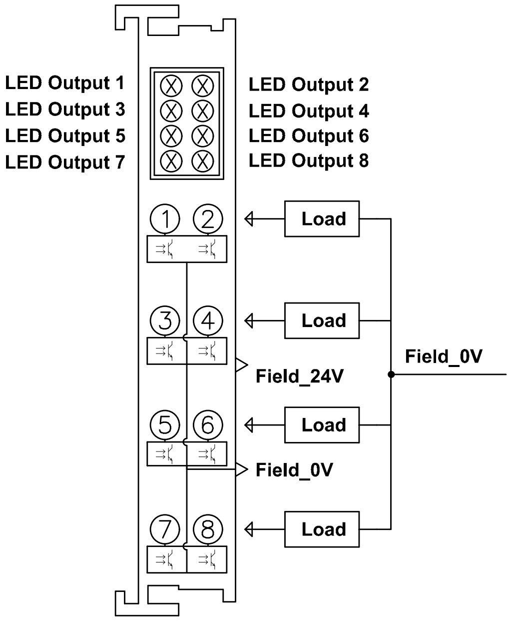
When using the DF20-M-8DO-N module, you can implement bit, array, and byte operations of the module by checking different types of PDO.

3.9 DF20-M-8DO-P: 8-channel digital output module PNP type

3.9.1 Technical parameters

Electrical parameters	
Number of output channels	8
Output signal type	PNP
logic"0" signal voltage	High impedance
logic"1" signal voltage	24V DC
Maximum output current	0.5A/channel, 3A/module
System side current	50mA
Maximum short circuit	2A
Load Type	Inductive load, resistive load, lamp load
Reverse voltage protection	support
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25～75°C
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.9.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED 1	On: Channel 1 output is valid	LED 2	On: Channel 2 output is valid
	Off: Channel 1 output is invalid		Off: Channel 2 output is invalid
LED 3	On: Channel 3 output is valid	LED 4	On: Channel 4 output is valid
	Off: Channel 3 output is invalid		Off: Channel 4 output is invalid
LED 5	On: Channel 5 output is valid	LED 6	On: Channel 6 output is valid
	Off: Channel 3 output is invalid		Off: Channel 6 output is invalid
LED 7	On: Channel 7 output is valid	LED 8	On: Channel 8 output is valid
	Off: Channel 7 output is invalid		Off: Channel 8 output is invalid

3.9.3 Module process data definition

Output data: 2 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	invalid							

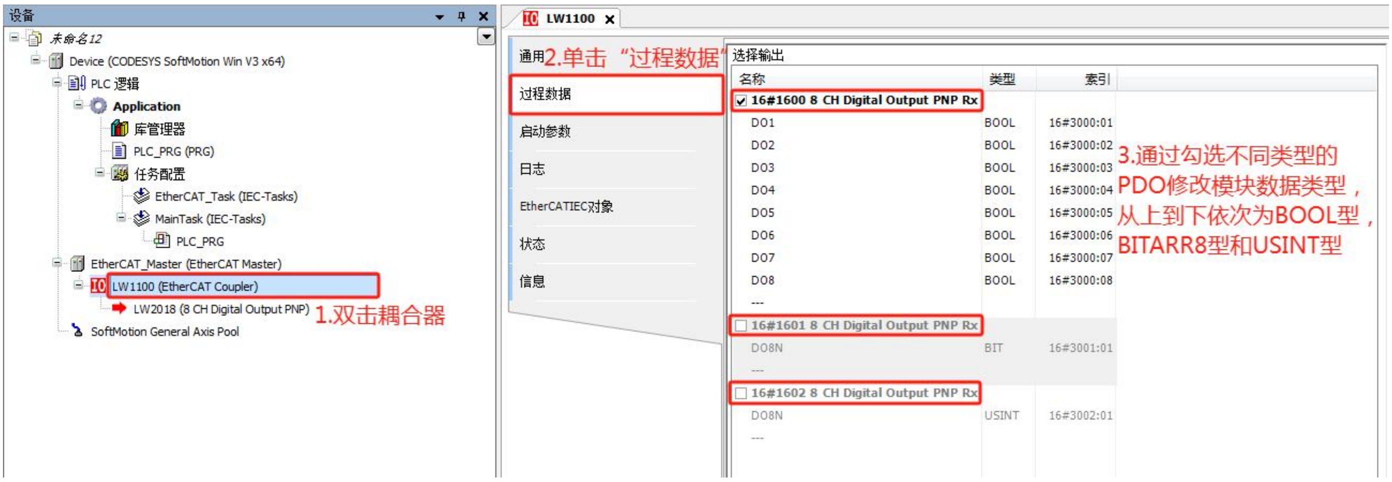
Data description:

CH1~CH8: When this position is 1, the corresponding channel output signal is valid and the output voltage is 24V. When it is 0, the output is invalid and the output voltage is high impedance.

0: Output signal is invalid.

1: Output signal is valid.

Module PDO switching instructions:



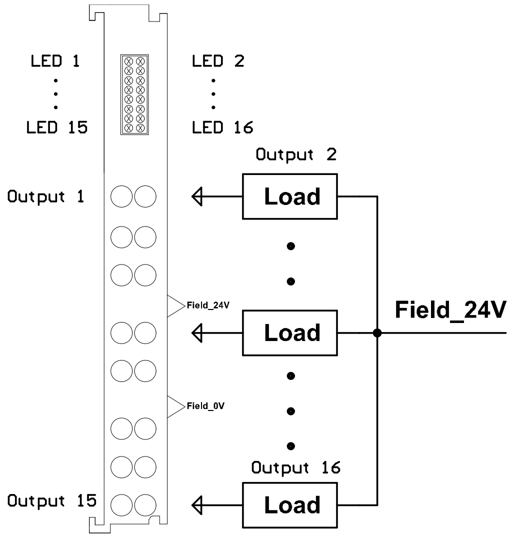
When using the DF20-M-8DO-P module, you can implement the module's bit, array, and byte operations by checking different types of PDO.

3.10 DF20-M-16DO-N: 16-channel digital output module NPN type

3.10.1 Technical parameters

Electrical parameters	
Number of output channels	16
Output signal type	NPN
logic"0" signal voltage	High impedance
logic"1" signal voltage	0V DC
Maximum output current	0.5A/channel, 6A/module
System side current	75mA
Maximum short circuit	2A
Load Type	Inductive load, resistive load, lamp load
Reverse voltage protection	support
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.10.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 output is valid	LED2	On: Channel 2 output is valid
	Off: Channel 1 output is invalid		Off: Channel 2 output is invalid
LED3	On: Channel 3 output is valid	LED4	On: Channel 4 output is valid
	Off: Channel 3 output is invalid		Off: Channel 4 output is invalid
LED5	On: Channel 5 output is valid	LED6	On: Channel 6 output is valid
	Off: Channel 5 output is invalid		Off: Channel 6 output is invalid
LED7	On: Channel 7 output is valid	LED8	On: Channel 8 output is valid
	Off: Channel 7 output is invalid		Off: Channel 8 output is invalid
LED9	On: Channel 9 output is valid	LED10	On: Channel 10 output is valid
	Off: Channel 9 output is invalid		Off: Channel 10 output is invalid
LED11	On: Channel 11 output is valid	LED12	On: Channel 12 output is valid
	Off: Channel 11 output is invalid		Off: Channel 12 output is invalid
LED13	On: Channel 13 output is valid	LED14	On: Channel 14 output is valid
	Off: Channel 13 output is invalid		Off: Channel 14 output is invalid
LED15	On: Channel 15 output is valid	LED16	On: Channel 16 output is valid

	Off: Channel 15 output is invalid		Off: Channel 16 output is invalid

3.10.3 Module process data definition

Output data: 2 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9

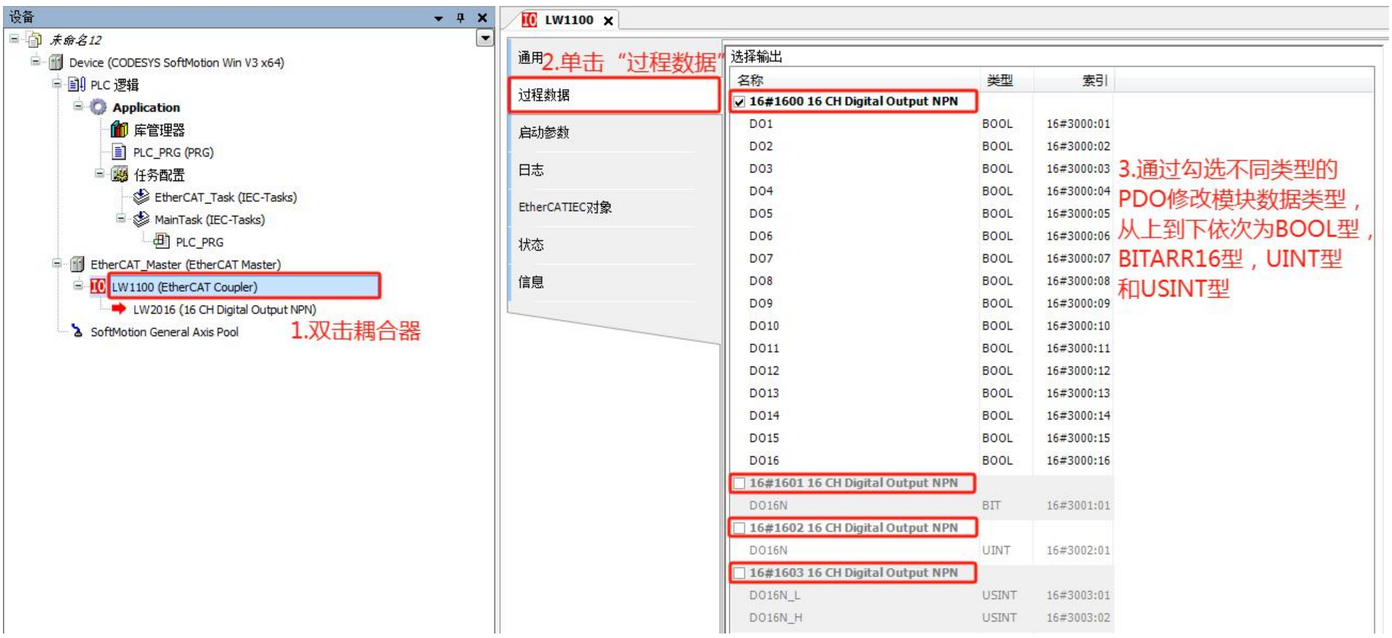
Data description:

CH1~CH16: When this position is 1, the corresponding channel output signal is valid and the output voltage is 0V. When it is 0, the output is invalid and the output voltage is in high impedance state.

0: Output signal is invalid.

1: Output signal is valid.

Module PDO switching instructions:



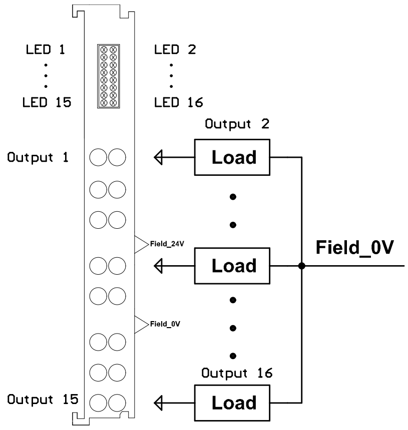
When using the DF20-M-16DO-N module, you can implement bit, array, word, and byte operations of the module by checking different types of PDO.

3.11 DF20-M-16DO-P: 16-channel digital output module PNP type

3.11.1 Technical parameters

Electrical parameters	
Number of output channels	16
Output signal type	PNP
logic"0" signal voltage	High impedance
logic"1" signal voltage	24V DC
Maximum output current	0.5A/channel, 6A/module
System side current	75mA
Maximum short circuit	2A
Load Type	Inductive load, resistive load, lamp load
Reverse voltage protection	support
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75℃
Storage temperature	-40°C~+85 °C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.11.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 output is valid	LED2	On: Channel 2 output is valid
	Off: Channel 1 output is invalid		Off: Channel 2 output is invalid
LED3	On: Channel 3 output is valid	LED4	On: Channel 4 output is valid
	Off: Channel 3 output is invalid		Off: Channel 4 output is invalid
LED5	On: Channel 5 output is valid	LED6	On: Channel 6 output is valid
	Off: Channel 5 output is invalid		Off: Channel 6 output is invalid
LED7	On: Channel 7 output is valid	LED8	On: Channel 8 output is valid
	Off: Channel 7 output is invalid		Off: Channel 8 output is invalid
LED9	On: Channel 9 output is valid	LED10	On: Channel 10 output is valid
	Off: Channel 9 output is invalid		Off: Channel 10 output is invalid
LED11	On: Channel 11 output is valid	LED12	On: Channel 12 output is valid
	Off: Channel 11 output is invalid		Off: Channel 12 output is invalid
LED13	On: Channel 13 output is valid	LED14	On: Channel 14 output is valid
	Off: Channel 13 output is invalid		Off: Channel 14 output is invalid
LED15	On: Channel 15 output is valid	LED16	On: Channel 16 output is valid
	Off: Channel 15 output is		Off: Channel 16 output is

	invalid		invalid

3.11.3 Module process data definition

Output data: 2 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9

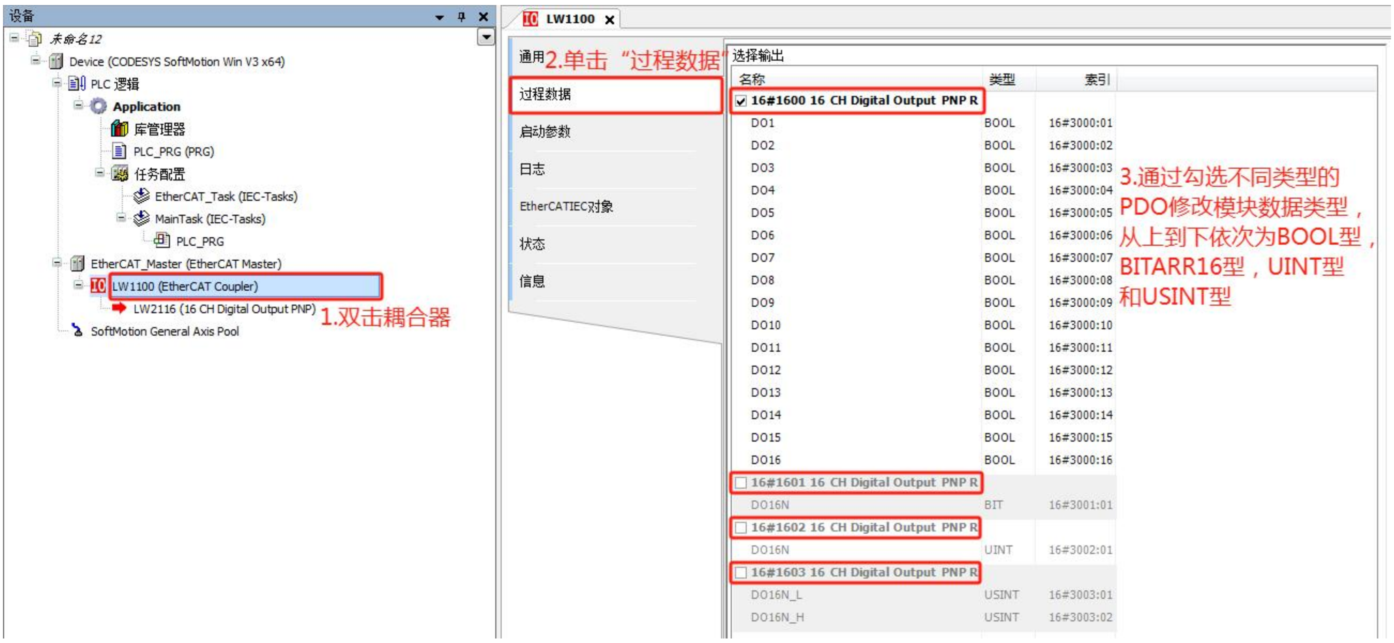
Data description:

CH1~CH16: When this position is 1, the corresponding channel output signal is valid and the output voltage is 24V. When it is 0, the output is invalid and the output voltage is high impedance.

0: Output signal is invalid.

1: Output signal is valid.

Module PDO switching instructions:



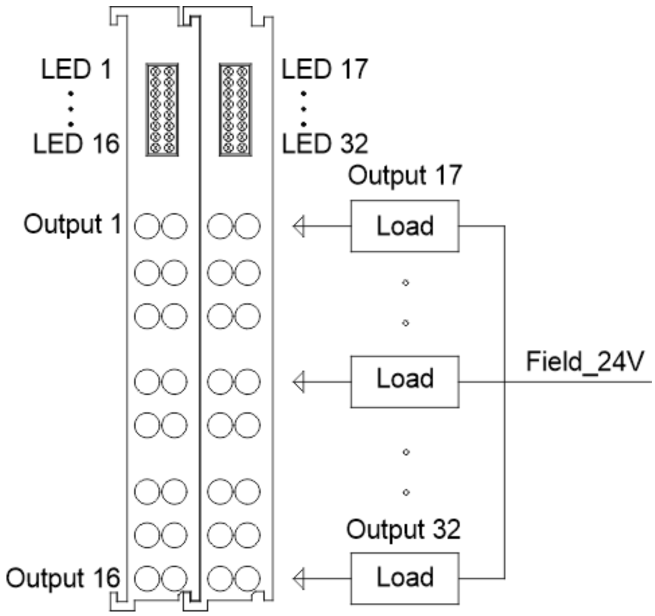
When using the DF20-M-16DO-P module, you can implement bit, array, word, and byte operations of the module by checking different types of PDO.

3.12 DF20-M-32DO-N: 32-channel digital output module NPN type

3.12.1 Technical parameters

Electrical parameters	
Number of output channels	32
Output signal type	NPN
logic"0" signal voltage	High impedance
logic"1" signal voltage	0V DC
Maximum output current	0.5A/channel, 12A/module
System side current	130mA
Maximum short circuit	2A
Load Type	Inductive load, resistive load, lamp load
Reverse voltage protection	support
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25～75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.12.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 output is valid Off: Channel 1 output is invalid	LED2	On: Channel 2 output is valid Off: Channel 2 output is invalid
LED3	On: Channel 3 output is valid Off: Channel 3 output is invalid	LED4	On: Channel 4 output is valid Off: Channel 4 output is invalid
LED5	On: Channel 5 output is valid Off: Channel 5 output is invalid	LED6	On: Channel 6 output is valid Off: Channel 6 output is invalid
LED7	On: Channel 7 output is valid Off: Channel 7 output is invalid	LED8	On: Channel 8 output is valid Off: Channel 8 output is invalid
LED9	On: Channel 9 output is valid Off: Channel 9 output is invalid	LED10	On: Channel 10 output is valid Off: Channel 10 output is invalid
LED11	On: Channel 11 output is valid Off: Channel 11 output is invalid	LED12	On: Channel 12 output is valid Off: Channel 12 output is invalid
LED13	On: Channel 13 output is valid Off: Channel 13 output is invalid	LED14	On: Channel 14 output is valid Off: Channel 14 output is invalid

LED15	On: Channel 15 output is valid	LED16	On: Channel 16 output is valid
	Off: Channel 15 output is invalid		Off: Channel 16 output is invalid
LED17	On: Channel 17 output is valid	LED18	On: Channel 18 output is valid
	Off: Channel 17 output is invalid		Off: Channel 18 output is invalid
LED19	On: Channel 19 output is valid	LED20	On: Channel 20 output is valid
	Off: Channel 19 output is invalid		Off: Channel 20 output is invalid
LED21	On: Channel 21 output is valid	LED22	On: Channel 22 output is valid
	Off: Channel 21 output is invalid		Off: Channel 22 output is invalid
LED23	On: Channel 23 output is valid	LED24	On: Channel 24 output is valid
	Off: Channel 23 output is invalid		Off: Channel 24 output is invalid
LED25	On: Channel 25 output is valid	LED26	On: Channel 26 output is valid
	Off: Channel 25 output is invalid		Off: Channel 26 output is invalid
LED27	On: Channel 27 output is valid	LED28	On: Channel 28 output is valid
	Off: Channel 27 output is invalid		Off: Channel 28 output is invalid
LED29	On: Channel 29 output is valid	LED30	On: Channel 30 output is valid
	Off: Channel 29 output is invalid		Off: Channel 30 output is invalid
LED31	On: Channel 31 output is valid	LED32	On: Channel 32 output is valid
	Off: Channel 31 output is invalid		Off: Channel 32 output is invalid

3.12.3 Module process data definition

Output data: 4 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9
Byte 2	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH24	CH23	CH22	CH21	CH20	CH19	CH18	CH17
Byte 3	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH32	CH31	CH30	CH29	CH28	CH27	CH26	CH25

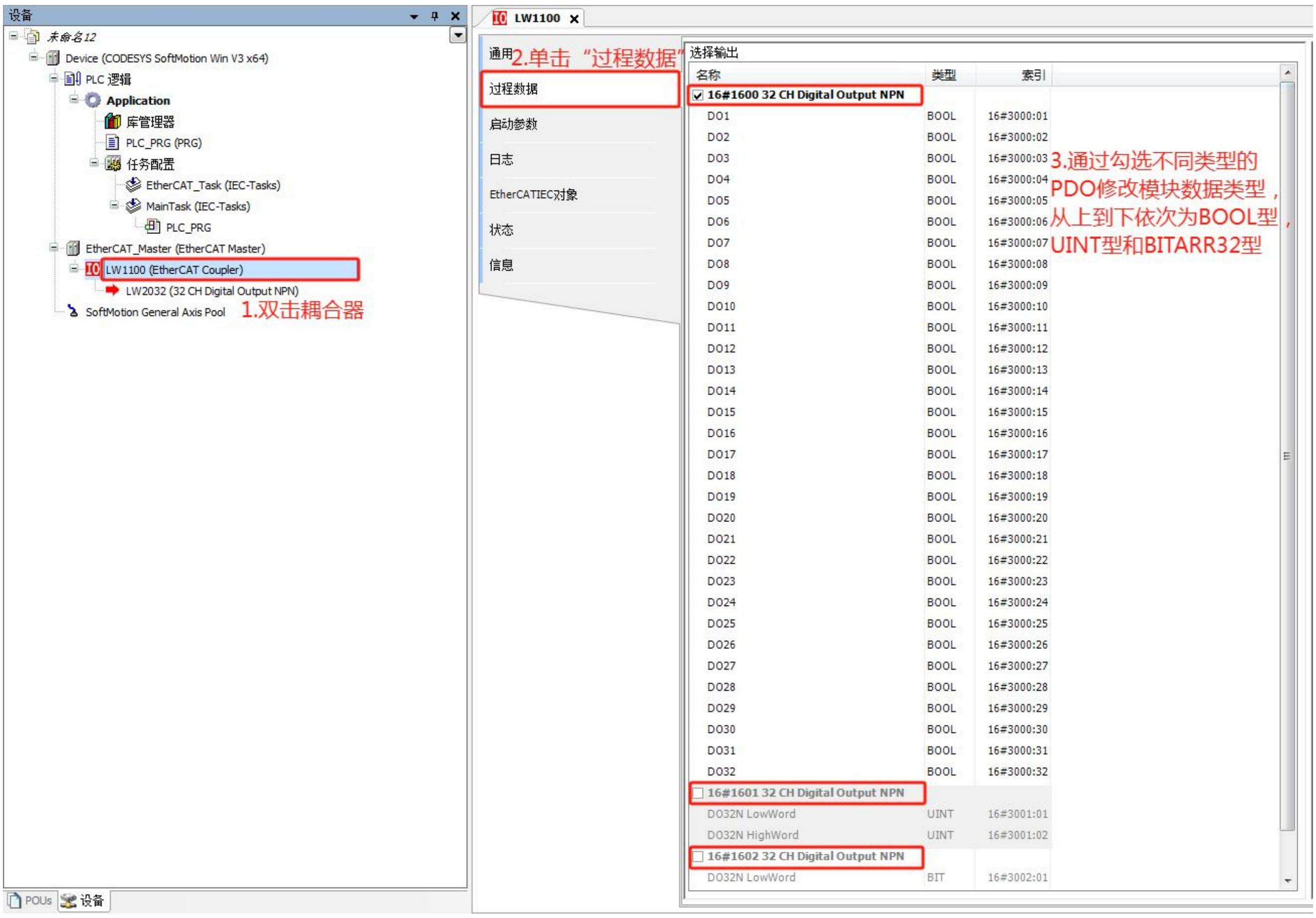
Data description:

CH1~CH32: When this position is 1, the corresponding channel output signal is valid and the output voltage is 0V. When it is 0, the output is invalid and the output voltage is in high impedance state.

0: Output signal is invalid.

1: Output signal is valid.

Module PDO switching instructions:



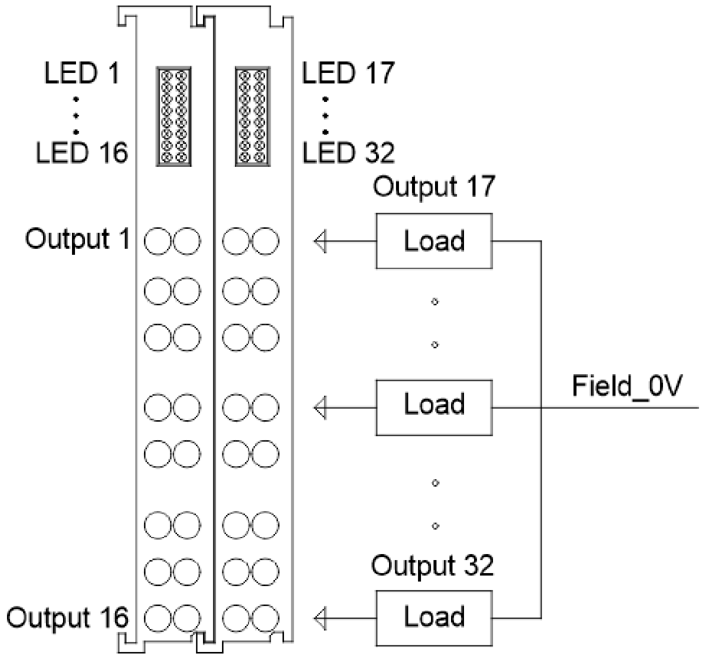
When using the DF20-M-32DO-N module, you can implement bit, word, and array operations of the module by checking different types of PDO.

3.13 DF20-M-32DO-P: 32-channel digital output module PNP type

3.13.1 Technical parameters

Electrical parameters	
Number of output channels	32
Output signal type	PNP
logic"0" signal voltage	High impedance
logic"1" signal voltage	24V DC
Maximum output current	0.5A/channel, 12A/module
System side current	130mA
Maximum short circuit	2A
Load Type	Inductive load, resistive load, lamp load
Reverse voltage protection	support
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75℃
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.13.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 output is valid	LED2	On: Channel 2 output is valid
	Off: Channel 1 output is invalid		Off: Channel 2 output is invalid
LED3	On: Channel 3 output is valid	LED4	On: Channel 4 output is valid
	Off: Channel 3 output is invalid		Off: Channel 4 output is invalid
LED5	On: Channel 5 output is valid	LED6	On: Channel 6 output is valid
	Off: Channel 5 output is invalid		Off: Channel 6 output is invalid
LED7	On: Channel 7 output is valid	LED8	On: Channel 8 output is valid
	Off: Channel 7 output is invalid		Off: Channel 8 output is invalid
LED9	On: Channel 9 output is valid	LED10	On: Channel 10 output is valid
	Off: Channel 9 output is invalid		Off: Channel 10 output is invalid
LED11	On: Channel 11 output is valid	LED12	On: Channel 12 output is valid
	Off: Channel 11 output is invalid		Off: Channel 12 output is invalid
LED13	On: Channel 13 output is valid	LED14	On: Channel 14 output is valid
	Off: Channel 13 output is		Off: Channel 14 output is

	invalid		invalid
LED15	On: Channel 15 output is valid	LED16	On: Channel 16 output is valid
	Off: Channel 15 output is invalid		Off: Channel 16 output is invalid
LED17	On: Channel 17 output is valid	LED18	On: Channel 18 output is valid
	Off: Channel 17 output is invalid		Off: Channel 18 output is invalid
LED19	On: Channel 19 output is valid	LED20	On: Channel 20 output is valid
	Off: Channel 19 output is invalid		Off: Channel 20 output is invalid
LED21	On: Channel 21 output is valid	LED22	On: Channel 22 output is valid
	Off: Channel 21 output is invalid		Off: Channel 22 output is invalid
LED23	On: Channel 23 output is valid	LED24	On: Channel 24 output is valid
	Off: Channel 23 output is invalid		Off: Channel 24 output is invalid
LED25	On: Channel 25 output is valid	LED26	On: Channel 26 output is valid
	Off: Channel 25 output is invalid		Off: Channel 26 output is invalid
LED27	On: Channel 27 output is valid	LED28	On: Channel 28 output is valid
	Off: Channel 27 output is invalid		Off: Channel 28 output is invalid
LED29	On: Channel 29 output is valid	LED30	On: Channel 30 output is valid
	Off: Channel 29 output is invalid		Off: Channel 30 output is invalid
LED31	On: Channel 31 output is valid	LED32	On: Channel 32 output is valid
	Off: Channel 31 output is invalid		Off: Channel 32 output is invalid

3.13.3 Module process data definition

Output data: 4 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9
Byte 2	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH24	CH23	CH22	CH21	CH20	CH19	CH18	CH17
Byte 3	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH32	CH31	CH30	CH29	CH28	CH27	CH26	CH25

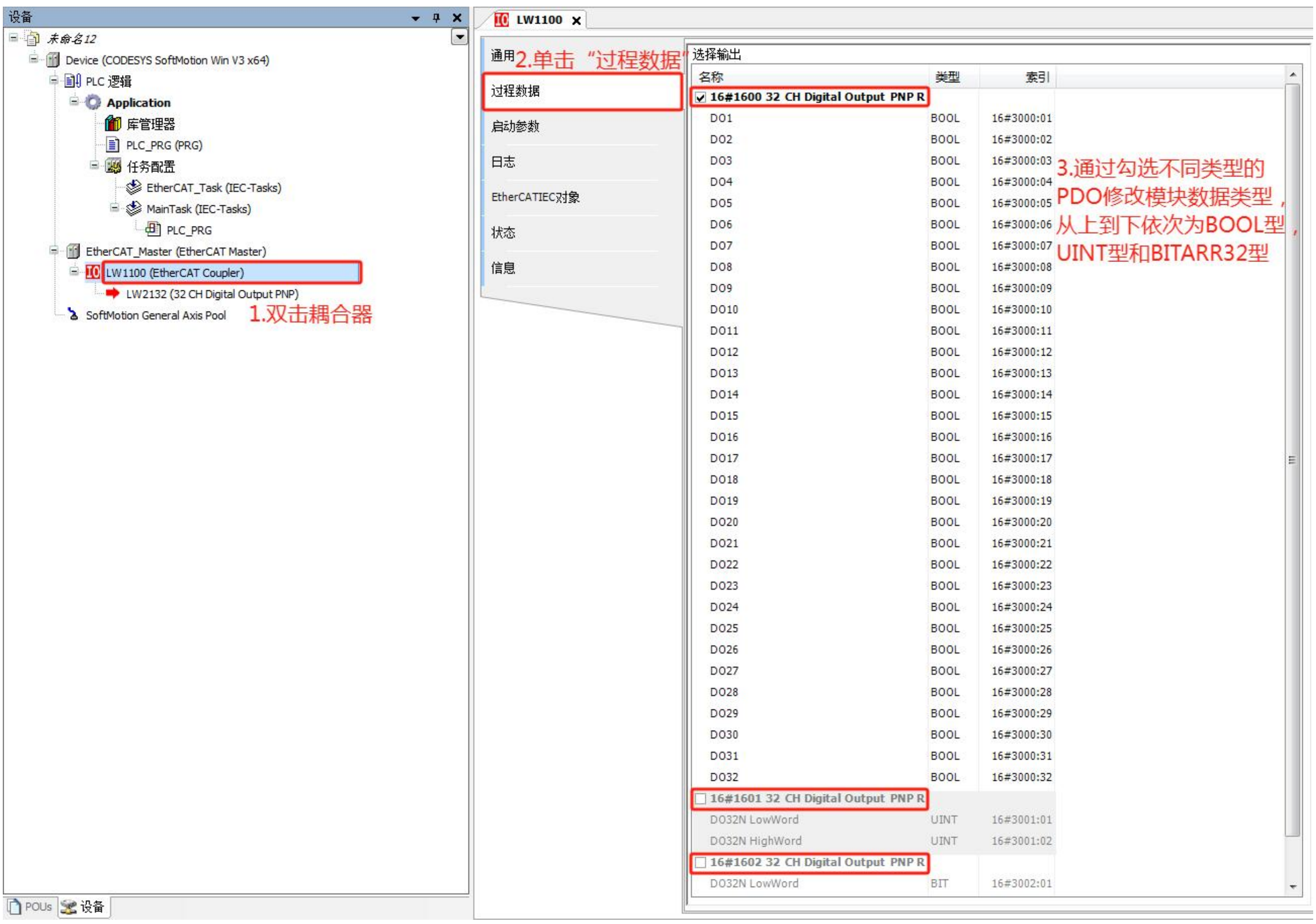
Data description:

CH1~CH32: When this position is 1, the corresponding channel output signal is valid and the output voltage is 24V. When it is 0, the output is invalid and the output voltage is high impedance.

0: Output signal is invalid.

1: Output signal is valid.

Module PDO switching instructions:



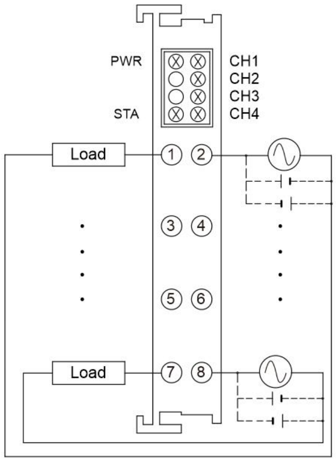
When using the DF20-M-32DO-P module, you can implement bit, word, and array operations of the module by checking different types of PDO.

3.14 DF20-M-4DO-R: 4-channel relay output module

3.14.1 Technical parameters

Electrical parameters	
Number of channels	4
Contact Type	NO contact
Maximum output current	5A/channel, 20A/module
System side current	20mA
Maximum switching voltage	250VAC/30VDC
Output Impedance	<200mΩ
Action time	≤15ms
Release time	≤15ms
Reverse circuit protection	support
Communication error diagnosis	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Complies with EN 61000-4
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Stripping length	8...9mm

3.14.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
PWR	Power light: When the power supply is normal, it will be green.
CH1	Channel 1 relay indicator light, off when disconnected, always on when closed
CH2	The 2nd channel relay indicator light is off when the circuit is open and always on when the circuit is closed.
CH3	The 3rd channel relay indicator light is off when the circuit is open and always on when the circuit is closed.
CH4	The 4th channel relay indicator light is off when the circuit is open and always on when the circuit is closed.
STA	Status LED: Power-on stage: Green light is always on when powered on; Turns off after the internal bus initialization is completed.
	Operation phase: When the module is operating normally, it flashes green; When the module operates abnormally, the green light goes out.

3.14.3 Module process data definition

Output data: 1 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	/	/	/	/	CH4	CH3	CH2	CH1

Data description:

CH1~CH4: When this position is 1, the corresponding channel output signal is valid and the channel relay is energized. When this position is 0, the corresponding channel output signal is invalid and the relay is disconnected.

0: Output signal is invalid

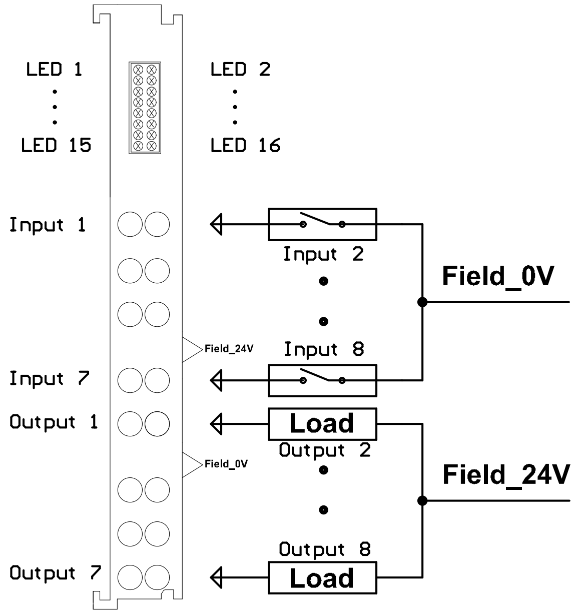
1: Output signal is valid

3.15 DF20-M-8DIO-N: 8-channel digital input 8-channel digital output module NPN

3.15.1 Technical parameters

Electrical parameters	
Number of input channels	8
Number of output channels	8
Input signal type	NPN
Output signal type	NPN
Input Logic"0" signal voltage	>11V DC
logic"1" signal voltage	<5V DC
Output Logic"0" signal voltage	High impedance
Output Logic"1" signal voltage	0V
System side current	50mA
Input filtering	Default 3ms, 0.2~40ms configurable
Input Impedance	>7.5kΩ
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.15.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 input signal is valid Off: Channel 1 input signal is invalid	LED2	On: Channel 2 input signal is valid Off: Channel 2 input signal is invalid
LED3	On: Channel 3 input signal is valid Off: Channel 3 input signal is invalid	LED4	On: Channel 4 input signal is valid Off: Channel 4 input signal is invalid
LED5	On: Channel 5 input signal is valid Off: Channel 5 input signal is invalid	LED6	On: Channel 6 input signal is valid Off: Channel 6 input signal is invalid
LED7	On: Channel 7 input signal is valid Off: Channel 7 input signal is invalid	LED8	On: Channel 8 input signal is valid Off: Channel 8 input signal is invalid
LED9	On: Channel 9 output signal is valid Off: Channel 9 output signal is invalid	LED10	On: Channel 10 output signal is valid Off: Channel 10 output signal is invalid
LED11	On: Channel 11 output signal is valid Off: Channel 11 output signal is invalid	LED12	On: Channel 12 output signal is valid Off: Channel 12 output signal is invalid

LED13	On: Channel 13 output signal is valid Off: Channel 13 output signal is invalid	LED14	On: Channel 14 output signal is valid Off: Channel 14 output signal is invalid
LED15	On: Channel 15 output signal is valid Off: Channel 15 output signal is invalid	LED16	On: Channel 16 output signal is valid Off: Channel 16 output signal is invalid

3.15.3 Module process data definition

Input data: 1 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Output data: 1 Byte								
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9

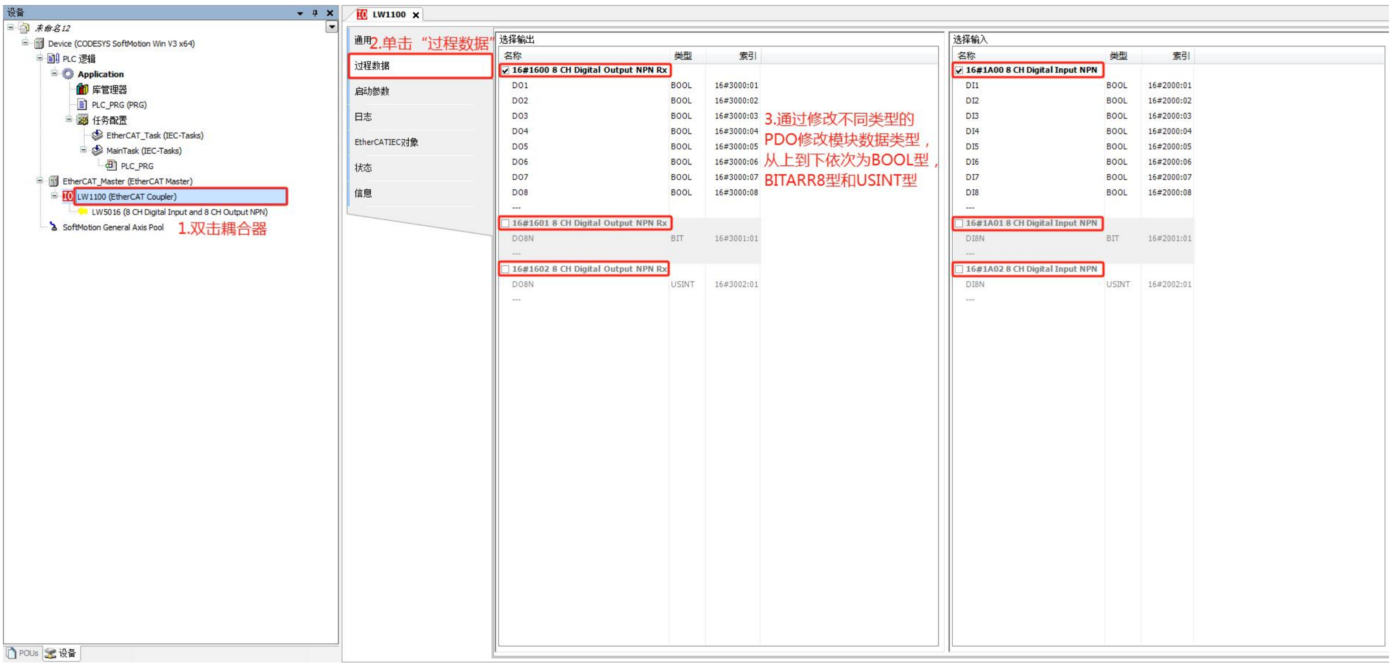
Data description:

CH1~CH16: When the corresponding channel input and output signals are valid, this position is 1, and when the input and output are invalid, it is 0.

0: Input signal is invalid

1: Input signal is valid

Module PDO switching instructions:



When using the DF20-M-8DIO-N module, you can implement the module's bit, array, and byte operations by checking different types of PDO.

3.15.4 Configuration parameter definition

<table>
<tr><td rowspan="2">SDO Configurati</td><td>index</td><td>Sub-</td><td>length</td><td>type</td><td>Value range</td><td>meaning</td></tr>
<tr><td>16#4000</td><td>1</td><td>16bit</td><td>UINT</td><td>0~40</td><td>Filter</td></tr>
<tr><td>Remark</td><td colspan="6">If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1</td></tr>
</table>

Data description: Channel input filter time, unit: ms, default value: 3ms.

The corresponding relationship between the write value of the sub-index 1 object under index 16#4000 and the filter time is shown in the table:

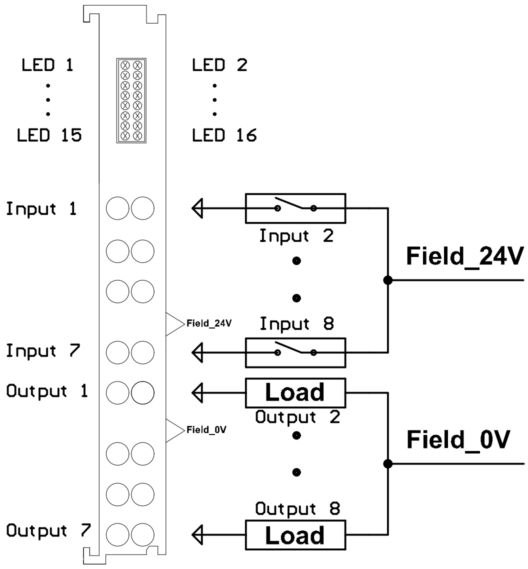
SDO Data	Filter	SDO Data	Filter
0	0.2ms	13	13ms
1	1ms	14	14ms
2	2ms	15	15ms
3	3ms	16	16ms
4	4ms	17	17ms
5	5ms	18	18ms
6	6ms	19	19ms
7	7ms	20	20ms
8	8ms	25	25ms
9	9ms	30	30ms
10	10ms	35	35ms
11	11ms	40	40ms
12	12ms		

3.16 DF20-M-8DIO-P: 8-channel digital input 8-channel digital output module PNP

3.16.1 Technical parameters

Electrical parameters	
Number of input channels	8
Number of output channels	8
Input signal type	PNP
Output signal type	PNP
Input Logic"0" signal voltage	<5V DC
Input Logic"1" signal voltage	>11V DC
Output Logic"0" signal voltage	High impedance
Output Logic"1" signal voltage	24V
System side current	50mA
Input filtering	Default 3ms, 0.2~40ms configurable
Input Impedance	>7.5kΩ
Module failure alarm	support
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	1.5mm²
Maximum crimping area of	AWG16
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28

3.16.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	LED No	Status and meaning
LED1	On: Channel 1 input signal is valid	LED2	On: Channel 2 input signal is valid
	Off: Channel 1 input signal is invalid		Off: Channel 2 input signal is invalid
LED3	On: Channel 3 input signal is valid	LED4	On: Channel 4 input signal is valid
	Off: Channel 3 input signal is invalid		Off: Channel 4 input signal is invalid
LED5	On: Channel 5 input signal is valid	LED6	On: Channel 6 input signal is valid
	Off: Channel 5 input signal is invalid		Off: Channel 6 input signal is invalid
LED7	On: Channel 7 input signal is valid	LED8	On: Channel 8 input signal is valid
	Off: Channel 7 input signal is invalid		Off: Channel 8 input signal is invalid
LED9	On: Channel 9 output signal is valid	LED10	On: Channel 10 output signal is valid
	Off: Channel 9 output signal is invalid		Off: Channel 10 output signal is invalid
LED11	On: Channel 11 output signal is valid	LED12	On: Channel 12 output signal is valid
	Off: Channel 11 output signal is invalid		Off: Channel 12 output signal is invalid
LED13	On: Channel 13 output signal is	LED14	On: Channel 14 output signal

	valid		is valid
	Off: Channel 13 output signal is invalid		Off: Channel 14 output signal is invalid
LED15	On: Channel 15 output signal is valid	LED16	On: Channel 16 output signal is valid
	Off: Channel 15 output signal is invalid		Off: Channel 16 output signal is invalid

3.16.3 Module process data definition

Input data: 1 Byte								
Byte 0	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Output data: 1 Byte								
Byte 1	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	CH16	CH15	CH14	CH13	CH12	CH11	CH10	CH9

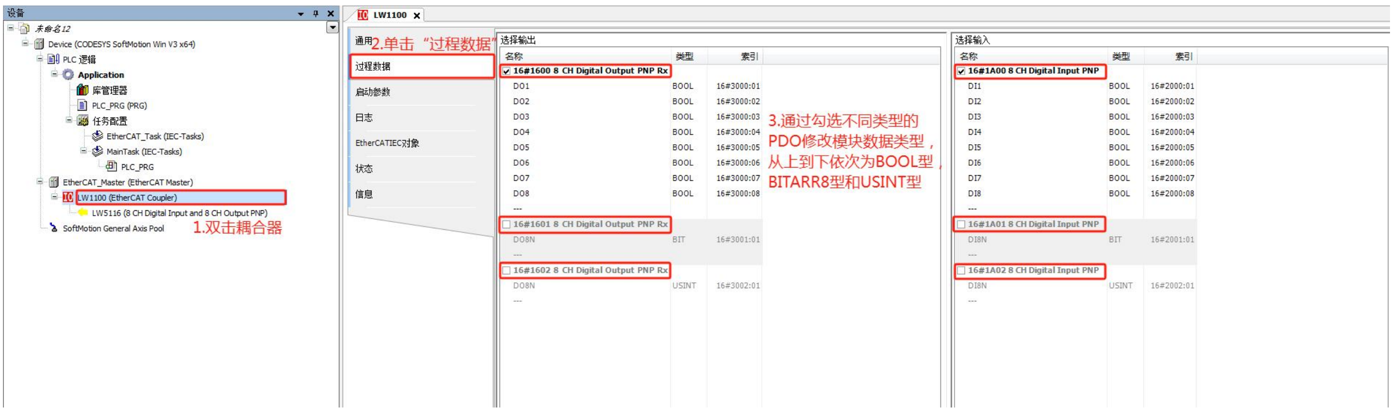
Data description:

CH1~CH16: When the corresponding channel input and output signals are valid, this position is 1, and when the input and output are invalid, it is 0.

0: Input signal is invalid

1: Input signal is valid

Module PDO switching instructions:



When using the DF20-M-8DIO-P module, you can implement the module's bit, array, and byte operations by checking different types of PDO.

3.16.4 Configuration parameter definition

SDO Configuration	index	Sub-index	length	type	Value range	meaning
	16#4000	1	16bit	UINT	0~40	Filter configuratio
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1					

Data description: channel input filter time, unit: ms, default value: 3ms. The corresponding relationship between the write value of sub-index 1 object under index 16#4000 and the filter time is shown in the table:

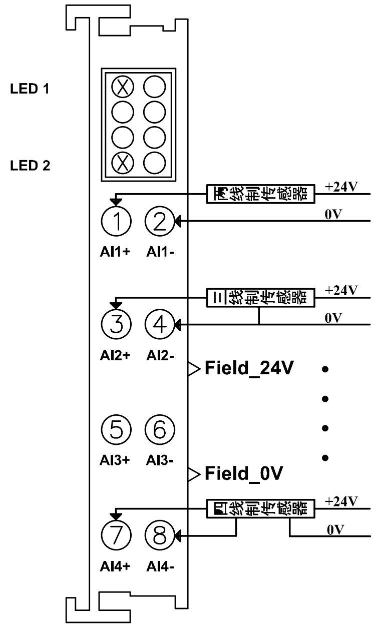
SDO Data	Filter time	SDO Data	Filter time
0	0.2ms	13	13ms
1	1ms	14	14ms
2	2ms	15	15ms
3	3ms	16	16ms
4	4ms	17	17ms
5	5ms	18	18ms
6	6ms	19	19ms
7	7ms	20	20ms
8	8ms	25	25ms
9	9ms	30	30ms
10	10ms	35	35ms
11	11ms	40	40ms
12	12ms		

3.17 DF20-M-4AI-U-0: 4-channel voltage input module

3.17.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	±10V
Signal Type	Differential/Single-ended
Connection Type	2-wire
Input Impedance	>500KΩ
Resolution/Accuracy	16bit/0.2%
Sampling frequency	20Hz~300Hz configurable, default 20Hz
System side current	120mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.17.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	
LED1	On: The module is powered normally	
	Off: Module power supply is abnormal	
LED2	Initialization phase	On: Module initialization error
		Off: Module initialization is normal
	Operation process	Flashing: The module is working in normal sampling state

3.17.3 Module process data definition

Input data: 4 words	
Word 1	AD Value CH1: first channel input data
Word 2	AD Value CH2: Second channel input data
Word 3	AD Value CH3: The third channel input data
Word 4	AD Value CH4: The fourth channel input data
Output data: 1 Word	
Word 1	AD CtrlWord: module control output word, used when calibrating the module

Process Data Definition

Signal range	Voltage value	Decimal data	Hexadecimal	Scope	Conversion relationship
±10V	>10V	32767	0x7FFF	Overflow	
	10V	32767	0x7FFF	Normal range	D = 32767 x U / 10 U = D x 10 / 32767
	0V	0	0		
	-10V	-32768	0x8000		
	<-10V	-32768	0x8000	Underflow	

3.17.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value	meaning
	16#4000	1	16bit	UINT	1~4	Sampling
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1					

Data description:

Sampling frequency configuration, the configuration object is sub-index 1 under index 16#4000; default value: 4, indicating 20Hz.

The corresponding relationship between the written value of the sub-index 1 object under index 16#4000 and the sampling frequency is shown in the table:

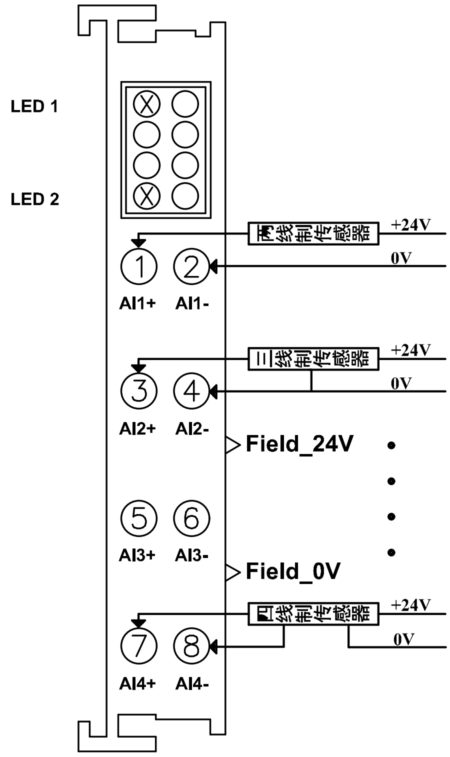
Subindex 1 object data	Sampling frequency
1	300Hz
2	150Hz
3	60Hz
4	20Hz

3.18 DF20-M-4AI-U-1: 4-channel voltage input module

3.18.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	0~10V
Signal Type	Differential/Single-ended
Connection Type	2-wire
Input Impedance	>500KΩ
Resolution/Accuracy	16bit/0.2%
Sampling frequency	20Hz~300Hz configurable, default 20Hz
System side current	120mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.18.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
LED1	On: The module is powered normally
	Off: Module power supply is abnormal
LED2	On: Module initialization error
	Off: Module initialization is normal
	Flashing: The module is working in normal sampling state

3.18.3 Module process data definition

Input data: 4 words	
Word 1	AD Value CH1: first channel input data
Word 2	AD Value CH2: Second channel input data
Word 3	AD Value CH3: The third channel input data
Word 4	AD Value CH4: The fourth channel input data
Output data: 1 Word	
Word 1	AD CtrlWord: module control output word, used when calibrating the module

Process Data Definition

Signal range	Voltage value	Decimal data	Hexadecimal	Scope	Conversion relationship
0~10V	>10V	65535	0xFFFF		
	10V	65535	0xFFFF	Normal range	D = 65535 x U / 10 U = D x 10 / 65535
	5V	32767	0x7FFF		
	0V	0	0		
	<0V	0	0		

3.18.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value	meaning
	16#4000	1	16bit	UINT	1~4	Sampling
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1					

Data description:

Sampling frequency configuration, the configuration object is sub-index 1 under index 16#4000; default value: 4, indicating 20Hz.

The corresponding relationship between the written value of the sub-index 1 object under index 16#4000 and the sampling frequency is shown in the table:

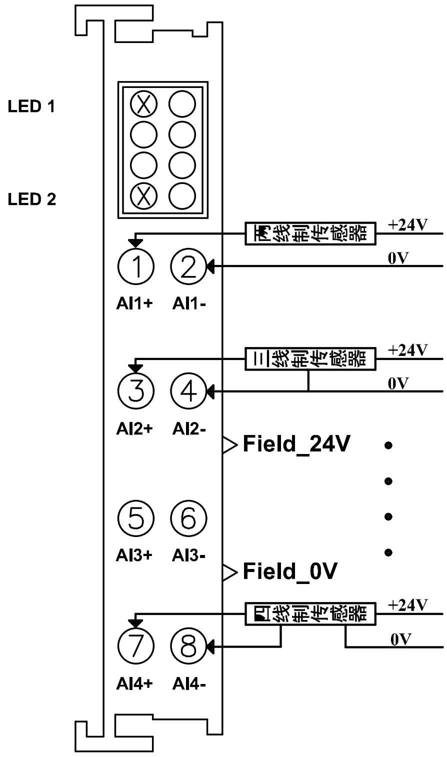
Subindex 1 object data	Sampling frequency
1	300Hz
2	150Hz
3	60Hz
4	20Hz

3.19 DF20-M-4AI-I-2: 4-channel current input module

3.19.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	0~20mA
Signal Type	Differential/Single-ended
Connection Type	2-wire
Input Impedance	100Ω
Resolution/Accuracy	16bit/0.2%
Sampling frequency	20Hz~300Hz configurable, default 20Hz
System side current	120mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	$2.5mm^2$
Maximum crimping area of	AWG14
Minimum crimping area of	$0.2mm^2$
Minimum crimping area for	AWG28
Line length	8...9mm

3.19.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	
LED1	On: The module is powered normally	
	Off: Module power supply is abnormal	
LED2	Initialization phase	On: Module initialization error
		Off: Module initialization is normal
	Operation process	Flashing: The module is working in normal sampling state

3.19.3 Module process data definition

Input data: 4 words	
Word 1	AD Value CH1: first channel input data
Word 2	AD Value CH2: Second channel input data
Word 3	AD Value CH3: The third channel input data
Word 4	AD Value CH4: The fourth channel input data
Output data: 1 Word	
Word 1	AD CtrlWord: module control output word, used when calibrating the module.

Process Data Definition

Signal range	Current value (I)	Decimal data	Hexadecimal data	scope	Conversion relationship
0～20 mA	>20mA	65535	0xFFFF	Overflow	
	20mA	65535	0xFFFF	Normal range	D = 65535 x I / 20 I = D x 20 / 65535
	10mA	32767	0x7FFF		
	0	0	0		
	<0	0	0	Underflow	

3.19.4 Configuration parameter definition

SDO Configuration	index	Sub-	length	type	Value	meaning
	16#4000	1	16bit	UINT	1~4	Sampling frequency configuration
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1					

Data description:

Sampling frequency configuration, the configuration object is sub-index 1 under index 16#4000; default value: 4, indicating 20Hz.

The corresponding relationship between the written value of the sub-index 1 object under index 16#4000 and the sampling frequency is shown in the table:

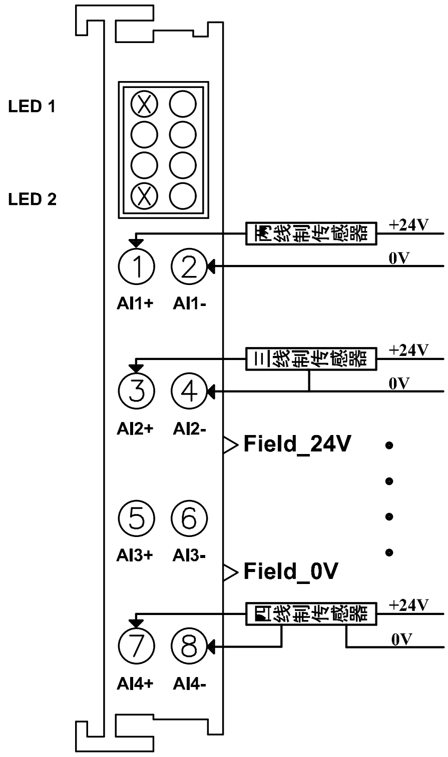
Subindex 1 object data	Sampling frequency
1	300Hz
2	150Hz
3	60Hz
4	20Hz

3.20 DF20-M-4AI-I-3: 4-channel current input module

3.20.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	4~20mA
Signal Type	Differential/Single-ended
Connection Type	2-wire
Input Impedance	100Ω
Resolution/Accuracy	16bit/0.2%
Sampling frequency	20Hz~300Hz configurable, default 20Hz
System side current	120mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.20.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">LED2</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Operation process</td><td>Flashing: The module is working in normal sampling state</td></tr>
</table>

3.20.3 Module process data definition

<table>
<tr><th colspan="2">Input data: 4 words</th></tr>
<tr><td>Word 1</td><td>AD Value CH1: first channel input data</td></tr>
<tr><td>Word 2</td><td>AD Value CH2: Second channel input data</td></tr>
<tr><td>Word 3</td><td>AD Value CH3: The third channel input data</td></tr>
<tr><td>Word 4</td><td>AD Value CH4: The fourth channel input data</td></tr>
<tr><td colspan="2">Output data: 1 Word</td></tr>
<tr><td>Word 1</td><td>AD CtrlWord: module control output word, used when calibrating the module.</td></tr>
</table>

Process Data Definition

Signal range	Current value (I)	Decimal data	Hexadecimal data	scope	Conversion relationship
4 ~ 20 mA	>20mA	65535	0xFFFF	Overflow	
	20mA	65535	0xFFFF	Normal range	D = 65535 x (I – 4) / 16 I = D x 16 / 65535 + 4
	12mA	32767	0x7FFF		
	4mA	0	0		
	<4mA	0	0	Underflow	

3.20.4 Configuration parameter definition

SDO Configuration	index	Sub-	length	type	Value	meaning
	16#4000	1	16bit	UINT	1~4	Sampling frequency configuration
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4001, and so on, 16#400x, where x is the card slot position -1					

Data description:

Sampling frequency configuration, the configuration object is sub-index 1 under index 16#4000; default value: 4, indicating 20Hz.

The corresponding relationship between the written value of the sub-index 1 object under index 16#4000 and the sampling frequency is shown in the table:

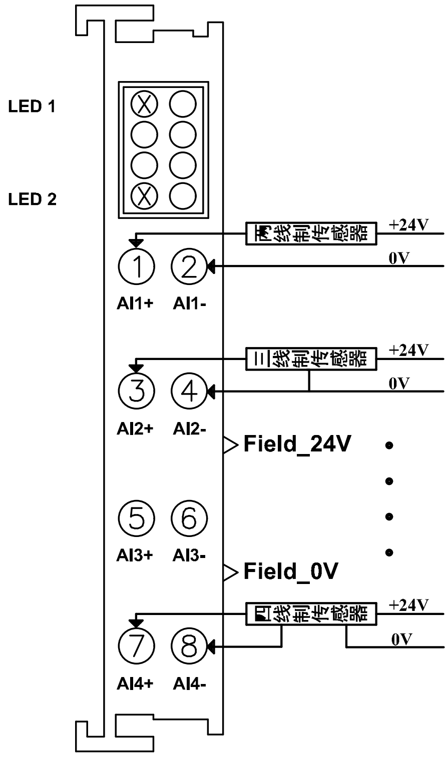
Subindex 1 object data	Sampling frequency
1	300Hz
2	150Hz
3	60Hz
4	20Hz

3.21 DF20-M-4AI-U-4: 4-channel voltage input module

3.21.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	±10V/0~10V/2~10V/±5V/0~5V/1~5V
Signal Type	Differential/Single-ended
Connection Type	2-wire
Input Impedance	>500KΩ
Resolution/Accuracy	16bit/0.2%
Sampling frequency	20Hz~300Hz configurable, default 20Hz
System side current	120mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.21.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">LED2</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Operation process</td><td>Flashing: The module is working in normal sampling state</td></tr>
</table>

3.21.3 Module process data definition

<table>
<tr><th colspan="2">Input data: 4 words</th></tr>
<tr><td>Word 1</td><td>AD Value CH1: first channel input data</td></tr>
<tr><td>Word 2</td><td>AD Value CH2: Second channel input data</td></tr>
<tr><td>Word 3</td><td>AD Value CH3: The third channel input data</td></tr>
<tr><td>Word 4</td><td>AD Value CH4: The fourth channel input data</td></tr>
<tr><td colspan="2">Output data: 1 Word</td></tr>
<tr><td>Word 1</td><td>AD CtrlWord: module control output word, used when calibrating the module</td></tr>
</table>

Process Data Definition

Signal range	Voltage value (U)	Decimal data	Hexadecimal data	Scope	Conversion relationship
±10V (-32768~32767)	>10V	32767	0x7FFF	Overflow	D = 32767 x U / 10 U = D x 10 / 32767
	10V	32767	0x7FFF	Normal range	
	0V	0	0		
	-10V	-32768	0x8000		
	<-10V	-32768	0x8000	Underflow	
0~10V (0~32767)	>10V	32767	0x7FFF	Overflow	D = 32767 x U / 10 U = D x 10 / 32767
	10V	32767	0x7FFF	Normal range	
	5V	16384	0x4000		
	0V	0	0		
	<0V	0	0	Underflow	
2~10V (0~32767)	>10V	32767	0x7FFF	Overflow	D = 32767 x (U – 2) / 8 U = D x 8 / 32767 + 2
	10V	32767	0x7FFF	Normal range	
	6V	16384	0x4000		
	2V	0	0		
	<2V	0	0	Underflow	
±5V (-32768~32767)	>5V	32767	0x7FFF	Overflow	D = 32767 x U / 5 U = D x 5 / 32767
	5V	32767	0x7FFF	Normal range	
	0V	0	0x0000		
	-5V	-32768	0x8000		
	<-5V	-32768	0x8000	Underflow	
0~5V (0~32767)	>5V	32767	0x7FFF	Overflow	D = 32767 x U / 5 U = D x 5 / 32767
	5V	32767	0x7FFF	Normal range	
	2.5V	16384	0x4000		
	0V	0	0		
	<0V	0	0	Underflow	
1~5V (0~32767)	>5V	32767	0x7FFF	Overflow	D = 32767 x (U – 1) / 4 U = D x 4 / 32767 + 1
	5V	32767	0x7FFF	Normal range	
	3V	16384	0x4000		
	1V	0	0		
	<1V	0	0	Underflow	
±10V OverRange (-27648~27648)	>11.76V	32767	0x7FFF	Overflow	D = 27648 x U / 10 U = D x 10 / 27648
	11.76V	32511	0x7EFF	Upper limit	
	10V	27648	0x6C00	Normal range	
	5V	13824	0x3600		
	0V	0	0x0000		
	-5V	-13824	0xCA00		
	-10V	-27648	0x9400		

	-11.76V	-32511	0x8100	Lower limit	
	<-11.76V	-32768	0x8000	Underflow	
0~10V OverRange (0~27648)	>11.76V	32767	0x7FFF	Overflow	D = 27648 x U / 10 U = D x 10 / 27648
	11.76V	32511	0x7EFF	Upper limit	
	10V	27648	0x6C00	Normal range	
	5V	13824	0x3600		
	0V	0	0x0000		
2~10V OverRange (0~27648)	>11.41V	32767	0x7FFF	Overflow	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	11.41V	32511	0x7EFF	Upper limit	
	10V	27648	0x6C00	Normal range	
	6V	13824	0x3600		
	2V	0	0x0000		
	0.59 V	-4864	0xED00	Lower limit	
	<0.59 V	-32768	0x8000	Underflow	
±5V OverRange (-27648~27648)	>5.88V	32767	0x7FFF	Overflow	D = 27648 x U / 5 U = D x 5 / 27648
	5.88V	32511	0x7EFF	Upper limit	
	5V	27648	0x6C00	Normal range	
	2.5V	13824	0x3600		
	0V	0	0x0000		
	-2.5V	-13824	0xCA00		
	-5V	-27648	0x9400		
	-5.88V	-32511	0x8100	Lower limit	
	<-5.88V	-32768	0x8000	Underflow	
0~5V OverRange (0~27648)	>5.88V	32767	0x7FFF	Overflow	D = 27648 x U / 5 U = D x 5 / 27648
	5.88V	32511	0x7EFF	Upper limit	
	5V	27648	0x6C00	Normal range	
	2.5V	13824	0x3600		
	0V	0	0x0000		
1~5V OverRange (0~27648)	>5.7V	32767	0x7FFF	Overflow	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5.7V	32511	0x7EFF	Upper limit	
	5V	27648	0x6C00	Normal range	
	3V	13824	0x3600		
	1V	0	0x0000		
	0.3V	-4864	0xED00	Lower limit	
	<0.3V	-32768	0x8000	Underflow	
±10V (0~65535)	>10V	65535	0xFFFF	Overflow	D = 32767 x U +32767 U = (D - 32767) / 3276.7
	10V	65535	0xFFFF	Normal range	
	0V	32767	0x7FFF		
	-10V	0	0		
	<-10V	0	0	Underflow	
0~10V (0~65535)	>10V	65535	0xFFFF	Overflow	D = 65535x U / 10 U = D x 10 / 65535
	10V	65535	0xFFFF	Normal range	
	5V	32767	0x7FFF		
	0V	0	0		
	<0V	0	0	Underflow	

2~10V (0~65535)	>10V	65535	0xFFFF	Overflow	D = 65535x (U – 2) / 8 U = D x 8 / 65535 + 2
	10V	65535	0xFFFF	Normal range	
	6V	32767	0x7FFF		
	2V	0	0		
	<2V	0	0	Underflow	
±5V (0~65535)	>5V	65535	0xFFFF	Overflow	D = 5 / 32767 x U + 32767 U = (D -32767) * 32767 / 5
	5V	65535	0xFFFF	Normal range	
	0V	32767	0x7FFF		
	-5V	0	0		
	<-5V	0	0	Underflow	
0~5V (0~65535)	>5V	65535	0xFFFF	Overflow	D = 65535x U / 5 U = D x 5 / 65535
	5V	65535	0xFFFF	Normal range	
	2.5V	32767	0x7FFF		
	0V	0	0		
	<0V	0	0	Underflow	
1~5V (0~65535)	>5V	65535	0xFFFF	Overflow	D = 65535x (U – 1) / 4 U = D x 4 / 65535 + 1
	5V	65535	0xFFFF	Normal range	
	3V	32767	0x7FFF		
	1V	0	0		
	<1V	0	0	Underflow	

Note 1: “OverRange” means that the module has over-range detection function under this configuration.

Module PDO switching instructions:

When using the DF20-M-4AI-U-4 module, you can implement word and byte operations of the module by checking different types of PDO.

3.21.4 Configuration parameter definition

	index	Sub-	length	type	Value	meaning
SDO Configuration	16#4020	1	16bit	UINT	1~38	Signal range
		2	16bit	UINT	1~4	Sampling frequency configuration
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4020. If it is inserted in the second card slot, the SDO index is 16#4021, and so on. 16#402x, where x is the card slot position -1					

Data description:

Signal range configuration. The configuration object is sub-index 1 under index 16#4020. The default value is 1, which means ±10V.

The correspondence between the write value and signal type of the sub-index 1 object under index 16#4020 is shown in the table:

Subindex 1 object data	Signal range
1	±10V (-32768~32767)
2	0~10V (0~32767)
3	2~10V (0~32767)
4	±5V (-32768~32767)
5	0~5V (0~32767)
6	1~5V (0~32767)
17	±10V OverRange (-27648~27648)
18	0~10V OverRange (0~27648)
19	2~10V OverRange (0~27648)
20	±5V OverRange (-27648~27648)
twenty one	0~5V OverRange (0~27648)
twenty two	1~5V OverRange (0~27648)
33	±10V (0~65535)
34	0~10V (0~65535)
35	2~10V (0~65535)
36	±5V (0~65535)
37	0~5V (0~65535)
38	1-5V (0~65535)

Sampling frequency configuration, the configuration object is sub-index 2 under index 16#4020; default value: 4, indicating 20Hz. The corresponding relationship between the written value of sub-index 2 object under index 16#4020 and the sampling frequency is shown in the table.

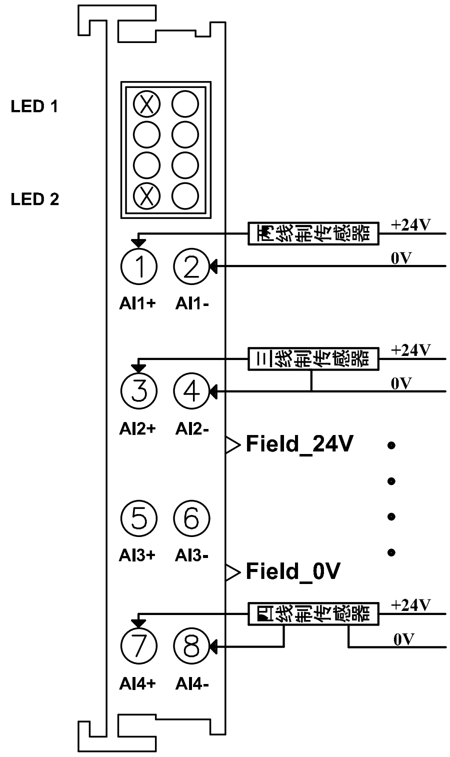
Subindex 2 object data	Sampling frequency
1	300Hz
2	150Hz
3	60Hz
4	20Hz

3.22 DF20-M-4AI-I-5: 4-channel current input module

3.22.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	0~20mA/4~20mA
Signal Type	Differential/Single-ended
Connection Type	2-wire
Input Impedance	100Ω
Resolution/Accuracy	16bit/0.2%
Sampling frequency	20Hz~300Hz configurable, default 20Hz
System side current	120mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.22.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	
LED1	On: The module is powered normally	
	Off: Module power supply is abnormal	
LED2	Initialization phase	On: Module initialization error
		Off: Module initialization is normal
	Operation process	Flashing: The module is working in normal sampling state

3.22.3 Module process data definition

Input data: 4 words	
Word 1	AD Value CH1: first channel input data
Word 2	AD Value CH2: Second channel input data
Word 3	AD Value CH3: The third channel input data
Word 4	AD Value CH4: The fourth channel input data
Output data: 1 Word	
Word 1	AD CtrlWord: module control output word, used when calibrating the module.

Process Data Definition

Signal range	Current value (I)	Decimal data	Hexadecimal data	scope	Conversion relationship
0 ~ 20 mA (0 ~ 65535)	>20mA	65535	0xFFFF	Overflow	D = 65535 x I / 20 I = D x 20 / 65535
	20mA	65535	0xFFFF	Normal range	
	10mA	32767	0x7FFF		
	0	0	0		
	<0mA	0	0	Underflow	
4~20 mA (0~65535)	>20mA	65535	0xFFFF	Overflow	D = 65535 x (I – 4) / 16 I = D x 16 / 65535 + 4
	20mA	65535	0xFFFF	Normal range	
	12mA	32767	0x7FFF		
	4mA	0	0		
	<4mA	0	0	Underflow	
0 ~ 20 mA OverRange Note 1 (0~27648)	>23.52 mA	32767	0x7FFF	Overflow	D = 27648 x I / 20 I = D x 20 / 27648
	23.52 mA	32511	0x7EFF	Upper limit	
	20 mA	27648	0x6C00	Normal range	
	10 mA	13824	0x3600		
	0 mA	0	0		
4 ~ 20 mA OverRange (0~27648)	>22.81 mA	32767	0x7FFF	Overflow	D = 27648 x (I – 4) / 16 I = D x 16 / 27648 + 4
	22.81 mA	32511	0x7EFF	Upper limit	
	20 mA	27648	0x6C00	Normal range	
	12 mA	13824	0x3600		
	4 mA	0	0		
	1.19 mA	-4864	0xED00	Lower limit	
	<1.19 mA	-32768	0x8000	Underflow	

Note 1: “OverRange” means that the module has over-range detection function under this configuration.

When using this configuration, you need toThe module's process data is switched to symbolic display

Module PDO switching instructions:

When using the DF20-M-4AI-I-5 module, you can implement byte and word operations of the module by checking different types of PDO.

3.22.4 Configuration parameter definition

	index	Sub-	length	type	Value	meaning
SDO Configuration	16#4020	1	16bit	UINT	1~18	Signal range
		2	16bit	UINT	1~4	Sampling frequency configuration
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4020. If it is inserted in the second card slot, the SDO index is 16#4021, and so on. 16#400x, where x is the card slot position -1					

Data description:

Signal range configuration, the configuration object is sub-index 1 under index 16#4020; default value: 1, indicating 0~20mA.

The correspondence between the write value and signal type of the sub-index 1 object under index 16#4020 is shown in the table:

Subindex 1 object	Signal range
1	0~20mA (0~65535)
2	4~20mA (0~65535)
17	0~20mA OverRange (0~27648)
18	4~20mA OverRange (0~27648)

Sampling frequency configuration, the configuration object is sub-index 2 under index 16#4020; default value: 4, indicating 20Hz.

The corresponding relationship between the written value of the sub-index 2 object under index 16#4020 and the sampling frequency is shown in the table:

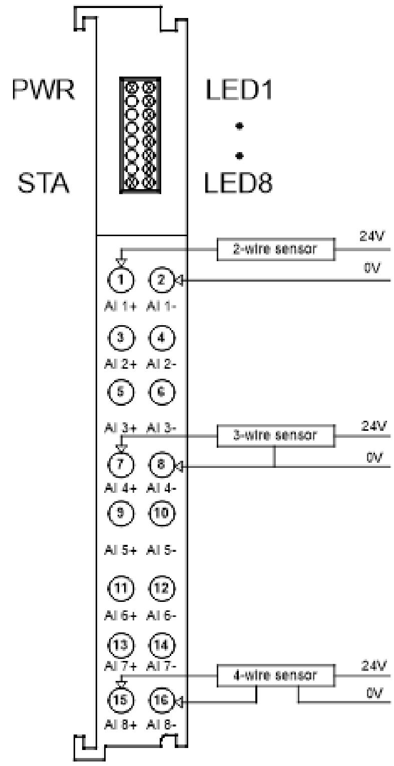
Subindex 2 object data	Sampling frequency
1	300Hz
2	150Hz
3	60Hz
4	20Hz

3.23 DF20-M-8AI-U-4: 8-channel voltage input module

3.23.1 Technical parameters

Electrical parameters	
Number of channels	8
Signal range	±10V/0~10V/2~10V/±5V/0~5V/1~5V
Signal Type	Differential/Single-ended
Connection Type	2-wire
Input Impedance	>500KΩ
Resolution/Accuracy	16bit/0.2%
Sampling frequency	50Hz~1000Hz configurable, default 100Hz
System side current	20mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.23.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">PWR</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">STA</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Sampling stage</td><td>Flashing: The module is working in normal sampling state</td></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED2</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED3</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED4</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED5</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td>LED6</td><td colspan="2">Off: No signal input to the module</td></tr>
</table>

	Flashing: The module has signal input
LED7	Off: No signal input to the module
	Flashing: The module has signal input
LED8	Off: No signal input to the module
	Flashing: The module has signal input

3.23.3 Module process data definition

Input data: 9 words	
Word 1	AD State: module status
Word 2	AD Value CH1: Input data of the first channel
Word 3	AD Value CH2: Second channel input data
Word 4	AD Value CH3: The third channel input data
Word 5	AD Value CH4: The fourth channel input data
Word 6	AD Value CH5: Fifth channel input data
Word 7	AD Value CH6: input data of the sixth channel
Word 8	AD Value CH7: seventh channel input data
Word 9	AD Value CH8: The eighth channel input data
Output data: 1 Word	
Word 1	AD CtrlWord: module control output word, reserved for calibration.

Process Data Definition

Signal range	Voltage value	Decimal data	Hexadecimal	Scope	Conversion
±10V (-32768~32767)	>10V	32767	0x7FFF	Overflow	D = 32767 x U / 10 U = D x 10 / 32767
	10V	32767	0x7FFF	Normal range	
	0V	0	0		
	-10V	-32768	0x8000		
	<-10V	-32768	0x8000	Underflow	
0~10V (0~32767)	>10V	32767	0x7FFF	Overflow	D = 32767 x U / 10 U = D x 10 / 32767
	10V	32767	0x7FFF	Normal range	
	5V	16384	0x4000		
	0V	0	0		
	<0V	0	0	Underflow	
2~10V (0~32767)	>10V	32767	0x7FFF	Overflow	D = 32767 x (U – 2) / 8 U = D x 8 / 32767 + 2
	10V	32767	0x7FFF	Normal range	
	6V	16384	0x4000		
	2V	0	0		
	<2V	0	0	Underflow	

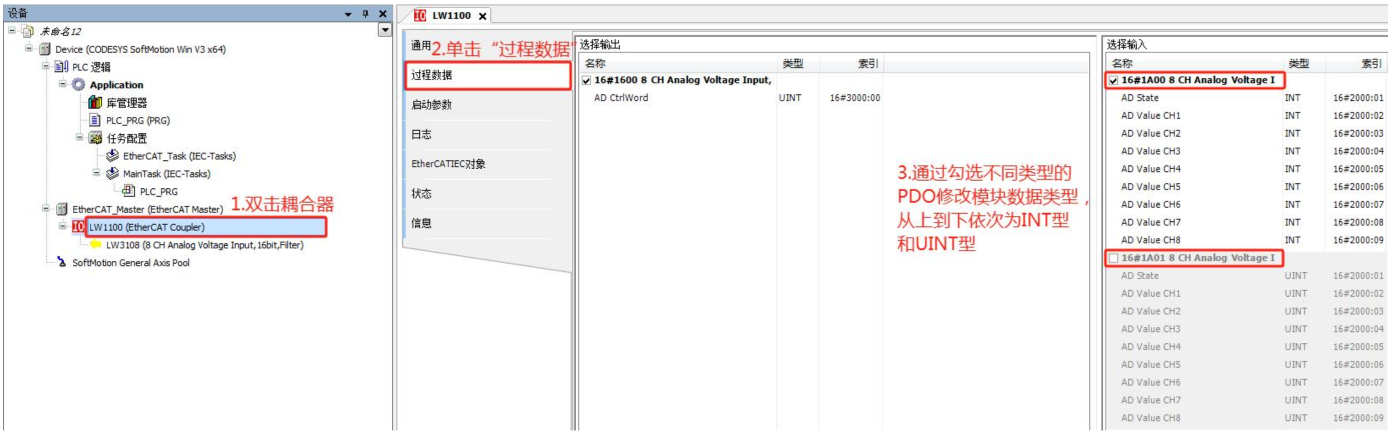
±5V (-32768~32767)	>5V	32767	0x7FFF	Overflow	D = 32767 x U / 5 U = D x 5 / 32767
	5V	32767	0x7FFF	Normal range	
	0V	0	0x0000		
	-5V	-32768	0x8000		
	<-5V	-32768	0x8000	Underflow	
0~5V (0~32767)	>5V	32767	0x7FFF	Overflow	D = 32767 x U / 5 U = D x 5 / 32767
	5V	32767	0x7FFF	Normal range	
	2.5V	16384	0x4000		
	0V	0	0		
	<0V	0	0	Underflow	
1~5V (0~32767)	>5V	32767	0x7FFF	Overflow	D = 32767 x (U – 1) / 4 U = D x 4 / 32767 + 1
	5V	32767	0x7FFF	Normal range	
	3V	16384	0x4000		
	1V	0	0		
	<1V	0	0	Underflow	
±10V OverRange (-27648~27648)	>11.76V	32767	0x7FFF	Overflow	D = 27648 x U / 10 U = D x 10 / 27648
	11.76V	32511	0x7EFF	Upper limit	
	10V	27648	0x6C00	Normal range	
	5V	13824	0x3600		
	0V	0	0x0000		
	-5V	-13824	0xCA00		
	-10V	-27648	0x9400		
	-11.76V	-32511	0x8100	Lower limit	
	<-11.76V	-32768	0x8000	Underflow	
0~10V OverRange (0~27648)	>11.76V	32767	0x7FFF	Overflow	D = 27648 x U / 10 U = D x 10 / 27648
	11.76V	32511	0x7EFF	Upper limit	
	10V	27648	0x6C00	Normal range	
	5V	13824	0x3600		
	0V	0	0x0000		
2~10V OverRange (0~27648)	>11.41V	32767	0x7FFF	Overflow	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	11.41V	32511	0x7EFF	Upper limit	
	10V	27648	0x6C00	Normal range	
	6V	13824	0x3600		
	2V	0	0x0000		
	0.59 V	-4864	0xED00	Lower limit	
	<0.59 V	-32768	0x8000	Underflow	
±5V OverRange (-27648~27648)	>5.88V	32767	0x7FFF	Overflow	D = 27648 x U / 5 U = D x 5 / 27648
	5.88V	32511	0x7EFF	Upper limit	
	5V	27648	0x6C00	Normal range	
	2.5V	13824	0x3600		
	0V	0	0x0000		
	-2.5V	-13824	0xCA00		
	-5V	-27648	0x9400		

	-5.88V	-32511	0x8100	Lower limit	
	<-5.88V	-32768	0x8000	Underflow	
0~5V OverRange (0~27648)	>5.88V	32767	0x7FFF	Overflow	D = 27648 x U / 5 U = D x 5 / 27648
	5.88V	32511	0x7EFF	Upper limit	
	5V	27648	0x6C00	Normal range	
	2.5V	13824	0x3600		
	0V	0	0x0000		
1~5V OverRange (0~27648)	>5.7V	32767	0x7FFF	Overflow	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5.7V	32511	0x7EFF	Upper limit	
	5V	27648	0x6C00	Normal range	
	3V	13824	0x3600		
	1V	0	0x0000		
	0.3V	-4864	0xED00	Lower limit	
	<0.3V	-32768	0x8000	Underflow	
±10V (0~65535)	>10V	65535	0xFFFF	Overflow	D = 3276.7 x U +32767 U = (D - 32767) / 3276.7
	10V	65535	0xFFFF	Normal range	
	0V	32767	0x7FFF		
	-10V	0	0		
	<-10V	0	0	Underflow	
0~10V (0~65535)	>10V	65535	0xFFFF	Overflow	D = 65535x U / 10 U = D x 10 / 65535
	10V	65535	0xFFFF	Normal range	
	5V	32767	0x7FFF		
	0V	0	0		
	<0V	0	0	Underflow	
2~10V (0~65535)	>10V	65535	0xFFFF	Overflow	D = 65535x (U – 2) / 8 U = D x 8 / 65535 + 2
	10V	65535	0xFFFF	Normal range	
	6V	32767	0x7FFF		
	2V	0	0		
	<2V	0	0	Underflow	
±5V (0~65535)	>5V	65535	0xFFFF	Overflow	D = 5 / 32767 x U + 32767 U = (D -32767) * 32767 / 5
	5V	65535	0xFFFF	Normal range	
	0V	32767	0x7FFF		
	-5V	0	0		
	<-5V	0	0	Underflow	
0~5V (0~65535)	>5V	65535	0xFFFF	Overflow	D = 65535x U / 5 U = D x 5 / 65535
	5V	65535	0xFFFF	Normal range	
	2.5V	32767	0x7FFF		
	0V	0	0		
	<0V	0	0	Underflow	
1~5V (0~65535)	>5V	65535	0xFFFF	Overflow	D = 65535x (U – 1) / 4 U = D x 4 / 65535 + 1
	5V	65535	0xFFFF	Normal	

	3V	32767	0x7FFF		
	1V	0	0		
	<1V	0	0	Underflow	

Note 1: “OverRange” means that the module has over-range detection function under this configuration.

Module PDO switching instructions:



When using the DF20-M-8AI-U-4 module, you can implement word and byte operations of the module by checking different types of PDO.

3.23.4 Configuration parameter definition

	index	Sub-	length	type	Value	meaning
SDO Configuration	16#4140	1	16bit	UINT	0~38	Signal range
		2	16bit	UINT	0~38	Signal range
		3	16bit	UINT	0~38	Signal range
		4	16bit	UINT	0~38	Signal range
		5	16bit	UINT	0~38	Signal range
		6	16bit	UINT	0~38	Signal range
		7	16bit	UINT	0~38	Signal range
		8	16bit	UINT	0~38	Signal range
		9	16bit	UINT	1~20	Filter range
		10	16bit	UINT	1~20	Filter range
		11	16bit	UINT	1~20	Filter range
		12	16bit	UINT	1~20	Filter range
		13	16bit	UINT	1~20	Filter range
		14	16bit	UINT	1~20	Filter range
		15	16bit	UINT	1~20	Filter range
		16	16bit	UINT	1~20	Filter range
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4140. If it is inserted in the second card slot, the SDO index is 16#4141, and so on, 16#414x, where x is the card slot position -1					

Data description:

Signal range configuration, the configuration object is sub-index 1~8 under index 16#4140; default value: 1, indicating ±10V. The corresponding relationship between the written value of sub-index 1~8 object under index 16#4140 and the signal type is shown in the table:

Sub-index 1~8 object data	Signal range
0	Disable
1	±10V (-32768~32767)
2	0~10V (0~32767)
3	2~10V (0~32767)
4	±5V (-32768~32767)
5	0~5V (0~32767)
6	1~5V (0~32767)
17	±10V OverRange (-27648~27648)
18	0~10V OverRange (0~27648)
19	2~10V OverRange (0~27648)
20	±5V OverRange (-27648~27648)
twenty one	0~5V OverRange (0~27648)
twenty two	1~5V OverRange (0~27648)
33	±10V (0~65535)
34	0~10V (0~65535)
35	2~10V (0~65535)
36	±5V (0~65535)
37	0~5V (0~65535)
38	1~5V (0~65535)

Sampling frequency configuration, the configuration object is sub-index 9~16 under index 16#4140; default value: 10, indicating 100Hz. The corresponding relationship between the written value of sub-index 9~16 object under index 16#4140 and the sampling frequency is shown in the table:

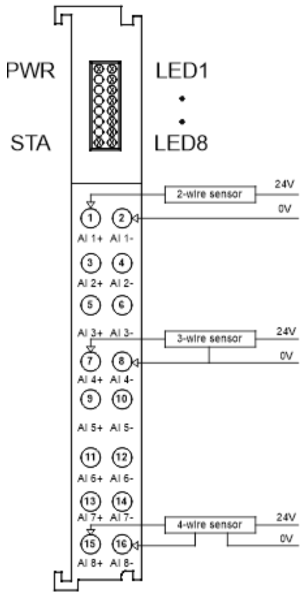
Sub-index 9~16 object data	Sampling frequency
1	1000Hz
2	500Hz
4	250Hz
8	125Hz
10	100Hz
20	50Hz

3.24 DF20-M-8AI-I-5: 8-channel current input module

3.24.1 Technical parameters

Electrical parameters	
Number of channels	8
Signal range	0~20mA/4~20mA
Signal Type	Differential/Single-ended
Connection Type	2-wire
Input Impedance	100Ω
Resolution/Accuracy	16bit/0.2%
Sampling frequency	50Hz~1000Hz configurable, default 100Hz
System side current	20mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75℃
Storage temperature	-40℃~+85℃
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.24.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">PWR</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">STA</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Sampling stage</td><td>Flashing: The module is working in normal sampling state</td></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED2</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED3</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED4</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED5</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED6</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED7</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
<tr><td rowspan="2">LED8</td><td colspan="2">Off: No signal input to the module</td></tr>
<tr><td colspan="2">Flashing: The module has signal input</td></tr>
</table>

3.24.3 Module process data definition

Input data: 9 words	
Word 1	AD State: module status
Word 2	AD Value CH1: Input data of the first channel
Word 3	AD Value CH2: Second channel input data
Word 4	AD Value CH3: The third channel input data
Word 5	AD Value CH4: The fourth channel input data
Word 6	AD Value CH5: Fifth channel input data
Word 7	AD Value CH6: input data of the sixth channel
Word 8	AD Value CH7: seventh channel input data
Word 9	AD Value CH8: The eighth channel input data
Output data: 1 Word	
Word 1	AD CtrlWord: module control output word, reserved for calibration.

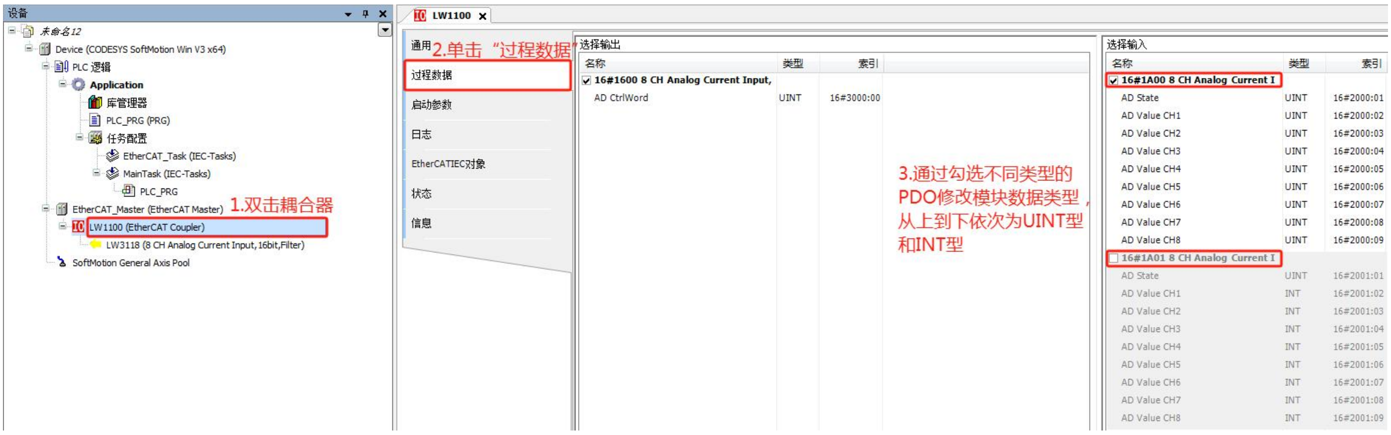
Process Data Definition

Signal range	Current value (I)	Decimal data	Hexadecimal data	scope	Conversion relationship
0 ~ 20 mA (0 ~ 65535)	>20 mA	65535	0xFFFF	Overflow	D = 65535 x I / 20 I = D x 20 / 65535
	20mA	65535	0xFFFF	Normal range	
	10mA	32767	0x7FFF		
	0	0	0		
	<0mA	0	0	Underflow	
4 ~ 20 mA (0 ~ 65535)	>20 mA	65535	0xFFFF	Overflow	D = 65535 x (I – 4) / 16 I = D x 16 / 65535 + 4
	20mA	65535	0xFFFF	Normal range	
	12mA	32767	0x7FFF		
	4mA	0	0		
	<4mA	0	0	Underflow	
0 ~ 20 mA OverRange Note 1 (0~27648)	>23.52 mA	32767	0x7FFF	Overflow	D = 27648 x I / 20 I = D x 20 / 27648
	23.52 mA	32511	0x7EFF	Upper limit	
	20 mA	27648	0x6C00	Normal range	
	10 mA	13824	0x3600		
	0 mA	0	0		
4 ~ 20 mA OverRange (0 ~ 27648)	>22.81 mA	32767	0x7FFF	Overflow	D = 27648 x (I – 4) / 16 I = D x 16 / 27648 + 4
	22.81 mA	32511	0x7EFF	Upper limit	
	20 mA	27648	0x6C00	Normal range	
	12 mA	13824	0x3600		
	4 mA	0	0		
	1.19 mA	-4864	0xED00	Lower limit	
	<1.19 mA	-32768	0x8000	Underflow	

Note 1: “OverRange” means that the module has over-range detection function under this configuration.

When using this configuration, you need toThe module's process data is switched to symbolic display

Module PDO switching instructions:



When using the DF20-M-8AI-I-5 module, you can implement byte and word operations of the module by checking different types of PDO.

3.24.4 Configuration parameter definition

	index	Sub-	length	type	Value	meaning
SDO Configuration	16#4140	1	16bit	UINT	0~18	Signal range
		2	16bit	UINT	0~18	Signal range
		3	16bit	UINT	0~18	Signal range
		4	16bit	UINT	0~18	Signal range
		5	16bit	UINT	0~18	Signal range
		6	16bit	UINT	0~18	Signal range
		7	16bit	UINT	0~18	Signal range
		8	16bit	UINT	0~18	Signal range
		9	16bit	UINT	1~20	Filter range
		10	16bit	UINT	1~20	Filter range
		11	16bit	UINT	1~20	Filter range
		12	16bit	UINT	1~20	Filter range
		13	16bit	UINT	1~20	Filter range
		14	16bit	UINT	1~20	Filter range
		15	16bit	UINT	1~20	Filter range
		16	16bit	UINT	1~20	Filter range
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4140. If it is inserted in the second card slot, the SDO index is 16#4141, and so on, 16#414x, where x is the card slot position -1					

Data description:

Signal range configuration, the configuration object is sub-index 1 under index 16#4140; default value: 2, indicating 4~20mA.

The correspondence between the write value and signal type of the sub-index 1 object under index 16#4020 is shown in the table:

Sub-index 1~8 object	Signal range
0	Disable
1	0~20mA (0~65535)
2	4~20mA (0~65535)
17	0~20mA OverRange (0~27648)
18	4~20mA OverRange (0~27648)

Sampling frequency configuration, the configuration object is sub-index 9~16 under index 16#4140; default value: 10, indicating 100Hz. The corresponding relationship between the written value of the sub-index 2 object under index 16#4140 and the sampling frequency is shown in the table:

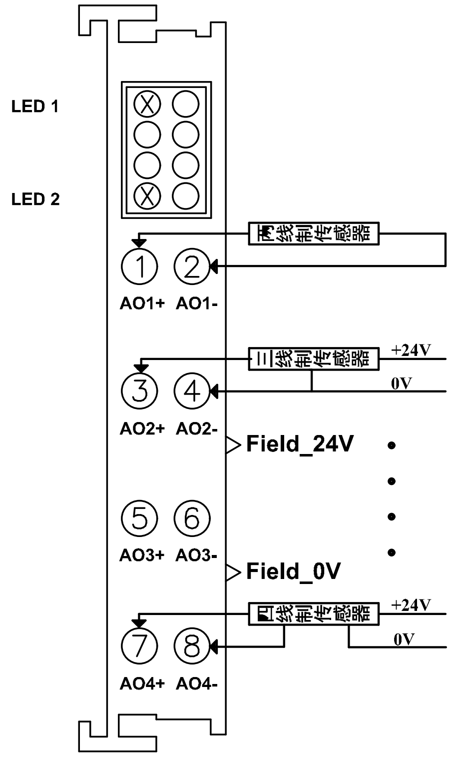
Sub-index 9~16 object	Sampling frequency
1	1000Hz
2	500Hz
4	250Hz
8	125Hz
10	100Hz
20	50Hz

3.25 DF20-M-4AO-U-0: 4-channel voltage output module

3.25.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	±10V
Signal Type	Differential/Single-ended
Connection Type	2-wire
Load Capacity	>1KΩ
Resolution/Accuracy	16bit/0.1%
Load Type	Resistive load/capacitive load
System side current	500mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.25.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	
LED1	On: The module is powered normally	
	Off: Module power supply is abnormal	
LED2	Initialization phase	On: Module initialization error
		Off: Module initialization is normal
	Sampling stage	Flashing: The module is working in normal output state

3.25.3 Module process data definition

Output data: 4 words	
Word 1	Set Value CH1: Output data of the first channel
Word 2	Set Value CH2: Output data of the second channel
Word 3	Set Value CH3: Output data of the third channel
Word 4	Set Value CH4: Output data of the fourth channel

Process data definition description:

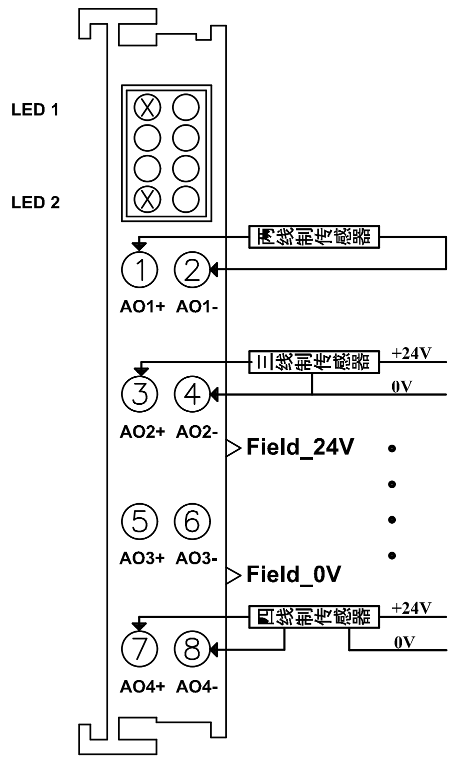
Signal range	Decimal data	Hexadecimal	Voltage	Scope	Conversion relationship
±10V	32767	0x7FFF	10V	Normal range	D = 32767 x U / 10 U = D x 10 / 32767
	0	0	0V		
	-32768	0x8000	-10V		

3.26 DF20-M-4AO-U-1: 4-channel voltage output module

3.26.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	0~10V
Signal Type	Differential/Single-ended
Connection Type	2-wire
Load Capacity	>1KΩ
Resolution/Accuracy	16bit/0.1%
Load Type	Resistive load/capacitive load
System side current	500mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.26.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">LED2</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Sampling stage</td><td>Flashing: The module is working in normal output state</td></tr>
</table>

3.26.3 Module process data definition

Output data: 4 words	
Word 1	Set Value CH1: Output data of the first channel
Word 2	Set Value CH2: Output data of the second channel
Word 3	Set Value CH3: Output data of the third channel
Word 4	Set Value CH4: Output data of the fourth channel

Process data definition description:

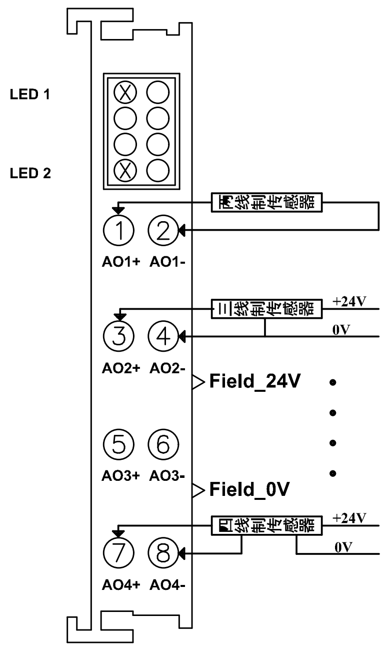
<table>
<tr><th>Signal range</th><th>Decimal data</th><th>Hexadecimal data</th><th>Voltage value (U)</th><th>Scope</th><th>Conversion relationship</th></tr>
<tr><td rowspan="3">0~10V</td><td>65535</td><td>0xFFFF</td><td>10V</td><td rowspan="3">Normal range</td><td rowspan="3">D = 65535 x U / 10
U = D x 10 / 65535</td></tr>
<tr><td>32767</td><td>0x7FFF</td><td>5V</td></tr>
<tr><td>0</td><td>0</td><td>0V</td></tr>
</table>

3.27 DF20-M-4AO-I-2: 4-channel current output module

3.27.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	0~20mA
Signal Type	Differential/Single-ended
Connection Type	2-wire
Load Capacity	<500Ω
Resolution/Accuracy	16bit/0.1%
Load Type	Resistive load/capacitive load
System side current	600mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.27.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">LED2</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Sampling stage</td><td>Flashing: The module is working in normal output state</td></tr>
</table>

3.27.3 Module process data definition

<table>
<tr><th colspan="2">Output data: 4 words</th></tr>
<tr><td>Word 1</td><td>Set Value CH1: Output data of the first channel</td></tr>
<tr><td>Word 2</td><td>Set Value CH2: Output data of the second channel</td></tr>
<tr><td>Word 3</td><td>Set Value CH3: Output data of the third channel</td></tr>
<tr><td>Word 4</td><td>Set Value CH4: Output data of the fourth channel</td></tr>
</table>

Process Data Definition

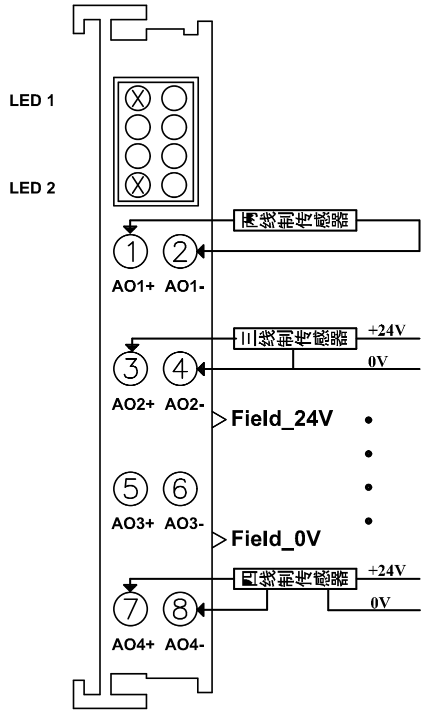
<table>
<tr><th>Signal range</th><th>Decimal data</th><th>Hexadecimal data</th><th>Current value (I)</th><th>scope</th><th>Conversion relationship</th></tr>
<tr><td rowspan="3">0 ~ 20 mA</td><td>65535</td><td>0xFFFF</td><td>20mA</td><td rowspan="3">Normal range</td><td rowspan="3">D = 65535 x I / 20
I = D x 20 / 65535</td></tr>
<tr><td>32767</td><td>0x7FFF</td><td>10mA</td></tr>
<tr><td>0</td><td>0</td><td>0</td></tr>
</table>

3.28 DF20-M-4AO-I-3: 4-channel current output module

3.28.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	4~20mA
Signal Type	Differential/Single-ended
Connection Type	2-wire
Load Capacity	<500Ω
Resolution/Accuracy	16bit/0.1%
Load Type	Resistive load/capacitive load
System side current	600mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.28.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">LED2</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Sampling stage</td><td>Flashing: The module is working in normal output state</td></tr>
</table>

3.28.3 Module process data definition

Output data: 4 words	
Word 1	Set Value CH1: Output data of the first channel
Word 2	Set Value CH2: Output data of the second channel
Word 3	Set Value CH3: Output data of the third channel
Word 4	Set Value CH4: Output data of the fourth channel

Process Data Definition

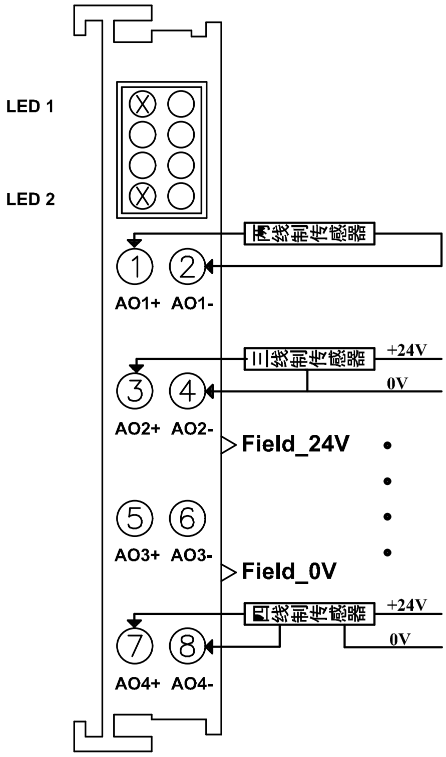
<table>
<tr><th>Signal range</th><th>Decimal data</th><th>Hexadecimal data</th><th>Current value (I)</th><th>scope</th><th>Conversion relationship</th></tr>
<tr><td rowspan="3">4 ~ 20 mA</td><td>65535</td><td>0xFFFF</td><td>20mA</td><td rowspan="3">Normal range</td><td rowspan="3">D = 65535 x (I – 4) / 16
I = D x 16 / 65535 + 4</td></tr>
<tr><td>32767</td><td>0x7FFF</td><td>12mA</td></tr>
<tr><td>0</td><td>0</td><td>4mA</td></tr>
</table>

3.29 DF20-M-4AO-U-4: 4-channel voltage output module

3.29.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	±10V/0~10V/2~10V/±5V/0~5V/1~5V
Signal Type	Differential/Single-ended
Connection Type	2-wire
Load Capacity	>1KΩ
Resolution/Accuracy	16bit/0.1%
Load Type	Resistive load/capacitive load
System side current	500mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.29.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	
LED1	On: The module is powered normally	
	Off: Module power supply is abnormal	
LED2	Initialization phase	On: Module initialization error
		Off: Module initialization is normal
	Sampling stage	Flashing: The module is working in normal output state

3.29.3 Module process data definition

Output data: 4 words	
Word 1	Set Value CH1: Output data of the first channel
Word 2	Set Value CH2: Output data of the second channel
Word 3	Set Value CH3: Output data of the third channel
Word 4	Set Value CH4: Output data of the fourth channel

Process Data Definition

Signal range	Decimal data	Hexadecimal data	Voltage value (U)	Scope	Conversion relationship
±10V (-32768~32767)	32767	0x7FFF	10V	Normal range	D = 32767 x U / 10 U = D x 10 / 32767
	0	0	0V		
	-32768	0x8000	-10V		

0~10V (0~32767)	32767	0x7FFF	10V	Normal range	D = 32767 x U / 10 U = D x 10 / 32767
	16384	0x4000	5V		
	0	0	0V		
2~10V (0~32767)	32767	0x7FFF	10V	Normal range	D = 32767 x (U – 2) / 8 U = D x 8 / 32767 + 2
	16384	0x4000	6V		
	0	0	2V		
±5V (-32768~32767)	32767	0x7FFF	5V	Normal range	D = 32767 x U / 5 U = D x 5 / 32767
	0	0x0000	0V		
	-32768	0x8000	-5V		
0~5V (0~32767)	32767	0x7FFF	5V	Normal range	D = 32767 x U / 5 U = D x 5 / 32767
	16384	0x4000	2.5V		
	0	0	0V		
1~5V (0~32767)	32767	0x7FFF	5V	Normal range	D = 32767 x (U – 1) / 4 U = D x 4 / 32767 + 1
	16384	0x4000	3V		
	0	0	1V		
±10V OverRange (-27648~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x U / 10 U = D x 10 / 27648
	32511	0x7EFF	11.76V	Upper limit	
	27648	0x6C00	10V	Normal range	
	13824	0x3600	5V		
	0	0x0000	0V		
	-13824	0xCA00	-5V		
	-27648	0x9400	-10V		
	-32511	0x8100	-11.76V	Lower limit	
	<-32511	<0x8100	0V	Underflow	
0~10V OverRange (0~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x U / 10 U = D x 10 / 27648
	32511	0x7EFF	11.76V	Upper limit	
	27648	0x6C00	10V	Normal range	
	13824	0x3600	5V		
	0	0x0000	0V		
	>32511	>0x7EFF	0V	Overflow	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
2~10V OverRange (0~27648)	32511	0x7EFF	11.41V	Upper limit	
	27648	0x6C00	10V	Normal range	
	13824	0x3600	6V		
	0	0x0000	2V		
	-4864	0xED00	0.59 V	Lower limit	
	<-4864	<0xED00	0V	Underflow	
±5V OverRange (-27648~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x U / 5 U = D x 5 / 27648
	32511	0x7EFF	5.88V	Upper limit	
	27648	0x6C00	5V	Normal range	
	13824	0x3600	2.5V		
	0	0x0000	0V		
	-13824	0xCA00	-2.5V		
	-27648	0x9400	-5V		

	-32511	0x8100	-5.88V	Lower limit	
	<-32511	<0x8100	0V	Underflow	
0-5V OverRange (0~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x U / 5 U = D x 5 / 27648
	32511	0x7EFF	5.88V	Upper limit	
	27648	0x6C00	5V	Normal range	
	13824	0x3600	2.5V		
	0	0x0000	0V		
1~5V OverRange (0~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	32511	0x7EFF	5.7V	Upper limit	
	27648	0x6C00	5V	Normal range	
	13824	0x3600	3V		
	0	0x0000	1V		
	-4864	0xED00	0.3V	Lower limit	
	<-4864	<0xED00	0V	Underflow	
±10V (0~65535)	65535	0xFFFF	10V	Normal range	D = 3276.7 x U +32767 U = (D - 32767) / 32767
	32767	0x7FFF	0V		
	0	0	-10V		
0~10V (0~65535)	65535	0xFFFF	10V	Normal range	D = 65535x U / 10 U = D x 10 / 65535
	32767	0x7FFF	5V		
	0	0	0V		
2~10V (0~65535)	65535	0xFFFF	10V	Normal range	D = 65535x (U – 2) / 8 U = D x 8 / 65535 + 2
	32767	0x7FFF	6V		
	0	0	2V		
±5V (0~65535)	65535	0xFFFF	5V	Normal range	D = 5 / 32767 x U + 32767 U = (D -32767) * 32767 / 5
	32767	0x7FFF	0V		
	0	0	-5V		
0~5V (0~65535)	65535	0xFFFF	5V	Normal range	D = 65535x U / 5 U = D x 5 / 65535
	32767	0x7FFF	2.5V		
	0	0	0V		
1~5V (0~65535)	65535	0xFFFF	5V	Normal range	D = 65535x (U – 1) / 4 U = D x 4 / 65535 + 1
	32767	0x7FFF	3V		
	0	0	1V		

Note 1: “OverRange” means that the module has over-range output function under this configuration.

Note 2: When the module signal range is switched to 0~65535, the module process data type needs to be changed to UINT type.

Module PDO switching instructions:

When using the DF20-M-4AO-U-4 module, you can implement word and byte operations of the module by checking different types of PDO.

3.29.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value	meaning
	16#4040	1	16bit	UINT	1~38	Signal range
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4040. If it is inserted in the second card slot, the SDO index is 16#4021, and so on. 16#400x, where x is the card slot position -1					

Data description:

Signal range configuration. The configuration object is sub-index 1 under index 16#4040. The default value is 1, which means ±10V.

The correspondence between the write value of the sub-index 1 object under index 16#4040 and the signal type is shown in the table:

Subindex 1 object data	Signal range
1	±10V (-32768~32767)
2	0~10V (0~32767)
3	2~10V (0~32767)
4	±5V (-32768~32767)
5	0~5V (0~32767)
6	1~5V (0~32767)
17	±10V OverRange (-27648~27648)
18	0~10V OverRange (0~27648)
19	2~10V OverRange (0~27648)
20	±5V OverRange (-27648~27648)
twenty one	0~5V OverRange (0~27648)
twenty two	1~5V OverRange (0~27648)
33	±10V (0~65535)
34	0~10V (0~65535)
35	2~10V (0~65535)

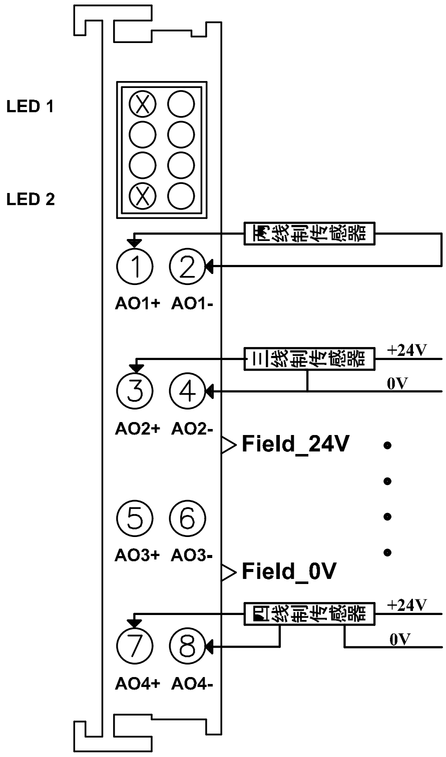
36	±5V (0~65535)
37	0~5V (0~65535)
38	1~5V (0~65535)

3.30 DF20-M-4AO-I-5: 4-channel current output module

3.30.1 Technical parameters

Electrical parameters	
Number of channels	4
Signal range	0~20mA/4~20mA
Signal Type	Differential/Single-ended
Connection Type	2-wire
Load Capacity	<500Ω
Resolution/Accuracy	16bit/0.1%
Load Type	Resistive load/capacitive load
System side current	600mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25～75℃
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	$2.5mm^2$
Maximum crimping area of	AWG14
Minimum crimping area of	$0.2mm^2$
Minimum crimping area for	AWG28
Line length	8...9mm

3.30.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	
LED1	On: The module is powered normally	
	Off: Module power supply is abnormal	
LED2	Initialization phase	On: Module initialization error
		Off: Module initialization is normal
	Sampling stage	Flashing: The module is working in normal output state

3.30.3 Module process data definition

Output data: 4 words	
Word 1	Set Value CH1: Output data of the first channel
Word 2	Set Value CH2: Output data of the second channel
Word 3	Set Value CH3: Output data of the third channel
Word 4	Set Value CH4: Output data of the fourth channel

Process Data Definition

Signal range	Decimal data	Hexadecimal data	Current value (I)	scope	Conversion relationship
0 ~ 20 mA (0~65535)	65535	0xFFFF	20mA	Normal range	D = 65535 x I / 20
	32767	0x7FFF	10mA		I = D x 20 / 65535

	0	0	0		
4 ~ 20 mA (0~65535)	65535	0xFFFF	20mA	Normal range	D = 65535 x (I – 4) / 16 I = D x 16 / 65535 + 4
	32767	0x7FFF	12mA		
	0	0	4mA		
0 ~ 20 mA OverRange Note 1 (0~27648)	>32511	>0x7EFF	0 mA	Overflow	D = 27648 x I / 20 I = D x 20 / 27648
	32511	0x7EFF	23.52 mA	Upper limit	
	27648	0x6C00	20 mA	Normal range	
	13824	0x3600	10 mA		
	0	0	0 mA		
4 ~ 20 mA OverRange (0~27648)	>32511	>0x7EFF	0 mA	Overflow	D = 27648 x (I – 4) / 16 I = D x 16 / 27648 + 4
	32511	0x7EFF	22.81 mA	Upper limit	
	27648	0x6C00	20 mA	Normal range	
	13824	0x3600	12 mA		
	0	0	4 mA		
	-4864	0xED00	1.19 mA	Lower limit	
	<-4864	<0xED00	0 mA	Underflow	

Note 1: "OverRange" means that the module has over-range output function under this configuration. When using this function,The module process data type needs to be changed to INT type.

Module PDO switching instructions:

When using the DF20-M-4AO-I-5 module, you can implement byte and word operations of the module by checking different types of PDO.

3.30.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value	meaning
	16#4040	1	16bit	UINT	1~22	Signal range
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4040. If it is inserted in the second card slot, the SDO index is 16#4041, and so on, 16#404x, where x is the card slot position -1					

Data description:

Signal range configuration, the configuration object is sub-index 1 under index 16#4040; default value: 1, indicating 0-20mA.

The correspondence between the write value of the sub-index 1 object under index 16#4040 and the signal type is shown in the table:

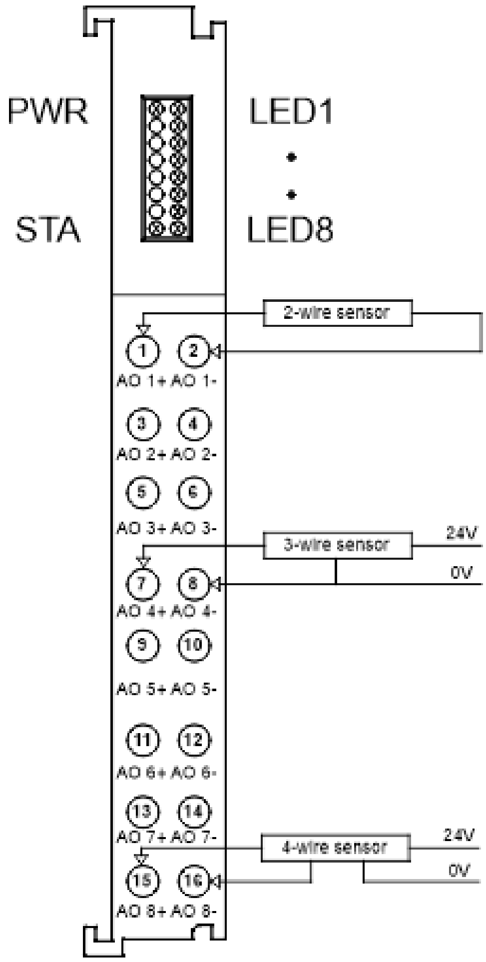
Subindex 1 object data	Signal range
1	0~20mA
2	4~20mA
17	0~20mA OverRange
18	4~20mA OverRange

3.31 DF20-M-8AO-U-4: 8-channel voltage output module

3.31.1 Technical parameters

Electrical parameters	
Number of channels	8
Signal range	±10V/0~10V/2~10V/±5V/0~5V/1~5V
Signal Type	Differential/Single-ended
Connection Type	2-wire
Load Capacity	>1KΩ
Resolution/Accuracy	16bit/0.1%
Load Type	Resistive load/capacitive load
System side current	35mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.31.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">PWR</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">STA</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Output stage</td><td>Flashing: The module is working in normal output state</td></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED2</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED3</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED4</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED5</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td>LED6</td><td colspan="2">Off: The module has no signal output</td></tr>
</table>

	Flashing: The module has signal output
LED7	Off: The module has no signal output
	Flashing: The module has signal output
LED8	Off: The module has no signal output
	Flashing: The module has signal output

3.31.3 Module process data definition

Output data: 8 words	
Word 1	Set Value CH1: Output data of the first channel
Word 2	Set Value CH2: Output data of the second channel
Word 3	Set Value CH3: Output data of the third channel
Word 4	Set Value CH4: Output data of the fourth channel
Word 5	Set Value CH5: Output data of the fifth channel
Word 6	Set Value CH6: Output data of the sixth channel
Word 7	Set Value CH7: Output data of the seventh channel
Word 8	Set Value CH8: Output data of the eighth channel

Process Data Definition

Signal range	Decimal data	Hexadecimal data	Voltage value (U)	Scope	Conversion relationship
±10V (-32768~32767)	32767	0x7FFF	10V	Normal range	D = 32767 x U / 10 U = D x 10 / 32767
	0	0	0V		
	-32768	0x8000	-10V		
0~10V (0~32767)	32767	0x7FFF	10V	Normal range	D = 32767 x U / 10 U = D x 10 / 32767
	16384	0x4000	5V		
	0	0	0V		
2~10V (0~32767)	32767	0x7FFF	10V	Normal range	D = 32767 x (U – 2) / 8 U = D x 8 / 32767 + 2
	16384	0x4000	6V		
	0	0	2V		
±5V (-32768~32767)	32767	0x7FFF	5V	Normal range	D = 32767 x U / 5 U = D x 5 / 32767
	0	0x0000	0V		
	-32768	0x8000	-5V		
0~5V (0~32767)	32767	0x7FFF	5V	Normal range	D = 32767 x U / 5 U = D x 5 / 32767
	16384	0x4000	2.5V		
	0	0	0V		
1~5V (0~32767)	32767	0x7FFF	5V	Normal range	D = 32767 x (U – 1) / 4 U = D x 4 / 32767 + 1
	16384	0x4000	3V		
	0	0	1V		
±10V	>32511	>0x7EFF	0V	Overflow	D = 27648 x U / 10

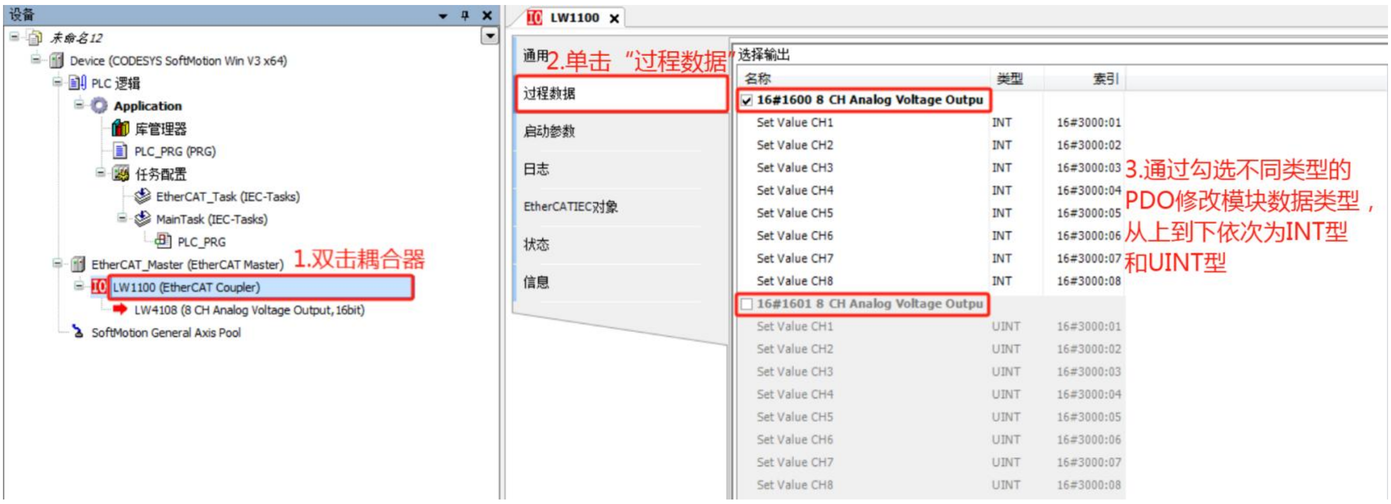
	32511	0x7EFF	11.76V	Upper limit	
	27648	0x6C00	10V	Normal range	
	13824	0x3600	5V		
	0	0x0000	0V		
	-13824	0xCA00	-5V		
	-27648	0x9400	-10V		
	-32511	0x8100	-11.76V	Lower limit	
	<-32511	<0x8100	0V	Underflow	
0~10V OverRange (0~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x U / 10 U = D x 10 / 27648
	32511	0x7EFF	11.76V	Upper limit	
	27648	0x6C00	10V	Normal range	
	13824	0x3600	5V		
	0	0x0000	0V		
2~10V OverRange (0~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	32511	0x7EFF	11.41V	Upper limit	
	27648	0x6C00	10V	Normal range	
	13824	0x3600	6V		
	0	0x0000	2V		
	-4864	0xED00	0.59 V	Lower limit	
	<-4864	<0xED00	0V	Underflow	
±5V OverRange (-27648~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x U / 5 U = D x 5 / 27648
	32511	0x7EFF	5.88V	Upper limit	
	27648	0x6C00	5V	Normal range	
	13824	0x3600	2.5V		
	0	0x0000	0V		
	-13824	0xCA00	-2.5V		
	-27648	0x9400	-5V		
	-32511	0x8100	-5.88V	Lower limit	
	<-32511	<0x8100	0V	Underflow	
0~5V OverRange (0~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x U / 5 U = D x 5 / 27648
	32511	0x7EFF	5.88V	Upper limit	
	27648	0x6C00	5V	Normal range	
	13824	0x3600	2.5V		
	0	0x0000	0V		
1~5V OverRange (0~27648)	>32511	>0x7EFF	0V	Overflow	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	32511	0x7EFF	5.7V	Upper limit	
	27648	0x6C00	5V	Normal range	
	13824	0x3600	3V		
	0	0x0000	1V		
	-4864	0xED00	0.3V	Lower limit	
	<-4864	<0xED00	0V	Underflow	
±10V (0~65535)	65535	0xFFFF	10V	Normal range	D = 3276.7 x U +32767 U = (D - 32767) / 3276.7
	32767	0x7FFF	0V		
	0	0	-10V		
0~10V (0~65535)	65535	0xFFFF	10V	Normal range	D = 65535x U / 10 U = D x 10 / 65535
	32767	0x7FFF	5V		

	0	0	0V		
2~10V (0~65535)	65535	0xFFFF	10V	Normal range	D = 65535x (U – 2) / 8 U = D x 8 / 65535 + 2
	32767	0x7FFF	6V		
	0	0	2V		
±5V (0~65535)	65535	0xFFFF	5V	Normal range	D = 5 / 32767 x U + 32767 U = (D -32767) * 32767 / 5
	32767	0x7FFF	0V		
	0	0	-5V		
0~5V (0~65535)	65535	0xFFFF	5V	Normal range	D = 65535x U / 5 U = D x 5 / 65535
	32767	0x7FFF	2.5V		
	0	0	0V		
1~5V (0~65535)	65535	0xFFFF	5V	Normal range	D = 65535x (U – 1) / 4 U = D x 4 / 65535 + 1
	32767	0x7FFF	3V		
	0	0	1V		

Note 1: “OverRange” means that the module has over-range output function under this configuration.

Note 2: When the module signal range is switched to 0~65535, the display mode of the module process data needs to be changed to unsigned type data display.

Module PDO switching instructions:



When using the DF20-M-8AO-U-4 module, you can implement word and byte operations of the module by checking different types of PDO.

3.31.4 Configuration parameter definition

	index	Sub-index	length	type	Value range	meaning
SDO Configuration	16#4180	1	16bit	UINT	0~38	Signal range
		2	16bit	UINT	0~38	Signal range
		3	16bit	UINT	0~38	Signal range
		4	16bit	UINT	0~38	Signal range

		5	16bit	UINT	0~38	Signal range
		6	16bit	UINT	0~38	Signal range
		7	16bit	UINT	0~38	Signal range
		8	16bit	UINT	0~38	Signal range
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4180. If it is inserted in the second card slot, the SDO index is 16#4181, and so on, 16#418x, where x is the card slot position -1					

Data description:

Signal range configuration, configuration object is index 16#4180Sub-index 1~8 under; default value: 1, indicating ±10V.

Index 16#4180The corresponding relationship between the write value of the sub-index 1~8 object and the signal type is shown in the table:

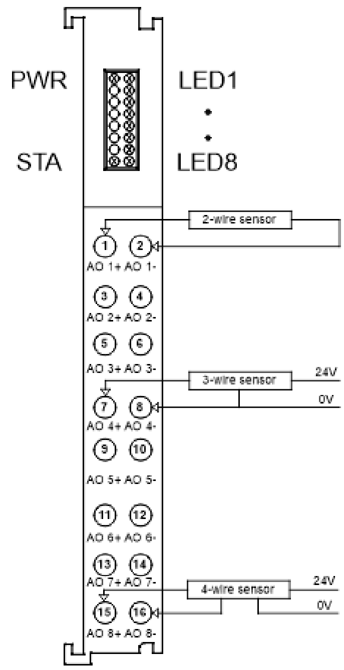
Sub-index 1~8 object data	Signal range
0	Disable
1	±10V (-32768~32767)
2	0~10V (0~32767)
3	2~10V (0~32767)
4	±5V (-32768~32767)
5	0~5V (0~32767)
6	1~5V (0~32767)
17	±10V OverRange (-27648~27648)
18	0~10V OverRange (0~27648)
19	2~10V OverRange (0~27648)
20	±5V OverRange (-27648~27648)
twenty one	0~5V OverRange (0~27648)
twenty two	1~5V OverRange (0~27648)
33	±10V (0~65535)
34	0~10V (0~65535)
35	2~10V (0~65535)
36	±5V (0~65535)
37	0~5V (0~65535)
38	1~5V (0~65535)

3.32 DF20-M-8AO-I-5: 8-channel current output module

3.32.1 Technical parameters

Electrical parameters	
Number of channels	8
Signal range	0~20mA/4~20mA
Signal Type	Differential/Single-ended
Connection Type	2-wire
Load Capacity	<500Ω
Resolution/Accuracy	16bit/0.1%
Load Type	Resistive load/capacitive load
System side current	35mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.32.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">PWR</td><td colspan="2">On: The module is powered normally</td></tr>
<tr><td colspan="2">Off: Module power supply is abnormal</td></tr>
<tr><td rowspan="3">STA</td><td rowspan="2">Initialization phase</td><td>On: Module initialization error</td></tr>
<tr><td>Off: Module initialization is normal</td></tr>
<tr><td>Output stage</td><td>Flashing: The module is working in normal output state</td></tr>
<tr><td rowspan="2">LED1</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED2</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED3</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED4</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED5</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED6</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED7</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
<tr><td rowspan="2">LED8</td><td colspan="2">Off: The module has no signal output</td></tr>
<tr><td colspan="2">Flashing: The module has signal output</td></tr>
</table>

3.32.3 Module process data definition

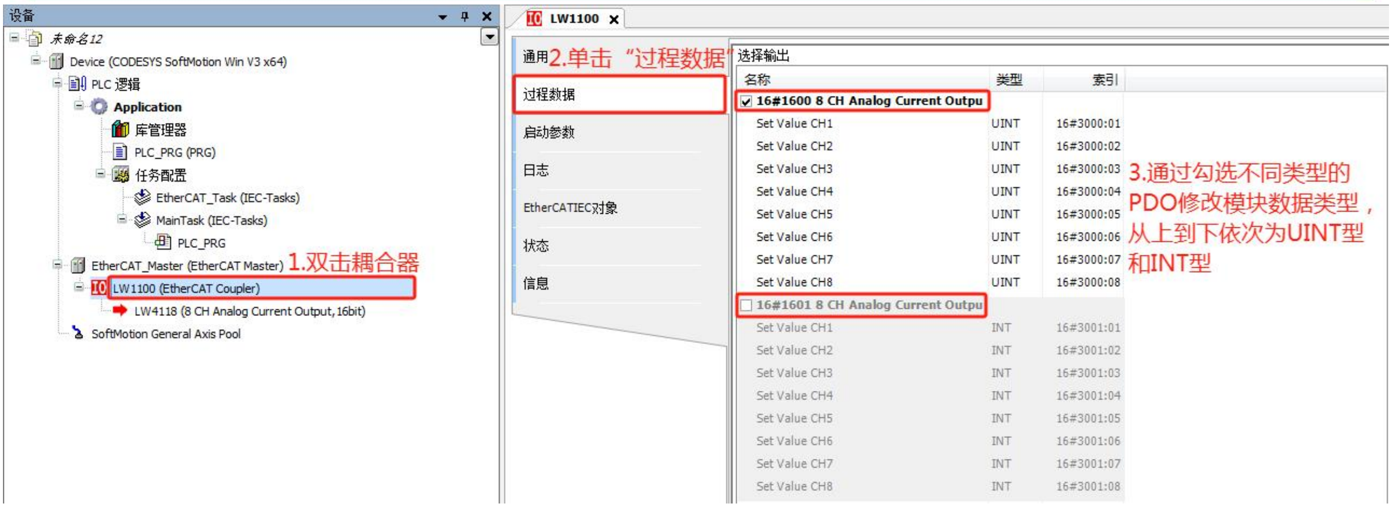
Output data: 8 words	
Word 1	Set Value CH1: Output data of the first channel
Word 2	Set Value CH2: Output data of the second channel
Word 3	Set Value CH3: Output data of the third channel
Word 4	Set Value CH4: Output data of the fourth channel
Word 5	Set Value CH5: Output data of the fifth channel
Word 6	Set Value CH6: Output data of the sixth channel
Word 7	Set Value CH7: Output data of the seventh channel
Word 8	Set Value CH8: Output data of the eighth channel

Process Data Definition

Signal range	Decimal data	Hexadecimal data	Current value (I)	scope	Conversion relationship
0 ~ 20 mA (0~65535)	65535	0xFFFF	20mA	Normal range	D = 65535 x I / 20 I = D x 20 / 65535
	32767	0x7FFF	10mA		
	0	0	0		
4~ 20 mA (0~65535)	65535	0xFFFF	20mA	Normal range	D = 65535 x (I – 4) / 16 I = D x 16 / 65535 + 4
	32767	0x7FFF	12mA		
	0	0	4mA		
0 ~ 20 mA OverRange Note 1 (0~27648)	>32511	>0x7EFF	0 mA	Overflow	D = 27648 x I / 20 I = D x 20 / 27648
	32511	0x7EFF	23.52 mA	Upper limit	
	27648	0x6C00	20 mA	Normal range	
	13824	0x3600	10 mA		
	0	0	0 mA		
4~ 20 mA OverRange (0~27648)	>32511	>0x7EFF	0 mA	Overflow	D = 27648 x (I – 4) / 16 I = D x 16 / 27648 + 4
	32511	0x7EFF	22.81 mA	Upper limit	
	27648	0x6C00	20 mA	Normal range	
	13824	0x3600	12 mA		
	0	0	4 mA		
	-4864	0xED00	1.19 mA	Lower limit	
	<-4864	<0xED00	0 mA	Underflow	

Note 1: "OverRange" means that the module has over-range output function under this configuration. When using this function,The module process data type needs to be changed to INT type.

Module PDO switching instructions:



When using the DF20-M-8AO-I-5 module, you can implement byte and word operations of the module by checking different types of PDO.

3.32.4 Configuration parameter definition

	index	Sub-	length	type	Value	meaning
SDO Configuration	16#4180	1	16bit	UINT	0~18	Signal range
		2	16bit	UINT	0~18	Signal range
		3	16bit	UINT	0~18	Signal range
		4	16bit	UINT	0~18	Signal range
		5	16bit	UINT	0~18	Signal range
		6	16bit	UINT	0~18	Signal range
		7	16bit	UINT	0~18	Signal range
		8	16bit	UINT	0~18	Signal range
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4180. If it is inserted in the second card slot, the SDO index is 16#4181, and so on, 16#418x, where x is the card slot position -1					

Data description:

Signal range configuration, configuration object is index 16#4180Sub-index 1 under; default value: 1, indicating 0~20mA.

Index 16#4180The corresponding relationship between the value written to the sub-index 1 object and the signal type is shown in the table:

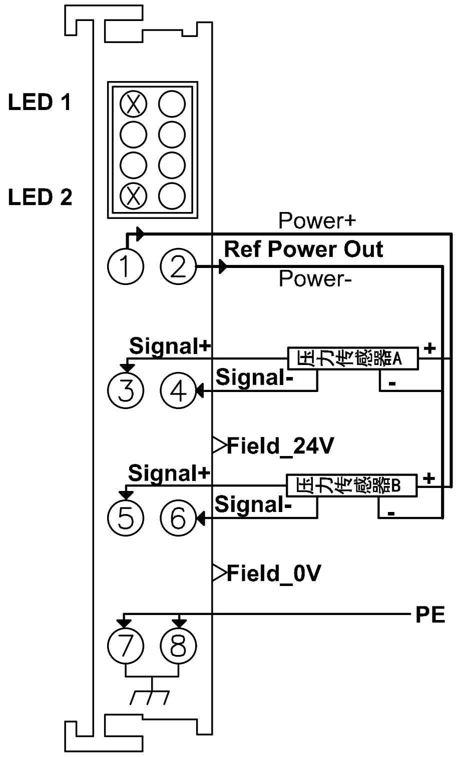
Subindex 1 object	Signal range
0	Disable
1	0~20mA (0~65535)
2	4~20mA (0~65535)
17	0~20mA OverRange (0~27648)
18	4~20mA OverRange (0~27648)

3.33 DF20-M-2LC-S-5: 2-channel pressure sensor input module

3.33.1 Technical parameters

Electrical parameters	
Number of channels	2
Signal range	0~10mv
Signal Type	Differential/Single-ended
Connection Type	3-wire/4-wire
Excitation power output	5V DC
Resolution/Accuracy	16bit/0.2%
Sampling frequency	20Hz~300Hz configurable
System side current	210mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	$2.5mm^2$
Maximum crimping area of	AWG14
Minimum crimping area of	$0.2mm^2$
Minimum crimping area for	AWG28
Line length	8...9mm

3.33.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning	
LED1	On: The module is powered normally	
	Off: Module power supply is abnormal	
LED2	Initialization phase	On: Module initialization error
		Off: Module initialization is normal
	Sampling stage	Flashing: The module is working in normal input state

3.33.3 Module process data definition

Input data: 3 words	
Word 1	LC StateWord: Status word
Word 2	LC Value CH1: First channel input data
Word 3	LC Value CH2: Second channel input data
Output data: 1 Word	
Word 1	AD CtrlWord: module control output word, used when calibrating the module.

3.33.4 Configuration parameter definition

SDO Configurati	index	Sub-	length	type	Value	meaning
	16#4000	1	16bit	UINT	1-4	Signal range
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4000. If it is inserted in the second card slot, the SDO index is 16#4000, and so on, 16#400x, where x is the card slot position -1					

Data description:

Signal range configuration, the configuration object is sub-index 1 under index 16#4000; default value: 2, indicating 150Hz.

The corresponding relationship between the write value of the sub-index 1 object under index 16#4000 and the signal type is shown in the table:

Subindex 1 object data	Signal range
1	300Hz
2	150Hz
3	80Hz
4	20Hz

Definition of various sensor process data

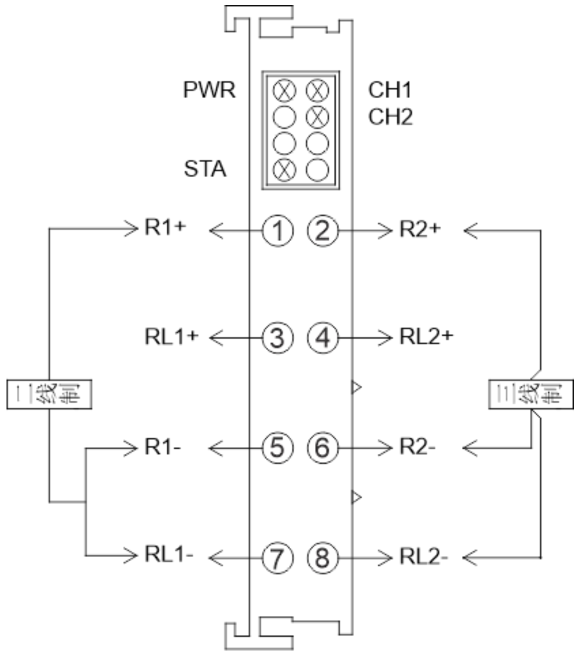
0~10mv pressure sensor			
Signal	Decimal	hexadecimal	Scope
0	0	0x0000	Normal range
5mv	16383	0x3FFF	
10mv	32767	0x7FFF	

3.34 DF20-M-2RTD-PT: 2-channel RTD sensor input module

3.34.1 Technical parameters

Electrical parameters	
Number of channels	2
Connection Type	2-wire/3-wire
Temperature resolution	Temperature value: 0.1℃/digit
Resistance value conversion formula (measurement resistance value)	Ractual = D/27648*R amount Among them: R is the current resistance value; R is the rated range value of the resistance.
Sampling frequency	Configurable
Sensor Type	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni200, Ni500, Ni1000, Cu10, Cu50, Cu53, Cu100, KTY84-130, KTY84-150, KTY84-151, 40 Ohm, 80 Ohm, 150 Ohm, 300 Ohm, 500 Ohm, 1000 Ohm, 2000 Ohm, 4000 Ohm, KTY83-110, KTY83-120, KTY83-121, KTY83-122, KTY83-150, KTY83-151, NTC-5K, NTC-10K
Disconnection detection	support
System side current	70mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75℃
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.34.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
PWR	On: The module is powered normally
	Off: Module power supply is abnormal
STA	Power-on stage: always on when powered on; Turns off after the internal bus initialization is completed.
	Running stage: flashes when the module is running normally; When the module is running abnormally, it is always on or off
CH1~CH2	Green off: disconnected
	Green flash: normal collection
	Green: Over limit

3.34.3 Module process data definition

Input data: 2 Words	
Word 1	RTD Input CH1: First channel input data
Word 2	RTD Input CH2: Second channel input data

Definition of various sensor process data

PT100			
temperature	Decimal	hexadecimal	Scope
>850	32767	0x7FFF	Overflow
850	8500	0x2134	Normal range
-200	-2000	0xF830	
<-200	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

PT200			
temperature	Decimal	hexadecimal	Scope
>850	32767	0x7FFF	Overflow
850	8500	0x2134	Normal range
-200	-2000	0xF830	
<-200	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

PT500			
temperature	Decimal	hexadecimal	Scope
>850	32767	0x7FFF	Overflow
850	8500	0x2134	Normal range
-200	-2000	0xF830	
<-200	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

PT1000			
temperature	Decimal	hexadecimal	Scope
>850	32767	0x7FFF	Overflow
850	8500	0x2134	Normal range
-200	-2000	0xF830	
<-200	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Ni100			
temperature	Decimal	hexadecimal	Scope

>250	32767	0x7FFF	Overflow
250	2500	0x09C4	Normal range
-60	-600	0xFDA8	
<-60	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Ni120			
temperature	Decimal	hexadecimal	Scope
>309	32767	0x7FFF	Overflow
309	3090	0x0C12	Normal range
-79	-790	0xFCEA	
<-79	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

NI200			
temperature	Decimal	hexadecimal	Scope
>250	32767	0x7FFF	Overflow
250	2500	0x09C4	Normal range
-60	-600	0xFDA8	
<-60	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Ni500			
temperature	Decimal	hexadecimal	Scope
>250	32767	0x7FFF	Overflow
250	2500	0x09C4	Normal range
-60	-600	0xFDA8	
<-60	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Ni1000			
temperature	Decimal	hexadecimal	Scope
>250	32767	0x7FFF	Overflow
250	2500	0x09C4	Normal range
-60	-600	0xFDA8	

<-60	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Cu10 type			
temperature	Decimal	hexadecimal	Scope
>159	32767	0x7FFF	Overflow
159	1590	0x0636	Normal range
-59	-590	0xFDB2	
<-59	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Cu50			
temperature	Decimal	hexadecimal	Scope
>159	32767	0x7FFF	Overflow
159	1590	0x0636	Normal range
-59	-590	0xFDB2	
<-59	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Cu53			
temperature	Decimal	hexadecimal	Scope
>150	32767	0x7FFF	Overflow
150	1500	0x05DC	Normal range
-50	-500	0xFE0C	
<-50	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Cu100			
temperature	Decimal	hexadecimal	Scope
>159	32767	0x7FFF	Overflow
159	1590	0x0636	Normal range
-59	-590	0xFDB2	
<-59	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY84_130			
temperature	Decimal	hexadecimal	Scope
>280	32767	0x7FFF	Overflow
280	2800	0x0AF0	Normal range
-40	-400	0xFE70	
<-40	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY84_150			
temperature	Decimal	hexadecimal	Scope
>280	32767	0x7FFF	Overflow
280	2800	0x0AF0	Normal range
-40	-400	0xFE70	
<-40	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY84_151			
temperature	Decimal	hexadecimal	Scope
>280	32767	0x7FFF	Overflow
280	2800	0x0AF0	Normal range
-40	-400	0xFE70	
<-40	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

0-40ohm type			
Ohm value	Decimal	hexadecimal	Scope
>319.25ohm	-32768	0x8000	Beyond the limit
>47.03ohm	32767	0x7FFF	Upper limit
47.03ohm	32511	0x7EFF	Overflow
40ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection
0-150ohm type			

Ohm value	Decimal	hexadecimal	Scope
>319.25ohm	-32768	0x8000	Beyond the limit
>176.38ohm	32767	0x7FFF	Upper limit
176.38ohm	32511	0x7EFF	Overflow
150ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-300ohm type			
Ohm value	Decimal	hexadecimal	Scope
>638.5ohm	-32768	0x8000	Beyond the limit
>352.77ohm	32767	0x7FFF	Upper limit
352.77ohm	32511	0x7EFF	Overflow
300ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-500ohm type			
Ohm value	Decimal	hexadecimal	Scope
>638.5ohm	-32768	0x8000	Beyond the limit
>587.94ohm	32767	0x7FFF	Upper limit
587.94ohm	32511	0x7EFF	Overflow
500ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-1000ohm type			
Ohm value	Decimal	hexadecimal	Scope
>1277ohm	-32768	0x8000	Beyond the limit
>1175.89ohm	32767	0x7FFF	Upper limit
1175.89ohm	32511	0x7EFF	Overflow
1000ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-2000ohm type			
Ohm value	Decimal	hexadecimal	Scope
>2554ohm	-32768	0x8000	Beyond the limit
>2351.78ohm	32767	0x7FFF	Upper limit
2351.78ohm	32511	0x7EFF	Overflow
2000ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-4000ohm type			
Ohm value	Decimal	hexadecimal	Scope
>5108ohm	-32768	0x8000	Beyond the limit
>4703.56ohm	32767	0x7FFF	Upper limit
4703.56ohm	32511	0x7EFF	Overflow
4000ohm	27648	0x6C00	Normal range
0ohm	0	0	
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-110			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-120			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-121			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-122			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-150			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-151			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

NTC-5K			
temperature	Decimal	hexadecimal	Scope
>90	32767	0x7FFF	Overflow
90	900	0x0384	Normal range
-30	-300	0xFED4	
<-30	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

NTC-10K			
temperature	Decimal	hexadecimal	Scope
>150	32767	0x7FFF	Overflow
150	1500	0x05DC	Normal range
25	250	0x00FA	
<25	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

3.34.4 Configuration parameter definition

SDO Configuration	index	Sub-	length	type	Value	meaning
	16#4020	1	16bit	UINT	0~22	Sensor Type
		2	16bit	UINT	0~4	Sampling frequency configuration

Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4020. If it is inserted in the second card slot, the SDO index is 16#4021, and so on. 16#402x, where x is the card slot position -1

Data description:

Sensor type configuration, the configuration object is sub-index 1 under index 16#4020; default value: 0, indicating PT100.

The correspondence between the write value and signal type of the sub-index 1 object under index 16#4020 is shown in the table:

Subindex 1 object	Sensor Type	Subindex 1 object	Sensor Type
0	PT100 -200...850°C	20	Resistor 40 Ohm
1	PT1000 -200...850°C	twenty one	Resistor 80 Ohm
2	PT200 -200...850°C	twenty two	Resistor 150 Ohm
3	PT500 -200...850°C	twenty three	Resistor 300 Ohm
4	Ni120 -80...260°C	twenty four	Resistor 500 Ohm
5	Ni100 -60...250°C	25	Resistor 1000 Ohm
6	Ni200 -60...250°C	26	Resistor 2000 Ohm
7	Ni500 -60...250°C	27	Resistor 4000 Ohm
8	Ni1000 -60...250°C	30	KTY83_110 -55~175°C
9	Cu10 -100...260°C	31	KTY83_120 -55~175°C
10	Cu50 -100...260°C	32	KTY83_121 -55~175°C
11	Cu100 -100...260°C	33	KTY83_122 -55~175°C
12	Cu53 -100...260°C	34	KTY83_150 -55~175°C
13	KTY84-130 -40...260°C	35	KTY83_151 -55~175°C
14	KTY84-150 -40...260°C	36	NTC_5K -30~90°C
15	KTY84-151 -40...260°C	37	NTC_10K 25~150°C

Sampling frequency configuration, the configuration object is sub-index 2 under index 16#4020; default value: 1, indicating 2.5Hz.

The corresponding relationship between the written value of the sub-index 2 object under index 16#4020 and the sampling frequency is shown in the table:

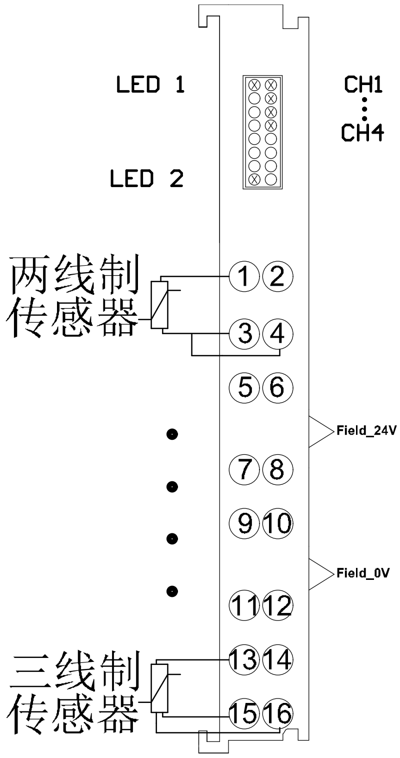
Subindex 2 object data	Sampling frequency
0	1.25Hz_800ms
1	2.5Hz_400ms
2	5Hz_200ms
3	7.5Hz_133ms

3.35 DF20-M-4RTD-PT: 4-channel thermal resistor sensor input module

3.35.1 Technical parameters

Electrical parameters	
Number of channels	4
Connection Type	2-wire/3-wire
Temperature resolution	Temperature value: 0.1℃/digit
Resistance value conversion formula (measurement resistance value)	Ractual = D/27648*R amount Among them: R is the current resistance value; R is the rated range value of the resistance.
Sampling frequency	Configurable
Sensor Type	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni200, Ni500, Ni1000, Cu10, Cu50, Cu53, Cu100, KTY84-130, KTY84-150, KTY84-151, 40 Ohm, 80 Ohm, 150 Ohm, 300 Ohm, 500 Ohm, 1000 Ohm, 2000 Ohm, 4000 Ohm, KTY83-110, KTY83-120, KTY83-121, KTY83-122, KTY83-150, KTY83-151, NTC-5K, NTC-10K
Disconnection detection	support
System side current	70mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75℃
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²

3.35.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
LED1	On: The module is powered normally
	Off: Module power supply is abnormal
LED2	Power-on stage: always on when powered on; Turns off after the internal bus initialization is completed.
	Running stage: flashes when the module is running normally; When the module is running abnormally, it is always on or off
CH1~CH4	Green off: disconnected
	Green flash: normal collection
	Green: Over limit

3.35.3 Module process data definition

Input data: 4 words	
Word 1	RTD Input CH1: First channel input data
Word 2	RTD Input CH2: Second channel input data
Word 3	RTD Input CH3: The third channel input data
Word 4	RTD Input CH4: The fourth channel input data

Definition of various sensor process data

PT100			
temperature	Decimal	hexadecimal	Scope
>850	32767	0x7FFF	Overflow
850	8500	0x2134	Normal range
-200	-2000	0xF830	
<-200	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

PT200			
temperature	Decimal	hexadecimal	Scope
>850	32767	0x7FFF	Overflow
850	8500	0x2134	Normal range
-200	-2000	0xF830	
<-200	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

PT500			
temperature	Decimal	hexadecimal	Scope
>850	32767	0x7FFF	Overflow
850	8500	0x2134	Normal range
-200	-2000	0xF830	
<-200	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

PT1000			
temperature	Decimal	hexadecimal	Scope
>850	32767	0x7FFF	Overflow
850	8500	0x2134	Normal range
-200	-2000	0xF830	
<-200	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Ni100			
temperature	Decimal	hexadecimal	Scope
>250	32767	0x7FFF	Overflow

250	2500	0x09C4	Normal range
-60	-600	0xFDA8	
<-60	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Ni120			
temperature	Decimal	hexadecimal	Scope
>309	32767	0x7FFF	Overflow
309	3090	0x0C12	Normal range
-79	-790	0xFCEA	
<-79	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

NI200			
temperature	Decimal	hexadecimal	Scope
>250	32767	0x7FFF	Overflow
250	2500	0x09C4	Normal range
-60	-600	0xFDA8	
<-60	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Ni500			
temperature	Decimal	hexadecimal	Scope
>250	32767	0x7FFF	Overflow
250	2500	0x09C4	Normal range
-60	-600	0xFDA8	
<-60	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Ni1000			
temperature	Decimal	hexadecimal	Scope
>250	32767	0x7FFF	Overflow
250	2500	0x09C4	Normal range
-60	-600	0xFDA8	
<-60	-32767	0x8001	Underflow

Sensor not connected	-32768	0x8000	Disconnection detection

Cu10 type			
temperature	Decimal	hexadecimal	Scope
>159	32767	0x7FFF	Overflow
159	1590	0x0636	Normal range
-59	-590	0xFDB2	
<-59	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Cu50			
temperature	Decimal	hexadecimal	Scope
>159	32767	0x7FFF	Overflow
159	1590	0x0636	Normal range
-59	-590	0xFDB2	
<-59	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Cu53			
temperature	Decimal	hexadecimal	Scope
>150	32767	0x7FFF	Overflow
150	1500	0x05DC	Normal range
-50	-500	0xFE0C	
<-50	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

Cu100			
temperature	Decimal	hexadecimal	Scope
>159	32767	0x7FFF	Overflow
159	1590	0x0636	Normal range
-59	-590	0xFDB2	
<-59	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY84_130			
temperature	Decimal	hexadecimal	Scope
>280	32767	0x7FFF	Overflow
280	2800	0x0AF0	Normal range
-40	-400	0xFE70	
<-40	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY84_150			
temperature	Decimal	hexadecimal	Scope
>280	32767	0x7FFF	Overflow
280	2800	0x0AF0	Normal range
-40	-400	0xFE70	
<-40	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY84_151			
temperature	Decimal	hexadecimal	Scope
>280	32767	0x7FFF	Overflow
280	2800	0x0AF0	Normal range
-40	-400	0xFE70	
<-40	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

0-40ohm type			
Ohm value	Decimal	hexadecimal	Scope
>319.25ohm	-32768	0x8000	Beyond the limit
>47.03ohm	32767	0x7FFF	Upper limit
47.03ohm	32511	0x7EFF	Overflow
40ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection
0-150ohm type			
Ohm value	Decimal	hexadecimal	Scope

>319.25ohm	-32768	0x8000	Beyond the limit
>176.38ohm	32767	0x7FFF	Upper limit
176.38ohm	32511	0x7EFF	Overflow
150ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-300ohm type			
Ohm value	Decimal	hexadecimal	Scope
>638.5ohm	-32768	0x8000	Beyond the limit
>352.77ohm	32767	0x7FFF	Upper limit
352.77ohm	32511	0x7EFF	Overflow
300ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-500ohm type			
Ohm value	Decimal	hexadecimal	Scope
>638.5ohm	-32768	0x8000	Beyond the limit
>587.94ohm	32767	0x7FFF	Upper limit
587.94ohm	32511	0x7EFF	Overflow
500ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-1000ohm type			
Ohm value	Decimal	hexadecimal	Scope
>1277ohm	-32768	0x8000	Beyond the limit
>1175.89ohm	32767	0x7FFF	Upper limit
1175.89ohm	32511	0x7EFF	Overflow
1000ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-2000ohm type

Ohm value	Decimal	hexadecimal	Scope
>2554ohm	-32768	0x8000	Beyond the limit
>2351.78ohm	32767	0x7FFF	Upper limit
2351.78ohm	32511	0x7EFF	Overflow
2000ohm	27648	0x6C00	Normal range
0ohm	0	0x0000	
Sensor not connected	-32768	0x8000	Disconnection detection

0-4000ohm type			
Ohm value	Decimal	hexadecimal	Scope
>5108ohm	-32768	0x8000	Beyond the limit
>4703.56ohm	32767	0x7FFF	Upper limit
4703.56ohm	32511	0x7EFF	Overflow
4000ohm	27648	0x6C00	Normal range
0ohm	0	0	
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-110			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-120			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-121			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-122

temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-150			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

KTY83-151			
temperature	Decimal	hexadecimal	Scope
>175	32767	0x7FFF	Overflow
175	1750	0x06D6	Normal range
-55	-550	0xFDDA	
<-55	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

NTC-5K			
temperature	Decimal	hexadecimal	Scope
>90	32767	0x7FFF	Overflow
90	900	0x0384	Normal range
-30	-300	0xFED4	
<-30	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

NTC-10K			
temperature	Decimal	hexadecimal	Scope
>150	32767	0x7FFF	Overflow
150	1500	0x05DC	Normal range
25	250	0x00FA	
<25	-32767	0x8001	Underflow
Sensor not connected	-32768	0x8000	Disconnection detection

3.35.4 Configuration parameter definition

	index	Sub-	length	type	Value	meaning
SDO Configuration	16#4020	1	16bit	UINT	0~22	Sensor Type
		2	16bit	UINT	0~4	Sampling frequency configuration

Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4020. If it is inserted in the second card slot, the SDO index is 16#4021, and so on, 16#402x, where x is the card slot position -1

Data description:

Sensor type configuration, the configuration object is sub-index 1 under index 16#4020; default value: 0, indicating PT100.

The correspondence between the write value and signal type of the sub-index 1 object under index 16#4020 is shown in the table:

Subindex 1 object	Sensor Type	Subindex 1 object	Sensor Type
0	PT100 -200...850℃	20	Resistor 40 Ohm
1	PT1000 -200...850℃	twenty one	Resistor 80 Ohm
2	PT200 -200...850℃	twenty two	Resistor 150 Ohm
3	PT500 -200...850℃	twenty three	Resistor 300 Ohm
4	Ni120 -80...260℃	twenty four	Resistor 500 Ohm
5	Ni100 -60...250℃	25	Resistor 1000 Ohm
6	Ni200 -60...250℃	26	Resistor 2000 Ohm
7	Ni500 -60...250℃	27	Resistor 4000 Ohm
8	Ni1000 -60...250℃	30	KTY83_110 -55~175℃
9	Cu10 -100...260℃	31	KTY83_120 -55~175℃
10	Cu50 -100...260℃	32	KTY83_121 -55~175℃
11	Cu100 -100...260℃	33	KTY83_122 -55~175℃
12	Cu53 -100...260℃	34	KTY83_150 -55~175℃
13	KTY84-130 -40...260℃	35	KTY83_151 -55~175℃
14	KTY84-150 -40...260℃	36	NTC_5K -30~90℃
15	KTY84-151 -40...260℃	37	NTC_10K 25~150℃

Sampling frequency configuration, the configuration object is sub-index 2 under index 16#4020; default value: 1, indicating 2.5Hz.

The corresponding relationship between the written value of the sub-index 2 object under index 16#4020 and the sampling frequency is shown in the table:

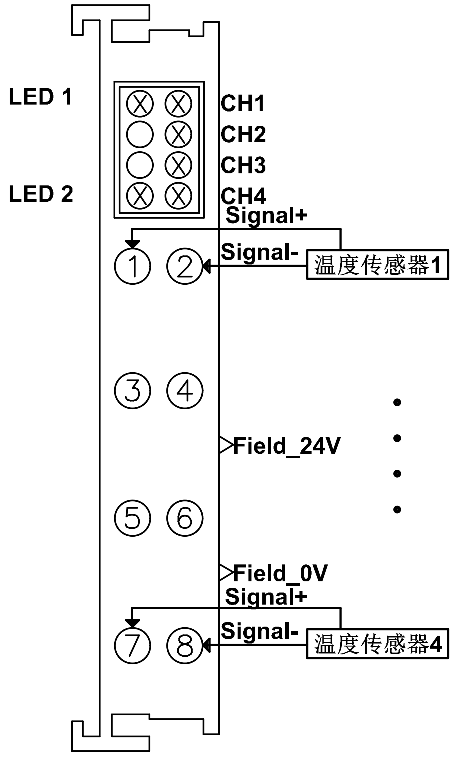
Subindex 2 object data	Sampling frequency
0	1.25Hz_800ms
1	2.5Hz_400ms
2	3.75Hz_200ms
3	5Hz_133ms

3.36 DF20-M-4TC-KETJ: 4-channel thermocouple sensor input module

3.36.1 Technical parameters

Electrical parameters	
Number of channels	4
Connection Type	2-wire
Temperature resolution	Temperature value: 0.1℃/digit
Voltage conversion formula (measure mV voltage value)	Vactual = D/32767*Vrated Where: Vactual is the current voltage value; Vrated is the rated range value of the sensor.
Sampling frequency	Configurable, default 4Hz
Sensor type/signal range	K, E, T, J, B, S, R, N, C, L, 15.625mV, 31.25mV, 62.5mV, 125mV, 250mV, 500mV, 1000mV, 2000mV
Disconnection detection	support
System side current	70mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25~75℃
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.36.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
LED1	On: The module is powered normally
	Off: Module power supply is abnormal
LED2	Power-on stage: always on when powered on; Turns off after the internal bus initialization is completed.
	Running stage: flashes when the module is running normally; When the module is running abnormally, it is always on or off
CH1~CH4	Green off: disconnected
	Green flash: normal collection
	Green: Over limit

3.36.3 Module process data definition

Input data: 4 words	
Word 1	TC Value CH1: First channel input data
Word 2	TC Value CH2: Second channel input data
Word 3	TC Value CH3: The third channel input data
Word 4	TC Value CH4: The fourth channel input data
Output data: 4 words	

Word 1	Offset Value CH1: The first channel data offset
Word 2	Offset Value CH2: Second channel data offset
Word 3	Offset Value CH3: The third channel data offset
Word 4	Offset Value CH4: The fourth channel data offset

Process Data Definition

K-Type			
temperature	Decimal	hexadecimal	Scope
>1370	32767	7FFF	Overflow
1370	13700	3584	Normal range
-270	-2700	F574	
<-270	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

Type E			
temperature	Decimal	hexadecimal	Scope
>1000	32767	7FFF	Overflow
1000	10000	2710	Normal range
-270	-2700	F574	
<-270	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

T-Type			
temperature	Decimal	hexadecimal	Scope
>400	32767	7FFF	Overflow
400	4000	FA0	Normal range
-270	-2700	F574	
<-270	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

J-Type			
temperature	Decimal	hexadecimal	Scope
>1200	32767	7FFF	Overflow
1200	12000	2EE0	Normal range
-210	-2100	F7CC	
<-210	-32767	8001	Underflow
Sensor not	-32768	8000	Disconnection

connected			detection

Type B			
temperature	Decimal	hexadecimal	Scope
>1820	32767	7FFF	Overflow
1820	18200	4718	Normal range
50	500	1F4	
<50	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

S-Type			
temperature	Decimal	hexadecimal	Scope
>1760	32767	7FFF	Overflow
1760	17600	44C0	Normal range
-50	-500	FE0C	
<-50	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

R-Type			
temperature	Decimal	hexadecimal	Scope
>1770	32767	7FFF	Overflow
1770	17700	4524	Normal range
-50	-500	FE0C	
<-50	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

N-type			
temperature	Decimal	hexadecimal	Scope
>1300	32767	7FFF	Overflow
1300	13000	32C8	Normal range
-270	-2700	F574	
<-270	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

Type C

temperature	Decimal	hexadecimal	Scope
>2320	32767	7FFF	Overflow
2320	23200	5AA0	Normal range
0	0	0	
<0	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

L-type			
temperature	Decimal	hexadecimal	Scope
>900	32767	7FFF	Overflow
900	9000	2328	Normal range
-200	-2000	F830	
<-200	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

±15.625mV			
mv value	Decimal	hexadecimal	Scope
15.625mV	32767	7FFF	Normal range
-15.625mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±62.5mV			
mv value	Decimal	hexadecimal	Scope
62.5mV	32767	7FFF	Normal range
-62.5mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±125mV			
mv value	Decimal	hexadecimal	Scope
125mV	32767	7FFF	Normal range
-125mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±250mV			
mv value	Decimal	hexadecimal	Scope
250mV	32767	7FFF	Normal range
-250mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±500mV			
mv value	Decimal	hexadecimal	Scope
500mV	32767	7FFF	Normal range
-500mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±1000mV			
mv value	Decimal	hexadecimal	Scope
1V	32767	7FFF	Normal range
-1V	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±2000mV			
mv value	Decimal	hexadecimal	Scope
2V	32767	7FFF	Normal range
-2V	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

3.36.4 Configuration parameter definition

SDO Configuration	index	Sub-	length	type	Value	meaning
	16#4020	1	16bit	UINT	0~18	Sensor Type
		2	16bit	UINT	0~4	Sampling frequency configuration
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4020. If it is inserted in the second card slot, the SDO index is 16#4021, and so on, 16#402x, where x is the card slot position -1					

Data description:

Sensor type configuration, the configuration object is sub-index 1 under index 16#4020; default value: 0, indicating K-type thermocouple. The corresponding relationship between the write value of sub-index 1 object under index 16#4020 and the signal type is shown in the table:

Subindex 1 object	Sensor Type	Subindex 1 object	Sensor Type
0	K	10	reserve
1	E	11	±15.625mV
2	T	12	±31.25mV
3	J	13	±62.5mV
4	B	14	±125mV
5	S	15	±250mV
6	R	16	±500mV
7	N	17	±1000mV
8	C	18	±2000mV
9	L		

Sampling frequency configuration, the configuration object is sub-index 2 under index 16#4020; default value: 2, indicating 4Hz.

The corresponding relationship between the written value of the sub-index 2 object under index 16#4020 and the sampling frequency is shown in the table:

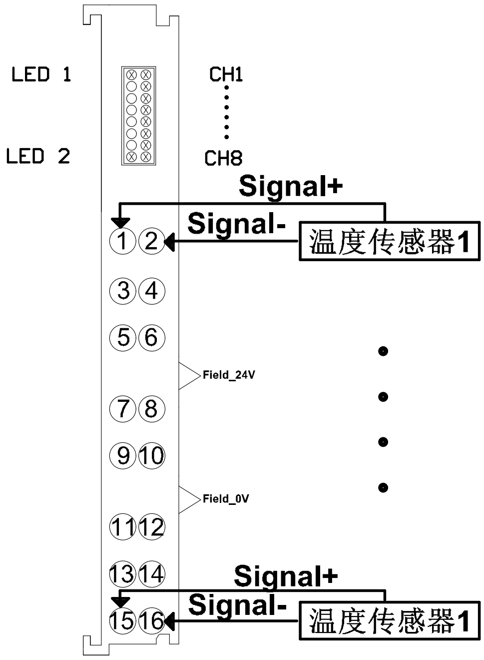
Subindex 2 object data	Sampling frequency
0	1Hz_1000ms
1	2Hz_500ms
2	4Hz_250ms
3	8Hz_125ms

3.37 DF20-M-8TC-KETJ: 8-channel thermocouple sensor input module

3.37.1 Technical parameters

Electrical parameters	
Number of channels	8
Connection Type	2-wire
Temperature resolution	Temperature value: 0.1℃/digit
Voltage conversion formula (measure mV voltage value)	Vactual = D/32767*Vrated Where: Vactual is the current voltage value; Vrated is the rated range value of the sensor.
Filter time	Configurable, default 1800ms
Sensor type/signal range	K, E, T, J, B, S, R, N, C, L, 15.625mV, 31.25mV, 62.5mV, 125mV, 250mV, 500mV, 1000mV, 2000mV
Disconnection detection	support
System side current	80mA
Reverse circuit protection	support
Module failure alarm	support
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25～75℃
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	$2.5mm^2$
Maximum crimping area of	AWG14
Minimum crimping area of	$0.2mm^2$
Minimum crimping area for	AWG28
Line length	8...9mm

3.37.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
LED1	On: The module is powered normally
	Off: Module power supply is abnormal
LED2	Power-on stage: always on when powered on; Turns off after the internal bus initialization is completed.
	Running stage: flashes when the module is running normally; When the module is running abnormally, it is always on or off
CH1~CH8	Green off: disconnected
	Green flash: normal collection
	Green: Over limit

3.37.3 Module process data definition

Input data: 8 words	
Word 1	TC Value CH1: First channel input data
Word 2	TC Value CH2: Second channel input data
Word 3	TC Value CH3: The third channel input data
Word 4	TC Value CH4: The fourth channel input data
Word 5	TC Value CH5: Fifth channel input data

Word 6	TC Value CH6: Sixth channel input data
Word 7	TC Value CH7: seventh channel input data
Word 8	TC Value CH8: Input data of the eighth channel
Output data: 8 words	
Word 1	Offset Value CH1: The first channel data offset
Word 2	Offset Value CH2: Second channel data offset
Word 3	Offset Value CH3: The third channel data offset
Word 4	Offset Value CH4: The fourth channel data offset
Word 5	Offset Value CH5: The fifth channel data offset
Word 6	Offset Value CH6: The sixth channel data offset
Word 7	Offset Value CH7: Data offset of the seventh channel
Word 8	Offset Value CH8: The eighth channel data offset

Process Data Definition

K-Type			
temperature	Decimal	hexadecimal	Scope
>1370	32767	7FFF	Overflow
1370	13700	3584	Normal range
-270	-2700	F574	
<-270	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

Type E			
temperature	Decimal	hexadecimal	Scope
>1000	32767	7FFF	Overflow
1000	10000	2710	Normal range
-270	-2700	F574	
<-270	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

T-Type			
temperature	Decimal	hexadecimal	Scope
>400	32767	7FFF	Overflow
400	4000	FA0	Normal range
-270	-2700	F574	
<-270	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

J-Type			
temperature	Decimal	hexadecimal	Scope
>1200	32767	7FFF	Overflow
1200	12000	2EE0	Normal range
-210	-2100	F7CC	
<-210	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

Type B			
temperature	Decimal	hexadecimal	Scope
>1820	32767	7FFF	Overflow
1820	18200	4718	Normal range
50	500	1F4	
<50	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

S-Type			
temperature	Decimal	hexadecimal	Scope
>1760	32767	7FFF	Overflow
1760	17600	44C0	Normal range
-50	-500	FE0C	
<-50	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

R-Type			
temperature	Decimal	hexadecimal	Scope
>1770	32767	7FFF	Overflow

1770	17700	4524	Normal range
-50	-500	FE0C	
<-50	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

N-type			
temperature	Decimal	hexadecimal	Scope
>1300	32767	7FFF	Overflow
1300	13000	32C8	Normal range
-270	-2700	F574	
<-270	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

Type C			
temperature	Decimal	hexadecimal	Scope
>2320	32767	7FFF	Overflow
2320	23200	5AA0	Normal range
0	0	0	
<0	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

L-type			
temperature	Decimal	hexadecimal	Scope
>900	32767	7FFF	Overflow
900	9000	2328	Normal range
-200	-2000	F830	
<-200	-32767	8001	Underflow
Sensor not connected	-32768	8000	Disconnection detection

±15.625mV			
mv value	Decimal	hexadecimal	Scope
15.625mV	32767	7FFF	Normal range
-15.625mV	-32767	8001	
Sensor not	-32768	8000	Disconnection

connected			detection

±62.5mV			
mv value	Decimal	hexadecimal	Scope
62.5mV	32767	7FFF	Normal range
-62.5mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±125mV			
mv value	Decimal	hexadecimal	Scope
125mV	32767	7FFF	Normal range
-125mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±250mV			
mv value	Decimal	hexadecimal	Scope
250mV	32767	7FFF	Normal range
-250mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±500mV			
mv value	Decimal	hexadecimal	Scope
500mV	32767	7FFF	Normal range
-500mV	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±1000mV			
mv value	Decimal	hexadecimal	Scope
1V	32767	7FFF	Normal range
-1V	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

±2000mV			
mv value	Decimal	hexadecimal	Scope
2V	32767	7FFF	Normal range
-2V	-32767	8001	
Sensor not connected	-32768	8000	Disconnection detection

3.37.4 Configuration parameter definition

SDO Configuration	index	Sub-	length	type	Value	meaning
	16#4020	1	16bit	UINT	0~18	Sensor Type Configuration
		2	16bit	UINT	0~4	Filter time configuration
Remark	If the module is inserted in the first card slot after the coupler, the SDO index is 16#4020. If it is inserted in the second card slot, the SDO index is 16#4021, and so on, 16#402x, where x is the card slot position -1					

Data description:

Sensor type configuration, the configuration object is sub-index 1 under index 16#4020; default value: 0, indicating K-type thermocouple.

The correspondence between the write value and signal type of the sub-index 1 object under index 16#4020 is shown in the table:

Subindex 1 object	Sensor Type	Subindex 1 object	Sensor Type
0	K	10	reserve
1	E	11	±15.625mV
2	T	12	±31.25mV
3	J	13	±62.5mV
4	B	14	±125mV
5	S	15	±250mV
6	R	16	±500mV
7	N	17	±1000mV
8	C	18	±2000mV
9	L		

Filter time configuration. The configuration object is sub-index 2 under index 16#4020. The default value is 2, which means 1800ms.

The corresponding relationship between the write value of the sub-index 2 object under index 16#4020 and the filter time is shown in the table:

Subindex 2 object data	Sampling frequency
0	7200ms
1	3600ms
2	1800ms
3	900ms
4	450ms
5	225ms
6	122.5ms
7	61.25ms

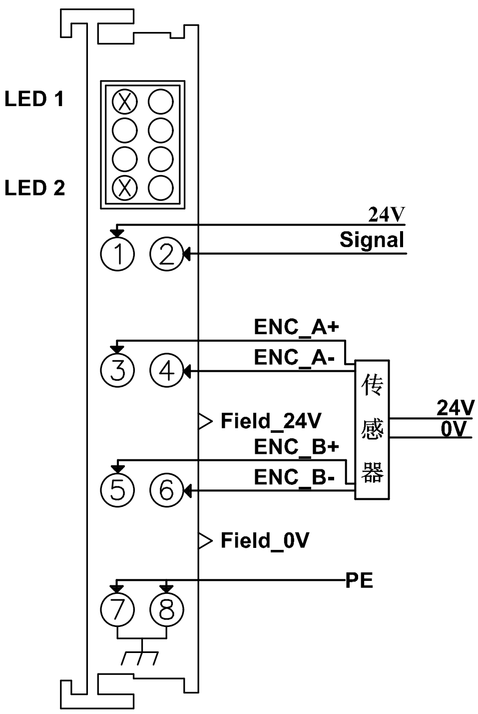
3.38 DF20-M-1CNT-EL-5: 1-channel encoder input module 5V signal

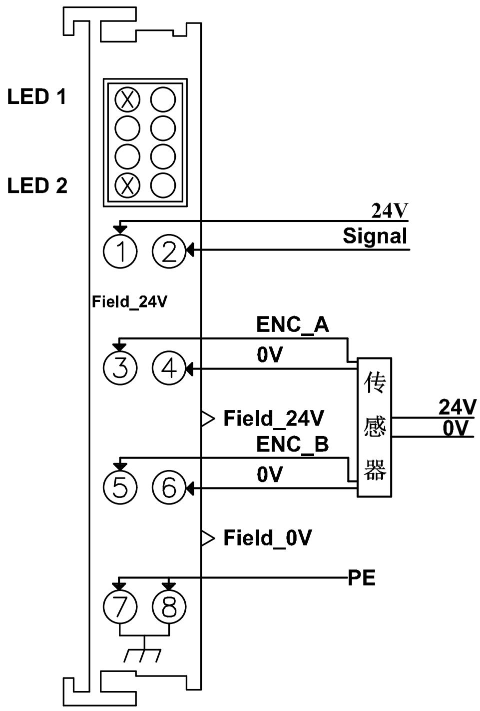
3.38.1 Technical parameters

Electrical parameters		
Input Channels	1 incremental encoder input	
	1 electronic probe input	
Input signal voltage	Encoder signal	5V
	Electron probe	24V
Encoder input parameters		
Signal Type	A+A-/B+B- differential signal or A/B signal	
Connection Type	2-wire/4-wire	
Counting range	–2147483648~2147483647	
Signal frequency	4x	
Maximum input frequency	1MHz	
Resolution/Accuracy	32bit/±1 pulse	
Input Impedance	>500KΩ	
System side current	30mA	
Module failure alarm	support	
General parameters		
Vibration Testing	1g, in accordance with IEC 60068-2-6	
Shock Test	15g, compliant with IEC 60068-2-27	
Electromagnetic	Compliant with EN 61000-4standard	
Protection level	IP20	
Operating temperature	-25~75℃	
Storage temperature	-40°C~+85°C	

Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.38.2 Status indicator light and wiring diagram





The status indicator lights are shown in the table below:

LED No	Status and meaning
LED1	On: The module is powered normally
	Off: Module power supply is abnormal
LED2	Power-on stage: always on when powered on; Turns off after the internal bus initialization is completed.
	Running stage: flashes when the module is running normally; When the module is running abnormally, it is always on or off

3.38.3 Module process data definition

Input data: 5 words	
Word 1	ENC State: module status word
Word 2~Word 3	Actual Position: Current position of the encoder (number of pulses)
Word 4~Word 5	TouchProbe Position: Electronic probe latch value (number of pulses)
Output data: 1 Word	
Word 1	Command: module command output word

DF20-M-1CNT-EL-5 module state machine description:

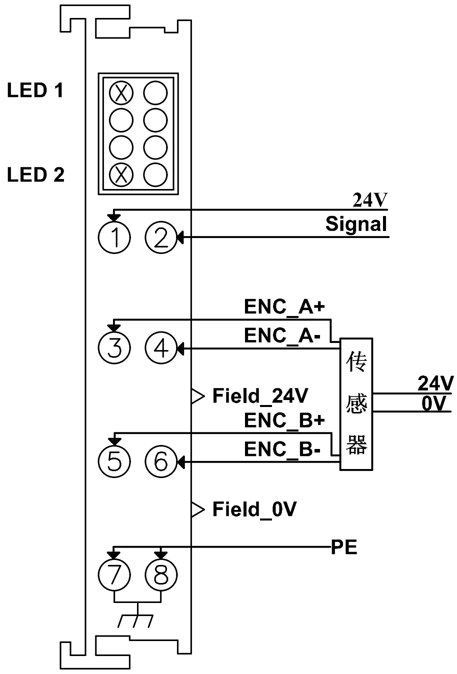
Control command	meaning	Module status word	meaning
0x012B	Enter counting state	0x010B	Counting status
0x012C	Clear current count	0x010C	Clear Status
		0x0109	Idle state
		0x010E	Error Status

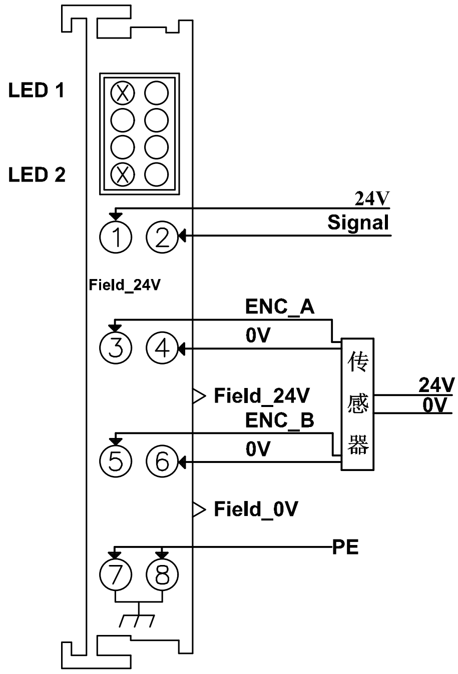
3.39 DF20-M-1CNT-EL-4: 1-channel encoder input module 24V signal

3.39.1 Technical parameters

Electrical parameters		
Input Channels	1 incremental encoder input	
	1 electronic probe input	
Input signal voltage	Encoder signal	24V
	Electron probe	24V
Encoder input parameters		
Signal Type	A+A-/B+B- differential signal or A/B signal	
Connection Type	2-wire/4-wire	
Counting range	–2147483648~2147483647	
Signal frequency	4x	
Maximum input frequency	1MHz	
Resolution/Accuracy	32bit/±1 pulse	
Input Impedance	>500KΩ	
System side current	30mA	
Module failure alarm	support	
General parameters		
Vibration Testing	1g, in accordance with IEC 60068-2-6	
Shock Test	15g, compliant with IEC 60068-2-27	
Electromagnetic	Compliant with EN 61000-4standard	
Protection level	IP20	
Operating temperature	-25～75℃	
Storage temperature	-40°C~+85°C	
Relative humidity	5～95%RH (no condensation)	
Installation	35mm rail mounting	
Dimensions	100mm × 12mm × 67mm	
Maximum crimping area of	2.5mm²	
Maximum crimping area of	AWG14	
Minimum crimping area of	0.2mm²	
Minimum crimping area for	AWG28	
Line length	8...9mm	

3.39.2 Status indicator light and wiring diagram





The status indicator lights are shown in the table below:

LED No	Status and meaning
LED1	On: The module is powered normally
	Off: Module power supply is abnormal
LED2	Power-on stage: always on when powered on; Turns off after the internal bus initialization is completed.
	Running stage: flashes when the module is running normally; When the module is running abnormally, it is always on or off

3.39.3 Module process data definition

Input data: 5 words	
Word 1	ENC State: module status word
Word 2~Word 3	Actual Position: Current position of the encoder (number of pulses)
Word 4~Word 5	TouchProbe Position: Electronic probe latch value (number of pulses)
Output data: 1 Word	
Word 1	Command: module command output word

DF20-M-1CNT-EL-4 module state machine description:

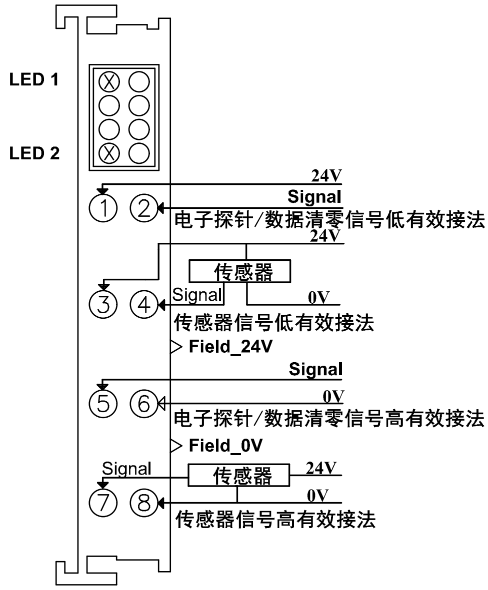
Control	meaning	Module	meaning
0x012B	Enter counting	0x010B	Counting
0x012C	Clear current	0x010C	Clear
		0x0109	Idle state
		0x010E	Error

3.40 DF20-M-2CNT-PIL-5: 2-channel pulse input module 5V signal

3.40.1 Technical parameters

Electrical parameters		
Input Channels	2 pulse inputs	
	2 electronic probe inputs	
Input signal voltage	Pulse signal	5V
	Electron probe	24V
Encoder input parameters		
Signal Type	Differential signal or single-ended signal	
Connection Type	2-wire	
Counting range	0~4294967295	
Maximum input frequency	500KHz	
Resolution/Accuracy	32bit/±1 pulse	
Input Impedance	>500KΩ	
System side current	30mA	
Module failure alarm	support	
General parameters		
Vibration Testing	1g, in accordance with IEC 60068-2-6	
Shock Test	15g, compliant with IEC 60068-2-27	
Electromagnetic	Compliant with EN 61000-4standard	
Protection level	IP20	
Operating temperature	-25～75℃	
Storage temperature	-40°C~+85°C	
Relative humidity	5～95%RH (no condensation)	
Installation	35mm rail mounting	
Dimensions	100mm × 12mm × 67mm	
Maximum crimping area of	2.5mm²	
Maximum crimping area of	AWG14	
Minimum crimping area of	0.2mm²	
Minimum crimping area for	AWG28	
Line length	8...9mm	

3.40.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
LED1	On: The module is powered normally
	Off: Module power supply is abnormal
LED2	Power-on stage: always on when powered on; Turns off after the internal bus initialization is completed.
	Running stage: flashes when the module is running normally; When the module is running abnormally, it is always on or off

3.40.3 Module process data definition

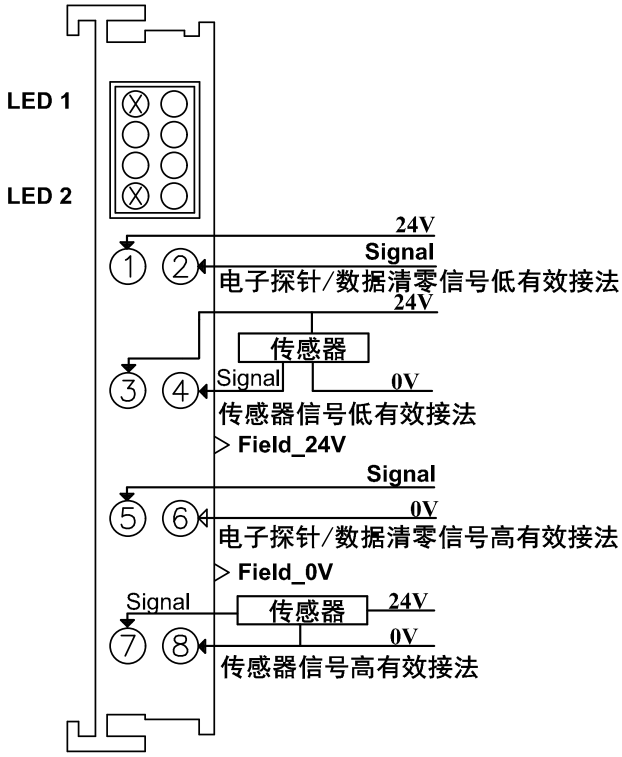
输入数据含义			
对象名称	对象含义		说明
PulseStateA	第一通道状态字	bit15~bit3	预留位
		bit2	0：通道1计数值小于比较值；　1：通道1计数值大于比较值。
		bit1	0：无电子探针/第一通道计数清零信号；　1：有电子探针/第一通道计数清零信号
		bit0	0：通道1计数停止状态，原计数清零；　1：通道1计数状态
PulseCountA	第一通道脉冲值	2 Word	通道1脉冲输入值，无符号32位数据
LatchCountA	第一通道脉冲锁存值	2 Word	通道1脉冲输入锁存值，无符号32位数据
PulseStateB	第二通道状态字	bit15~bit3	预留位
		bit2	0：通道2计数值小于比较值；　1：通道2计数值大于比较值。
		bit1	0：第2通道无电子探针/计数清零信号；　1：第2通道有电子探针/计数清零信号
		bit0	0：通道2计数停止状态，原计数清零；　1：通道2计数状态
PulseCountB	第二通道脉冲值	2 Word	通道2脉冲输入值，无符号32位数据
LatchCountB	第二通道脉冲锁存值	2 Word	通道2脉冲输入锁存值，无符号32位数据
输出数据说明			
对象名称	对象含义	说明	
PulseCtrlA	第一通道控制字	bit15~bit3	预留位
		bit2	0：通道1比较值失能；　1：使能通道1比较值
		bit1	0：使能通道1电子探针功能；　1：使能通道1外部信号触发计数清零功能
		bit0	0：通道1停止计数，原计数清零；　1：通道1开始计数
PulseCompareA	第一通道脉冲比较值	2 Word	通道1脉冲比较值输出，无符号32位数据
PulseCtrlB	第二通道控制字	bit15~bit3	预留位
		bit2	0：通道2比较值失能；　1：使能通道2比较值
		bit1	0：使能通道2电子探针功能；　1：使能通道2外部信号触发计数清零功能
		bit0	0：通道2停止计数，原计数清零；　1：通道2开始计数
PulseCompareB	第二通道脉冲比较值	2 Word	通道2脉冲比较值输出，无符号32位数据

3.41 DF20-M-2CNT-PIL-4: 2-channel pulse input module 24V signal

3.41.1 Technical parameters

Electrical parameters		
Input Channels	2 pulse inputs	
	2 electronic probe inputs	
Input signal voltage	Pulse signal	24V
	Electron probe	24V
Encoder input parameters		
Signal Type	Differential signal or single-ended signal	
Connection Type	2-wire	
Counting range	0~4294967295	
Maximum input frequency	500KHz	
Resolution/Accuracy	32bit/±1 pulse	
Input Impedance	>500KΩ	
System side current	30mA	
Module failure alarm	support	
General parameters		
Vibration Testing	1g, in accordance with IEC 60068-2-6	
Shock Test	15g, compliant with IEC 60068-2-27	
Electromagnetic	Compliant with EN 61000-4standard	
Protection level	IP20	
Operating temperature	-25～75℃	
Storage temperature	-40°C~+85°C	
Relative humidity	5～95%RH (no condensation)	
Installation	35mm rail mounting	
Dimensions	100mm × 12mm × 67mm	
Maximum crimping area of	2.5mm²	
Maximum crimping area of	AWG14	
Minimum crimping area of	0.2mm²	
Minimum crimping area for	AWG28	
Line length	8...9mm	

3.41.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
LED1	On: The module is powered normally
	Off: Module power supply is abnormal
LED2	Power-on stage: always on when powered on; Turns off after the internal bus initialization is completed.
	Running stage: flashes when the module is running normally; When the module is running abnormally, it is always on or off

3.41.3 Module process data definition

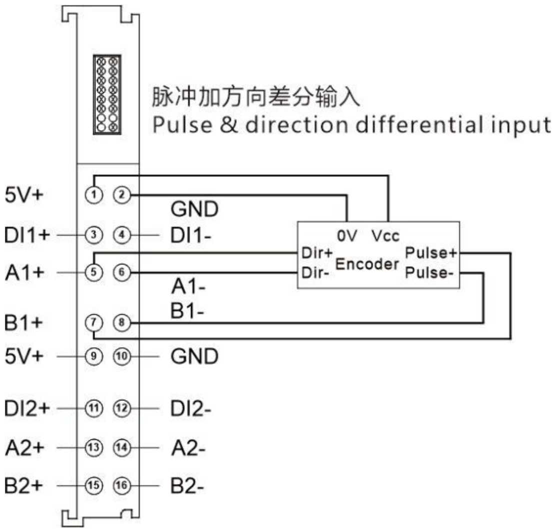
输入数据含义			
对象名称	对象含义		说明
PulseStateA	第一通道状态字	bit15~bit3	预留位
		bit2	0：通道1计数值小于比较值； 1：通道1计数值大于比较值。
		bit1	0：无电子探针/第一通道计数清零信号； 1：有电子探针/第一通道计数清零信号
		bit0	0：通道1计数停止状态，原计数清零； 1：通道1计数状态
PulseCountA	第一通道脉冲值	2 Word	通道1脉冲输入值，无符号32位数据
LatchCountA	第一通道脉冲锁存值	2 Word	通道1脉冲输入锁存值，无符号32位数据
PulseStateB	第二通道状态字	bit15~bit3	预留位
		bit2	0：通道2计数值小于比较值； 1：通道2计数值大于比较值。
		bit1	0：第2通道无电子探针/计数清零信号； 1：第2通道有电子探针/计数清零信号
		bit0	0：通道2计数停止状态，原计数清零； 1：通道2计数状态
PulseCountB	第二通道脉冲值	2 Word	通道2脉冲输入值，无符号32位数据
LatchCountB	第二通道脉冲锁存值	2 Word	通道2脉冲输入锁存值，无符号32位数据
输出数据说明			
对象名称	对象含义	说明	
PulseCtrlA	第一通道控制字	bit15~bit3	预留位
		bit2	0：通道1比较值失能； 1：使能通道1比较值
		bit1	0：使能通道1电子探针功能； 1：使能通道1外部信号触发计数清零功能
		bit0	0：通道1停止计数，原计数清零； 1：通道1开始计数
PulseCompareA	第一通道脉冲比较值	2 Word	通道1脉冲比较值输出，无符号32位数据
PulseCtrlB	第二通道控制字	bit15~bit3	预留位
		bit2	0：通道2比较值失能； 1：使能通道2比较值
		bit1	0：使能通道2电子探针功能； 1：使能通道2外部信号触发计数清零功能
		bit0	0：通道2停止计数，原计数清零； 1：通道2开始计数
PulseCompareB	第二通道脉冲比较值	2 Word	通道2脉冲比较值输出，无符号32位数据

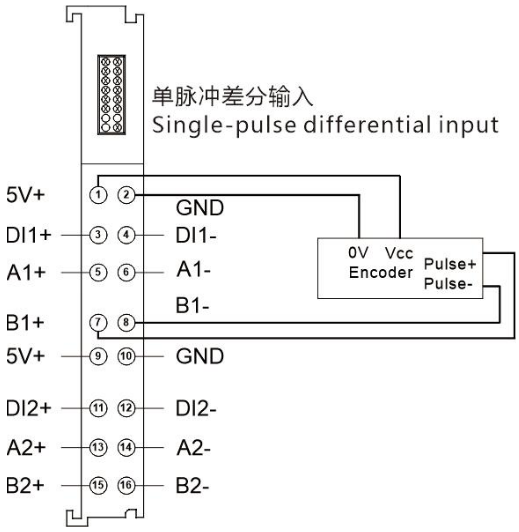
3.42 DF20-M-2CNT-EL-5: 2-channel encoder input module 5V signal

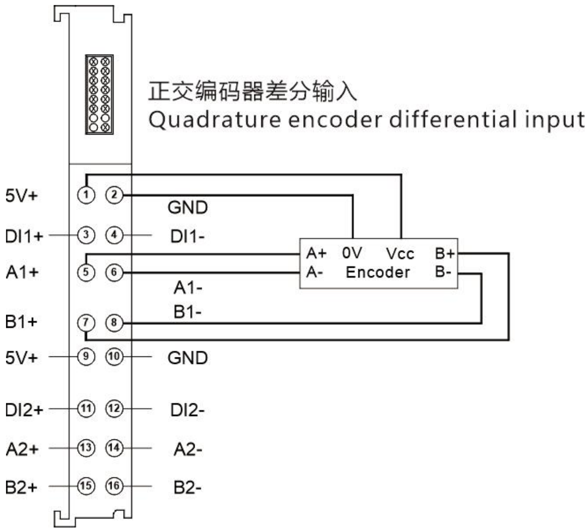
3.42.1 Technical parameters

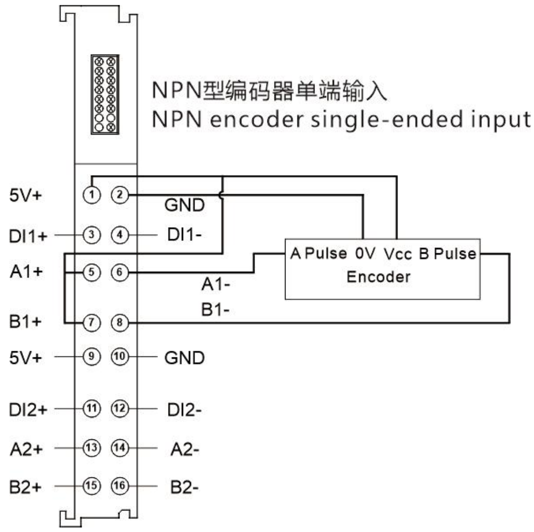
Electrical parameters	
Bus input power rated voltage	DC5V
Bus input power rated current	65mA
Terminal output rated voltage	DC5V
Terminal output rated current	500mA
Input connection type	2-wire / 4-wire
Number of input channels	2
Input signal type	AB quadrature/pulse+direction
Input signal voltage	5V
DI channel input signal type	Single-ended/differential
DI channel input voltage	DC24V
Maximum input frequency	1MHz
Orthogonal coded signal frequency multiplication	4x/2x/1x, configurable
Accuracy	±1 pulse
Hardware filtering	Support, configurable
Channel Configuration	support
Error diagnosis	support
Counting Mode	Linear counter form, ring counter form, configurable
Count latch/reset function	Support, configurable
Counting range	–2147483648~2147483647
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility testing	Complies with EN 61000-4
Protection level	IP20
Operating temperature	-25~75°C
Storage temperature	-40°C~+85°C
Relative humidity	5~95%RH (non-condensing)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of wire	2.5mm²
Maximum crimping area of wire (AWG)	AWG14
Minimum crimping area of wire	0.2mm²
Minimum crimping area for wire (AWG)	AWG28
Line length	8...9mm

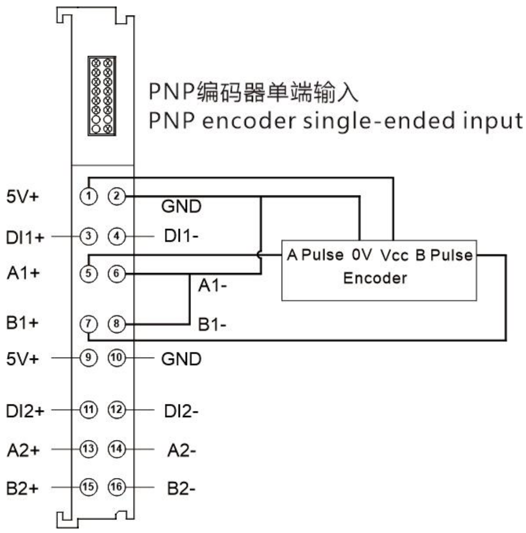
3.42.2 Status indicator light and wiring diagram











The status indicator lights are shown in the table below:

name	Status description
PWR power indicator	On: Internal bus power supply is normal Off: Internal bus power supply is abnormal
STA status indicator	Power-on stage: Green: Module initialization abnormality
	Power-on stage: Green off: Module initialization is normal

	Running stage: Green flash: The internal bus of the module is working normally
	Running stage: Green off: The internal bus of the module is working abnormally
TP1/TP2 trigger signal indicator	On: Input signal is valid Off: Input signal is invalid
A1/A2 encoder signal indicator	On: Input signal is valid Off: Input signal is invalid
B1/B2 encoder signal indicator	On: Input signal is valid Off: Input signal is invalid
UP1/UP2 indicator	On: Encoder is rotating forward Off: Encoder is stationary or rotating reverse
DN1/DN2 indicator light	On: Encoder is rotating in the reverse direction Off: Encoder is stationary or rotating in the forward direction
FP 5V indicator	On: The module power is normal Off: The module power is abnormal

3.42.3 Module process data definition

The first channel output data		
PulseCtrl CH1	bit3~bit15	reserve
	bit2	0: Disable the position comparison function of channel 1; 1: Enable the position comparison function of channel 1
	bit1	0: Enable the electronic probe latch function of channel 1; 1: Enable the electronic probe count clear function of channel 1
	bit0	0: Channel 1 stops counting and the original count is reset to zero; 1: Channel 1 starts counting
PulseCompare CH1		Channel 1 pulse comparison value, range:–2147483648~2147483647
Second channel output data		
PulseCtrl CH2	bit3~bit15	reserve
	bit2	0: Disable the position comparison function of channel 2; 1: Enable the position comparison function of channel 2
	bit1	0: Enable the electronic probe latch function of channel 2; 1: Enable the electronic probe count clear function of channel 2
	bit0	0: Channel 2 stops counting and the original count is reset; 1: Channel 2 starts counting
PulseCompare CH2		Channel 2 pulse comparison value, range: –2147483648~2147483647
First channel input data		
PulseState CH1	bit3~bit15	reserve
	bit2	0: Channel 1 count value is less than the comparison value; 1: Channel 1 count value is greater than or equal to the comparison value.
	bit1	0: Channel 1 has no electronic probe; 1: Channel 1 has an electronic probe
	bit0	0: Channel 1 counting stop state; 1: Channel 1 counting state
PulseCount CH1		Channel 1 pulse input value, range:–2147483648~2147483647
LatchCount CH1		Channel 1 pulse input latch value, range:–2147483648~2147483647
Second channel input data		
PulseState CH2	bit3~bit15	reserve
	bit2	0: Channel 2 count value is less than the comparison value; 1:

		Channel 2 count value is greater than or equal to the comparison value.
	bit1	0: Channel 2 has no electronic probe; 1: Channel 2 has an electronic probe
	bit0	0: Channel 2 counting stop state; 1: Channel 2 counting state
PulseCount CH2		Channel 2 pulse input value, range:–2147483648~2147483647
LatchCount CH2		Channel 2 pulse input latch value, range:–2147483648~2147483647

3.42.4 Configuration parameter definition

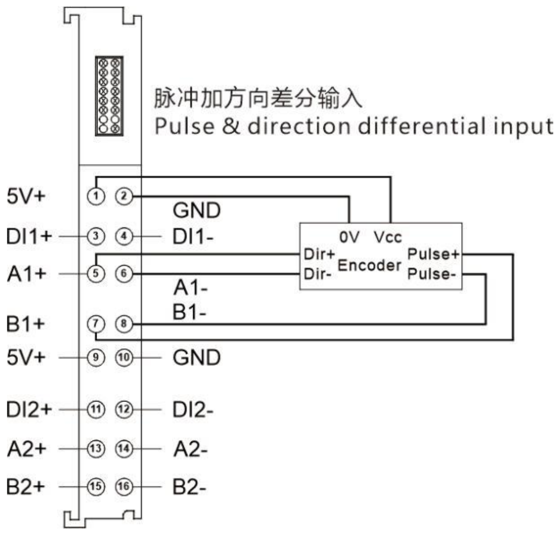
Configuration items	Parameter meaning
Counter Type (Count type)	0: Line Counter (Linear Count) 1: Ring Counter
Pulse Input Method (Input signal type)	0: Phase Differential x4 (quadrature encoding 4 times frequency) 1: Phase Differential x2 (orthogonal encoding 2 times frequency) 2: Phase Differential x1 (orthogonal encoding 1 times frequency) 3: Pulse and Directions
Encoder Count Direction (Signal input direction logic)	0:Position Direaction of Phase A (positive logic) 1:Position Direaction of Phase B (negative logic) Positive logic: Orthogonal encoding input, phase A leads phase B by 90 degrees for forward rotation, pulse plus direction input, direction input high effective signal for forward rotation. Negative logic: Orthogonal encoding input, B phase leads A phase by 90 degrees for forward rotation, pulse plus direction input, direction input low effective signal or floating for forward rotation.
Counter Filter A (Input pulse signal filtering configuration)	3:4MHZ 4:1.5MHZ 5:1MHZ 6:800KHZ 7:600KHZ 8:420KHZ 9:315KHZ 10:250KHZ 11:200KHZ 12:160KHZ 13:120KHZ 14:100KHZ 15:75KHZ
Maximum Counter Value (ring count upper limit)	-2147483648~ 2147483647
Minimum Counter Value (Ring Count Lower Limit)	-2147483648~ 2147483647 For example, if the upper and lower limits are set to 5 and -5 respectively in loop mode, the upward count is -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, -5, -4.... The downward count is -5, 4, 3, 2, 1, 0, -1, -2, -3, -4, -5, 4....

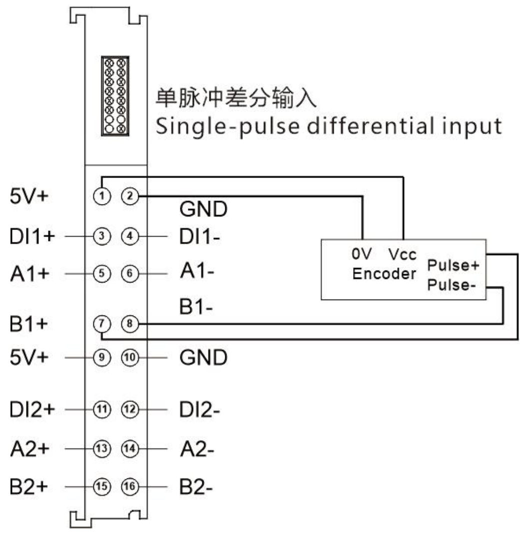
3.43 DF20-M-2CNT-EL-4: 2-channel encoder input module 24V signal

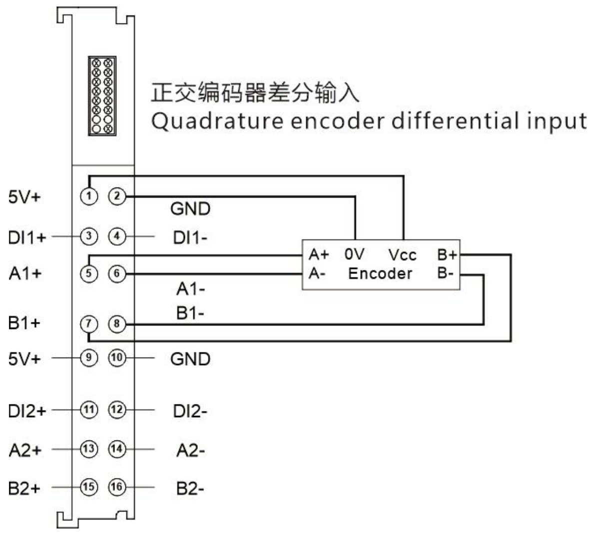
3.43.1 Technical parameters

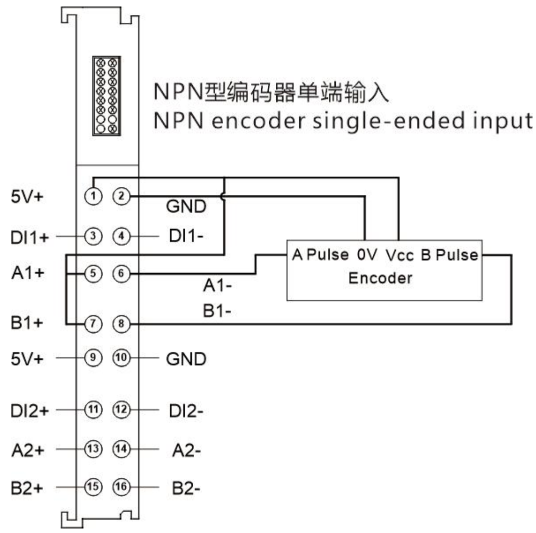
Electrical parameters	
Bus input power rated voltage	DC5V
Bus input power rated current	65mA
Terminal output rated voltage	DC24V
Terminal output rated current	500mA
Input connection type	2-wire / 4-wire
Number of input channels	2
Input signal type	AB quadrature/pulse+direction
Input signal voltage	24V
DI channel input signal type	Single-ended/differential
DI channel input voltage	DC24V
Maximum input frequency	1MHz
Orthogonal coded signal frequency multiplication	4x/2x/1x, configurable
Accuracy	±1 pulse
Hardware filtering	Support, configurable
Channel Configuration	support
Error diagnosis	support
Counting Mode	Linear counter form, ring counter form, configurable
Count latch/reset function	Support, configurable
Counting range	–2147483648~2147483647
General parameters	
Isolation withstand voltage	500V
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility testing	Complies with EN 61000-4
Protection level	IP20
Operating temperature	-25～75℃
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of wire	2.5mm²
Maximum crimping area of wire (AWG)	AWG14
Minimum crimping area of wire	0.2mm²
Minimum crimping area for wire (AWG)	AWG28
Line length	8...9mm

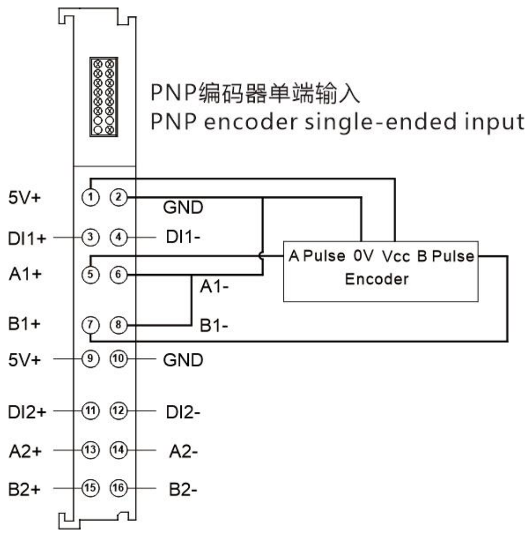
3.43.2 Status indicator light and wiring diagram











The status indicator lights are shown in the table below:

name	Status description
PWR power indicator	On: Internal bus power supply is normal Off: Internal bus power supply is abnormal
STA status indicator	Power-on stage: Green: Module initialization abnormality
	Power-on stage: Green off: Module initialization is normal
	Running stage: Green flash: The internal bus of the module is working normally
	Running stage: Green off: The internal bus of the module is working abnormally
TP1/TP2 trigger signal indicator	On: Input signal is valid Off: Input signal is invalid
A1/A2 encoder signal indicator	On: Input signal is valid Off: Input signal is invalid
B1/B2 encoder signal indicator	On: Input signal is valid Off: Input signal is invalid
UP1/UP2 indicator	On: Encoder is rotating forward Off: Encoder is stationary or rotating reverse
DN1/DN2 indicator light	On: Encoder is rotating in the reverse direction Off: Encoder is stationary or rotating in the forward direction
FP 24V indicator light	On: The module power is normal Off: The module power is abnormal

3.43.3 Module process data definition

The first channel output data		
PulseCtrl CH1	bit3~bit15	reserve
	bit2	0: Disable the position comparison function of channel 1; 1: Enable the position comparison function of channel 1
	bit1	0: Enable the electronic probe latch function of channel 1; 1: Enable the electronic probe count clear function of channel 1
	bit0	0: Channel 1 stops counting and the original count is reset to zero; 1: Channel 1 starts counting
PulseCompare CH1		Channel 1 pulse comparison value, range:–2147483648~2147483647
Second channel output data		
PulseCtrl CH2	bit3~bit15	reserve
	bit2	0: Disable the position comparison function of channel 2; 1: Enable the position comparison function of channel 2
	bit1	0: Enable the electronic probe latch function of channel 2; 1: Enable the electronic probe count clear function of channel 2
	bit0	0: Channel 2 stops counting and the original count is reset; 1: Channel 2 starts counting
PulseCompare CH2		Channel 2 pulse comparison value, range: –2147483648~2147483647
First channel input data		
PulseState	bit3~bit15	reserve

CH1	bit2	0: Channel 1 count value is less than the comparison value; 1: Channel 1 count value is greater than or equal to the comparison value.
	bit1	0: Channel 1 has no electronic probe; 1: Channel 1 has an electronic probe
	bit0	0: Channel 1 counting stop state; 1: Channel 1 counting state
PulseCount CH1		Channel 1 pulse input value, range:–2147483648~2147483647
LatchCount CH1		Channel 1 pulse input latch value, range:–2147483648~2147483647
Second channel input data		
PulseState CH2	bit3~bit15	reserve
	bit2	0: Channel 2 count value is less than the comparison value; 1: Channel 2 count value is greater than or equal to the comparison value.
	bit1	0: Channel 2 has no electronic probe; 1: Channel 2 has an electronic probe
	bit0	0: Channel 2 counting stop state; 1: Channel 2 counting state
PulseCount CH2		Channel 2 pulse input value, range:–2147483648~2147483647
LatchCount CH2		Channel 2 pulse input latch value, range:–2147483648~2147483647

3.43.4 Configuration parameter definition

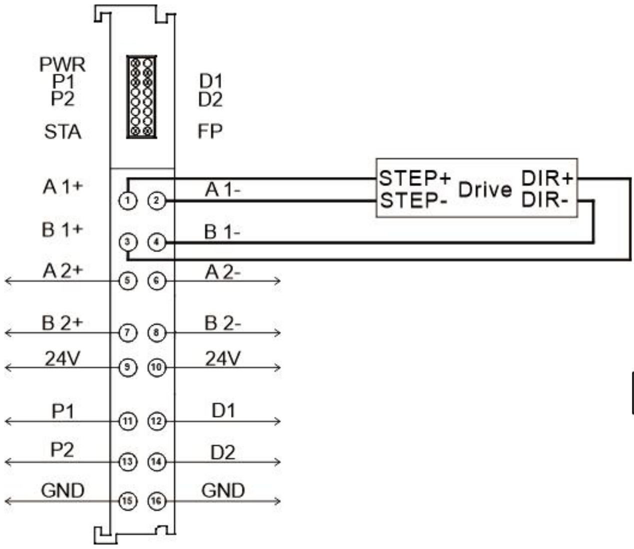
Configuration items	Parameter meaning
Counter Type	0: Line Counter (Linear Count) 1: Ring Counter
Pulse Input Method (input signal type)	0: Phase Differential x4 (quadrature encoding 4 times frequency) 1: Phase Differential x2 (orthogonal encoding 2 times frequency) 2: Phase Differential x1 (orthogonal encoding 1 times frequency) 3: Pulse and Directions
Encoder Count Direction (signal input direction logic)	0:Position Direaction of Phase A (positive logic) 1:Position Direaction of Phase B (negative logic) Positive logic: Orthogonal encoding input, phase A leads phase B by 90 degrees for forward rotation, pulse plus direction input, direction input high effective signal for forward rotation. Negative logic: Orthogonal encoding input, B phase leads A phase by 90 degrees for forward rotation, pulse plus direction input, direction input low effective signal or floating for forward rotation.
Counter Filter A (Input pulse signal filtering configuration)	3:4MHZ 4:1.5MHZ 5:1MHZ 6:800KHZ 7:600KHZ 8:420KHZ 9:315KHZ 10:250KHZ 11:200KHZ 12:160KHZ 13:120KHZ 14:100KHZ 15:75KHZ
Maximum Counter Value (ring count upper limit)	-2147483648~ 2147483647
Minimum Counter Value (Ring Count Lower Limit)	-2147483648~ 2147483647 For example, if the upper and lower limits are set to 5 and -5 respectively in loop mode, the upward count is -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, -5, -4.... The downward count is -5, 4, 3, 2, 1, 0, -1, -2, -3, -4, -5, 4....

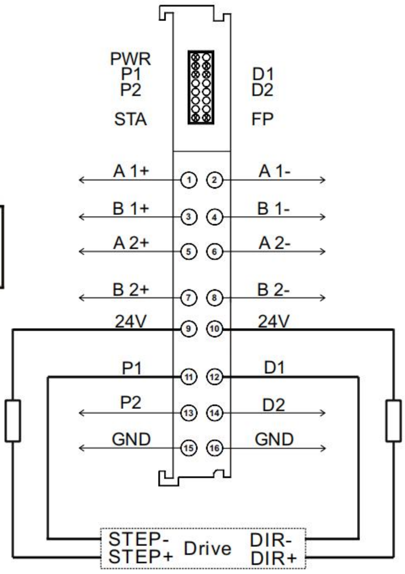
3.44 DF20-M-2PWM: 2-channel pulse output module 24V signal

3.44.1 Technical parameters

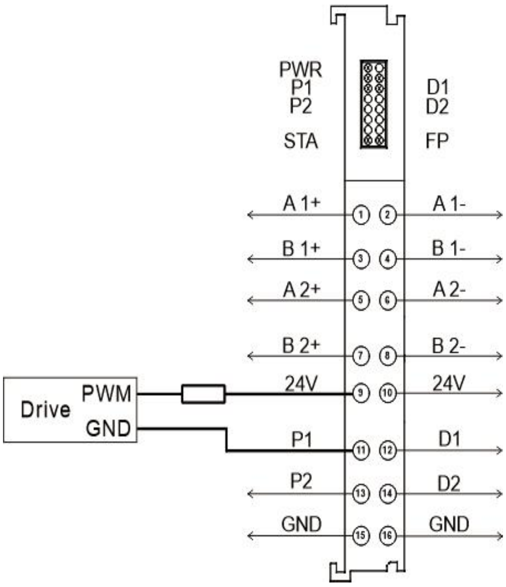
Electrical parameters	
Bus input power rated	DC5V
Bus input power rated	40mA
Terminal output rated	DC24V
Terminal output rated	500mA
Output connection type	2-wire / 4-wire
Number of output channels	2
Output signal type	Pulse+direction/PWM, configurable
Output signal voltage	DC5V
Differential signal output	800HZ~4MHZ
Open drain signal output	800HZ~500KHZ
PWM signal output	20HZ~12KHZ
Open drain output	30mA
Open drain output maximum pull-up voltage	28V
Accuracy	±1 pulse
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25～75℃
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.44.2 Status indicator light and wiring diagram





Pulse plus direction differential output Pulse plus direction open drain output



PWM open-drain output

The status indicator lights are shown in the table below:

LED No	Status and meaning
PWR	On: The module is powered normally
	Off: Module power supply is abnormal
STA	Power-on stage: Green: initialization abnormality; Green off: Initialization is normal
	Running stage: Green flashing: the internal bus is working normally Green off: Internal bus working abnormally
P1~P2	Green flash: Pulse/PWM signal output
	Green off: No signal output
D1~D2	Green: Output forward direction signal
	Green off: Output reverse direction signal or stop
FP	Green: Power input is normal
	Green off: Power input abnormality

3.44.3 Module process data definition

RXPD0			
Name	Type	Size	meaning
Stop bit CH1	BOOL	0.1	1: Channel 1 emergency stop
			0: Channel 1 does not stop suddenly
Jog Enable bit CH1	BOOL	0.1	0->1: Channel 1 starts jog motion
			1->0: Channel 1 stops jog motion
Jog Direction bit CH1	BOOL	0.1	0: Channel 1 jog direction forward
			1: Channel 1 jog direction reverse
Position Enable bit CH1	BOOL	0.1	0->1: Channel 1 starts positioning motion
			1->0: Channel 1 stops positioning motion
Position Clear bit CH1	BOOL	0.1	1: Clear the current position of channel 1
			0: Channel 1 position counts normally
Target Duty Cycle CH1	UINT	2.0	Channel 1 duty cycle setting, 1/1000 resolution.
Target Position or frequency CH1	DINT	4.0	Channel 1 pulse plus direction positioning mode target position setting, or PWM mode frequency setting.
Stop bit CH2	BOOL	0.1	1: Channel 2 emergency stop
			0: Channel 2 does not stop suddenly
Jog Enable bit CH2	BOOL	0.1	0->1: Channel 2 starts jog motion
			1->0: Channel 2 stops jog motion
Jog Direction bit CH2	BOOL	0.1	0: Channel 2 jog direction forward
			1: Channel 2 jog direction reverse
Position Enable bit CH2	BOOL	0.1	0->1: Channel 2 starts positioning motion
			1->0: Channel 2 stops positioning motion
Position Clear bit CH2	BOOL	0.1	1: Clear the current position of channel 2
			0: Channel 2 position counts normally

Target Duty Cycle CH2	UINT	2.0	Channel 2 duty cycle setting, 1/1000 resolution.
Target Position or frequency CH2	DINT	4.0	Channel 2 pulse plus direction positioning mode target position setting, or PWM mode frequency setting.
TXPD0			
Name	Type	Size	meaning
Pulse Fault bit CH1	BOOL	0.1	0: Channel 1 is normal 1: Channel 1 fault
CtrlWord Fault bit CH1	BOOL	0.1	0: Channel 1 process data is normal 1: Channel 1 process data is abnormal
Positioning Complete bit CH1	BOOL	0.1	0: Channel 1 is in signal output state 1: Channel 1 has no signal output status
Config Fault bit CH1	BOOL	0.1	0: Channel 1 configuration data is normal 1: Channel 1 configuration data is abnormal
ActualPosition CH1	DINT	4.0	Actual position or number of PWM outputs of channel 1.
Pulse Fault bit CH2	BOOL	0.1	0: Channel 2 is normal 1: Channel 2 fault
CtrlWord Fault bit CH2	BOOL	0.1	0: Channel 2 process data is normal 1: Channel 2 process data is abnormal
Positioning Complete bit CH2	BOOL	0.1	0: Channel 2 is in signal output state 1: Channel 2 has no signal output status
Config Fault bit CH2	BOOL	0.1	0: Channel 2 configuration data is normal 1: Channel 2 configuration data is abnormal
ActualPosition CH2	DINT	4.0	Actual position or number of PWM outputs of channel 2.

3.44.4 Configuration parameter definition

index	Sub-index	name	Size	Value range	default value	meaning
16#40A0	1	Pulse Mode CH1	2.0	See DTA41A0: Table	0	Channel 1 signal type.
	2	Motion Mode CH1	2.0	See DTB41A0: Table	0	Channel 1 pulse control mode.
	3	Ramp Mode CH1	2.0	See DTC41A0: Table	0	Channel 1 pulse ramp enable.
	4	Direction Mode CH1	2.0	See DTD41A0: Table	0	Channel 1 direction logic.
	5	Signal Type CH1	2.0	See DTE41A0: Table	0	Channel 1 pulse output mode.
	6	Duty Cycle CH1	2.0	See DTF41A0: Table	0	Channel 1 PWM signal duty cycle enable.
	7	PWM Freq Range CH1	2.0	See DTA41B0: Table	3	Channel 1 PWM frequency range.
	8	Startup Freq CH1	4.0	800~4000000	1000	Channel 1 pulse output starting frequency, unit: HZ.
	9	Target Freq CH1	4.0	800~4000000	10000	Channel 1

						pulse output target frequency, unit: HZ.
	10	Ramp Up Time CH1	2.0	10~4096	100	Channel 1 pulse output ramp-up time, in ms.
	11	Ramp Dn Time CH1	2.0	10~4096	100	Channel 1 pulse output downslope time, in ms.
	12	Pulse Mode CH2	2.0	See DTA41A0: Table	0	Channel 2 signal type.
	13	Motion Mode CH2	2.0	See DTB41A0: Table	0	Channel 2 pulse control mode.
	14	Ramp Mode CH2	2.0	See DTC41A0: Table	0	Channel 2 pulse ramp enable.
	15	Direction Mode CH2	2.0	See DTD41A0: Table	0	Channel 2 direction logic.
	16	Signal Type CH2	2.0	See DTE41A0: Table	0	Channel 2 pulse output mode.
	17	Duty Cycle CH2	2.0	See DTF41A0: Table	0	Channel 2 PWM signal duty cycle enable.
	18	PWM Freq Range CH2	2.0	See DTA41B0: Table	3	Channel 1 PWM frequency range.
	19	Startup Freq CH2	4.0	800~4000000	1000	Channel 2 pulse output starting frequency, unit: HZ.
	20	Target Freq CH2	4.0	800~4000000	10000	Channel 2 pulse output target frequency, unit: HZ.
	twenty one	Ramp Up Time CH2	2.0	10~4096	100	Channel 2 pulse output ramp-up time, in ms.
	twenty two	Ramp Dn Time CH2	2.0	10~4096	100	Channel 2 pulse

						output downslope time, in ms.
Note: If the module is inserted in the first card slot after the coupler, the SDO index is 16#40A0. If it is inserted in the second card slot, the SDO index is 16#40A1 and the index offset is 16#01.						

Table DTA41A0:

Sub-index object data	name	meaning
0	Pulse/Dir	Pulse plus direction
1	CW/CCW (Not Supported)	Not supported yet
2	A/B (Not Supported)	Not supported yet
3	PWM	PWM

Table DTB41A0:

Sub-index object data	name	meaning
0	Jog	Jog control
1	RelativePosition	Relative position control
2	AbsolutePosition	Absolute position control

Table DTC41A0:

Sub-index object data	name	meaning
0	Ramp Enable	Open ramp
1	Ramp Disable	Close the ramp

Table DTD41A0:

Sub-index object data	name	meaning
0	Positive	Direction output positive logic
1	Negative	Direction output negative logic

Table DTE41A0:

Sub-index object data	name	meaning
0	OpenDrain	Open-drain output
1	Difference 5V	Differential output

Table DTF41A0:

Sub-index object data	name	meaning
0	Duty cycle enable	Duty cycle adjustment enable
1	Duty cycle disable	Duty cycle adjustment is off, default is 50%

Table DTA41B0:

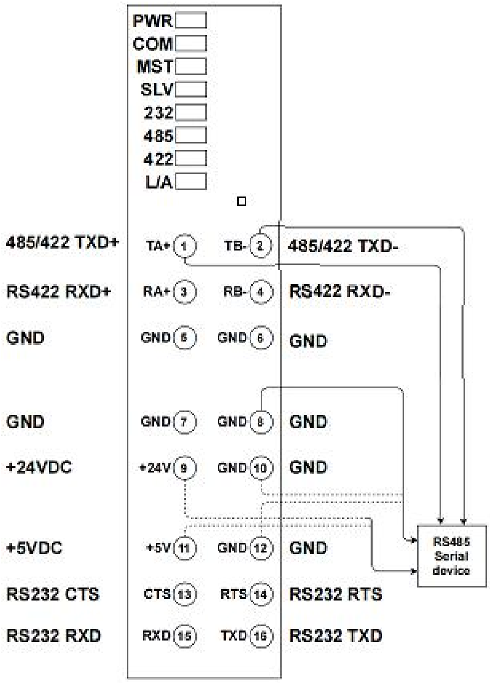
Sub-index object data	name	meaning
0	20Hz~1.2kHz	
1	40Hz~2.4kHz	
2	50Hz~3kHz	
3	100Hz~6kHz	
4	140Hz~8.4kHz	
5	200Hz~12kHz	

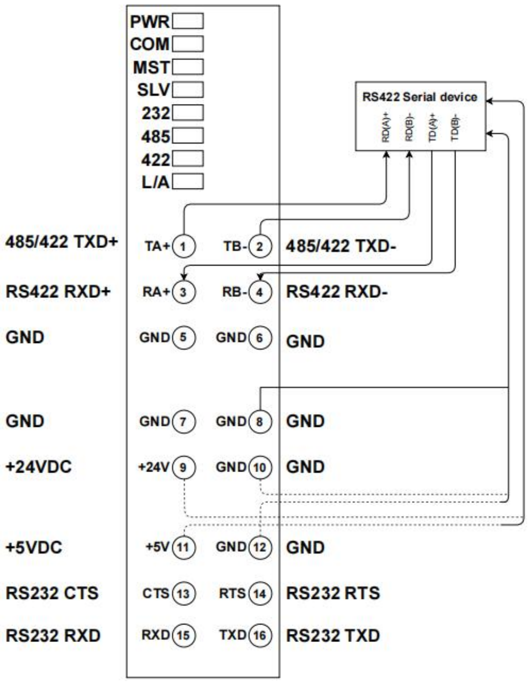
3.45 DF20-M-1COM-232/485/422: Serial communication module

3.45.1 Technical parameters

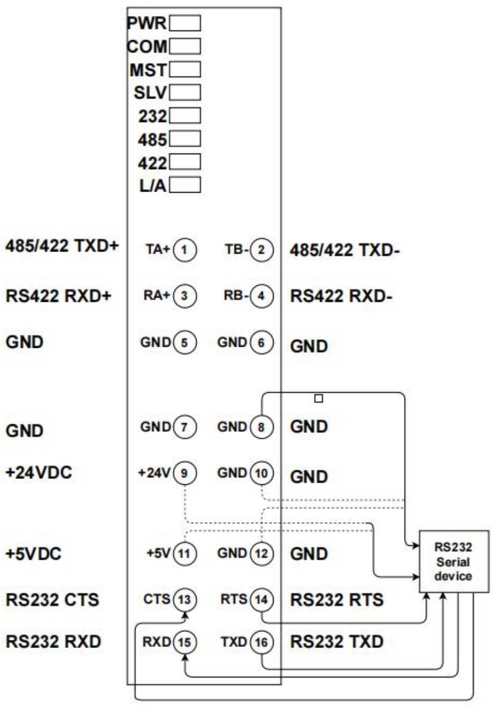
Electrical parameters	
Bus input power rated	DC5V
Bus input power rated	75mA
interface	RS232/RS485/RS422
Number of channels	1 channel
protocol	Modbus RTU/ASCII master and slave modes; free protocol
Baud rate	2400bps - 512000bps
Data bits	7bit/8bit
Check digit	None/Even/Odd
Stop bits	1bit/2bit
Maximum data frame	40 bytes
Power supply for	5V/500mA
Power supply for	24V/500mA
General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25～75℃
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping	2.5mm²
Maximum crimping	AWG14
Minimum crimping	0.2mm²
Minimum crimping	AWG28
Line length	8...9mm

3.45.2 Status indicator light and wiring diagram





RS485 wiring diagram RS422 wiring diagram

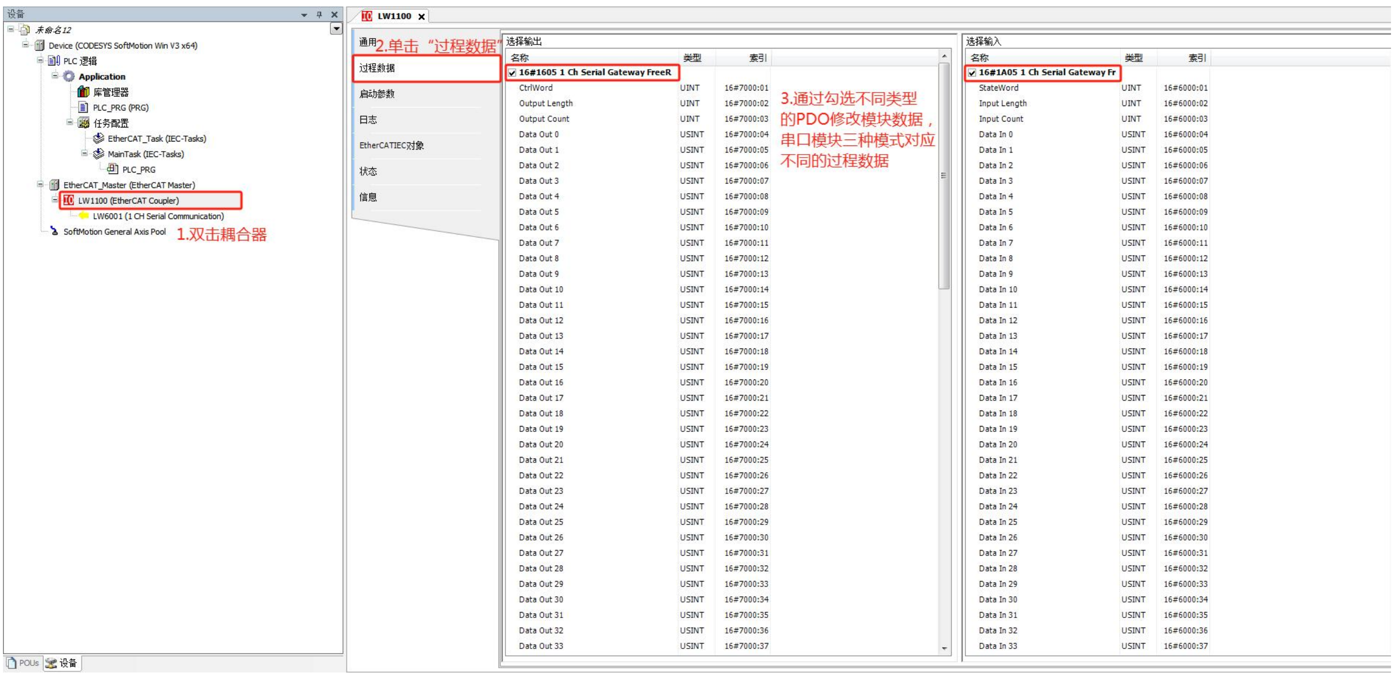


RS232 Wiring Diagram

The status indicator lights are shown in the table below:

LED No	Status and meaning
PWR	When the power supply is normal, the green light is always on.
CUSTOM	In free protocol mode, green is always on
MASTER	In MASTER mode, green is always on
SLAVE	In SLAVE mode, green is always on
RS232	In RS232 mode, green is always on
RS485	In RS485 mode, green is always on
RS422	In RS422 mode, green is always on
L/A	Power-on stage: Green light is on when powered on; Turns off after the internal bus is initialized.
	Operation phase: When the module is operating normally, it flashes green; When the module operates abnormally, the green light goes out.
Tx	Flashing: sending data; Off: no data
Rx	Flashing: receiving data; Off: no data

3.45.3 Module process data definition



Mode Type	Process data (output)	Process data (input)
Free Protocol Mode	1 Ch Serial Gateway FreeRUN RxPDO-Mapping	1 Ch Serial Gateway FreeRUN TxPDO-Mapping
Modbus RTU /ASCII Master	1 Ch Serial Gateway Master RxPDO-Mapping	1 Ch Serial Gateway Master TxPDO-Mapping
Slave Mode	1 Ch Serial Gateway Slave RxPDO-Mapping	1 Ch Serial Gateway Slave TxPDO-Mapping

3.45.3.1 FreeRun process data description

Output Data		
name	**length**	**meaning**
CtrlWord	2Byte	Control Word
OutputLength	2Byte	Send data length
OutputCount	2Byte	Send data sequence number
DataOut 0-39	40Byte	Send data content
Input Data		
name	**length**	**meaning**
StateWord	2Byte	Status word
InputLength	2Byte	Receive data length
InputCount	2Byte	Receive data sequence number
DataIn 0-39	40Byte	Receive data content

3.45.3.2 Modbus RTU Master Process Data Description

Output Data		
name	**length**	**meaning**
CtrlWord	2Byte	Control Word
Reserve	2Byte	reserve
Select Channel	2Byte	Channel operation selection
DataOut 0-19	40Byte	Send data content
Input Data		
name	**length**	**meaning**
StateWord	2Byte	Status word
ReadDataLength	2Byte	Receive data length
ActiveChannel	2Byte	Current active channels
DataIn 0-19	40Byte	Receive data content

3.45.3.3 Modbus RTU Slave Process Data Description

Output Data		
name	**length**	**meaning**
CtrlWord	2byte	Control Word
WriteCMD	1byte	Write operation commands to the slave station
WriteRegAddr	1byte	Write register address to slave station
WriteRegNum	2byte	Write register quantity to slave
ReadCMD	1byte	Read operation commands from the slave station
ReadRegAddr	1byte	Read register address from slave
ReadRegNum	2byte	Read the number of registers from the slave
DataOut0-17	36byte	Send data area
Input Data		
name	**length**	**meaning**
StateWord	2byte	Status word
Read Data Length	1byte	Readback data length Byte
Reserve 1	1byte	reserve
SlaveRegNum	2byte	Readback register quantity
DataIn0-19	40byte	Receive data area

3.45.4 Configuration parameter definition

General parameter configuration

Module parameters	Parameter meaning	Initial Value
OperationMode	0: Custom free protocol 1: Modbus RTU Master 2: Modbus RTU Slave	0:Custom
Interface Type Interfance	0:RS232 Flow OFF 1:RS232 Flow ON 2:RS485 3:RS422	2: RS485
Check digit Parity	0:None 1:Odd 2: Even	0:None
Data bits	0:8 bits	0:8 bits

Data bits	1:7 bits	
Stop bits Stop bit	0:1Bit 1:2Bits	0:1Bit
Baud rate Baudrate	300bps-512000bps (0-17 enumeration value setting)	11:115200
Custom Baudrate	Custom baud rate (valid when not 0)	0

FreeRun parameter configuration

FreeRun Interval time	The frame receiving interval in transparent transmission mode, in ms	1

Modbus RTU Master Parameter Configuration

Module parameters	Parameter meaning	Initial value
Slave Address Slave ID	0: Disable the channel 1-127: Modbus RTU Slave ID (slave address)	0
Trigger Mode EventTrig	0: Polling mode, write data to the Slave in a loop 1: Write data to the slave only when the data content changes	0
Disconnection Action LostAction	0: Keep the last output data 1: Clear output data	0
Function code Operation Code	01:READ COILS 02:READ DISCRETE INPUTS (read discrete inputs) 03:READ HOLDING REGISTERS (read holding registers) 04:READ INPUT REGISTERS (read input registers) 05:WRITE SINGLE COIL (write single coil) 06:WRITE SINGLE HOLDING REGISTER (write single register) 15:WRITE MULTIPLE COILS (write multiple coils) 16:WRITE MULTIPLE HOLDING REGISTERS (write multiple registers)	16
Register addressRegistorAddr	Register address span range: 65535 (e.g. 0-65535) Coil address span range: 65535 (e.g. 0-65535)	0
Register number	Register quantity range: 0-20 (40 bytes)	0

RegistorNum	Coil quantity range: 0-320 (40 bytes)	
Polling period Poll Time	Master station polling slave station cycle 0-5000ms	500
Slave timeout RespTimeout	When the master station polls the slave station, the slave station's response timeout 0-65535	1000
Interval time PollDelay	When the Master station polls the slave station, the polling delay time between the two slave stations 0 - 5000ms	100

Modbus RTU Slave Parameter Configuration

Slave ID	Slave ID	0
Slave Response Delay	Slave station response delay time, unit: ms	0

Module Status Description

Normal state value	Status Name	meaning
16#0000	OP_SUCCESS	Configuration or write operation successful
16#0001	DATA_FULL	Data has been updated and can be read
16#0002	WRITE_IDLE	Write idle, writable
16#0003	DATA_EMPTY	Read idle, receive data not updated
Error Status Value	**Status Name**	**meaning**
16#E0A1	WRITE_BUSY	Write busy, can't write
16#E0A2	DATA_LARGE	Data length exceeds limit
16#E0A3	CMD_ERR	Command Error
16#E0A4	PARA_ERR	Configuration parameter error
16#E0A5	CHECK_ERR	Verification Error
16#E0A6	SLAVE_NOEXIT	The slave device does not exist
16#E0A7	PACK_LOSS	Packet Loss
16#E0A8	OVER_FLOW	Data overflow

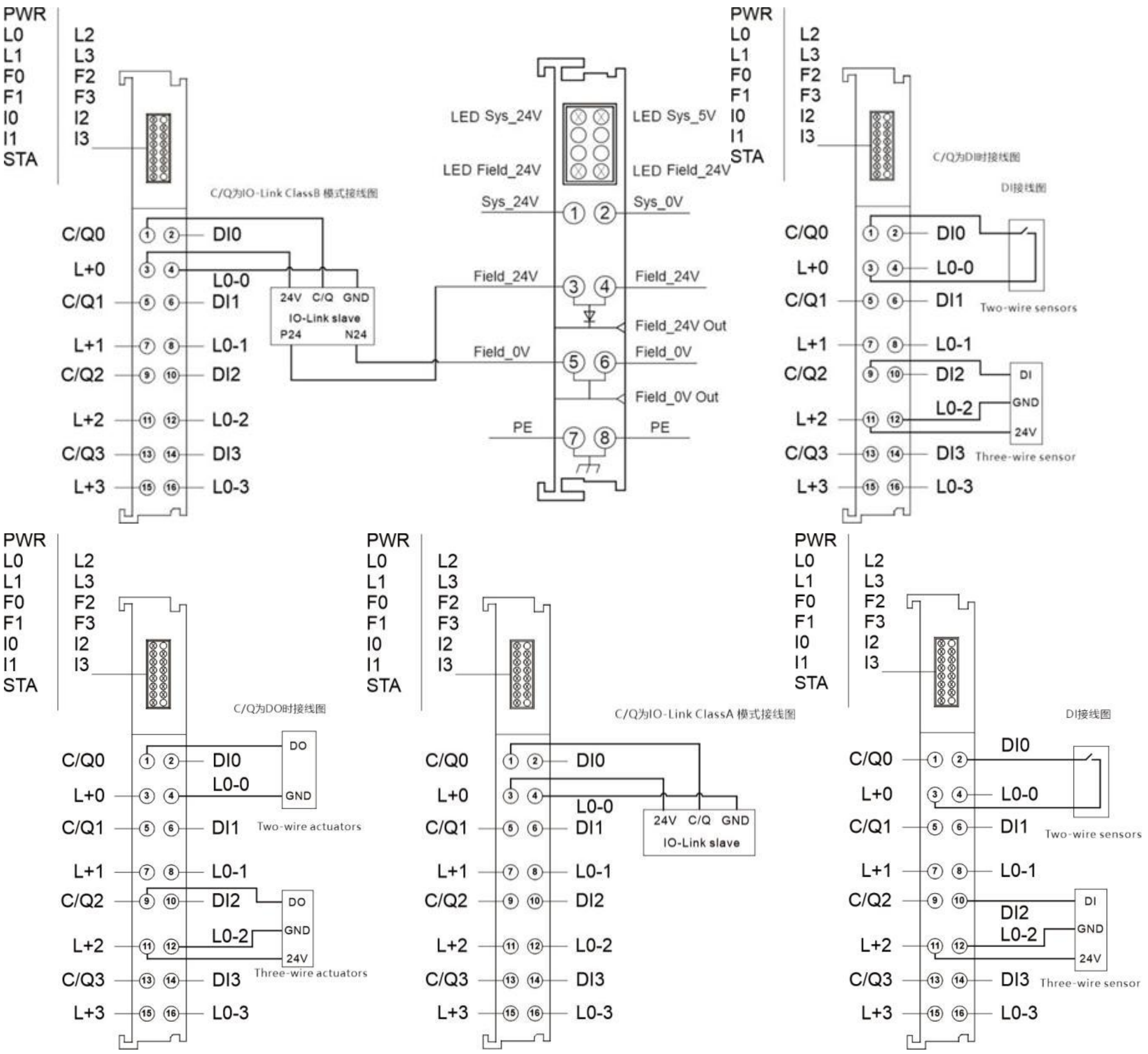
3.46 DF20-M-4IOL: 4-channel IO-Link communication module

3.46.1 Technical parameters

Electrical parameters	
Common digital port input parameters	
Number of channels	IEC 61131-2: Type 1 PNP
Input voltage range, "0" signal	-0.3 V DC ... 8 V DC
Input voltage range, "1" signal	12.9 V DC ... 24.3 V DC
IO-LINK port input parameters	
IO-LINK Mode	
Number of ports	4
Connection	Push-in connection
Connecting the system	3-wire/5-wire
Port Type	Category A
Connect the cables	The length should not exceed 20 m. If there is a lot of interference, it is recommended to use RVVP shielded cables and ground the shielding layer according to the site conditions.
Communication rate	COM1:4.8kbit/s COM2:38.4kbit/s
Digital input mode	
Input Description	IO-Link port in digital input (DI) mode
Input quantity	Max 4
Input Type	IEC 61131-2 :Type 1 PNP
Connection	Push-in connection
Connecting the system	3 lines
Rated input voltage	24 V DC
Input voltage range, "0" signal	-0.3 V DC ... 8 V DC
Input voltage range, "1" signal	12.9 V DC ... 24.3 V DC
Digital output mode	
Output Description	IO-Link port in digital output (DO) mode
Number of outputs	Max 4
Output Type	IEC 61131-2 :Type 0.5 PNP
Connection	Push-in connection
Connecting the system	2, 3 lines
Rated output voltage	24 V DC
Rated current per channel	500 mA
Basic parameters	
Coupler Support Quantity	Max 6

General parameters	
Vibration Testing	1g, in accordance with IEC 60068-2-6
Shock Test	15g, compliant with IEC 60068-2-27
Electromagnetic compatibility	Compliant with EN 61000-4standard
Protection level	IP20
Operating temperature	-25～75℃
Storage temperature	-40°C~+85°C
Relative humidity	5～95%RH (no condensation)
Installation	35mm rail mounting
Dimensions	100mm × 12mm × 67mm
Maximum crimping area of	2.5mm²
Maximum crimping area of	AWG14
Minimum crimping area of	0.2mm²
Minimum crimping area for	AWG28
Line length	8...9mm

3.46.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

<table>
<tr><th>LED No</th><th colspan="2">Status and meaning</th></tr>
<tr><td rowspan="2">PWR</td><td colspan="2">On: Internal bus power supply is normal</td></tr>
<tr><td colspan="2">Off: Internal bus power supply abnormality</td></tr>
<tr><td rowspan="4">STA</td><td rowspan="2">Power-on stage:</td><td>Green: Module initialization error</td></tr>
<tr><td>Green off: Module initialization is normal</td></tr>
<tr><td rowspan="2">Operation phase:</td><td>Green flash: The internal bus of the module is working normally</td></tr>
<tr><td>Green off: The internal bus of the module is working abnormally</td></tr>
<tr><td rowspan="3">L0~L3</td><td colspan="2">Green: The corresponding channel IO-LINK is communicating normally</td></tr>
<tr><td colspan="2">Green flash: No IO-LINK slave is connected to the corresponding channel</td></tr>
<tr><td colspan="2">Green off: The corresponding channel is not configured as IO-LINK mode</td></tr>
<tr><td rowspan="2">F0~F3</td><td colspan="2">Red: The corresponding channel reports an error</td></tr>
<tr><td colspan="2">Red off: No error reported on the corresponding channel</td></tr>
<tr><td rowspan="2">I0~I3</td><td colspan="2">Green: DI input valid signal</td></tr>
<tr><td colspan="2">Green off: DI has no valid input signal</td></tr>
</table>

3.46.3 Module process data definition

RXPDO			
SubIndex	Name	Size	meaning
1	Port0 Command	2.0	Port 0 opcodes
2	Port0 reserve1	0.1	Port 0 reserved word 1
3	Port0 C/Q DO	0.1	Port 0 is configured as DO mode, C/Q pin output control bit, 0: C/Q pin outputs 0V signal, 1: C/Q pin outputs 24V signal
4	Port0 Valid	0.1	Port 0 output validity
5	Port0 reserve2	0.5	Port 0 reserved word 2
6	Port0 Transmit Len	1.0	Port 0 sends data length
7	Port0 data0	1.0	Port 0 sends data
8	Port0 data1	1.0	Port 0 sends data
9	Port0 data2	1.0	Port 0 sends data
10	Port0 data3	1.0	Port 0 sends data
11	Port0 data4	1.0	Port 0 sends data
12	Port0 data5	1.0	Port 0 sends data
13	Port0 data6	1.0	Port 0 sends data

14	Port0 data7	1.0	Port 0 sends data
15	Port0 data8	1.0	Port 0 sends data
16	Port0 data9	1.0	Port 0 sends data
17	Port0 data10	1.0	Port 0 sends data
18	Port0 data11	1.0	Port 0 sends data
19	Port0 data12	1.0	Port 0 sends data
20	Port0 data13	1.0	Port 0 sends data
twenty one	Port0 data14	1.0	Port 0 sends data
twenty two	Port0 data15	1.0	Port 0 sends data
twenty three	Port0 data16	1.0	Port 0 sends data
twenty four	Port0 data17	1.0	Port 0 sends data
25	Port0 data18	1.0	Port 0 sends data
26	Port0 data19	1.0	Port 0 sends data
27	Port1 Command	2.0	Port 1 Opcode
28	Port1 reserve1	0.1	Port 1 reserved word 1
29	Port1 C/Q DO	0.1	Port 1 is configured as DO mode, C/Q pin output control bit, 0: C/Q pin outputs 0V signal, 1: C/Q pin outputs 24V signal
30	Port1 Valid	0.1	Port 1 output validity
31	Port1 reserve2	0.5	Port 1 reserved word 2
32	Port1 Transmit Len	1.0	Port 1 sends data length
33	Port1 data0	1.0	Port 1 sends data
34	Port1 data1	1.0	Port 1 sends data
35	Port1 data2	1.0	Port 1 sends data
36	Port1 data3	1.0	Port 1 sends data
37	Port1 data4	1.0	Port 1 sends data
38	Port1 data5	1.0	Port 1 sends data
39	Port1 data6	1.0	Port 1 sends data
40	Port1 data7	1.0	Port 1 sends data
41	Port1 data8	1.0	Port 1 sends data
42	Port1 data9	1.0	Port 1 sends data
43	Port1 data10	1.0	Port 1 sends data
44	Port1 data11	1.0	Port 1 sends data
45	Port1 data12	1.0	Port 1 sends data
46	Port1 data13	1.0	Port 1 sends data
47	Port1 data14	1.0	Port 1 sends data
48	Port1 data15	1.0	Port 1 sends data
49	Port1 data16	1.0	Port 1 sends data
50	Port1 data17	1.0	Port 1 sends data
51	Port1 data18	1.0	Port 1 sends data

52	Port1 data19	1.0	Port 1 sends data
53	Port2 Command	2.0	Port 2 Opcodes
54	Port2 reserve1	0.1	Port 2 reserved word 1
55	Port2 C/Q DO	0.1	Port 2 is configured as DO mode, C/Q pin output control bit, 0: C/Q pin outputs 0V signal, 1: C/Q pin outputs 24V signal
56	Port2 Valid	0.1	Port 2 Output Validity
57	Port2 reserve2	0.5	Port 2 reserved word 2
58	Port2 Transmit Len	1.0	Port 2 sends data length
59	Port2 data0	1.0	Port 2 sends data
60	Port2 data1	1.0	Port 2 sends data
61	Port2 data2	1.0	Port 2 sends data
62	Port2 data3	1.0	Port 2 sends data
63	Port2 data4	1.0	Port 2 sends data
64	Port2 data5	1.0	Port 2 sends data
65	Port2 data6	1.0	Port 2 sends data
66	Port2 data7	1.0	Port 2 sends data
67	Port2 data8	1.0	Port 2 sends data
68	Port2 data9	1.0	Port 2 sends data
69	Port2 data10	1.0	Port 2 sends data
70	Port2 data11	1.0	Port 2 sends data
71	Port2 data12	1.0	Port 2 sends data
72	Port2 data13	1.0	Port 2 sends data
73	Port2 data14	1.0	Port 2 sends data
74	Port2 data15	1.0	Port 2 sends data
75	Port2 data16	1.0	Port 2 sends data
76	Port2 data17	1.0	Port 2 sends data
77	Port2 data18	1.0	Port 2 sends data
78	Port2 data19	1.0	Port 2 sends data
79	Port3 Command	2.0	Port 3 Opcodes
80	Port3 reserve1	0.1	Port 3 reserved word 1
81	Port3 C/Q DO	0.1	Port 3 is configured as DO mode, C/Q pin output control bit, 0: C/Q pin outputs 0V signal, 1: C/Q pin outputs 24V signal
82	Port3 Valid	0.1	Port 3 output validity
83	Port3 reserve2	0.5	Port 3 reserved word 2
84	Port3 Transmit Len	1.0	Port 3 sends data length
85	Port3 data0	1.0	Port 3 sends data
86	Port3 data1	1.0	Port 3 sends data
87	Port3 data2	1.0	Port 3 sends data

88	Port3 data3	1.0	Port 3 sends data
89	Port3 data4	1.0	Port 3 sends data
90	Port3 data5	1.0	Port 3 sends data
91	Port3 data6	1.0	Port 3 sends data
92	Port3 data7	1.0	Port 3 sends data
93	Port3 data8	1.0	Port 3 sends data
94	Port3 data9	1.0	Port 3 sends data
95	Port3 data10	1.0	Port 3 sends data
96	Port3 data11	1.0	Port 3 sends data
97	Port3 data12	1.0	Port 3 sends data
98	Port3 data13	1.0	Port 3 sends data
99	Port3 data14	1.0	Port 3 sends data
100	Port3 data15	1.0	Port 3 sends data
101	Port3 data16	1.0	Port 3 sends data
102	Port3 data17	1.0	Port 3 sends data
103	Port3 data18	1.0	Port 3 sends data
104	Port3 data19	1.0	Port 3 sends data

TXPDO			
SubIndex	Name	Size	meaning
1	Port0 Event Code	2.0	The most recent event code that occurred on port 0
2	Port0 Device Err	0.1	Port 0 error status
3	Port0 I/Q DI	0.1	Port 0 I/Q pin input status
4	Port0 C/Q DI	0.1	Port 0 C/Q pin input status when C/Q is in DI mode
5	Port0 Valid	0.1	Port 0 input data validity
6	Port0 reserve	0.4	Port 0 reserved words
7	Port0 Receive Len	1.0	The length of data received on port 0
8	Port0 data0	1.0	Port 0 receives data
9	Port0 data1	1.0	Port 0 receives data
10	Port0 data2	1.0	Port 0 receives data
11	Port0 data3	1.0	Port 0 receives data
12	Port0 data4	1.0	Port 0 receives data
13	Port0 data5	1.0	Port 0 receives data
14	Port0 data6	1.0	Port 0 receives data
15	Port0 data7	1.0	Port 0 receives data
16	Port0 data8	1.0	Port 0 receives data
17	Port0 data9	1.0	Port 0 receives data
18	Port0 data10	1.0	Port 0 receives data

19	Port0 data11	1.0	Port 0 receives data
20	Port0 data12	1.0	Port 0 receives data
twenty one	Port0 data13	1.0	Port 0 receives data
twenty two	Port0 data14	1.0	Port 0 receives data
twenty three	Port0 data15	1.0	Port 0 receives data
twenty four	Port0 data16	1.0	Port 0 receives data
25	Port0 data17	1.0	Port 0 receives data
26	Port0 data18	1.0	Port 0 receives data
27	Port0 data19	1.0	Port 0 receives data
28	Port1 Event Code	2.0	The most recent event code that occurred on port 1
29	Port1 Device Err	0.1	Port 1 error status
30	Port1 I/Q DI	0.1	Port 1I/Q pin input status
31	Port1 C/Q DI	0.1	Port 1 C/Q pin input status when C/Q is in DI mode
32	Port1 Valid	0.1	Port 1 input data validity
33	Port1 reserve	0.4	Port 1 reserved words
34	Port1 Receive Len	1.0	The length of data received by port 1
35	Port1 data0	1.0	Port 1 receives data
36	Port1 data1	1.0	Port 1 receives data
37	Port1 data2	1.0	Port 1 receives data
38	Port1 data3	1.0	Port 1 receives data
39	Port1 data4	1.0	Port 1 receives data
40	Port1 data5	1.0	Port 1 receives data
41	Port1 data6	1.0	Port 1 receives data
42	Port1 data7	1.0	Port 1 receives data
43	Port1 data8	1.0	Port 1 receives data
44	Port1 data9	1.0	Port 1 receives data
45	Port1 data10	1.0	Port 1 receives data
46	Port1 data11	1.0	Port 1 receives data
47	Port1 data12	1.0	Port 1 receives data
48	Port1 data13	1.0	Port 1 receives data
49	Port1 data14	1.0	Port 1 receives data
50	Port1 data15	1.0	Port 1 receives data
51	Port1 data16	1.0	Port 1 receives data
52	Port1 data17	1.0	Port 1 receives data
53	Port1 data18	1.0	Port 1 receives data
54	Port1 data19	1.0	Port 1 receives data
55	Port2 Event Code	2.0	The most recent event code that occurred on port 2

56	Port2 Device Err	0.1	Port 2 error status
57	Port2 I/Q DI	0.1	Port 2 I/Q pin input status
58	Port2 C/Q DI	0.1	Port 2 C/Q pin input status when C/Q is in DI mode
59	Port2 Valid	0.1	Port 2 input data validity
60	Port2 reserve	0.4	Port 2 reserved words
61	Port2 Receive Len	1.0	The length of data received by port 2
62	Port2 data0	1.0	Port 2 receives data
63	Port2 data1	1.0	Port 2 receives data
64	Port2 data2	1.0	Port 2 receives data
65	Port2 data3	1.0	Port 2 receives data
66	Port2 data4	1.0	Port 2 receives data
67	Port2 data5	1.0	Port 2 receives data
68	Port2 data6	1.0	Port 2 receives data
69	Port2 data7	1.0	Port 2 receives data
70	Port2 data8	1.0	Port 2 receives data
71	Port2 data9	1.0	Port 2 receives data
72	Port2 data10	1.0	Port 2 receives data
73	Port2 data11	1.0	Port 2 receives data
74	Port2 data12	1.0	Port 2 receives data
75	Port2 data13	1.0	Port 2 receives data
76	Port2 data14	1.0	Port 2 receives data
77	Port2 data15	1.0	Port 2 receives data
78	Port2 data16	1.0	Port 2 receives data
79	Port2 data17	1.0	Port 2 receives data
80	Port2 data18	1.0	Port 2 receives data
81	Port2 data19	1.0	Port 2 receives data
82	Port3 Event Code	2.0	The most recent event code that occurred on port 3
83	Port3 Device Err	0.1	Port 3 error status
84	Port3 I/Q DI	0.1	Port 3I/Q pin input status
85	Port3 C/Q DI	0.1	Port 3 C/Q pin input status when C/Q is in DI mode
86	Port3 Valid	0.1	Port 3 input data validity
87	Port3 reserve	0.4	Port 3 reserved words
88	Port3 Receive Len	1.0	The length of data received on port 3
89	Port3 data0	1.0	Port 3 receives data
90	Port3 data1	1.0	Port 3 receives data
91	Port3 data2	1.0	Port 3 receives data
92	Port3 data3	1.0	Port 3 receives data

93	Port3 data4	1.0	Port 3 receives data
94	Port3 data5	1.0	Port 3 receives data
95	Port3 data6	1.0	Port 3 receives data
96	Port3 data7	1.0	Port 3 receives data
97	Port3 data8	1.0	Port 3 receives data
98	Port3 data9	1.0	Port 3 receives data
99	Port3 data10	1.0	Port 3 receives data
100	Port3 data11	1.0	Port 3 receives data
101	Port3 data12	1.0	Port 3 receives data
102	Port3 data13	1.0	Port 3 receives data
103	Port3 data14	1.0	Port 3 receives data
104	Port3 data15	1.0	Port 3 receives data
105	Port3 data16	1.0	Port 3 receives data
106	Port3 data17	1.0	Port 3 receives data
107	Port3 data18	1.0	Port 3 receives data
108	Port3 data19	1.0	Port 3 receives data

Port event code:

Event Code	illustrate
0x1800	IO-LINK slave is offline, check the slave connection
0x1801	Wrong startup parameters
0x1802	VendorID does not match
0x1803	DeviceID does not match
0x1804	C/Q short circuit
0x1805	PHY chip overheating
0x1806	L+ L- short circuit
0x1807	L+ overcurrent
0x1808	Device event overflow
0x1809	Backup inconsistent, memory out of range
0x180A	Backup inconsistent, identity verification error
0x180B	Backup inconsistency, non-specific error with data storage
0x180C	Backup inconsistent, upload error
0x180D	Parameters are inconsistent, download failure
0x180E	P24 (Class B) missing or overvoltage
0x180F	Short circuit at P24 (Class B), check wire connections
0x1810	I/Q check line has short circuit
0x1811	C/Q is short-circuited when used as digital output

0x1812	I/Q Overcurrent
0x1813	C/Q overcurrent when used as digital output
0x4000	Slave over temperature
0x5000	Slave hardware failure
0x5100	Slave power failure
0x5101	The slave fuse is blown
0x6320	Slave parameter error
0x6321	Slave parameter missing
other	View slave manual

Port operation code:

Command	illustrate
0x00	Normally obtain the port event code
0x01	Clear port event codes
other	reserve

3.46.4 Configuration parameter definition

The SDO index is 16#4260 and the SDO offset of the slot is 16#0001.

Sub-index	Configuration items	Parameter Description	default value
1	Port0 Operating Mode	0:disable 1:IO-LINK 2:DI 3:DO	1
2	Port0 Cycle Mode	0:Free Running 1:Fixed Time 2:Message sync (not supported yet)	0
3	Port0 Cycle Time	3.2ms~132.8ms (This parameter is only effective when Cycle Mode is Fixed Time)	3.2ms
4	Port0 Validation Mode	0:disable 1:compatible 2:identical (not supported yet)	0
5	Port0 Parameter Server	0:disable 1:BackUp/Restore 2:Restore	0
6	Port0 VendorID	Vendor ID (unsigned 16 bits)	0
7	Port0 DeviceID	Device ID (unsigned 32 bits)	0
8	Port0 ISDU Down Load Enable	0:Disable 1:Enable (ISDU download enable bit)	0
9	Port0 ISDU Index	ISDU index (unsigned 16 bits)	0
10	Port0 ISDU SubIndex	ISDU subindex (unsigned 8 bits)	0
11	Port0 ISDU Length	ISDU data length to be written (0~8)	0
12	Port0 ISDU data0		0
13	Port0 ISDU data1		0
14	Port0 ISDU data2		0

15	Port0 ISDU data3		0
16	Port0 ISDU data4		0
17	Port0 ISDU data5		0
18	Port0 ISDU data6		0
19	Port0 ISDU data7		0
20	Port1 Operating Mode	0:disable 1:IO-LINK 2:DI 3:DO	1
twenty one	Port1 Cycle Mode	0:Free Running 1:Fixed Time 2:Message sync (not supported yet)	0
twenty two	Port1 Cycle Time	3.2ms~132.8ms (This parameter is only effective when Cycle Mode is Fixed Time)	3.2ms
twenty three	Port1 Validation Mode	0:disable 1:compatible 2:identical (not supported yet)	0
twenty four	Port1 Parameter Server	0:disable 1:BackUp/Restore 2:Restore	0
25	Port1 VendorID	Vendor ID (unsigned 16 bits)	0
26	Port1 DeviceID	Device ID (unsigned 32 bits)	0
27	Port1 ISDU Down Load Enable	0: Disable 1: Enable (ISDU download enable bit)	0
28	Port1 ISDU Index	ISDU index (unsigned 16 bits)	0
29	Port1 ISDU SubIndex	ISDU subindex (unsigned 8 bits)	0
30	Port1 ISDU Length	ISDU data length to be written (0~8)	0
31	Port1 ISDU data0		0
32	Port1 ISDU data1		0
33	Port1 ISDU data2		0
34	Port1 ISDU data3		0
35	Port1 ISDU data4		0
36	Port1 ISDU data5		0
37	Port1 ISDU data6		0
38	Port1 ISDU data7		0
39	Port2 Operating Mode	0:disable 1:IO-LINK 2:DI 3:DO	1
40	Port2 Cycle Mode	0:Free Running 1:Fixed Time 2:Message sync (not supported yet)	0
41	Port2 Cycle Time	3.2ms~132.8ms (This parameter is only effective when Cycle Mode is Fixed Time)	3.2ms
42	Port2 Validation Mode	0:disable 1:compatible 2:identical (not supported yet)	0
43	Port2 Parameter Server	0:disable 1:BackUp/Restore	0

		2:Restore	
44	Port2 VendorID	Vendor ID (unsigned 16 bits)	0
45	Port2 DeviceID	Device ID (unsigned 32 bits)	0
46	Port2 ISDU Down Load Enable	0: Disable 1: Enable (ISDU download enable bit)	0
47	Port2 ISDU Index	ISDU index (unsigned 16 bits)	0
48	Port2 ISDU SubIndex	ISDU subindex (unsigned 8 bits)	0
49	Port2 ISDU Length	ISDU data length to be written (0~8)	0
50	Port2 ISDU data0		0
51	Port2 ISDU data1		0
52	Port2 ISDU data2		0
53	Port2 ISDU data3		0
54	Port2 ISDU data4		0
55	Port2 ISDU data5		0
56	Port2 ISDU data6		0
57	Port2 ISDU data7		0
58	Port3 Operating Mode	0:disable 1:IO-LINK 2:DI 3:DO	1
59	Port3 Cycle Mode	0:Free Running 1:Fixed Time 2:Message sync (not supported yet)	0
60	Port3 Cycle Time	3.2ms~132.8ms (This parameter is only effective when Cycle Mode is Fixed Time)	3.2ms
61	Port3 Validation Mode	0:disable 1:compatible 2:identical (not supported yet)	0
62	Port3 Parameter Server	0:disable 1:BackUp/Restore 2:Restore	0
63	Port3 VendorID	Vendor ID (unsigned 16 bits)	0
64	Port3 DeviceID	Device ID (unsigned 32 bits)	0
65	Port3 ISDU Down Load Enable	0: Disable 1: Enable (ISDU download enable bit)	0
66	Port3 ISDU Index	ISDU index (unsigned 16 bits)	0
67	Port3 ISDU SubIndex	ISDU subindex (unsigned 8 bits)	0
68	Port3 ISDU Length	ISDU data length to be written (0~8)	0
69	Port3 ISDU data0		0
70	Port3 ISDU data1		0
71	Port3 ISDU data2		0
72	Port3 ISDU data3		0
73	Port3 ISDU data4		0
74	Port3 ISDU data5		0

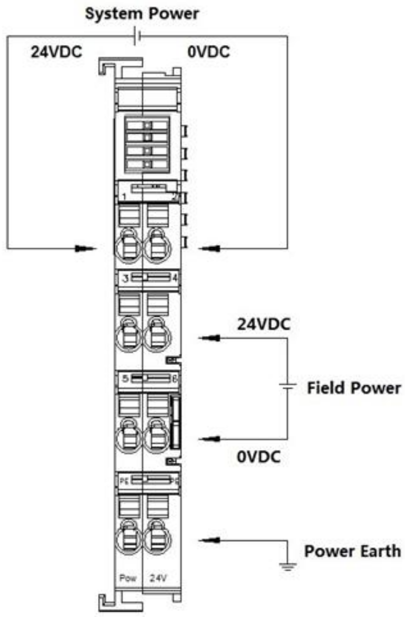
75	Port3 ISDU data6		0
76	Port3 ISDU data7		0

3.47 DF20-M-DC-UD-5: Power module

3.47.1 Technical parameters

Electrical parameters		
System Power	Power Input	24V DC (18~36V)
	Power Output	5V DC/2A
Common power supply	Power Input	24V DC (±20%)
	Rated current	8A
General parameters		
Vibration Testing	1g, in accordance with IEC 60068-2-6	
Shock Test	15g, compliant with IEC 60068-2-27	
Electromagnetic compatibility	Compliant with EN 61000-4standard	
Protection level	IP20	
Operating temperature	-25～75℃	
Storage temperature	-40°C~+85°C	
Relative humidity	5～95%RH (no condensation)	
Installation	35mm rail mounting	
Dimensions	100mm × 12mm × 67mm	
Maximum crimping area of	2.5mm²	
Maximum crimping area of	AWG14	
Minimum crimping area of	0.2mm²	
Minimum crimping area for	AWG28	
Line length	8...9mm	

3.47.2 Status indicator light and wiring diagram



The status indicator lights are shown in the table below:

LED No	Status and meaning
LED Sys-24V	Off: The system power supply 24V input is disconnected
	On: The system power supply 24V input is normal
LED Sys-5V	Off: System power supply 5V output is disconnected
	On: The system power supply 5V output is normal
LED Field-24V	Off: Load power supply 24V input is disconnected
	On: Load power supply 24V input is normal
LED Field-24V	Off: Load power supply 24V output is disconnected
	On: Load power supply 24V output is normal

4 Software Configuration Instructions

This chapter specifically introduces the use of the adapter DF20-C-EC using TwinCAT3 from Beckhoff, Sysmac Studio from Omron, and CODESYS as configuration software.

4.1 Application in CODESYS software environment

- As shown in Figure 4-1-1, first find the DF20-C-EC EtherCAT Module V3i7i0_240904_1321_B device description provided by the manufacturer.

Double-click the CoDeSys icon to start the software, click "Tools", select "Device Reposity", and click "Install" to install the device.

Figure 4-1-1

- Set the IP address of the computer and the IP address of the PLC, and ensure that they are in the same network segment.
- In the newly created project, right-click "Device" in the device tree and select "Add Device". Select EtherCAT in the pop-up device.

Main station.

- As shown in Figure 4-1-2, select the EtherCAT master in the device view, right-click and select "Add Device".

In the dialog box, select Add EtherCAT Slave: Select "All Suppliers" for Supplier, and select "EtherCAT" -> "Slave" -> "EtherCAT Coupler" for Fieldbus.

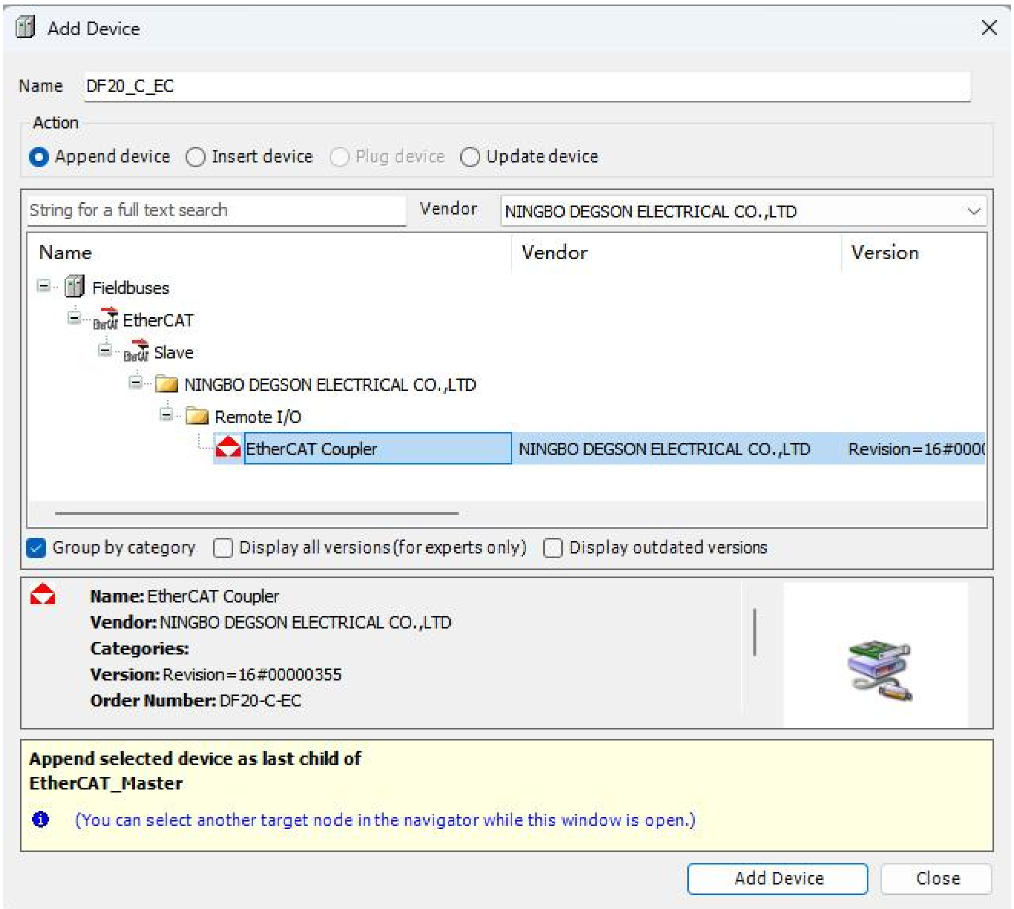


Figure 4-1-2

- As shown in Figure 4-1-3, users can click Edit Module Configuration to add modules to the project based on the actual topology.

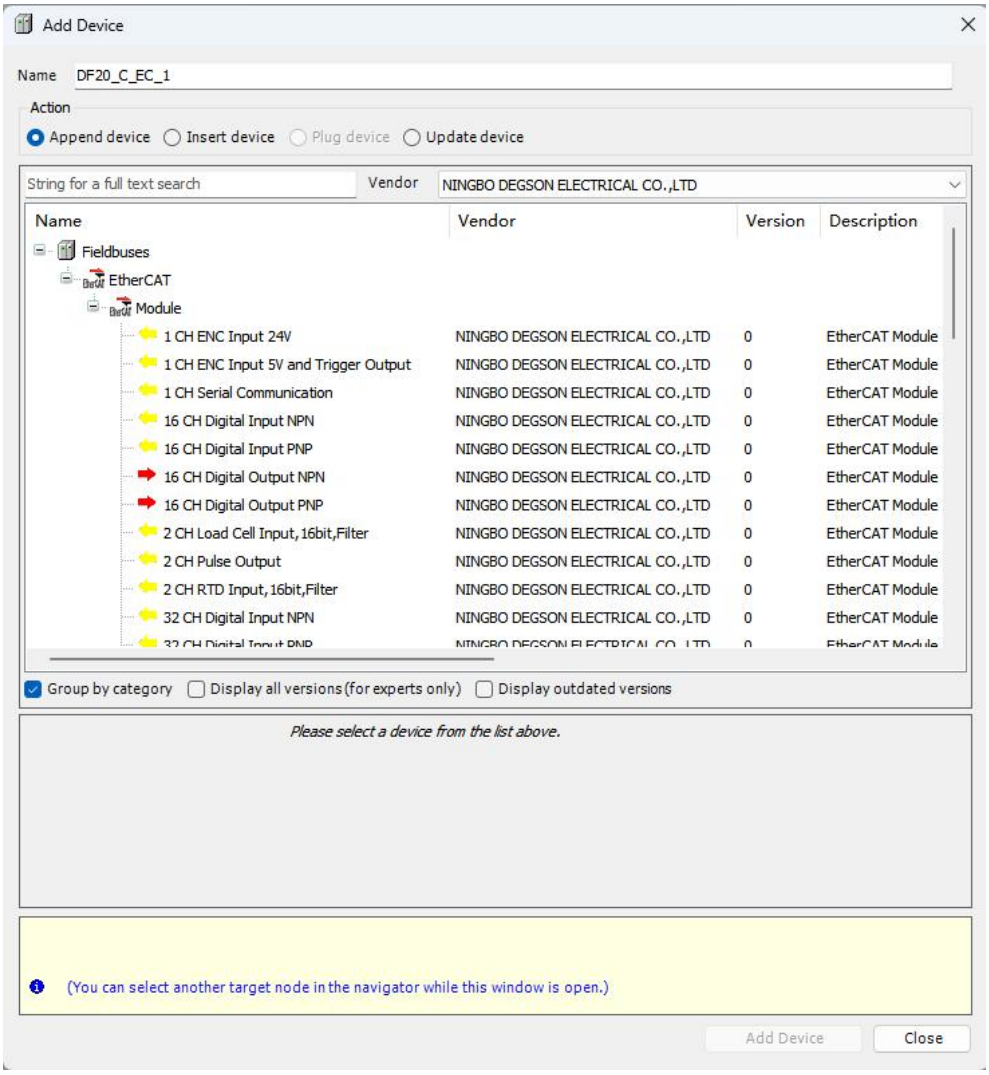

Add Device
Name DF20_C_EC_1
Action
Append device
Insert device
Plug device
Update device
String for a full text search
Vendor NINGBO DEGSON ELECTRICAL CO.,LTD
Name
Vendor
Version
Description
Fieldbuses
EtherCAT
Module
1 CH ENC Input 24V NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
1 CH ENC Input 5V and Trigger Output NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
1 CH Serial Communication NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
16 CH Digital Input NPN NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
16 CH Digital Input PNP NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
16 CH Digital Output NPN NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
16 CH Digital Output PNP NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
2 CH Load Cell Input,16bit,Filter NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
2 CH Pulse Output NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
2 CH RTD Input,16bit,Filter NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
32 CH Digital Input NPN NINGBO DEGSON ELECTRICAL CO.,LTD 0 EtherCAT Module
Group by category
Display all versions (for experts only)
Display outdated versions
Please select a device from the list above.
(You can select another target node in the navigator while this window is open.)
Add Device
Close

Figure 4-1-3

4.1.1 Digital Module and Alarm Module Usage Examples

➢ This example uses the DF20-C-EC+DF20-M-16DI-N+DF20-M-16DO-N topology. As shown in Figure 4-1-4, the user

Add modules to the project in order.In addition, after adding the actual module, the user needs to add an additional "Alarm" module to display error information in the topology structure..

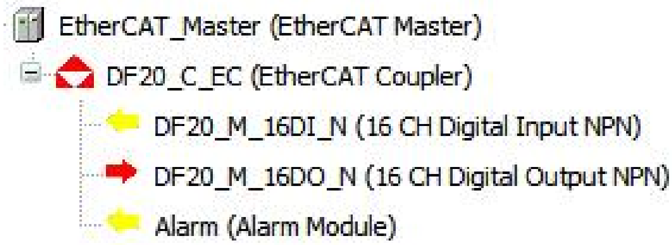


Figure 4-1-4

➢ After adding the adapter DF20-C-EC and IO module, perform IO data association and power on the device to complete the group.

As shown in Figure 4-1-5, double-click the corresponding model card to view and operate the channel data.

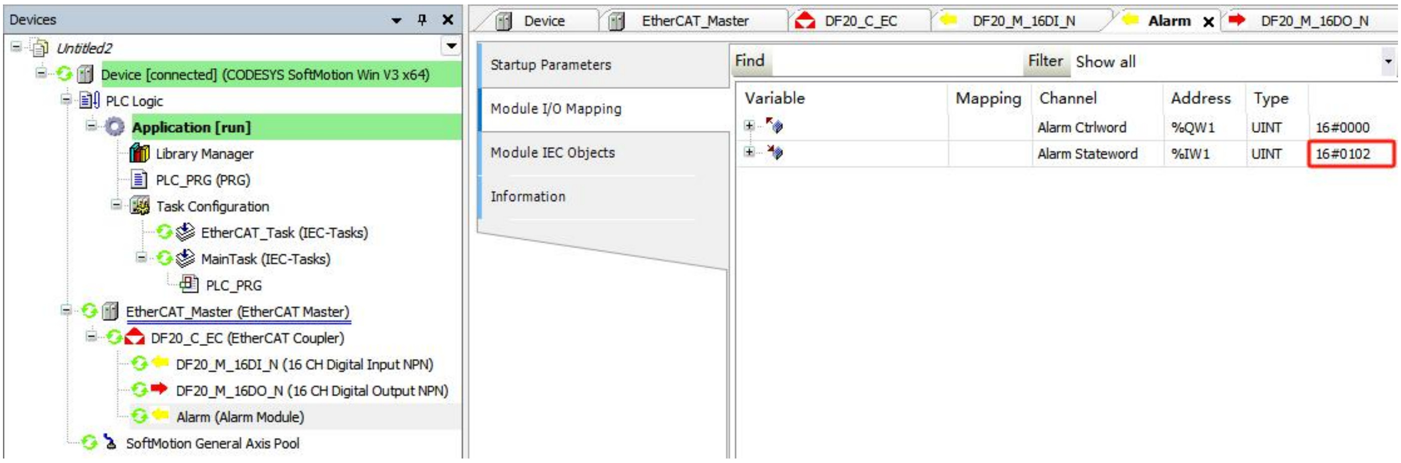


Figure 4-1-5

➢ The Alarm module is the alarm information module that comes with the adapter DF20-C-EC, and the "Error Feedback" is a module in the topology structure.

The value of "Error Feedback" is 0x0102 (258), which means that the second module has an error. Similarly, when the third, second, and first modules have errors, the values of "Error Feedback" are 0x0103, 0x0102, and 0x0101, respectively. When all modules are working normally, the value is 0. There is also an "Alarm Clear" object in the Alarm module. When "1" is written to this object, the current error information can be cleared.

4.1.2 Universal analog input module usage example

- This example uses the topology of DF20-C-EC++DF20-M-4AI-U-4+DF20-M-4AI-I-5. This type of module has two states.

Status indicator light: When the module is powered normally, LED1 is always on; when the module enters working state, LED2 flashes.

- As shown in Figure 4-1-6, the topology of the routine is scanned on CODESYS. Taking DF20-M-4AI-U-4 as an example, in one module

Contains four analog data input objects and one command output object. The command object is used when calibrating the module and the user does not need to operate it. The data objects and functions of DF20-M-4AI-I-5 are similar to those of DF20-M-4AI-U-4.

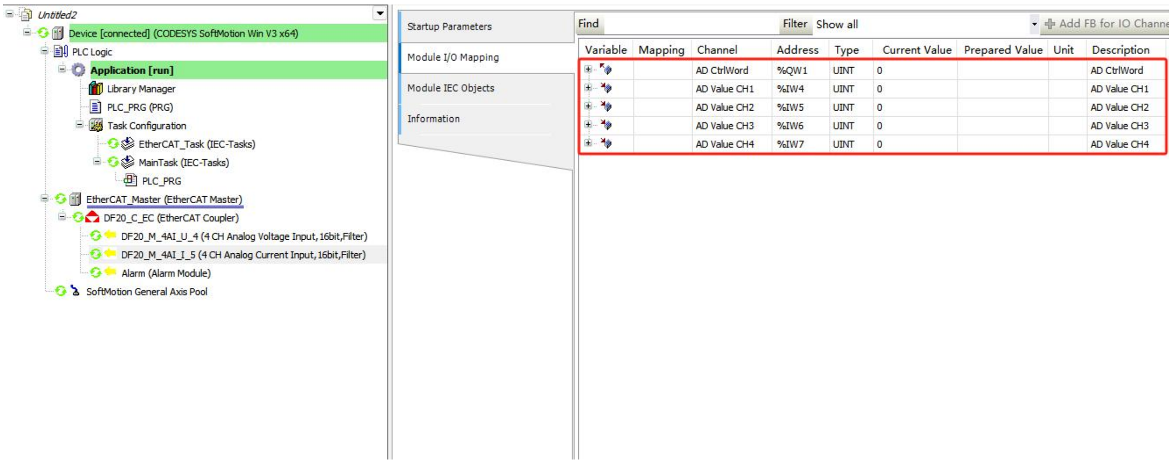


Figure 4-1-6

- Analog input module signal detection range and sampling frequency settings: As shown in Figure 4-1-7, double-click "DF20-M-4AI-U-4" -> "Start

The default setting value of the sampling frequency of the analog input module is 20Hz.

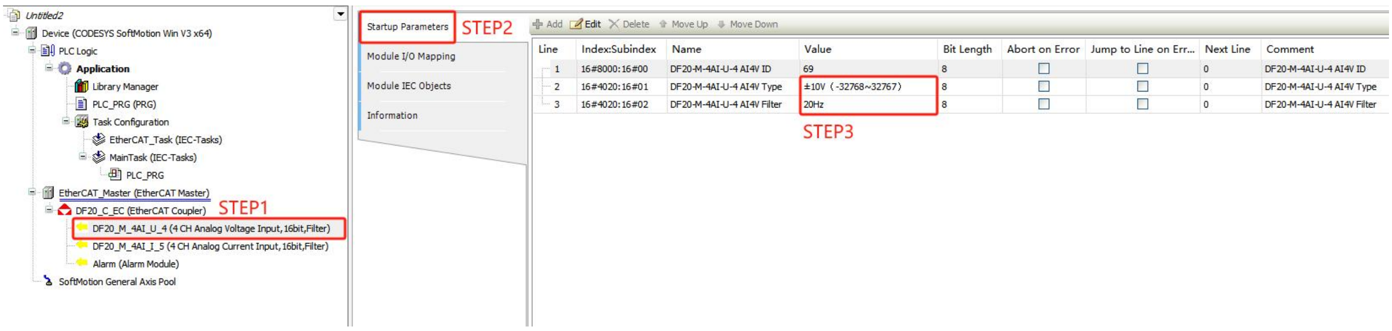


Figure 4-1-7

4.1.3 General analog output module usage examples

- This example uses the topology of DF20-C-EC+DF20-M-4AO-U-4+DF20-M-4AO-I-5. This type of module has two states.

Status indicator light: When the module is powered normally, LED1 is always on; when the module enters working state, LED2 flashes.

- As shown in Figure 4-1-8, the topological structure of the routine scanned by CODESYS is shown. Taking DF20-M-4AO-U-4 as an example, one module contains

Contains four analog data output objects "Set Value CH1~Set Value CH4". Users only need to write the digital value corresponding to the output voltage value into the object. The data object function of the DF20-M-4AO-I-5 module is similar to that of the DF20-M-4AO-U-4.

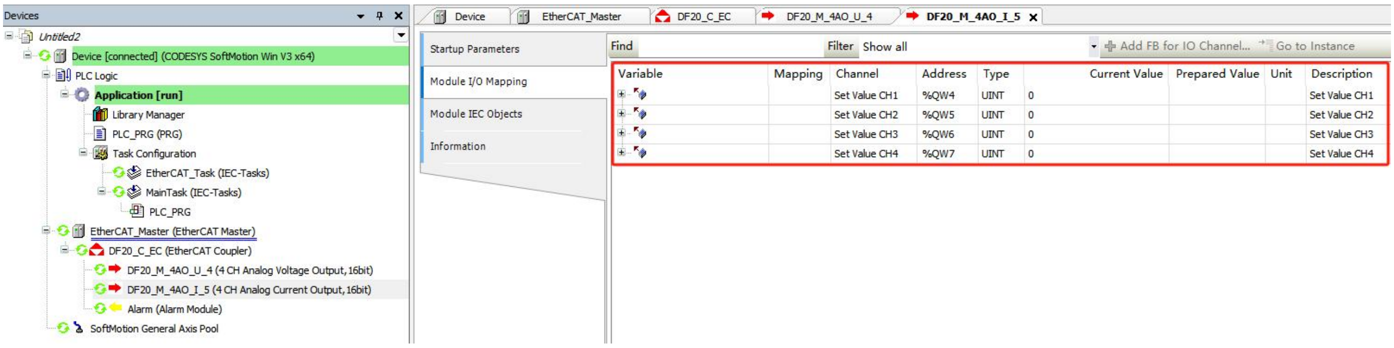


Figure 4-1-8

- Analog output module signal range: As shown in Figure 4-1-9, double-click "DF20-M-4AO-U-4" -> "Startup Parameters".

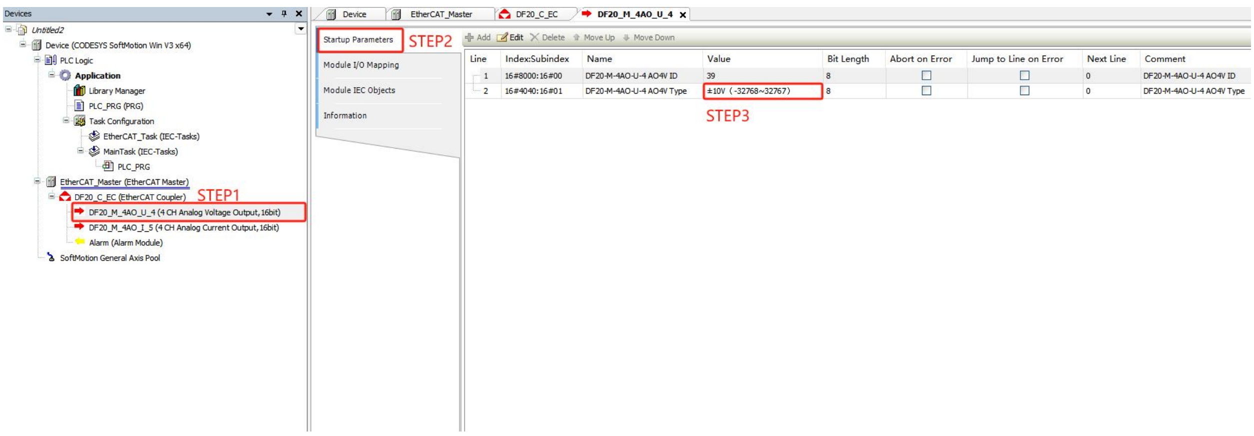


Figure 4-1-9

4.1.4 Pressure sensor data acquisition module usage routine

- This example uses the DF20-C-EC+DF20-M-2LC-S-5 topology. DF20-M-2LC-S-5 can connect to two sets of pressure sensor signals.

This type of module has two status indicators. When the module is powered normally, LED1 is always on. When the module enters the working state, LED2 flashes.

- Figure 4-1-10 shows the topological structure of the routine scanned on CODESYS. Table 4.1.5 shows the topological structure of DF20-M-2LC-S-5.

The meaning of elephant.

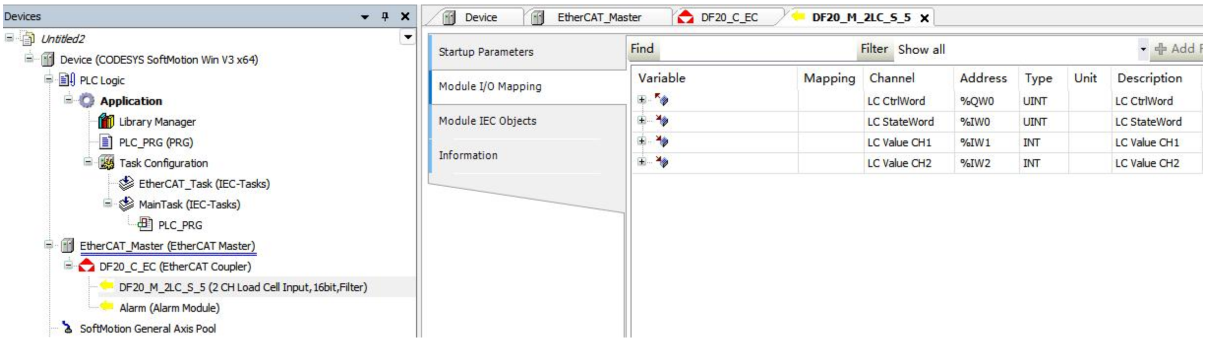


Figure 4-1-10

Table 4.1.5

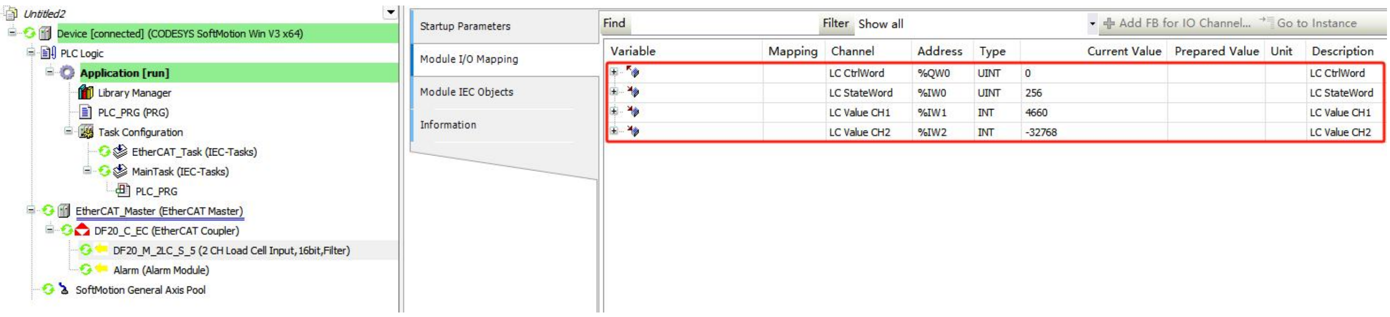
Object	illustrate
BR State	The working status of DF20-M-2LC-S-5 is described in detail in Table 4.1.6
BR Value CH1	DF20-M-2LC-S-5 first channel data
BR Value CH2	DF20-M-2LC-S-5 second channel data
Command	DF20-M-2LC-S-5 output commands, see Table 4.1.6 for details

- Table 4.1.6 shows the commands and corresponding status feedback descriptions of DF20-M-2LC-S-5.

Table 4.1.6

BR CMD	Command Description	BR State	Status Description	Indicator status
0x0000	sampling	0x0100	Normal sampling status	LED1 is always on, LED2 is flashing
0x0120	idle	0x0000	idle	LED1 is always on, LED2 is always on
0x0121	1 channel zero-level calibration	0x0101	1 channel zero level calibration completed	LED1 flashes
0x0122	1 channel full scale calibration	0x0102	1 channel full scale calibration completed	LED1 is always on
		0x0111	1 channel calibration	LED2 flashes

			error	
0x0123	2-channel zero-level calibration	0x0103	2-channel zero-level calibration completed	LED1 flashes
0x0124	2-channel full-scale calibration	0x0104	2-channel full-scale calibration completed	LED1 is always on
		0x0112	2 channel calibration error	LED2 flashes
		0x0109	During calibration	Maintain the previous state
Other commands		0x0115	Wrong instruction	LED1 flashes, LED2 flashes
		0x0116	Module initialization error	LED2 is always on



- DF20-M-2LC-S-5 has been calibrated at the factory and can be used directly. The command object defaults to the sampling command (0x0000) and the user does not need to

To operate, this module can detect voltage range of 0~10mV.

- The pressure sensor used in this example has a resolution of 2mV/V, a weight range of 0~5KG, and a DF20-M-2LC-S-5 module excitation power supply.

It is 5V, so the voltage signal range of the pressure sensor output is 0~10mV, that is, 0~10mV corresponds to 0~32767.

- If the user needs to recalibrate the DF20-M-2LC-S-5 module, just follow the process below to prepare:

Connect the sensor cables and power on to the EtherCAT running state.

First calibration:

1. Zero-level calibration: When the pressure sensor is in the no-load state, the command value is written to 0x0121, and the waiting state value returns to 0x0101. If LED1 flashes at this time, the zero-level calibration of the first channel is completed;

2. Full-scale calibration: When the pressure sensor is fully loaded, write the command value to 0x0122, and wait for the status value to return to 0x0102. If LED1 is always on at this time, the full-scale calibration of the first channel is completed. If the status value returns to 0x0111 and LED2 flashes, the calibration of the first channel is wrong, and you need to start again from step 1.

Second calibration:

1. Zero-level calibration: When the pressure sensor is in the no-load state, the command value is written to 0x0123, and the waiting state value returns to 0x0103. If LED1 flashes at this time, the zero-level calibration of the second channel is completed;

2. Full-scale calibration: When the pressure sensor is fully loaded, write the command value to 0x0124 and wait for the status value to return to 0x0104. If LED1 is always on at this time, the full-scale calibration of the second channel is completed. If the status value returns to 0x0112 and LED2 flashes, the calibration of the second channel is wrong, and you need to start again from step 1.

4.1.5 Routine use of thermal resistance sensor data acquisition module

➢ This example uses the DF20-C-EC+DF20-M-2RTD-PT+DF20-M-4RTD-PT topology. DF20-M-2RTD-PT and

DF20-M-4RTD-PT module supports sensor types PT100/PT200/PT500/PT1000,

Ni100/Ni120/Ni200/Ni500/

Ni1000,Cu10/Cu50/Cu53/Cu100,KTY84-130/KTY84-150/KTY84-151,Ressistor40ohm/Ressistor80ohm/

Ressistor150ohm/Ressistor300ohm,

Ressistor500ohm/Ressistor1000ohm/Ressistor2000ohm/Ressistor4000ohm/KTY83-110/KTY83-120/KTY83-121/KTY83-122/KTY83-150/KTY83-151/NTC-5K/NTC-10K. This type of module has two status indicators. When the module is powered normally, LED1 is always on. When the module enters the working state, LED2 flashes.

➢ Figure 4-1-11 shows the topological structure of the routine scanned on CODESYS, and Table 4.1.7 shows the meaning of the DF20-M-2RTD-PT object.

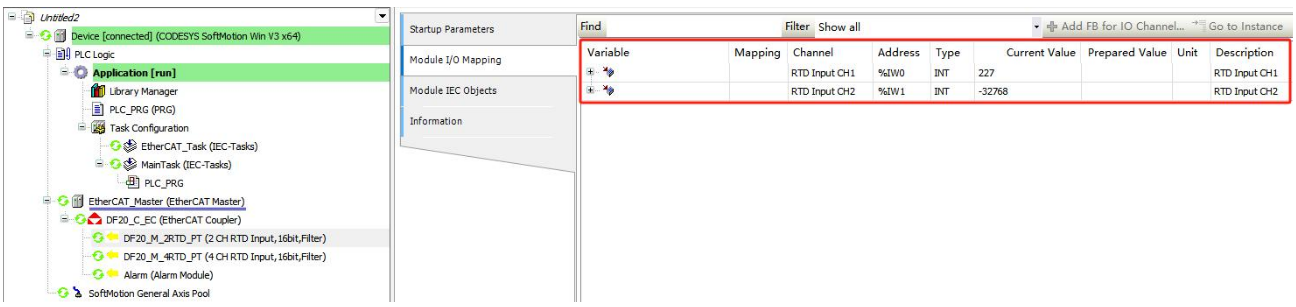


Figure 4-1-11

Table 4.1.7

Object Name	illustrate	Remark
RTD Input CH1	First channel data	If the data values of both channels are -32768, this means that the sensor is disconnected or the sensor type configured by the master station does not match the actual sensor type.
RTD Input CH2	Second channel data	

- DF20-M-2RTD-PT supports PT100 type sensors by default. The first channel is connected to the PT100 sensor, and the second channel

Without connecting the sensor, the temperature data is shown in Figure 4-1-11. The reading of the first channel is 227, which means 22.7°. The second channel has no sensor connected and the reading is -32768, which means the line is broken.

- As shown in Figure 4-1-12, if you need to configure the sensor type and filter configuration, select the sensor type. The system supports PT100 by default; select

Filter configuration, the system default is 5Hz_200ms.

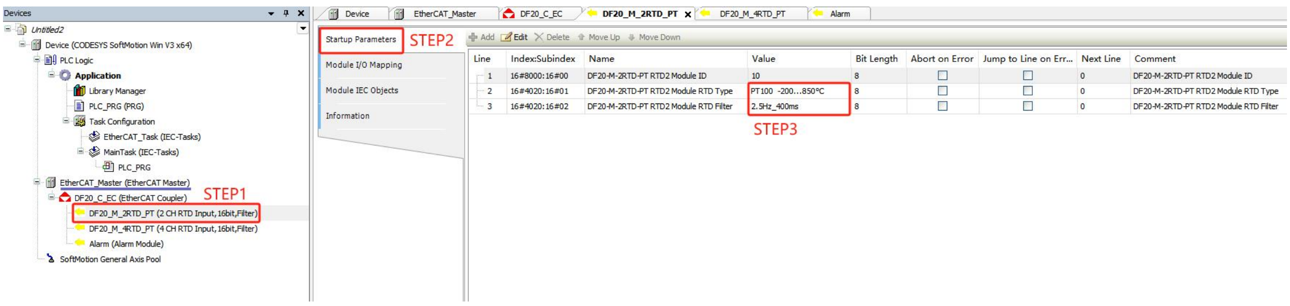


Figure 4-1-12

4.1.6 Thermocouple temperature data acquisition module usage routine

- This example uses the DF20-C-EC+DF20-M-4TC-KETJ+DF20-M-8TC-KETJ topology, DF20-M-4TC-KETJ

Sensor types supported by the module K/E/T/J/B/S/R/N/C/L thermocouple +/-15.625mv, +/-31.25mv, +/-62.5mv, +/-125mv,

+/-250mv, +/-500mv, +/-1000mv, +/-2000mv. This type of module has two status indicators. When the module is powered normally, LED1 is always on. When the module enters the working state, LED2 flashes.

- As shown in Figure 4-1-13, the topological structure of the routine scanned on CODESYS is shown in Table 4.1.8.

The meaning of the object.

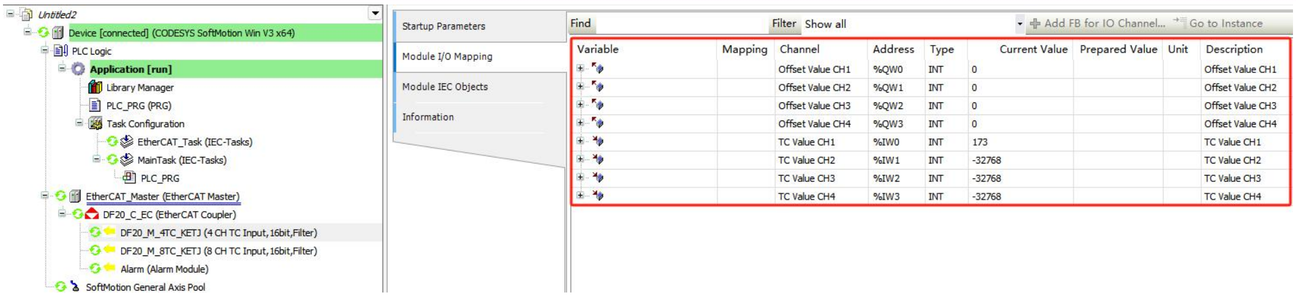


Figure 4-1-13

Table 4.1.8

Object Name	illustrate	Remark
Thermocouple CH1	The first channel	The quality of many domestic sensors varies greatly, and the Offset Value is used to compensate for the error of the sensor itself.
Thermocouple CH2	Second channel	
Thermocouple CH3	The third channel	
Thermocouple CH4	The fourth channel	
Offset Value CH1	Temperature	
Offset Value CH2	Second channel	
Offset Value CH3	Temperature	
Offset Value CH4	Temperature	

➢ As shown in Figure 4-1-14, if you need to configure the sensor type, the system defaults to supporting K-type thermocouples; select filter configuration, the system defaults to 4Hz_250ms.

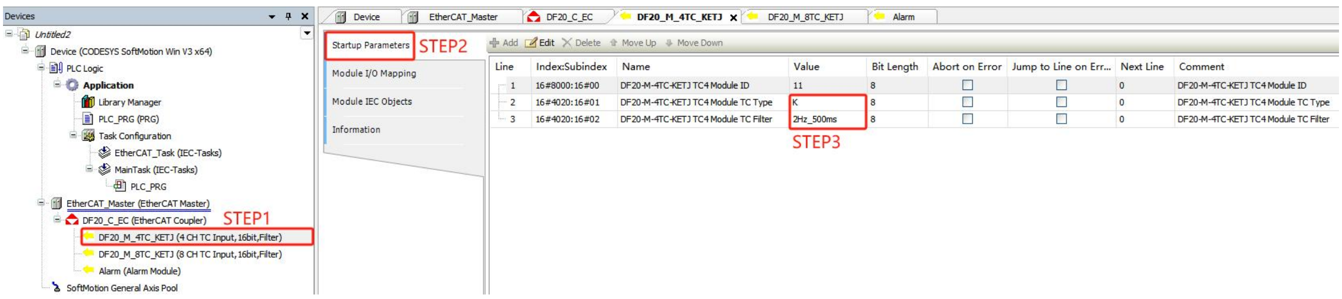


Figure 4-1-14

4.1.7 Single-channel encoder data acquisition module usage routine

➢ The single-channel encoder data acquisition modules are available in two types: DF20-M-1CNT-EL-5 and DF20-M-1CNT-EL-4.

The method is the same as the usage method. DF20-M-1CNT-EL-5 is connected to a 5V encoder signal, and DF20-M-1CNT-EL-4 is connected to a 24V encoder signal. This document uses the DF20-M-1CNT-EL-5 module as an example.

➢ DF20-M-1CNT-EL-5 module features:

(1) Quadrature encoder A+/A-, B+/B- differential input, 4 times frequency;

(2) Electronic probe input;

(3) Two LED indicator outputs. After the module is powered on, Led1 is always on, indicating that the module is powered on and initialized.

Different display states of Led2 represent different working states of the module: when the module is running in the data sampling state, Led2 flashes; when the module is running in the idle state or clearing the sampling data state, Led2 is not lit.

➢ Figure 4-1-15 shows the PDO process data of the DF20-M-1CNT-EL-5 module:

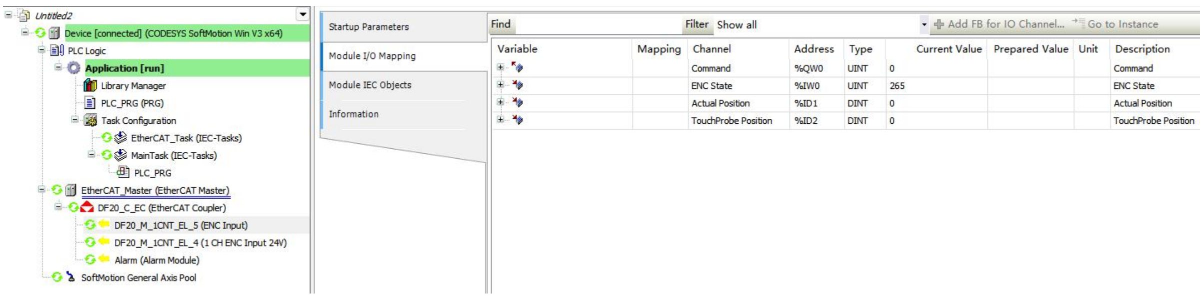


Figure 4-1-15

Table 4.1.10

name	PDO data meaning	Data Types
ENC State	Feedback status word	UINT16
Actual Position	Feedback encoder current position	INT32
Touch Probe Position	Feedback electronic probe latch	INT32
ENC Command	Control command word	UINT16

➢ Table 4.1.11 shows the module state machine description of DF20-M-1CNT-EL-5.

Table 4.1.11

Control	meaning	Feedback status	meaning
0x012B	Enter counting state	0x010B	Counting status
0x012C	Clear current count	0x010C	Clear Status
		0x0109	Idle state
		0x010E	Error Status

➢ The module automatically enters the idle state when powered on. Enter the 0x012B command for ENC Command to make the module enter the counting state.

When the word feedback is 0x010B, the counting is normal; if the pulse count value and the electronic probe latch value need to be cleared, write 0x012C to clear the data in the module. When the status word is judged to be 0x010C, the clearing is completed; then the command object ENC Command is input with 0x012B again, and the module enters the counting state.

4.1.8 Two-channel pulse data acquisition module usage routine

Note: The pulse acquisition module is divided into two types: DF20-M-2CNT-PIL-5 and DF20-M-2CNT-PIL-4. The wiring and usage methods of the two modules are the same. The difference is that DF20-M-2CNT-PIL-5 is connected to a 5V pulse signal, and DF20-M-2CNT-PIL-4 is connected to a 24V pulse signal.

DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module functions:

- Two-channel pulse input and position comparison;
- Two-channel electronic probe input, which can latch the current pulse input value of two channels respectively;
- The current two channel count values can be cleared to zero respectively according to the external trigger signal;
- Two LED indicator outputs. After the module is powered on, LED1 is always on, indicating that the module is powered on and initialized normally. Different display states of LED2 represent different working states of the module: when the module is running in the data sampling state, LED2 flashes; when the module is running in the idle state, LED2 is off.

DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module wiring instructions:

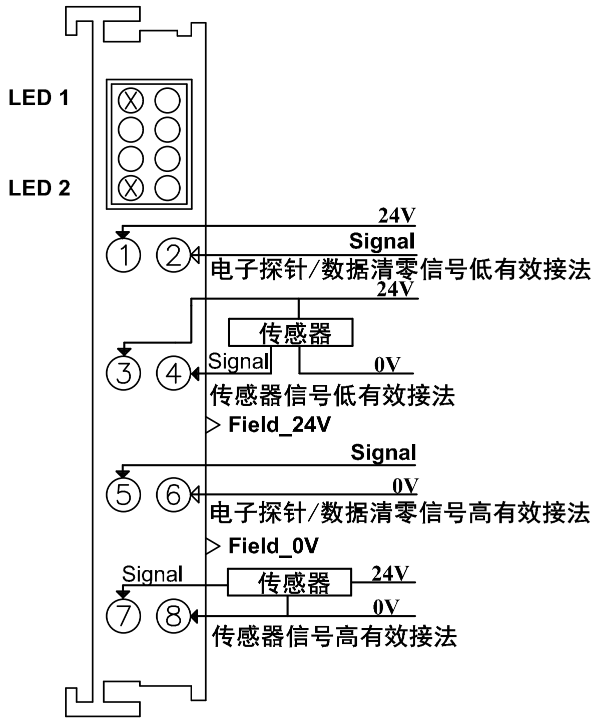


Figure 1 DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) wiring diagram

- As shown in Figure 1, the wiring diagram of DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4): Pins 1 and 2 are the first channel electronic probes.

Note 1/The first channel data reset signal input, the specific function to be selected can be configured according to needs; 5 and 6 pins are the second channel electronic probe[Note 1]/The second channel data reset signal input; the usage is the same as the first channel electronic probe/first channel data reset signal input. Pins 3 and 4 are the first pulse input channel, as shown in the figure, the sensor signal is low effective connection; pins 7 and 8 are the second pulse input channel, as shown in the figure, the sensor signal is high effective connection.

Note 1: The latch of the counting module is the electronic probe function that is often found in the servo. After being triggered by an electronic probe signal (such as a photoelectric switch), the card directly latches the current value. This is much faster than using the host computer PLC to determine the probe signal and then latch the position. The host computer has a delay in determining the position and the position is inaccurate. Some packaging industries need to use this function. If not, just ignore it.

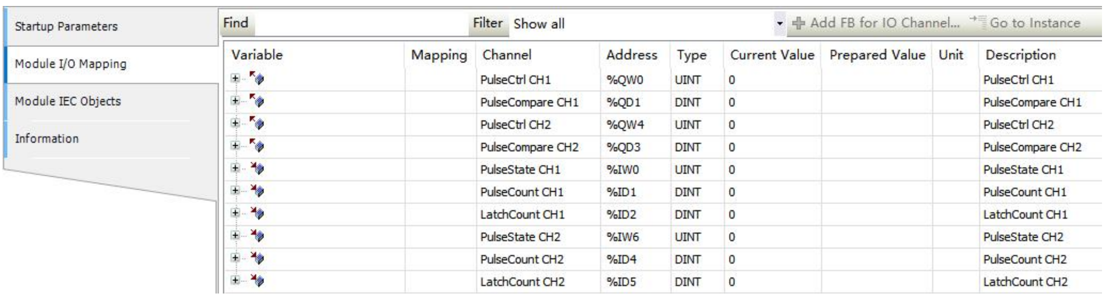
DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module process data description:

- The bus adapter will allocate corresponding input and output addresses according to the different modules connected to it; as shown in the table

DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) input and output data meaning, data length and data type.

Table 1

输出数据	字节数	数据类型
通道1命令输出数据	1	Uint8
通道1脉冲比较直输出	4	Uint32
通道2命令输出数据	1	Uint8
通道2脉冲比较直输出	4	Uint32
输入数据	字节数	数据类型
通道1状态输入数据	1	Uint8
通道1脉冲数	4	Uint32
通道1锁存脉冲数	4	Uint32
通道2状态输入数据	1	Uint8
通道2脉冲数	4	Uint32
通道2锁存脉冲数	4	Uint32



Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		PulseCtrl CH1	%QW0	UINT	0			PulseCtrl CH1
		PulseCompare CH1	%QD1	DINT	0			PulseCompare CH1
		PulseCtrl CH2	%QW4	UINT	0			PulseCtrl CH2
		PulseCompare CH2	%QD3	DINT	0			PulseCompare CH2
		PulseState CH1	%IW0	UINT	0			PulseState CH1
		PulseCount CH1	%ID1	DINT	0			PulseCount CH1
		LatchCount CH1	%ID2	DINT	0			LatchCount CH1
		PulseState CH2	%IW6	UINT	0			PulseState CH2
		PulseCount CH2	%ID4	DINT	0			PulseCount CH2
		LatchCount CH2	%ID5	DINT	0			LatchCount CH2

Figure 4-1-16

- Output data meaning

Table 2

Output data meaning	
0byte	
bit7~bit3	Reserved seat
bit2	0: Disable channel 1 comparison value; 1: Enable channel 1 comparison value
bit1	0: Enable the electronic probe function of channel 1; 1: Enable the count clearing function triggered by external signal of channel 1
bit0	0: Channel 1 stops counting and the original count is reset to zero; 1: Channel 1 starts counting
1~4byte	Channel 1 pulse comparison value output, unsigned 32-bit data
5byte	
bit7~bit3	Reserved seat
bit2	0: Disable channel 2 comparison value; 1: Enable channel 2 comparison value
bit1	0: Enable the electronic probe function of channel 2; 1: Enable the count clearing function triggered by external signal of channel 2
bit0	0: Channel 2 stops counting and the original count is cleared; 1: Channel 2 starts counting
6~9byte	Channel 2 pulse comparison value output, unsigned 32-bit data

➢ Input data meaning

Table 3

Input data meaning	
0 bytes	
bit7~bit3	Reserved seat
bit2	0: The count value of channel 1 is less than the comparison value; 1: The count value of channel 1 is greater than the comparison value.
bit1	0: No electronic probe/first channel count reset signal; 1: Electronic probe/first channel count reset signal
bit0	0: Channel 1 counting stop state, the original count is cleared; 1: Channel 1 counting state
1~4 bytes	Channel 1 pulse input value, unsigned 32-bit data
5~8 bytes	Channel 1 pulse input latch value, unsigned 32-bit data
9 bytes	
bit7~bit3	Reserved seat
bit2	0: The count value of channel 2 is less than the comparison value; 1: The count value of channel 2 is greater than the comparison value.
bit1	0: No electronic probe/count clear signal on channel 2; 1: Electronic probe/count clear signal on channel 2
bit0	0: Channel 2 counting stop state, the original count is cleared; 1: Channel 2 counting state

10~13 bytes	Channel 2 pulse input value, unsigned 32-bit data
14~17 bytes	Channel 2 pulse input latch value, unsigned 32-bit data

➢ As shown in Figure 4-1-17, this is the usage example of DF20-M-2CNT-PIL-5:

PluseCtrl CH1 writes 5 (channel 1 starts counting, enables channel 1 electronic probe function, and enables channel 1 comparison value).

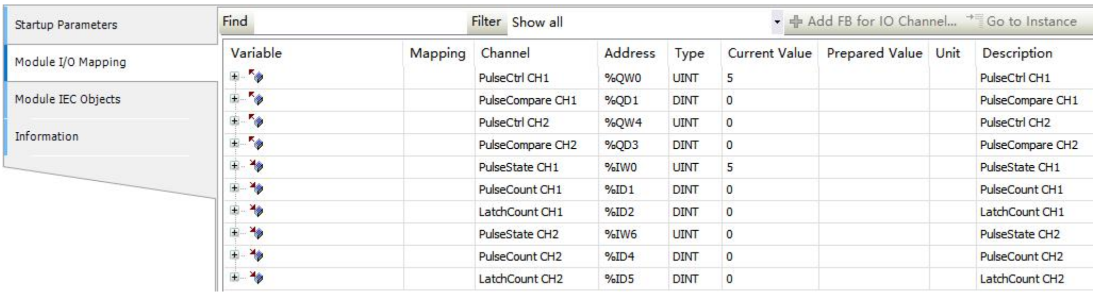


Figure 4-1-17

4.1.9 Two-channel encoder data acquisition module usage routine

Note: The two-channel encoder data acquisition module is divided into two types: DF20-M-2CNT-EL-5 and DF20-M-2CNT-EL-4. The wiring and usage methods of the two modules are the same. The difference is that DF20-M-2CNT-EL-5 is connected to a 5V signal, and DF20-M-2CNT-EL-4 is connected to a 24V signal.

➢ This example uses the topology of DF20-C-EC+DF20-M-2CNT-EL-5, taking DF20-M-2CNT-EL-5 as an example.

The PWR power indicator and FP 5V indicator are always on, the module enters the working state, and the STA status indicator flashes.

➢ As shown in Figure 4-1-18, the topological structure of the routine is scanned on CODESYS. Data objects and functions of DF20-M-2CNT-EL-4

Same as DF20-M-2CNT-EL-5.

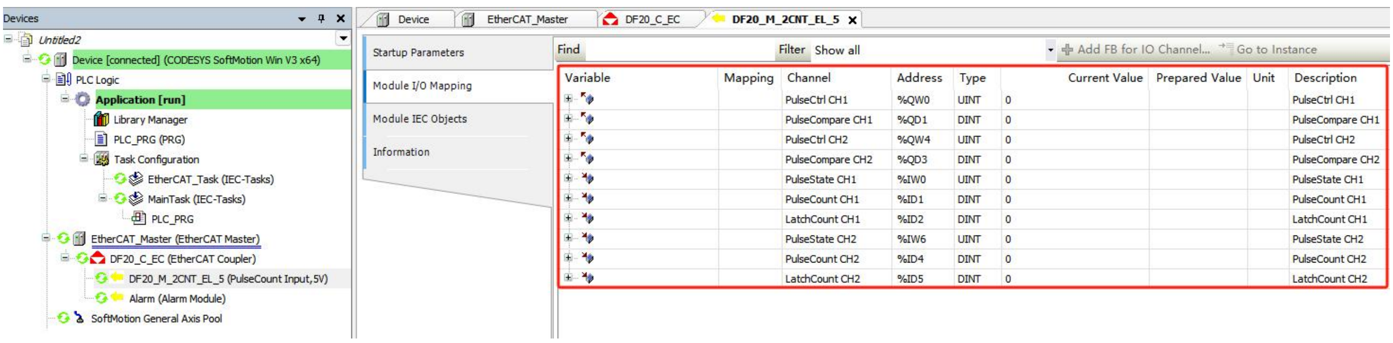
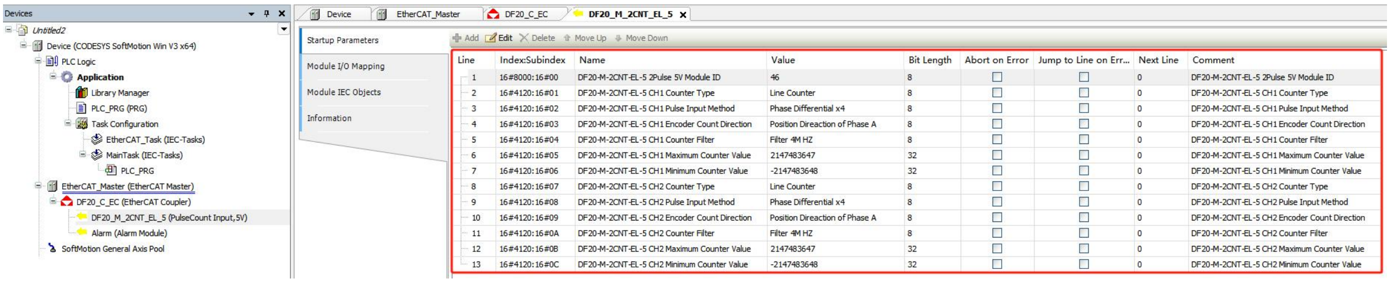


Figure 4-1-18

➢ Module configuration parameter setting: As shown in Figure 4-1-19, double-click "DF20-M-2CNT-EL-5" -> "Startup parameters". Card default configuration

It is the orthogonal encoding input mode. Taking CH1 channel as an example, the counting mode of CH1 channel is linear mode, the signal is input at 4 times the frequency, and the filter frequency is 4MHz. For the specific meaning of the parameters, refer to3.42.4 Configuration parameter definition.



Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#8000:16#00	DF20-M-2CNT-EL-5 2Pulse 5V Module ID	46	8			0	DF20-M-2CNT-EL-5 2Pulse 5V Module ID
2	16#4120:16#01	DF20-M-2CNT-EL-5 CH1 Counter Type	Line Counter	8			0	DF20-M-2CNT-EL-5 CH1 Counter Type
3	16#4120:16#02	DF20-M-2CNT-EL-5 CH1 Pulse Input Method	Phase Differential x4	8			0	DF20-M-2CNT-EL-5 CH1 Pulse Input Method
4	16#4120:16#03	DF20-M-2CNT-EL-5 CH1 Encoder Count Direction	Position Direaction of Phase A	8			0	DF20-M-2CNT-EL-5 CH1 Encoder Count Direction
5	16#4120:16#04	DF20-M-2CNT-EL-5 CH1 Counter Filter	Filter 4M HZ	8			0	DF20-M-2CNT-EL-5 CH1 Counter Filter
6	16#4120:16#05	DF20-M-2CNT-EL-5 CH1 Maximum Counter Value	2147483647	32			0	DF20-M-2CNT-EL-5 CH1 Maximum Counter Value
7	16#4120:16#06	DF20-M-2CNT-EL-5 CH1 Minimum Counter Value	-2147483648	32			0	DF20-M-2CNT-EL-5 CH1 Minimum Counter Value
8	16#4120:16#07	DF20-M-2CNT-EL-5 CH2 Counter Type	Line Counter	8			0	DF20-M-2CNT-EL-5 CH2 Counter Type
9	16#4120:16#08	DF20-M-2CNT-EL-5 CH2 Pulse Input Method	Phase Differential x4	8			0	DF20-M-2CNT-EL-5 CH2 Pulse Input Method
10	16#4120:16#09	DF20-M-2CNT-EL-5 CH2 Encoder Count Direction	Position Direaction of Phase A	8			0	DF20-M-2CNT-EL-5 CH2 Encoder Count Direction
11	16#4120:16#0A	DF20-M-2CNT-EL-5 CH2 Counter Filter	Filter 4M HZ	8			0	DF20-M-2CNT-EL-5 CH2 Counter Filter
12	16#4120:16#0B	DF20-M-2CNT-EL-5 CH2 Maximum Counter Value	2147483647	32			0	DF20-M-2CNT-EL-5 CH2 Maximum Counter Value
13	16#4120:16#0C	DF20-M-2CNT-EL-5 CH2 Minimum Counter Value	-2147483648	32			0	DF20-M-2CNT-EL-5 CH2 Minimum Counter Value

Figure 4-1-19

4.1.9.1 Signal 4x frequency input usage example

1) The configuration diagram of CH1 channel of DF20-M-2CNT-EL-5 module is shown in the figure below. The counting mode of CH1 channel is Line Counter (linear counting), the input signal type is Phase Differential x4 (orthogonal encoding 4 times frequency), the signal input direction logic is Position Direaction of Phase A (positive logic), and the filter frequency is 4MHz.

Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#8000:16#00	DF20-M-2CNT-EL-5 2Pulse 5V Module ID	46	8			0	DF20-M-2CNT-EL-5 2Pulse 5V Module ID
2	16#4120:16#01	DF20-M-2CNT-EL-5 CH1 Counter Type	Line Counter	8			0	DF20-M-2CNT-EL-5 CH1 Counter Type
3	16#4120:16#02	DF20-M-2CNT-EL-5 CH1 Pulse Input Method	Phase Differential x4	8			0	DF20-M-2CNT-EL-5 CH1 Pulse Input Method
4	16#4120:16#03	DF20-M-2CNT-EL-5 CH1 Encoder Count Direction	Position Direaction of Phase A	8			0	DF20-M-2CNT-EL-5 CH1 Encoder Count Direction
5	16#4120:16#04	DF20-M-2CNT-EL-5 CH1 Counter Filter	Filter 4M HZ	8			0	DF20-M-2CNT-EL-5 CH1 Counter Filter
6	16#4120:16#05	DF20-M-2CNT-EL-5 CH1 Maximum Counter Value	2147483647	32			0	DF20-M-2CNT-EL-5 CH1 Maximum Counter Value
7	16#4120:16#06	DF20-M-2CNT-EL-5 CH1 Minimum Counter Value	-2147483648	32			0	DF20-M-2CNT-EL-5 CH1 Minimum Counter Value

Figure 4-1-20

2) Write 1 to PluseCtrl CH1 (enable channel 1 counting function, enable electronic probe function, and disable comparison function). Set the signal generator frequency to 10Khz and output 10,000 pulse signals. Module control command reference3.42.3 Module process data definition.

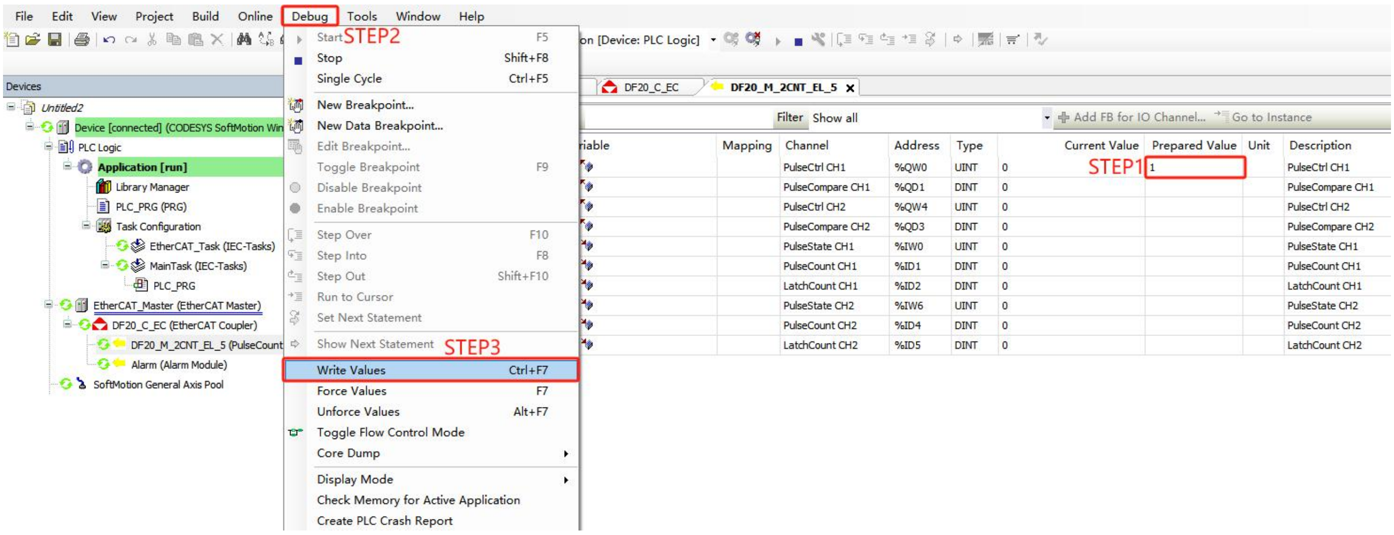


Figure 4-1-21

3) The signal generator outputs AB orthogonal signal with 10,000 pulses. The number of pulses received by the card is shown in the figure.

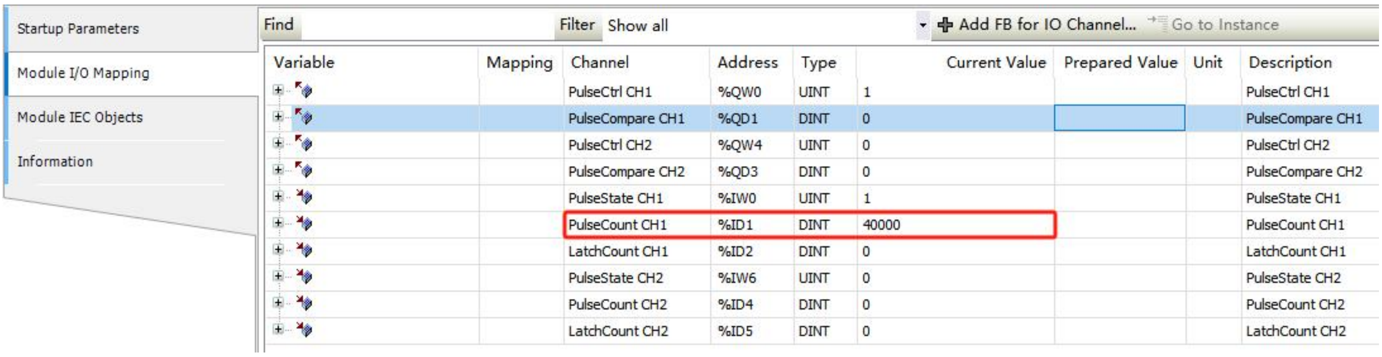


Figure 4-1-22

4) Draw out a 24V signal from the DC power supply and connect it to DI1+, DI1- to trigger the electronic probe function to latch the current count value.

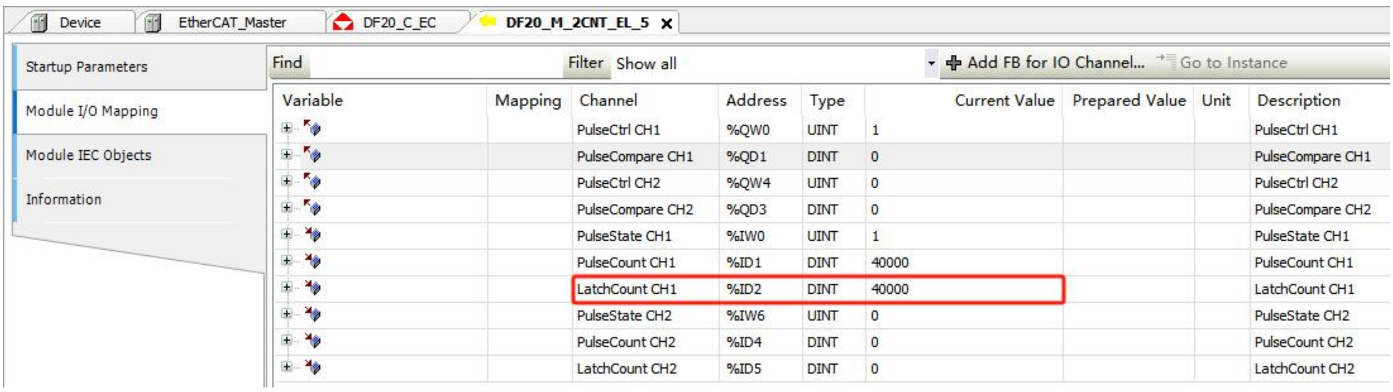
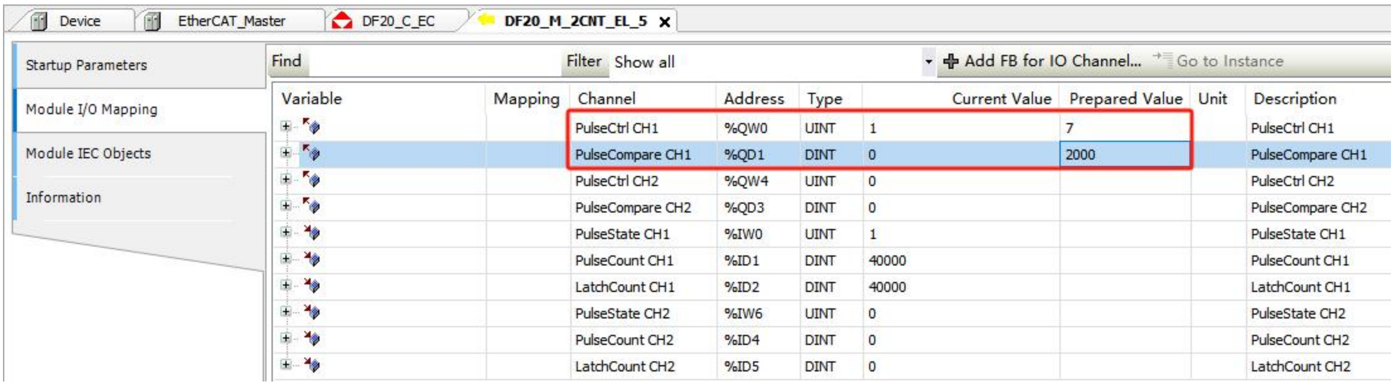


Figure 4-1-23

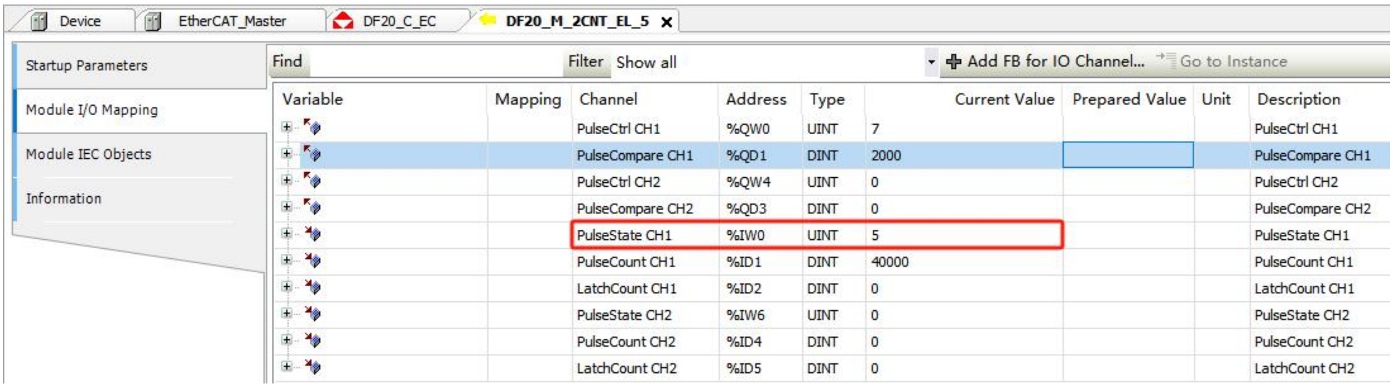
5) Write 7 to PluseCtrl CH1 (channel 1 counting function enabled, channel 1 count clear enabled, comparison function enabled), and set the comparison value to 2000.



Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		PulseCtrl CH1	%QW0	UINT	1	7		PulseCtrl CH1
		PulseCompare CH1	%QD1	DINT	0	2000		PulseCompare CH1
		PulseCtrl CH2	%QW4	UINT	0			PulseCtrl CH2
		PulseCompare CH2	%QD3	DINT	0			PulseCompare CH2
		PulseState CH1	%IW0	UINT	1			PulseState CH1
		PulseCount CH1	%ID1	DINT	40000			PulseCount CH1
		LatchCount CH1	%ID2	DINT	40000			LatchCount CH1
		PulseState CH2	%IW6	UINT	0			PulseState CH2
		PulseCount CH2	%ID4	DINT	0			PulseCount CH2
		LatchCount CH2	%ID5	DINT	0			LatchCount CH2

Figure 4-1-24

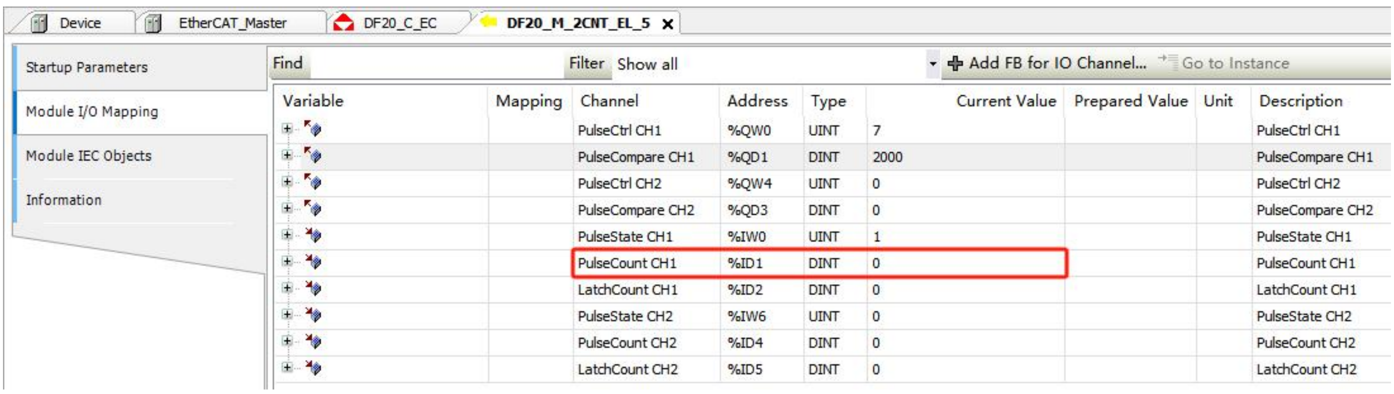
6) At this time, the channel count value is greater than 2000, and PulseState Count Ch1 is 5 (Channel 1 count value is greater than or equal to the comparison value, channel 1 has no electronic probe, channel 1 count status). Module input data meaning reference3.42.3 Module process data definition.



Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		PulseCtrl CH1	%QW0	UINT	7			PulseCtrl CH1
		PulseCompare CH1	%QD1	DINT	2000			PulseCompare CH1
		PulseCtrl CH2	%QW4	UINT	0			PulseCtrl CH2
		PulseCompare CH2	%QD3	DINT	0			PulseCompare CH2
		PulseState CH1	%IW0	UINT	5			PulseState CH1
		PulseCount CH1	%ID1	DINT	40000			PulseCount CH1
		LatchCount CH1	%ID2	DINT	0			LatchCount CH1
		PulseState CH2	%IW6	UINT	0			PulseState CH2
		PulseCount CH2	%ID4	DINT	0			PulseCount CH2
		LatchCount CH2	%ID5	DINT	0			LatchCount CH2

Figure 4-1-25

7) DI1+, DI1- are connected to 24V signal, the count clearing function is triggered, and the count value is cleared. PulseState Count Ch1 is 1 (Channel 1 count value is less than the comparison value, channel 1 has no electronic probe, channel 1 count status).



Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		PulseCtrl CH1	%QW0	UINT	7			PulseCtrl CH1
		PulseCompare CH1	%QD1	DINT	2000			PulseCompare CH1
		PulseCtrl CH2	%QW4	UINT	0			PulseCtrl CH2
		PulseCompare CH2	%QD3	DINT	0			PulseCompare CH2
		PulseState CH1	%IW0	UINT	1			PulseState CH1
		PulseCount CH1	%ID1	DINT	0			PulseCount CH1
		LatchCount CH1	%ID2	DINT	0			LatchCount CH1
		PulseState CH2	%IW6	UINT	0			PulseState CH2
		PulseCount CH2	%ID4	DINT	0			PulseCount CH2
		LatchCount CH2	%ID5	DINT	0			LatchCount CH2

Figure 4-1-26

4.1.9.2 Pulse plus direction function usage routine

➢ The configuration diagram of CH1 channel of DF20-M-2CNT-EL-5 module is shown in the figure below. The counting mode of CH1 channel is Line Counter (Linear

Count), the input signal type is Pulse and Directions (pulse plus direction), the signal input direction logic is Position Direaction of Phase A (positive logic), and the filter frequency is 4MHz. ;

Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Error	Next Line	Comment
1	16#8000:16#00	DF20-M-2CNT-EL-5 2Pulse 5V Module ID	46	8	☐	☐	0	DF20-M-2CNT-EL-5 2Pulse 5V Module ID
2	16#4120:16#01	DF20-M-2CNT-EL-5 CH1 Counter Type	Line Counter	8	☐	☐	0	DF20-M-2CNT-EL-5 CH1 Counter Type
3	16#4120:16#02	DF20-M-2CNT-EL-5 CH1 Pulse Input Method	Pulse and Directions	8	☐	☐	0	DF20-M-2CNT-EL-5 CH1 Pulse Input Method
4	16#4120:16#03	DF20-M-2CNT-EL-5 CH1 Encoder Count Direction	Position Direaction of Phase A	8	☐	☐	0	DF20-M-2CNT-EL-5 CH1 Encoder Count Direc
5	16#4120:16#04	DF20-M-2CNT-EL-5 CH1 Counter Filter	Filter 4M HZ	8	☐	☐	0	DF20-M-2CNT-EL-5 CH1 Counter Filter
6	16#4120:16#05	DF20-M-2CNT-EL-5 CH1 Maximum Counter Value	2147483647	32	☐	☐	0	DF20-M-2CNT-EL-5 CH1 Maximum Counter V
7	16#4120:16#06	DF20-M-2CNT-EL-5 CH1 Minimum Counter Value	-2147483648	32	☐	☐	0	DF20-M-2CNT-EL-5 CH1 Minimum Counter Va
8	16#4120:16#07	DF20-M-2CNT-EL-5 CH2 Counter Type	Line Counter	8	☐	☐	0	DF20-M-2CNT-EL-5 CH2 Counter Type
9	16#4120:16#08	DF20-M-2CNT-EL-5 CH2 Pulse Input Method	Phase Differential x4	8	☐	☐	0	DF20-M-2CNT-EL-5 CH2 Pulse Input Method
10	16#4120:16#09	DF20-M-2CNT-EL-5 CH2 Encoder Count Direction	Position Direaction of Phase A	8	☐	☐	0	DF20-M-2CNT-EL-5 CH2 Encoder Count Direc
11	16#4120:16#0A	DF20-M-2CNT-EL-5 CH2 Counter Filter	Filter 4M HZ	8	☐	☐	0	DF20-M-2CNT-EL-5 CH2 Counter Filter
12	16#4120:16#0B	DF20-M-2CNT-EL-5 CH2 Maximum Counter Value	2147483647	32	☐	☐	0	DF20-M-2CNT-EL-5 CH2 Maximum Counter V
13	16#4120:16#0C	DF20-M-2CNT-EL-5 CH2 Minimum Counter Value	-2147483648	32	☐	☐	0	DF20-M-2CNT-EL-5 CH2 Minimum Counter Va

Figure 4-1-27

The control instructions and module input data of pulse plus direction mode and orthogonal mode have the same meaning.3.42.3 Module process data definition, module input data meaning reference3.42.3 Module process data definition.

4.1.9.2.1 Instructions for single pulse differential input wiring

A1+A1- pins are left hanging (0V signal), B1+B1- are connected to pulse signals, please refer to the wiring method3.42.2 Status indicator light and wiring diagram.

PluseCtrl CH1 writes 1 (channel 1 counting function is enabled, electronic probe function is enabled, and comparison function is disabled).

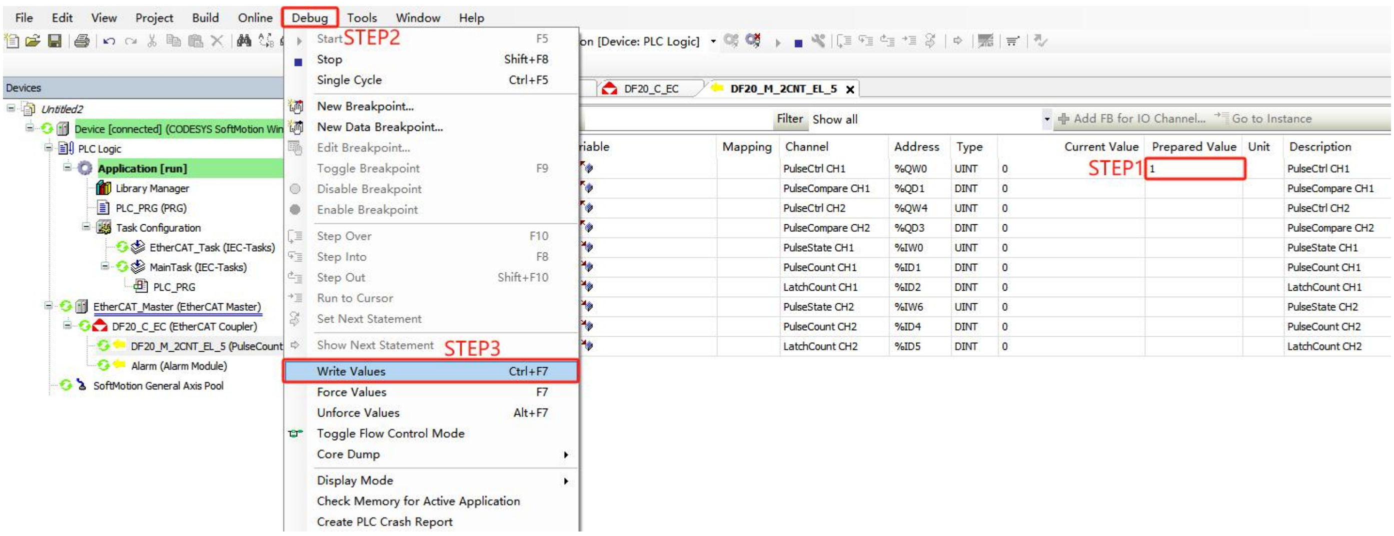


Figure 4-1-28

1) As shown in the figure, the number of pulses received by CH1 channel continues to increase.

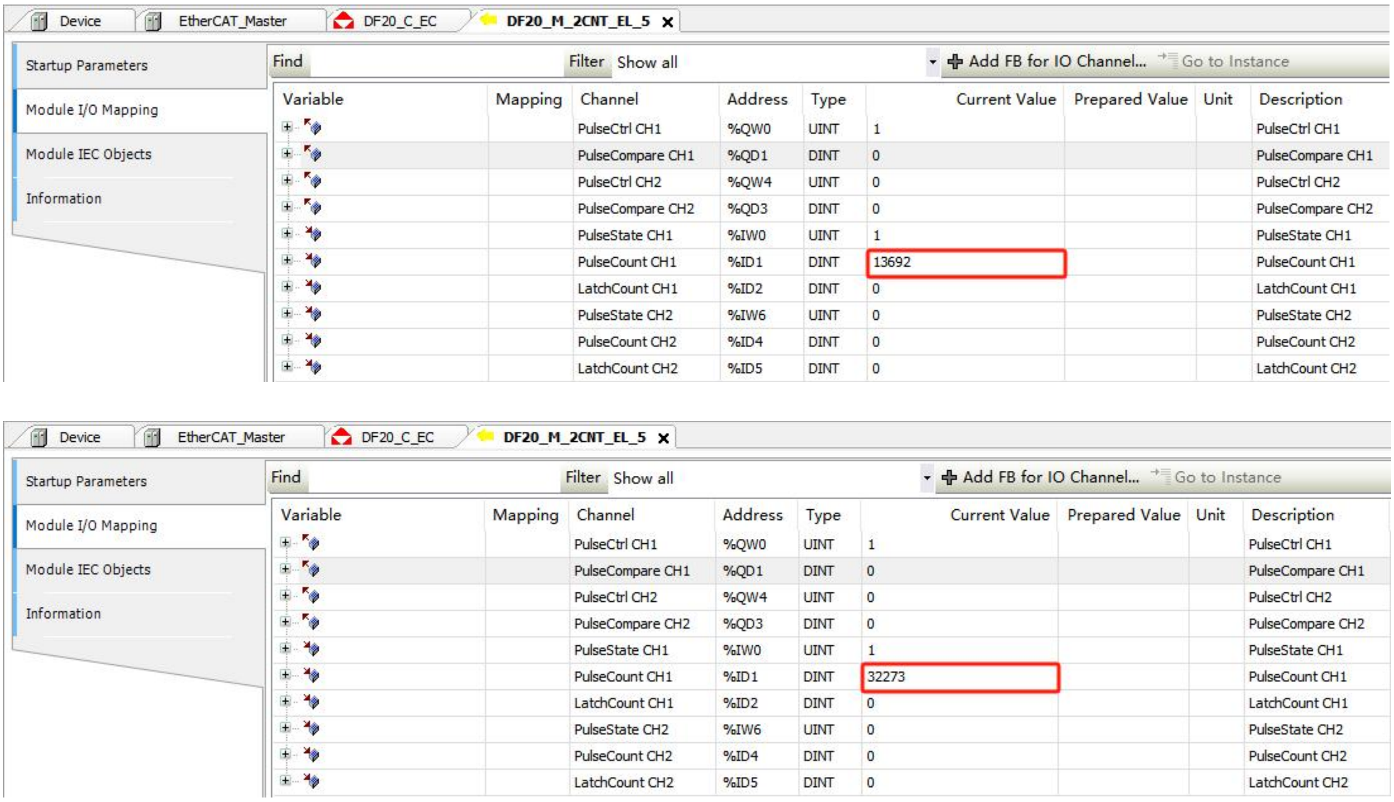


Figure 4-1-29

4.1.9.2.2 Pulse plus direction differential input wiring instructions

A1+A1- is connected to the direction signal (5V signal), B1+B1- is connected to the pulse signal, the wiring method refers to [3.42.2 Status indicator light and wiring diagram](#).

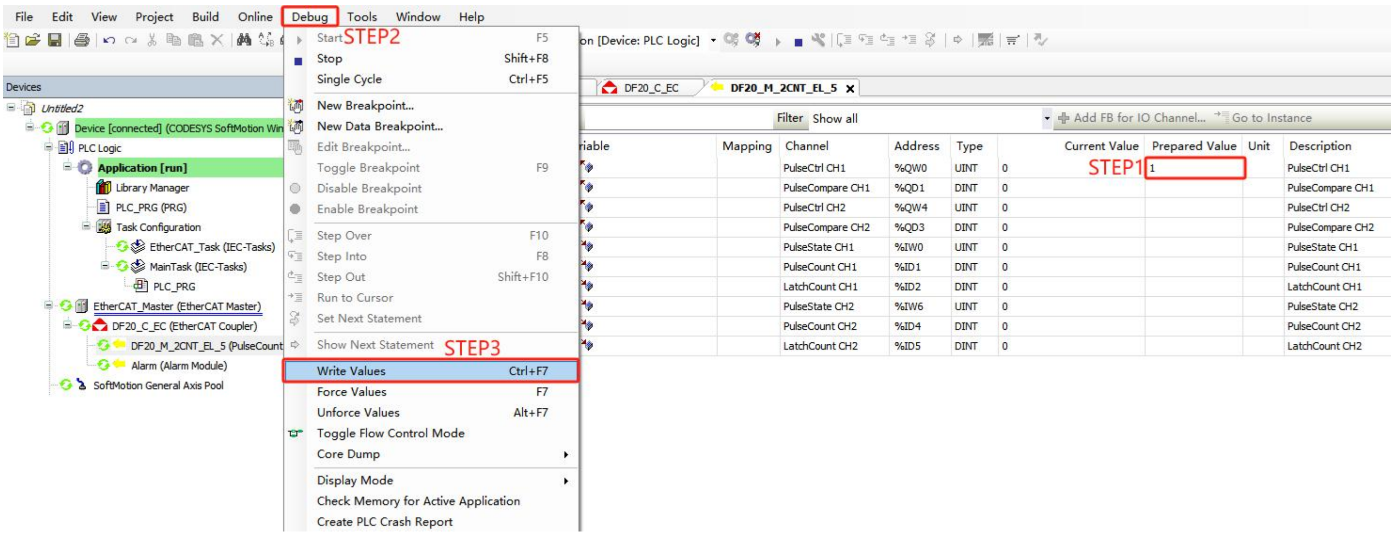
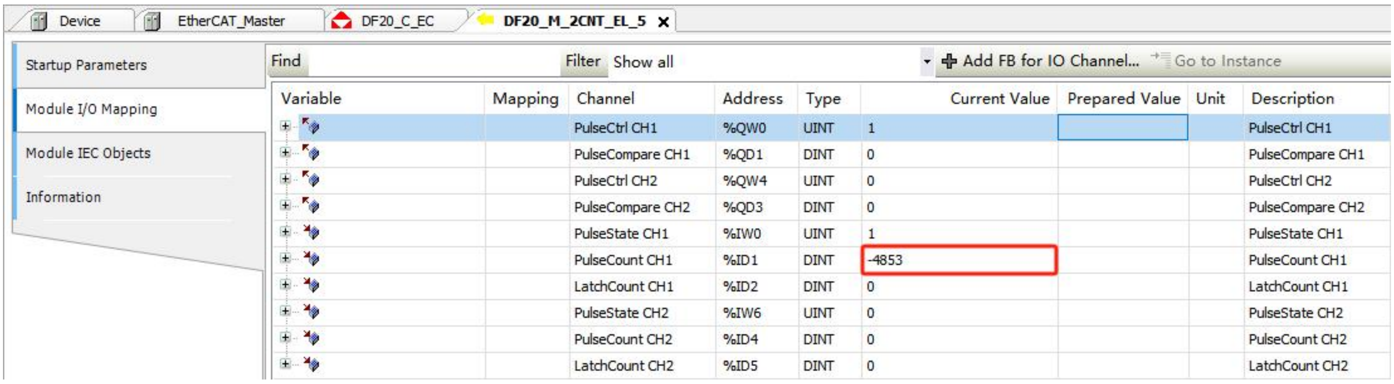


Figure 4-1-30

1) As shown in the figure, the number of pulses received by CH1 channel keeps decreasing.



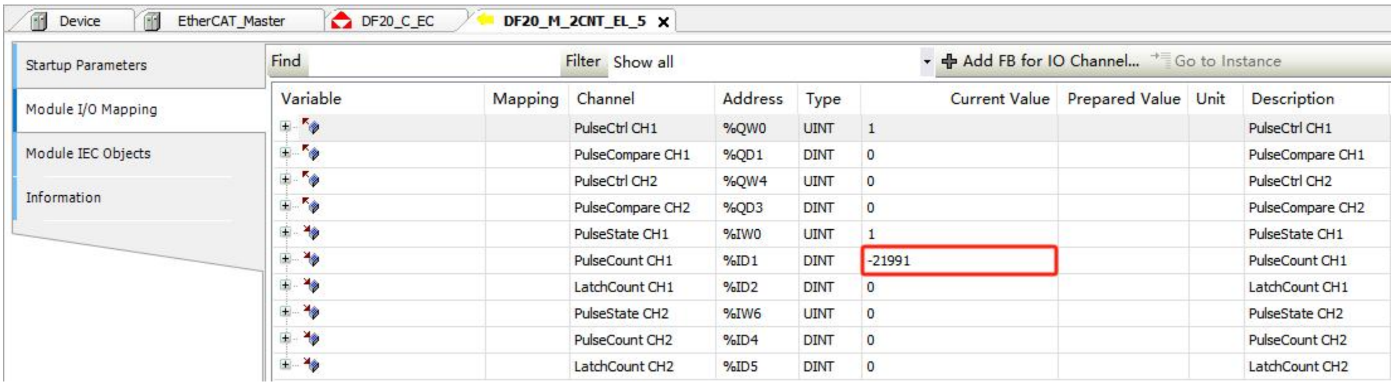


Figure 4-1-31

4.1.10 Two-channel pulse output module usage example

- ➢ This example uses the DF20-C-EC+DF20-M-2PWM topology. During the power-on phase, the PWR power indicator light and the FP indicator light are always on.

The module enters working state and the STA status indicator flashes.

- ➢ As shown in Figure 4-1-32, the topology of the routine is scanned on CODESYS. Module control instruction reference3.44.3 Module process number

By definition.

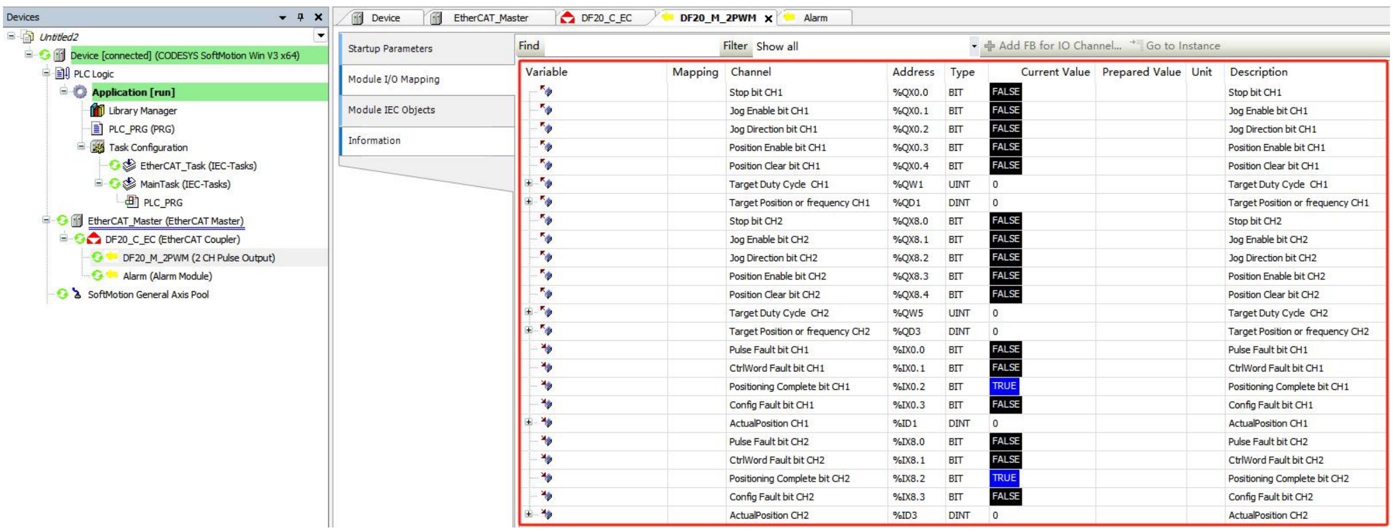
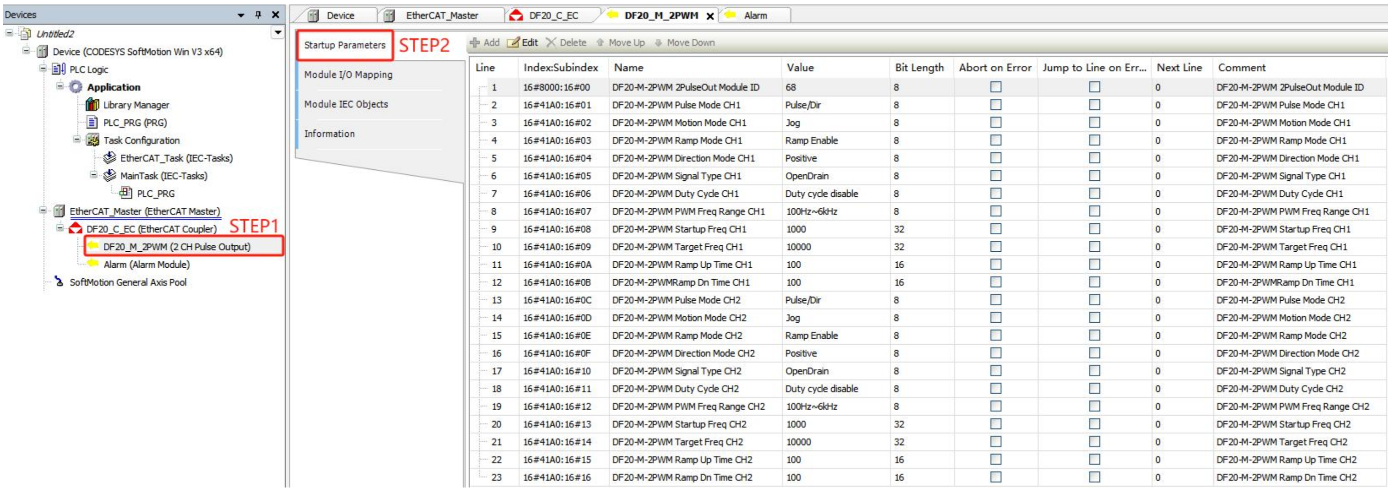


Figure 4-1-32

➢ The card is configured as pulse plus direction mode by default. Taking CH1 as an example, the CH1 channel is configured as jog mode by default.

Yes. Parameter meaning reference3.44.4 Configuration parameter definition.



Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#8000:16#00	DF20-M-2PWM 2PulseOut Module ID	68	8	☐	☐	0	DF20-M-2PWM 2PulseOut Module ID
2	16#41A0:16#01	DF20-M-2PWM Pulse Mode CH1	Pulse/Dir	8	☐	☐	0	DF20-M-2PWM Pulse Mode CH1
3	16#41A0:16#02	DF20-M-2PWM Motion Mode CH1	Jog	8	☐	☐	0	DF20-M-2PWM Motion Mode CH1
4	16#41A0:16#03	DF20-M-2PWM Ramp Mode CH1	Ramp Enable	8	☐	☐	0	DF20-M-2PWM Ramp Mode CH1
5	16#41A0:16#04	DF20-M-2PWM Direction Mode CH1	Positive	8	☐	☐	0	DF20-M-2PWM Direction Mode CH1
6	16#41A0:16#05	DF20-M-2PWM Signal Type CH1	OpenDrain	8	☐	☐	0	DF20-M-2PWM Signal Type CH1
7	16#41A0:16#06	DF20-M-2PWM Duty Cycle CH1	Duty cycle disable	8	☐	☐	0	DF20-M-2PWM Duty Cycle CH1
8	16#41A0:16#07	DF20-M-2PWM PWM Freq Range CH1	100Hz~6kHz	8	☐	☐	0	DF20-M-2PWM PWM Freq Range CH1
9	16#41A0:16#08	DF20-M-2PWM Startup Freq CH1	1000	32	☐	☐	0	DF20-M-2PWM Startup Freq CH1
10	16#41A0:16#09	DF20-M-2PWM Target Freq CH1	10000	32	☐	☐	0	DF20-M-2PWM Target Freq CH1
11	16#41A0:16#0A	DF20-M-2PWM Ramp Up Time CH1	100	16	☐	☐	0	DF20-M-2PWM Ramp Up Time CH1
12	16#41A0:16#0B	DF20-M-2PWMRamp Dn Time CH1	100	16	☐	☐	0	DF20-M-2PWMRamp Dn Time CH1
13	16#41A0:16#0C	DF20-M-2PWM Pulse Mode CH2	Pulse/Dir	8	☐	☐	0	DF20-M-2PWM Pulse Mode CH2
14	16#41A0:16#0D	DF20-M-2PWM Motion Mode CH2	Jog	8	☐	☐	0	DF20-M-2PWM Motion Mode CH2
15	16#41A0:16#0E	DF20-M-2PWM Ramp Mode CH2	Ramp Enable	8	☐	☐	0	DF20-M-2PWM Ramp Mode CH2
16	16#41A0:16#0F	DF20-M-2PWM Direction Mode CH2	Positive	8	☐	☐	0	DF20-M-2PWM Direction Mode CH2
17	16#41A0:16#10	DF20-M-2PWM Signal Type CH2	OpenDrain	8	☐	☐	0	DF20-M-2PWM Signal Type CH2
18	16#41A0:16#11	DF20-M-2PWM Duty Cycle CH2	Duty cycle disable	8	☐	☐	0	DF20-M-2PWM Duty Cycle CH2
19	16#41A0:16#12	DF20-M-2PWM PWM Freq Range CH2	100Hz~6kHz	8	☐	☐	0	DF20-M-2PWM PWM Freq Range CH2
20	16#41A0:16#13	DF20-M-2PWM Startup Freq CH2	1000	32	☐	☐	0	DF20-M-2PWM Startup Freq CH2
21	16#41A0:16#14	DF20-M-2PWM Target Freq CH2	10000	32	☐	☐	0	DF20-M-2PWM Target Freq CH2
22	16#41A0:16#15	DF20-M-2PWM Ramp Up Time CH2	100	16	☐	☐	0	DF20-M-2PWM Ramp Up Time CH2
23	16#41A0:16#16	DF20-M-2PWM Ramp Dn Time CH2	100	16	☐	☐	0	DF20-M-2PWM Ramp Dn Time CH2

Figure 4-1-33

➢ Double-click the parameter option to change the configuration options, as shown in the figure below

Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#8000:16#00	DF20-M-2PWM 2PulseOut Module ID	68	8	☐	☐	0	DF20-M-2PWM 2PulseOut Module ID
2	16#41A0:16#01	DF20-M-2PWM Pulse Mode CH1	Pulse/Dir	8	☐	☐	0	DF20-M-2PWM Pulse Mode CH1
3	16#41A0:16#02	DF20-M-2PWM Motion Mode CH1	Jog	8	☐	☐	0	DF20-M-2PWM Motion Mode CH1
4	16#41A0:16#03	DF20-M-2PWM Ramp Mode CH1	Ramp Enable Ramp Enable Ramp Disable	8	☐	☐	0	DF20-M-2PWM Ramp Mode CH1
5	16#41A0:16#04	DF20-M-2PWM Direction Mode CH1		8	☐	☐	0	DF20-M-2PWM Direction Mode CH1
6	16#41A0:16#05	DF20-M-2PWM Signal Type CH1	OpenDrain	8	☐	☐	0	DF20-M-2PWM Signal Type CH1
7	16#41A0:16#06	DF20-M-2PWM Duty Cycle CH1	Duty cycle disable	8	☐	☐	0	DF20-M-2PWM Duty Cycle CH1
8	16#41A0:16#07	DF20-M-2PWM PWM Freq Range CH1	100Hz~6kHz	8	☐	☐	0	DF20-M-2PWM PWM Freq Range CH1
9	16#41A0:16#08	DF20-M-2PWM Startup Freq CH1	1000	32	☐	☐	0	DF20-M-2PWM Startup Freq CH1
10	16#41A0:16#09	DF20-M-2PWM Target Freq CH1	10000	32	☐	☐	0	DF20-M-2PWM Target Freq CH1
11	16#41A0:16#0A	DF20-M-2PWM Ramp Up Time CH1	100	16	☐	☐	0	DF20-M-2PWM Ramp Up Time CH1
12	16#41A0:16#0B	DF20-M-2PWMRamp Dn Time CH1	100	16	☐	☐	0	DF20-M-2PWMRamp Dn Time CH1

Figure 4-1-34

4.1.10.1 Instructions for use of pulse plus direction mode + jog mode

1) Set the CH1 channel of the DF20-M-2PWM module to pulse plus direction mode, the output mode to jog mode, the frequency ramp enable to turn on, the pulse frequency rise buffer time to 100ms, the fall buffer time to 100ms, the start frequency to 1000Hz, the target frequency to 10000Hz, the pulse output direction to positive logic, and the configuration diagram is shown in the figure below.

Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#8000:16#00	DF20-M-2PWM 2PulseOut Module ID	68	8	☐	☐	0	DF20-M-2PWM 2PulseOut Module ID
2	16#41A0:16#01	DF20-M-2PWM Pulse Mode CH1	Pulse/Dir	8	☐	☐	0	DF20-M-2PWM Pulse Mode CH1
3	16#41A0:16#02	DF20-M-2PWM Motion Mode CH1	Jog	8	☐	☐	0	DF20-M-2PWM Motion Mode CH1
4	16#41A0:16#03	DF20-M-2PWM Ramp Mode CH1	Ramp Enable	8	☐	☐	0	DF20-M-2PWM Ramp Mode CH1
5	16#41A0:16#04	DF20-M-2PWM Direction Mode CH1	Positive	8	☐	☐	0	DF20-M-2PWM Direction Mode CH1
6	16#41A0:16#05	DF20-M-2PWM Signal Type CH1	OpenDrain	8	☐	☐	0	DF20-M-2PWM Signal Type CH1
7	16#41A0:16#06	DF20-M-2PWM Duty Cycle CH1	Duty cycle disable	8	☐	☐	0	DF20-M-2PWM Duty Cycle CH1
8	16#41A0:16#07	DF20-M-2PWM PWM Freq Range CH1	100Hz~6kHz	8	☐	☐	0	DF20-M-2PWM PWM Freq Range CH1
9	16#41A0:16#08	DF20-M-2PWM Startup Freq CH1	1000	32	☐	☐	0	DF20-M-2PWM Startup Freq CH1
10	16#41A0:16#09	DF20-M-2PWM Target Freq CH1	10000	32	☐	☐	0	DF20-M-2PWM Target Freq CH1
11	16#41A0:16#0A	DF20-M-2PWM Ramp Up Time CH1	100	16	☐	☐	0	DF20-M-2PWM Ramp Up Time CH1
12	16#41A0:16#0B	DF20-M-2PWMRamp Dn Time CH1	100	16	☐	☐	0	DF20-M-2PWMRamp Dn Time CH1

Figure 4-1-35

2) Inching switch enable

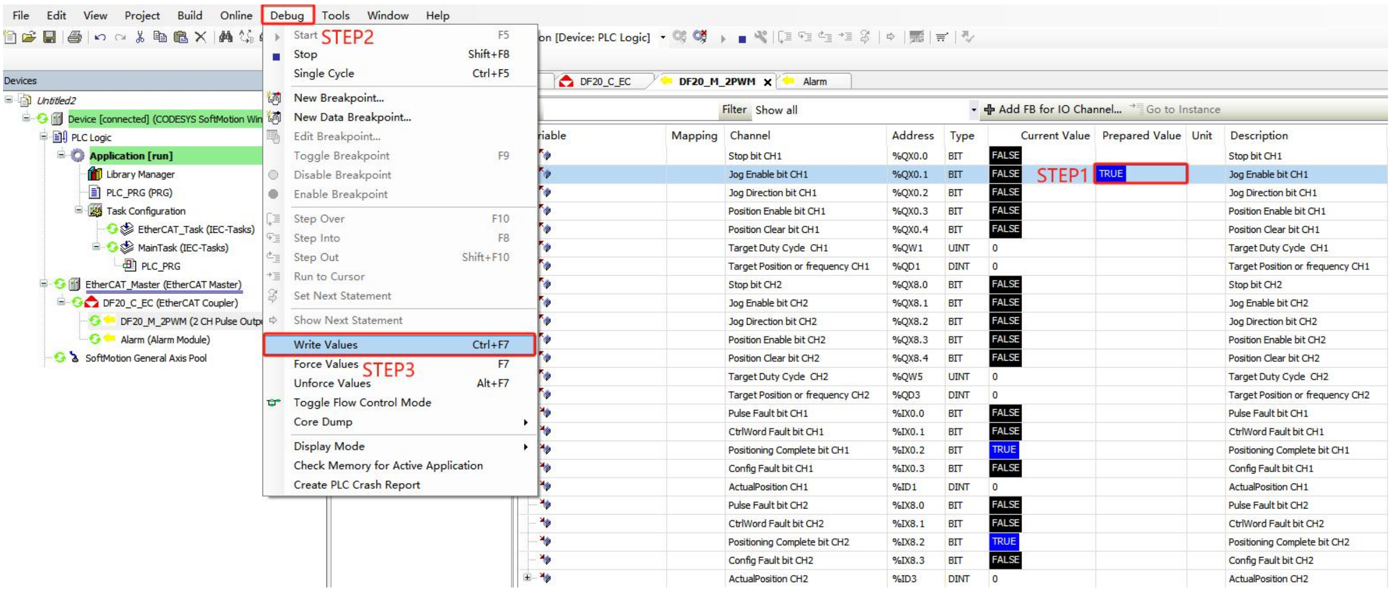


Figure 4-1-36

3) Observe the oscilloscope at this time, the current pulse output frequency is 10000HZ. The number of pulses of the DF20-M-2PWM module continues to accumulate, as shown in the figure below.

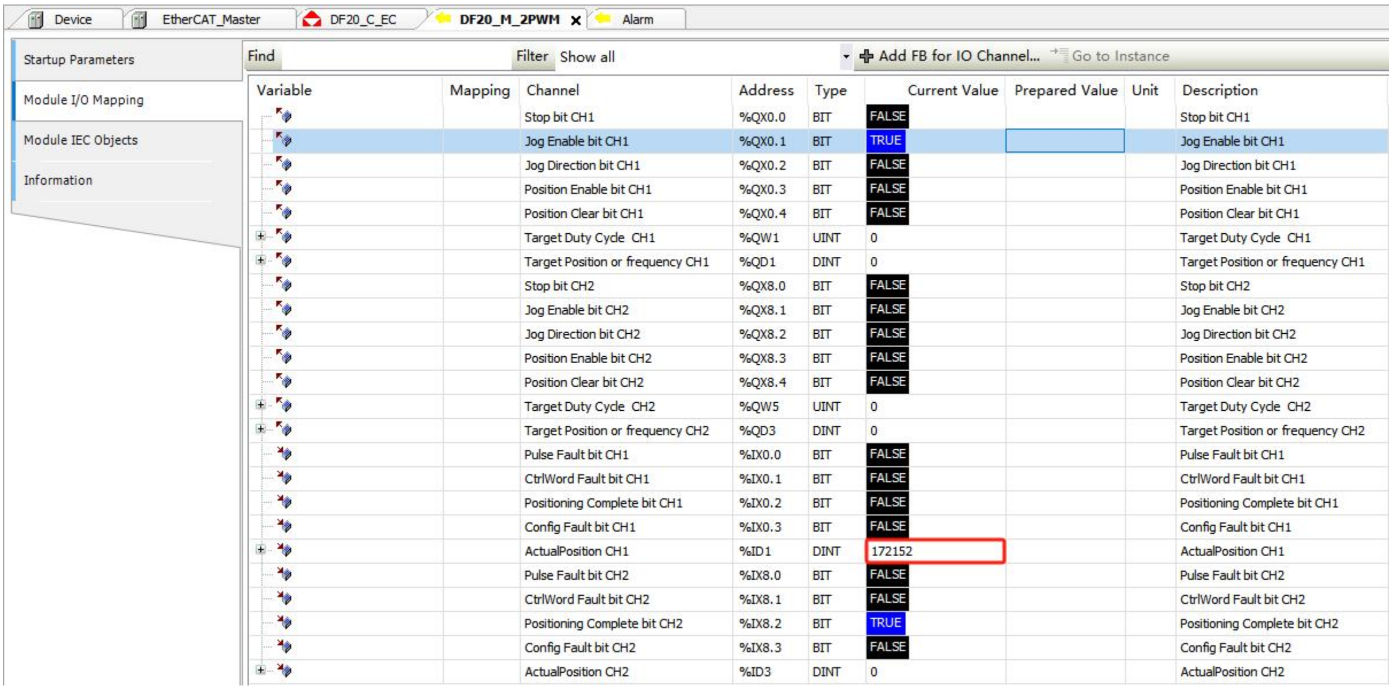


Figure 4-1-37

4.1.10.2 Instructions for use of pulse plus direction mode + relative position mode

1) Set the CH1 channel of the DF20-M-2PWM module to pulse plus direction mode, the output mode to relative position mode, the frequency ramp enable to open, the pulse frequency rise buffer time to 100ms, the fall buffer time to 100ms, the start frequency to 1000Hz, the target frequency to 10000Hz, the pulse

output direction to positive logic, and the CH1 channel configuration diagram as shown below. To switch modes, you need to clear "Jog Enable bit CH1" to 0.

Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#8000:16#00	DF20-M-2PWM 2PulseOut Module ID	68	8	☐	☐	0	DF20-M-2PWM 2PulseOut Module ID
2	16#41A0:16#01	DF20-M-2PWM Pulse Mode CH1	Pulse/Dir	8	☐	☐	0	DF20-M-2PWM Pulse Mode CH1
3	16#41A0:16#02	DF20-M-2PWM Motion Mode CH1	RelativePosition	8	☐	☐	0	DF20-M-2PWM Motion Mode CH1
4	16#41A0:16#03	DF20-M-2PWM Ramp Mode CH1	Ramp Enable	8	☐	☐	0	DF20-M-2PWM Ramp Mode CH1
5	16#41A0:16#04	DF20-M-2PWM Direction Mode CH1	Positive	8	☐	☐	0	DF20-M-2PWM Direction Mode CH1
6	16#41A0:16#05	DF20-M-2PWM Signal Type CH1	OpenDrain	8	☐	☐	0	DF20-M-2PWM Signal Type CH1
7	16#41A0:16#06	DF20-M-2PWM Duty Cycle CH1	Duty cycle disable	8	☐	☐	0	DF20-M-2PWM Duty Cycle CH1
8	16#41A0:16#07	DF20-M-2PWM PWM Freq Range CH1	100Hz~6kHz	8	☐	☐	0	DF20-M-2PWM PWM Freq Range CH1
9	16#41A0:16#08	DF20-M-2PWM Startup Freq CH1	1000	32	☐	☐	0	DF20-M-2PWM Startup Freq CH1
10	16#41A0:16#09	DF20-M-2PWM Target Freq CH1	10000	32	☐	☐	0	DF20-M-2PWM Target Freq CH1
11	16#41A0:16#0A	DF20-M-2PWM Ramp Up Time CH1	100	16	☐	☐	0	DF20-M-2PWM Ramp Up Time CH1
12	16#41A0:16#0B	DF20-M-2PWMRamp Dn Time CH1	100	16	☐	☐	0	DF20-M-2PWMRamp Dn Time CH1

Figure 4-1-38

2) Write "1" to Position Clear bit CH1 to clear the current accumulated pulse count. After clearing, write "0" to Position Clear bit CH1.

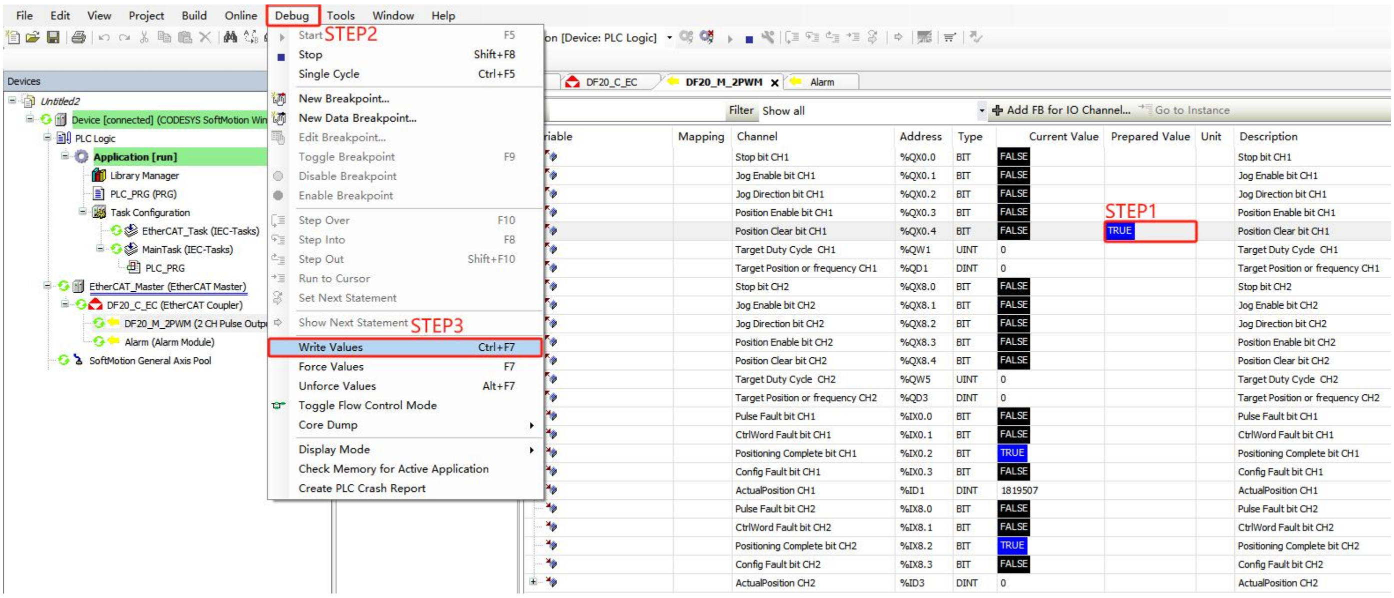
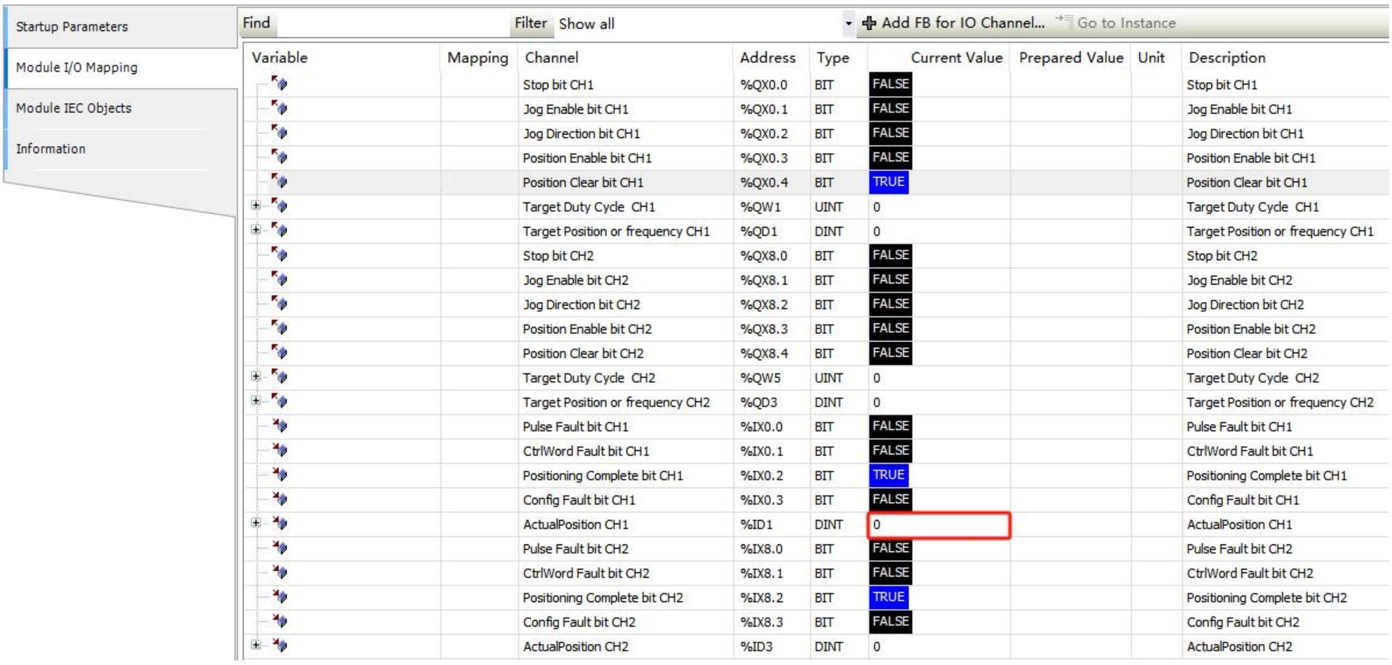


Figure 4-1-39



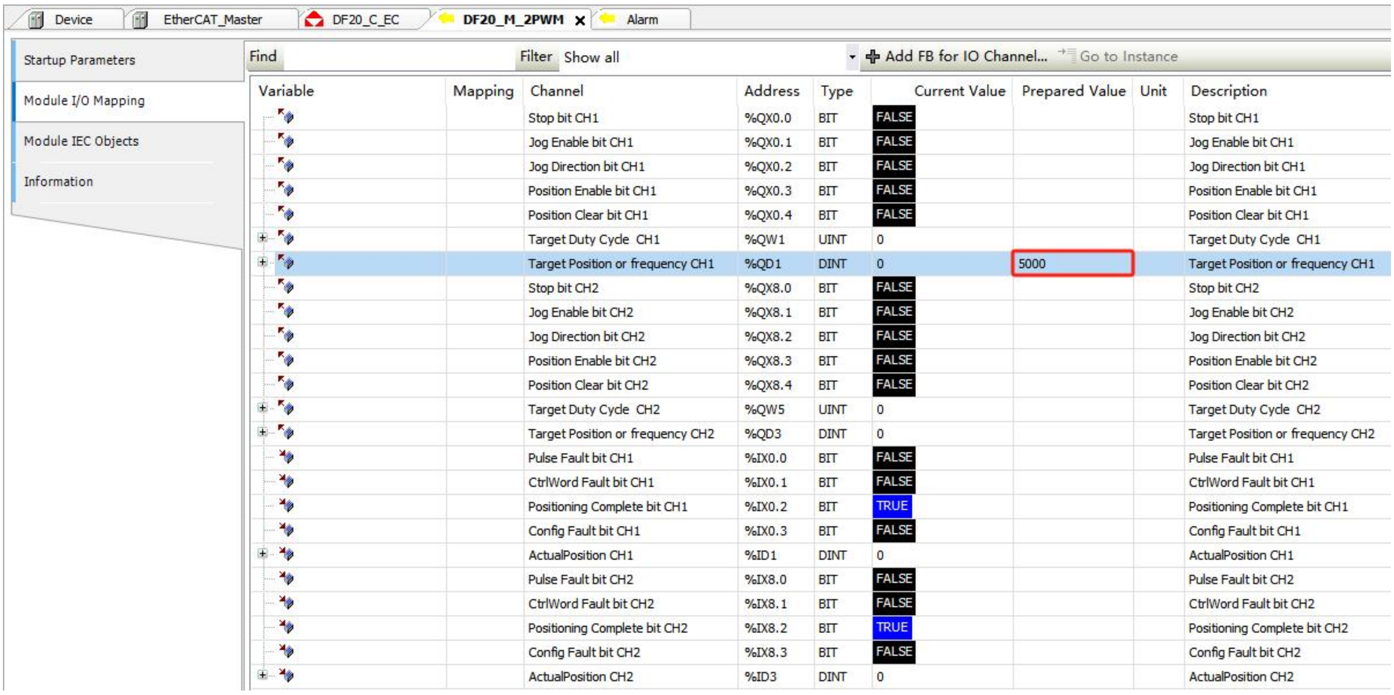
Startup Parameters
Module I/O Mapping
Module IEC Objects
Information

Find | Filter Show all | Add FB for IO Channel... | Go to Instance

Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		Stop bit CH1	%QX0.0	BIT	FALSE			Stop bit CH1
		Jog Enable bit CH1	%QX0.1	BIT	FALSE			Jog Enable bit CH1
		Jog Direction bit CH1	%QX0.2	BIT	FALSE			Jog Direction bit CH1
		Position Enable bit CH1	%QX0.3	BIT	FALSE			Position Enable bit CH1
		Position Clear bit CH1	%QX0.4	BIT	TRUE			Position Clear bit CH1
		Target Duty Cycle CH1	%QW1	UINT	0			Target Duty Cycle CH1
		Target Position or frequency CH1	%QD1	DINT	0			Target Position or frequency CH1
		Stop bit CH2	%QX8.0	BIT	FALSE			Stop bit CH2
		Jog Enable bit CH2	%QX8.1	BIT	FALSE			Jog Enable bit CH2
		Jog Direction bit CH2	%QX8.2	BIT	FALSE			Jog Direction bit CH2
		Position Enable bit CH2	%QX8.3	BIT	FALSE			Position Enable bit CH2
		Position Clear bit CH2	%QX8.4	BIT	FALSE			Position Clear bit CH2
		Target Duty Cycle CH2	%QW5	UINT	0			Target Duty Cycle CH2
		Target Position or frequency CH2	%QD3	DINT	0			Target Position or frequency CH2
		Pulse Fault bit CH1	%IX0.0	BIT	FALSE			Pulse Fault bit CH1
		CtrlWord Fault bit CH1	%IX0.1	BIT	FALSE			CtrlWord Fault bit CH1
		Positioning Complete bit CH1	%IX0.2	BIT	TRUE			Positioning Complete bit CH1
		Config Fault bit CH1	%IX0.3	BIT	FALSE			Config Fault bit CH1
		ActualPosition CH1	%ID1	DINT	0			ActualPosition CH1
		Pulse Fault bit CH2	%IX8.0	BIT	FALSE			Pulse Fault bit CH2
		CtrlWord Fault bit CH2	%IX8.1	BIT	FALSE			CtrlWord Fault bit CH2
		Positioning Complete bit CH2	%IX8.2	BIT	TRUE			Positioning Complete bit CH2
		Config Fault bit CH2	%IX8.3	BIT	FALSE			Config Fault bit CH2
		ActualPosition CH2	%ID3	DINT	0			ActualPosition CH2

Figure 4-1-40

3) Set the target output pulse number to 5000.



Device | EtherCAT_Master | DF20_C_EC | DF20_M_2PWM | Alarm

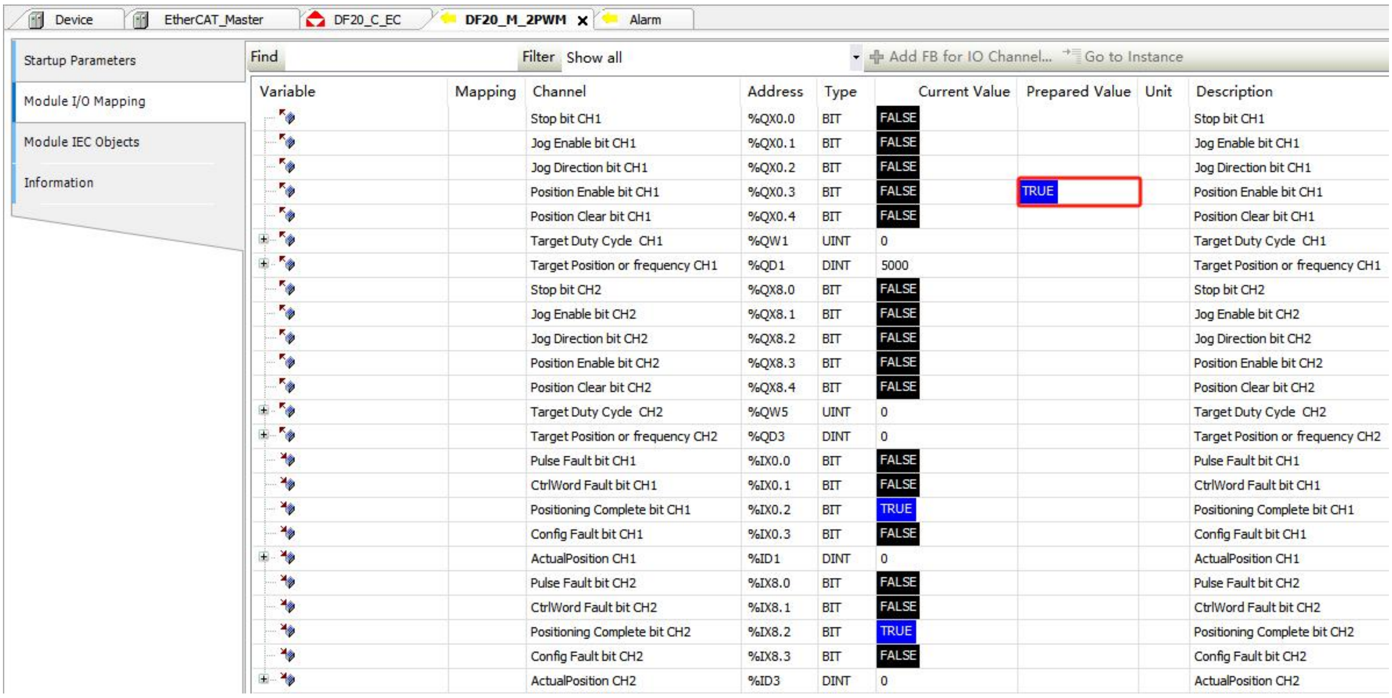
Startup Parameters
Module I/O Mapping
Module IEC Objects
Information

Find | Filter Show all | Add FB for IO Channel... | Go to Instance

Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		Stop bit CH1	%QX0.0	BIT	FALSE			Stop bit CH1
		Jog Enable bit CH1	%QX0.1	BIT	FALSE			Jog Enable bit CH1
		Jog Direction bit CH1	%QX0.2	BIT	FALSE			Jog Direction bit CH1
		Position Enable bit CH1	%QX0.3	BIT	FALSE			Position Enable bit CH1
		Position Clear bit CH1	%QX0.4	BIT	FALSE			Position Clear bit CH1
		Target Duty Cycle CH1	%QW1	UINT	0			Target Duty Cycle CH1
		Target Position or frequency CH1	%QD1	DINT	0	5000		Target Position or frequency CH1
		Stop bit CH2	%QX8.0	BIT	FALSE			Stop bit CH2
		Jog Enable bit CH2	%QX8.1	BIT	FALSE			Jog Enable bit CH2
		Jog Direction bit CH2	%QX8.2	BIT	FALSE			Jog Direction bit CH2
		Position Enable bit CH2	%QX8.3	BIT	FALSE			Position Enable bit CH2
		Position Clear bit CH2	%QX8.4	BIT	FALSE			Position Clear bit CH2
		Target Duty Cycle CH2	%QW5	UINT	0			Target Duty Cycle CH2
		Target Position or frequency CH2	%QD3	DINT	0			Target Position or frequency CH2
		Pulse Fault bit CH1	%IX0.0	BIT	FALSE			Pulse Fault bit CH1
		CtrlWord Fault bit CH1	%IX0.1	BIT	FALSE			CtrlWord Fault bit CH1
		Positioning Complete bit CH1	%IX0.2	BIT	TRUE			Positioning Complete bit CH1
		Config Fault bit CH1	%IX0.3	BIT	FALSE			Config Fault bit CH1
		ActualPosition CH1	%ID1	DINT	0			ActualPosition CH1
		Pulse Fault bit CH2	%IX8.0	BIT	FALSE			Pulse Fault bit CH2
		CtrlWord Fault bit CH2	%IX8.1	BIT	FALSE			CtrlWord Fault bit CH2
		Positioning Complete bit CH2	%IX8.2	BIT	TRUE			Positioning Complete bit CH2
		Config Fault bit CH2	%IX8.3	BIT	FALSE			Config Fault bit CH2
		ActualPosition CH2	%ID3	DINT	0			ActualPosition CH2

Figure 4-1-41

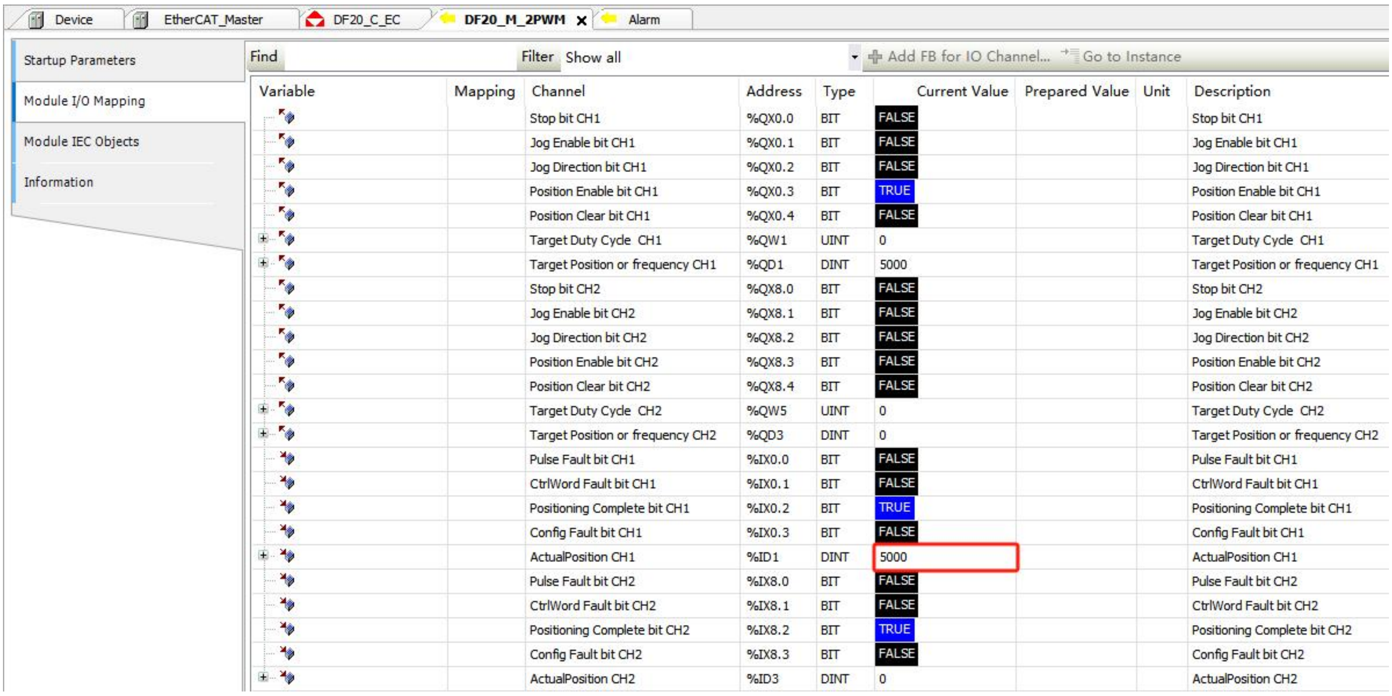
4) Enable module pulse output.



Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		Stop bit CH1	%QX0.0	BIT	FALSE			Stop bit CH1
		Jog Enable bit CH1	%QX0.1	BIT	FALSE			Jog Enable bit CH1
		Jog Direction bit CH1	%QX0.2	BIT	FALSE			Jog Direction bit CH1
		Position Enable bit CH1	%QX0.3	BIT	FALSE	TRUE		Position Enable bit CH1
		Position Clear bit CH1	%QX0.4	BIT	FALSE			Position Clear bit CH1
		Target Duty Cycle CH1	%QW1	UINT	0			Target Duty Cycle CH1
		Target Position or frequency CH1	%QD1	DINT	5000			Target Position or frequency CH1
		Stop bit CH2	%QX8.0	BIT	FALSE			Stop bit CH2
		Jog Enable bit CH2	%QX8.1	BIT	FALSE			Jog Enable bit CH2
		Jog Direction bit CH2	%QX8.2	BIT	FALSE			Jog Direction bit CH2
		Position Enable bit CH2	%QX8.3	BIT	FALSE			Position Enable bit CH2
		Position Clear bit CH2	%QX8.4	BIT	FALSE			Position Clear bit CH2
		Target Duty Cycle CH2	%QW5	UINT	0			Target Duty Cycle CH2
		Target Position or frequency CH2	%QD3	DINT	0			Target Position or frequency CH2
		Pulse Fault bit CH1	%IX0.0	BIT	FALSE			Pulse Fault bit CH1
		CtrlWord Fault bit CH1	%IX0.1	BIT	FALSE			CtrlWord Fault bit CH1
		Positioning Complete bit CH1	%IX0.2	BIT	TRUE			Positioning Complete bit CH1
		Config Fault bit CH1	%IX0.3	BIT	FALSE			Config Fault bit CH1
		ActualPosition CH1	%ID1	DINT	0			ActualPosition CH1
		Pulse Fault bit CH2	%IX8.0	BIT	FALSE			Pulse Fault bit CH2
		CtrlWord Fault bit CH2	%IX8.1	BIT	FALSE			CtrlWord Fault bit CH2
		Positioning Complete bit CH2	%IX8.2	BIT	TRUE			Positioning Complete bit CH2
		Config Fault bit CH2	%IX8.3	BIT	FALSE			Config Fault bit CH2
		ActualPosition CH2	%ID3	DINT	0			ActualPosition CH2

Figure 4-1-42

5) The current accumulated pulse number is 5000.



Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		Stop bit CH1	%QX0.0	BIT	FALSE			Stop bit CH1
		Jog Enable bit CH1	%QX0.1	BIT	FALSE			Jog Enable bit CH1
		Jog Direction bit CH1	%QX0.2	BIT	FALSE			Jog Direction bit CH1
		Position Enable bit CH1	%QX0.3	BIT	TRUE			Position Enable bit CH1
		Position Clear bit CH1	%QX0.4	BIT	FALSE			Position Clear bit CH1
		Target Duty Cycle CH1	%QW1	UINT	0			Target Duty Cycle CH1
		Target Position or frequency CH1	%QD1	DINT	5000			Target Position or frequency CH1
		Stop bit CH2	%QX8.0	BIT	FALSE			Stop bit CH2
		Jog Enable bit CH2	%QX8.1	BIT	FALSE			Jog Enable bit CH2
		Jog Direction bit CH2	%QX8.2	BIT	FALSE			Jog Direction bit CH2
		Position Enable bit CH2	%QX8.3	BIT	FALSE			Position Enable bit CH2
		Position Clear bit CH2	%QX8.4	BIT	FALSE			Position Clear bit CH2
		Target Duty Cycle CH2	%QW5	UINT	0			Target Duty Cycle CH2
		Target Position or frequency CH2	%QD3	DINT	0			Target Position or frequency CH2
		Pulse Fault bit CH1	%IX0.0	BIT	FALSE			Pulse Fault bit CH1
		CtrlWord Fault bit CH1	%IX0.1	BIT	FALSE			CtrlWord Fault bit CH1
		Positioning Complete bit CH1	%IX0.2	BIT	TRUE			Positioning Complete bit CH1
		Config Fault bit CH1	%IX0.3	BIT	FALSE			Config Fault bit CH1
		ActualPosition CH1	%ID1	DINT	5000			ActualPosition CH1
		Pulse Fault bit CH2	%IX8.0	BIT	FALSE			Pulse Fault bit CH2
		CtrlWord Fault bit CH2	%IX8.1	BIT	FALSE			CtrlWord Fault bit CH2
		Positioning Complete bit CH2	%IX8.2	BIT	TRUE			Positioning Complete bit CH2
		Config Fault bit CH2	%IX8.3	BIT	FALSE			Config Fault bit CH2
		ActualPosition CH2	%ID3	DINT	0			ActualPosition CH2

Figure 4-1-43

4.1.10.3 PWM Mode Instructions

1) Set the CH1 channel of the DF20-M-2PWM module to PWM mode and set the PWM frequency range to 100Hz-6kHz as shown in the figure below.

Device | EtherCAT_Master | DF20_C_EC | DF20_M_2PWM | Alarm

Startup Parameters | Module I/O Mapping | Module IEC Objects | Information

Add | Edit | Delete | Move Up | Move Down

Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#8000:16#00	DF20-M-2PWM 2PulseOut Module ID	68	8	☐	☐	0	DF20-M-2PWM 2PulseOut Module ID
2	16#41A0:16#01	DF20-M-2PWM Pulse Mode CH1	PWM	8	☐	☐	0	DF20-M-2PWM Pulse Mode CH1
3	16#41A0:16#02	DF20-M-2PWM Motion Mode CH1	Jog	8	☐	☐	0	DF20-M-2PWM Motion Mode CH1
4	16#41A0:16#03	DF20-M-2PWM Ramp Mode CH1	Ramp Enable	8	☐	☐	0	DF20-M-2PWM Ramp Mode CH1
5	16#41A0:16#04	DF20-M-2PWM Direction Mode CH1	Positive	8	☐	☐	0	DF20-M-2PWM Direction Mode CH1
6	16#41A0:16#05	DF20-M-2PWM Signal Type CH1	OpenDrain	8	☐	☐	0	DF20-M-2PWM Signal Type CH1
7	16#41A0:16#06	DF20-M-2PWM Duty Cycle CH1	Duty cycle disable	8	☐	☐	0	DF20-M-2PWM Duty Cycle CH1
8	16#41A0:16#07	DF20-M-2PWM PWM Freq Range CH1	100Hz~6kHz	8	☐	☐	0	DF20-M-2PWM PWM Freq Range CH1
9	16#41A0:16#08	DF20-M-2PWM Startup Freq CH1	1000	32	☐	☐	0	DF20-M-2PWM Startup Freq CH1
10	16#41A0:16#09	DF20-M-2PWM Target Freq CH1	10000	32	☐	☐	0	DF20-M-2PWM Target Freq CH1
11	16#41A0:16#0A	DF20-M-2PWM Ramp Up Time CH1	100	16	☐	☐	0	DF20-M-2PWM Ramp Up Time CH1
12	16#41A0:16#0B	DF20-M-2PWMRamp Dn Time CH1	100	16	☐	☐	0	DF20-M-2PWMRamp Dn Time CH1
13	16#41A0:16#0C	DF20-M-2PWM Pulse Mode CH2	Pulse/Dir	8	☐	☐	0	DF20-M-2PWM Pulse Mode CH2
14	16#41A0:16#0D	DF20-M-2PWM Motion Mode CH2	Jog	8	☐	☐	0	DF20-M-2PWM Motion Mode CH2
15	16#41A0:16#0E	DF20-M-2PWM Ramp Mode CH2	Ramp Enable	8	☐	☐	0	DF20-M-2PWM Ramp Mode CH2
16	16#41A0:16#0F	DF20-M-2PWM Direction Mode CH2	Positive	8	☐	☐	0	DF20-M-2PWM Direction Mode CH2
17	16#41A0:16#10	DF20-M-2PWM Signal Type CH2	OpenDrain	8	☐	☐	0	DF20-M-2PWM Signal Type CH2
18	16#41A0:16#11	DF20-M-2PWM Duty Cycle CH2	Duty cycle disable	8	☐	☐	0	DF20-M-2PWM Duty Cycle CH2
19	16#41A0:16#12	DF20-M-2PWM PWM Freq Range CH2	100Hz~6kHz	8	☐	☐	0	DF20-M-2PWM PWM Freq Range CH2
20	16#41A0:16#13	DF20-M-2PWM Startup Freq CH2	1000	32	☐	☐	0	DF20-M-2PWM Startup Freq CH2
21	16#41A0:16#14	DF20-M-2PWM Target Freq CH2	10000	32	☐	☐	0	DF20-M-2PWM Target Freq CH2
22	16#41A0:16#15	DF20-M-2PWM Ramp Up Time CH2	100	16	☐	☐	0	DF20-M-2PWM Ramp Up Time CH2
23	16#41A0:16#16	DF20-M-2PWM Ramp Dn Time CH2	100	16	☐	☐	0	DF20-M-2PWM Ramp Dn Time CH2

Figure 4-1-44

2) Set the PWM output frequency and observe the continuous output of DF20-M-2PWM module pulses on the oscilloscope, and the number of pulses continues to accumulate.

Device | EtherCAT_Master | DF20_C_EC | DF20_M_2PWM | Alarm

Startup Parameters | Module I/O Mapping | Module IEC Objects | Information

Find | Filter Show all | Add FB for IO Channel... | Go to Instance

Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		Stop bit CH1	%QX0.0	BIT	FALSE			Stop bit CH1
		Jog Enable bit CH1	%QX0.1	BIT	FALSE			Jog Enable bit CH1
		Jog Direction bit CH1	%QX0.2	BIT	FALSE			Jog Direction bit CH1
		Position Enable bit CH1	%QX0.3	BIT	FALSE			Position Enable bit CH1
		Position Clear bit CH1	%QX0.4	BIT	FALSE			Position Clear bit CH1
		Target Duty Cycle CH1	%QW1	UINT	0 STEP1			Target Duty Cycle CH1
		Target Position or frequency CH1	%QD1	DINT	500			Target Position or frequency CH1
		Stop bit CH2	%QX8.0	BIT	FALSE			Stop bit CH2
		Jog Enable bit CH2	%QX8.1	BIT	FALSE			Jog Enable bit CH2
		Jog Direction bit CH2	%QX8.2	BIT	FALSE			Jog Direction bit CH2
		Position Enable bit CH2	%QX8.3	BIT	FALSE			Position Enable bit CH2
		Position Clear bit CH2	%QX8.4	BIT	FALSE			Position Clear bit CH2
		Target Duty Cycle CH2	%QW5	UINT	0			Target Duty Cycle CH2
		Target Position or frequency CH2	%QD3	DINT	0			Target Position or frequency CH2
		Pulse Fault bit CH1	%IX0.0	BIT	FALSE			Pulse Fault bit CH1
		CtrlWord Fault bit CH1	%IX0.1	BIT	FALSE			CtrlWord Fault bit CH1
		Positioning Complete bit CH1	%IX0.2	BIT	FALSE			Positioning Complete bit CH1
		Config Fault bit CH1	%IX0.3	BIT	FALSE STEP2			Config Fault bit CH1
		ActualPosition CH1	%ID1	DINT	17195			ActualPosition CH1
		Pulse Fault bit CH2	%IX8.0	BIT	FALSE			Pulse Fault bit CH2
		CtrlWord Fault bit CH2	%IX8.1	BIT	FALSE			CtrlWord Fault bit CH2
		Positioning Complete bit CH2	%IX8.2	BIT	TRUE			Positioning Complete bit CH2
		Config Fault bit CH2	%IX8.3	BIT	FALSE			Config Fault bit CH2
		ActualPosition CH2	%ID3	DINT	0			ActualPosition CH2

Figure 4-1-45

4.1.11 Single-channel serial communication module usage routine

- This example uses the DF20-C-EC+DF20-M-1COM-232/485/422 topology. During the power-on phase, the PWR power indicator is always

The module enters working state, the STA status indicator flashes, and the status indicators corresponding to RS485/422/232 and CUSTOM/MASTER/SLAVE are always on.

- As shown in Figure 4-1-46, the topology of the routine is scanned on CODESYS.

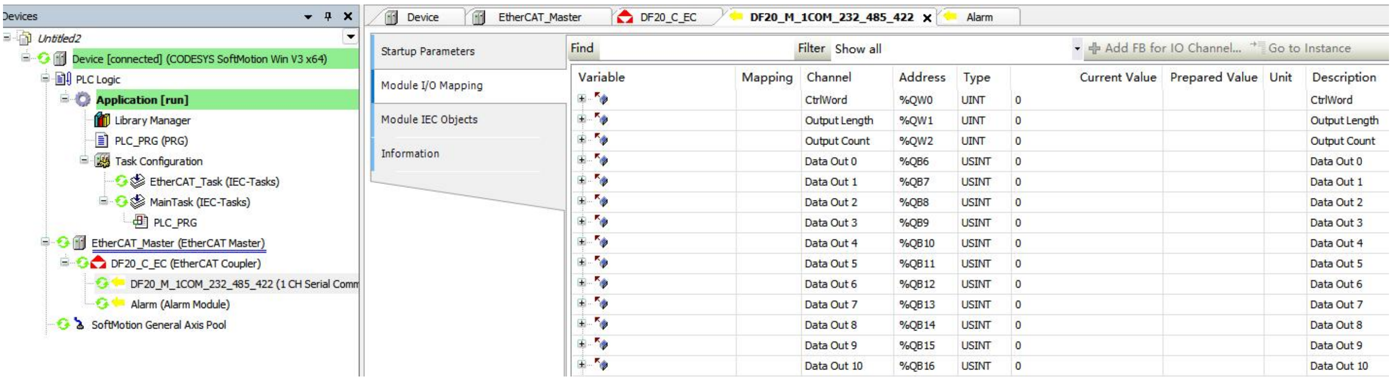


Figure 4-1-46

- Double-click the parameter option to change the configuration options, as shown in the figure below.

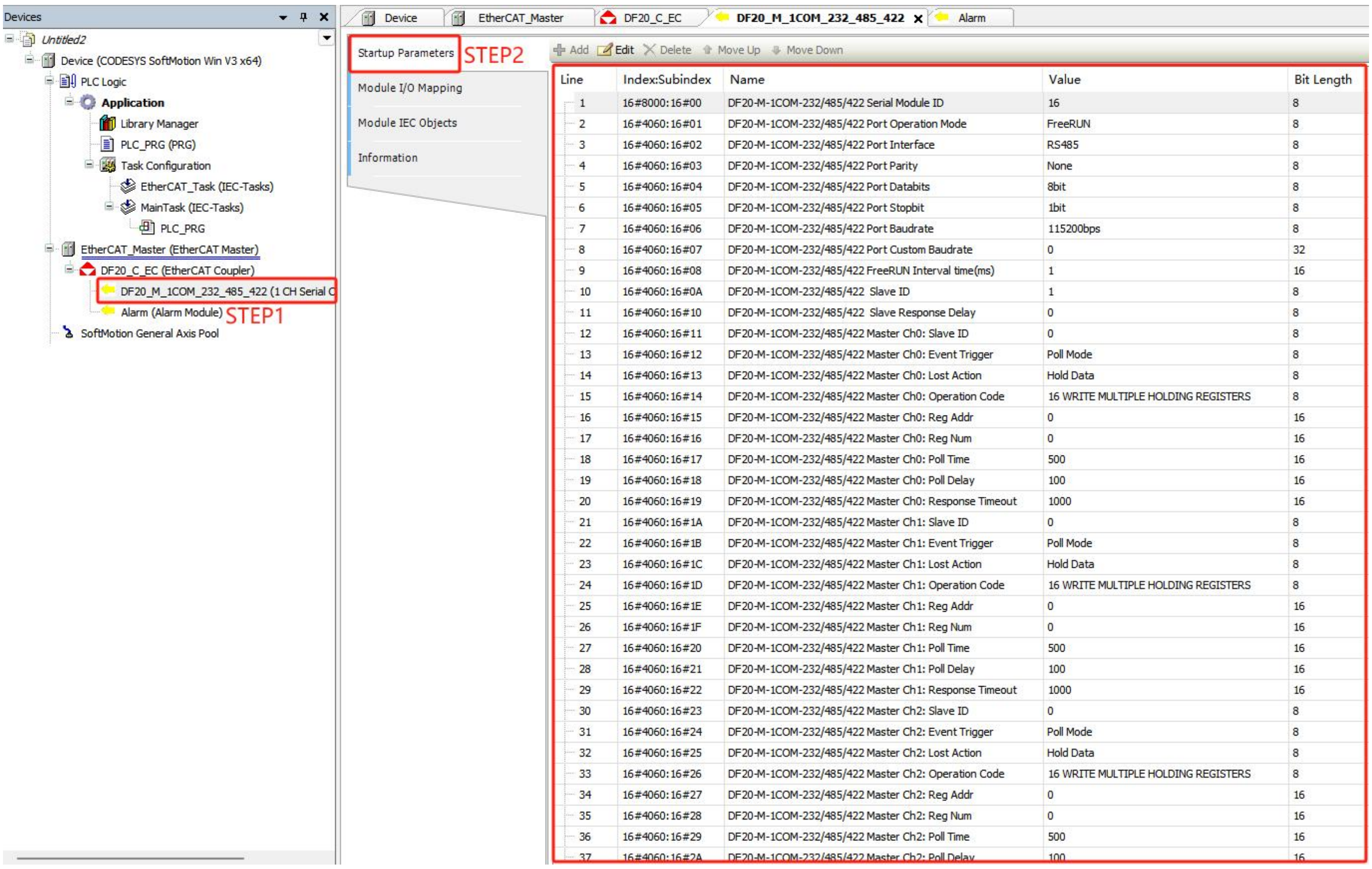


Figure 4-1-47

4.1.11.1 Free Mode Routine

- Free transparent transmission mode configuration
- For the meaning of configuration data, please refer to3.45.4 Configuration parameter definitionThe configuration interface of free transparent transmission mode is shown in the figure below.

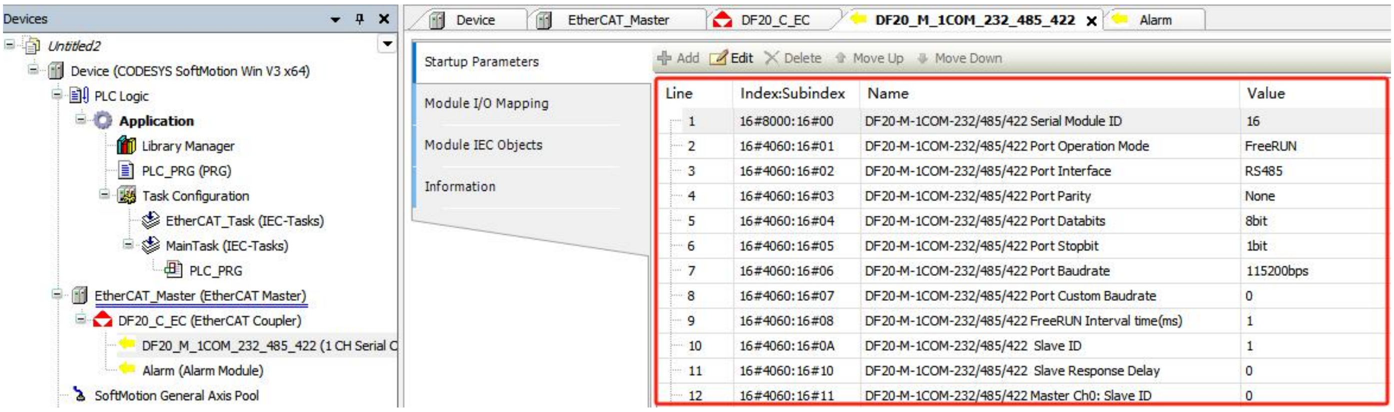


Figure 4-1-48

- In the Run Mode option, configure the mode to FreeRUN mode.

Line	Index:Subindex	Name	Value
1	16#8000:16#00	DF20-M-1COM-232/485/422 Serial Module ID	16
2	16#4060:16#01	DF20-M-1COM-232/485/422 Port Operation Mode	FreeRUN
3	16#4060:16#02	DF20-M-1COM-232/485/422 Port Interface	RS485
4	16#4060:16#03	DF20-M-1COM-232/485/422 Port Parity	None
5	16#4060:16#04	DF20-M-1COM-232/485/422 Port Databits	8bit
6	16#4060:16#05	DF20-M-1COM-232/485/422 Port Stopbit	1bit
7	16#4060:16#06	DF20-M-1COM-232/485/422 Port Baudrate	115200bps
8	16#4060:16#07	DF20-M-1COM-232/485/422 Port Custom Baudrate	0

Figure 4-1-49

- The configuration process data is 1 Ch Serial Gateway FreeRUN.

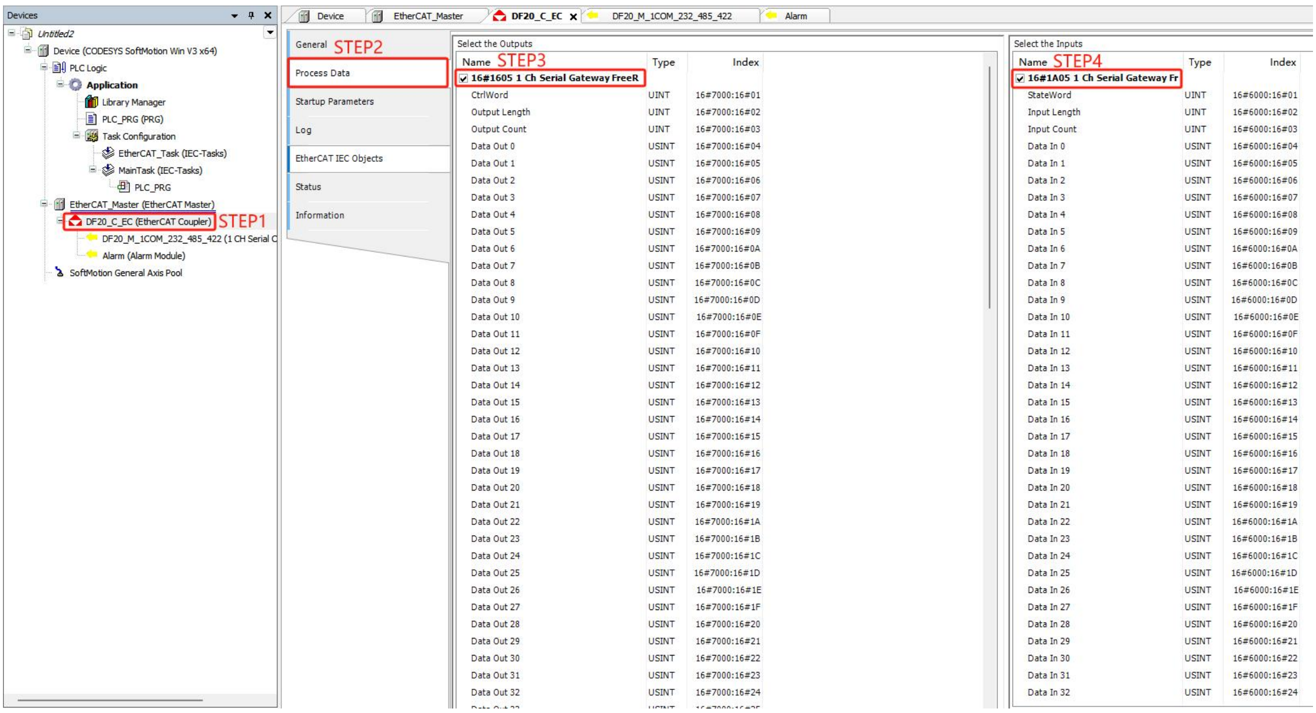


Figure 4-1-50

➢ Click Log in to the device again, download the parameters and run it.

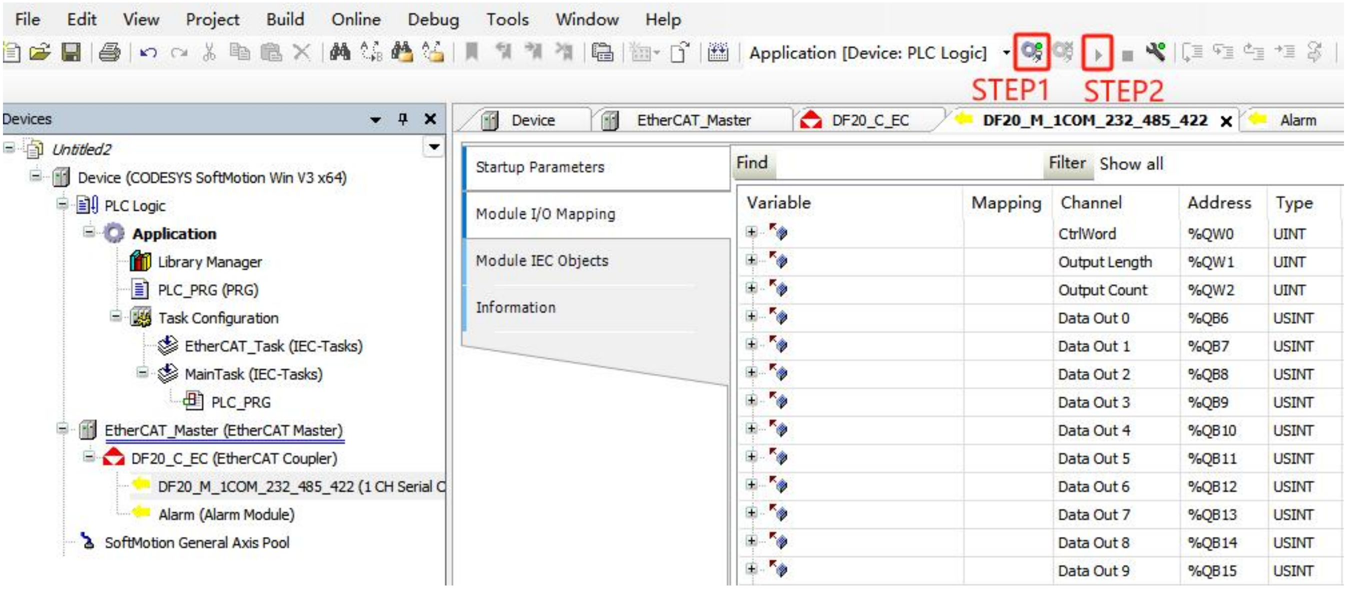
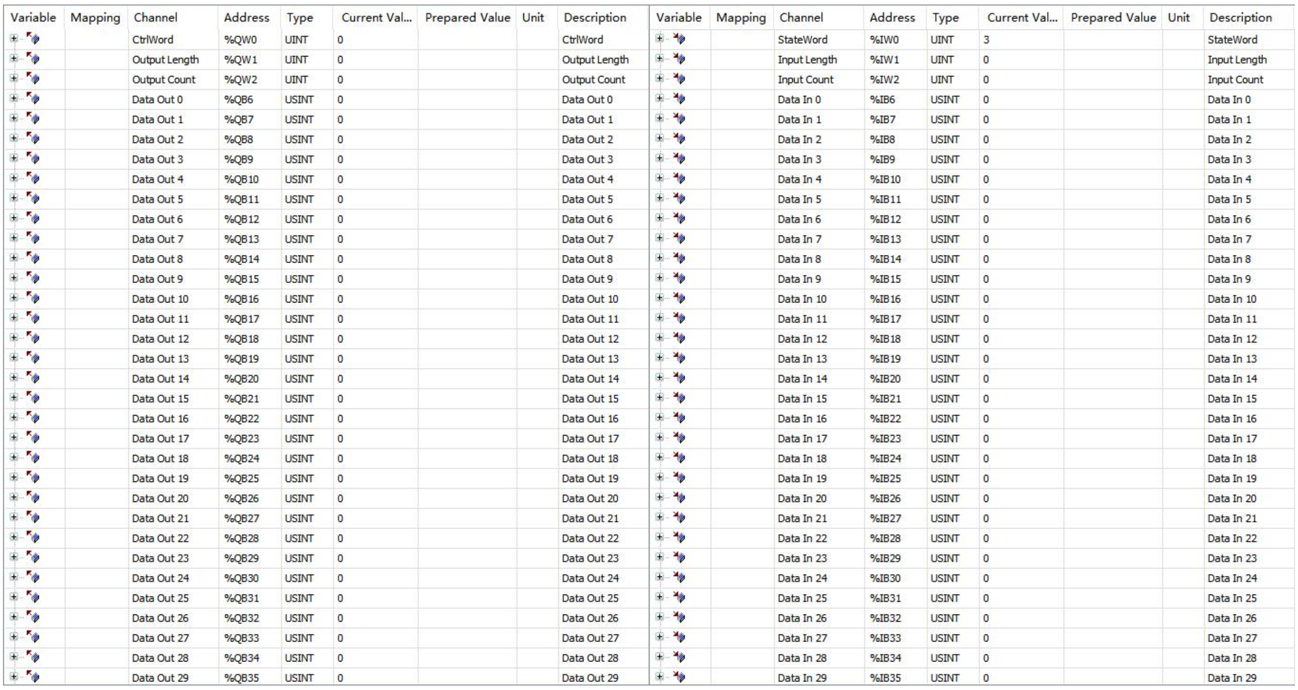


Figure 4-1-51

➢ The free mode input and output data are shown in the figure below.



Variable	Mapping	Channel	Address	Type	Current Val...	Prepared Value	Unit	Description
		CtrlWord	%QW0	UINT	0			CtrlWord
		Output Length	%QW1	UINT	0			Output Length
		Output Count	%QW2	UINT	0			Output Count
		Data Out 0	%QB6	USINT	0			Data Out 0
		Data Out 1	%QB7	USINT	0			Data Out 1
		Data Out 2	%QB8	USINT	0			Data Out 2
		Data Out 3	%QB9	USINT	0			Data Out 3
		Data Out 4	%QB10	USINT	0			Data Out 4
		Data Out 5	%QB11	USINT	0			Data Out 5
		Data Out 6	%QB12	USINT	0			Data Out 6
		Data Out 7	%QB13	USINT	0			Data Out 7
		Data Out 8	%QB14	USINT	0			Data Out 8
		Data Out 9	%QB15	USINT	0			Data Out 9
		Data Out 10	%QB16	USINT	0			Data Out 10
		Data Out 11	%QB17	USINT	0			Data Out 11
		Data Out 12	%QB18	USINT	0			Data Out 12
		Data Out 13	%QB19	USINT	0			Data Out 13
		Data Out 14	%QB20	USINT	0			Data Out 14
		Data Out 15	%QB21	USINT	0			Data Out 15
		Data Out 16	%QB22	USINT	0			Data Out 16
		Data Out 17	%QB23	USINT	0			Data Out 17
		Data Out 18	%QB24	USINT	0			Data Out 18
		Data Out 19	%QB25	USINT	0			Data Out 19
		Data Out 20	%QB26	USINT	0			Data Out 20
		Data Out 21	%QB27	USINT	0			Data Out 21
		Data Out 22	%QB28	USINT	0			Data Out 22
		Data Out 23	%QB29	USINT	0			Data Out 23
		Data Out 24	%QB30	USINT	0			Data Out 24
		Data Out 25	%QB31	USINT	0			Data Out 25
		Data Out 26	%QB32	USINT	0			Data Out 26
		Data Out 27	%QB33	USINT	0			Data Out 27
		Data Out 28	%QB34	USINT	0			Data Out 28
		Data Out 29	%QB35	USINT	0			Data Out 29

Variable	Mapping	Channel	Address	Type	Current Val...	Prepared Value	Unit	Description
		StateWord	%IW0	UINT	3			StateWord
		Input Length	%IW1	UINT	0			Input Length
		Input Count	%IW2	UINT	0			Input Count
		Data In 0	%IB6	USINT	0			Data In 0
		Data In 1	%IB7	USINT	0			Data In 1
		Data In 2	%IB8	USINT	0			Data In 2
		Data In 3	%IB9	USINT	0			Data In 3
		Data In 4	%IB10	USINT	0			Data In 4
		Data In 5	%IB11	USINT	0			Data In 5
		Data In 6	%IB12	USINT	0			Data In 6
		Data In 7	%IB13	USINT	0			Data In 7
		Data In 8	%IB14	USINT	0			Data In 8
		Data In 9	%IB15	USINT	0			Data In 9
		Data In 10	%IB16	USINT	0			Data In 10
		Data In 11	%IB17	USINT	0			Data In 11
		Data In 12	%IB18	USINT	0			Data In 12
		Data In 13	%IB19	USINT	0			Data In 13
		Data In 14	%IB20	USINT	0			Data In 14
		Data In 15	%IB21	USINT	0			Data In 15
		Data In 16	%IB22	USINT	0			Data In 16
		Data In 17	%IB23	USINT	0			Data In 17
		Data In 18	%IB24	USINT	0			Data In 18
		Data In 19	%IB25	USINT	0			Data In 19
		Data In 20	%IB26	USINT	0			Data In 20
		Data In 21	%IB27	USINT	0			Data In 21
		Data In 22	%IB28	USINT	0			Data In 22
		Data In 23	%IB29	USINT	0			Data In 23
		Data In 24	%IB30	USINT	0			Data In 24
		Data In 25	%IB31	USINT	0			Data In 25
		Data In 26	%IB32	USINT	0			Data In 26
		Data In 27	%IB33	USINT	0			Data In 27
		Data In 28	%IB34	USINT	0			Data In 28
		Data In 29	%IB35	USINT	0			Data In 29

Figure 4-1-52

➢ Description of process data in free transparent transmission mode.

Output Data		
name	**length**	**meaning**
CtrlWord	2Byte	Control Word
OutputLength	2Byte	Send data length
OutputCount	2Byte	Send data sequence number

DataOut 0-39	40Byte	Send data content

- As shown in the table above, OutputLength is the length of the data to be sent, DataOut 0-39 is the data to be sent, and OutputCount

Assigning a new value can activate a single transmission, and the PLC program can periodically accumulate OutputCount to achieve fixed periodic transmission.

Input Data		
name	**length**	**meaning**
StateWord	2Byte	Status word
InputLength	2Byte	Receive data length
InputCount	2Byte	Receive data sequence number
DataIn 0-39	40Byte	Receive data content

- As shown in the table above, receiving data is similar to sending data. InputLength indicates the length of the received data, and DataIn 0-39 indicates the length of the received data.

Valid data, InputCount indicates the sequence number of the currently received data frame (accumulated value). Users can determine whether a new data frame has been received based on whether the current InputCount value is updated, and the length of the received new data frame can be determined by InputLength.

- CtrlWord command table.

Command Value	Command Name	meaning
16#00A1	CONFIGUREPORT	Configuration Commands
16#00C1	WRITEFreeRUN	Free mode write data command
16#00C2	READFreeRUN	Free mode read data command

- CtrlWord writes 193 (0x00C1) to configure the module into send mode.

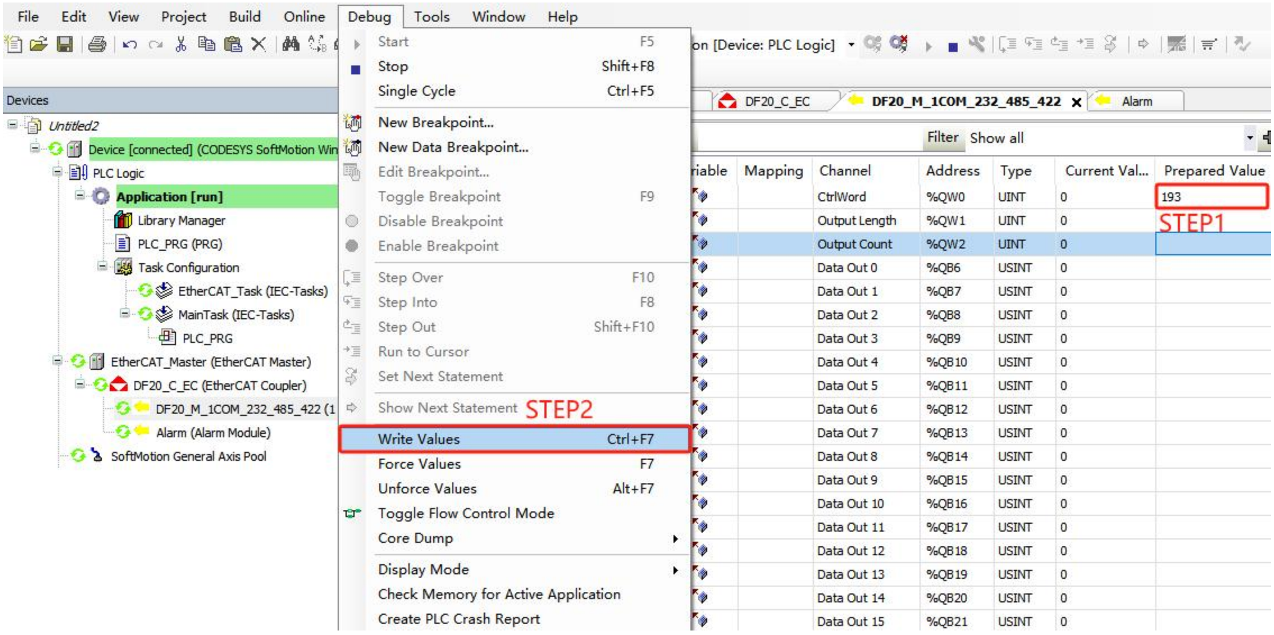


Figure 4-1-53

➢ Output Length sets the transmission length to 3, Data Out 0 writes the transmission data 01, Data Out 1 writes the transmission data 02, Data Out

2 Write send data 03.

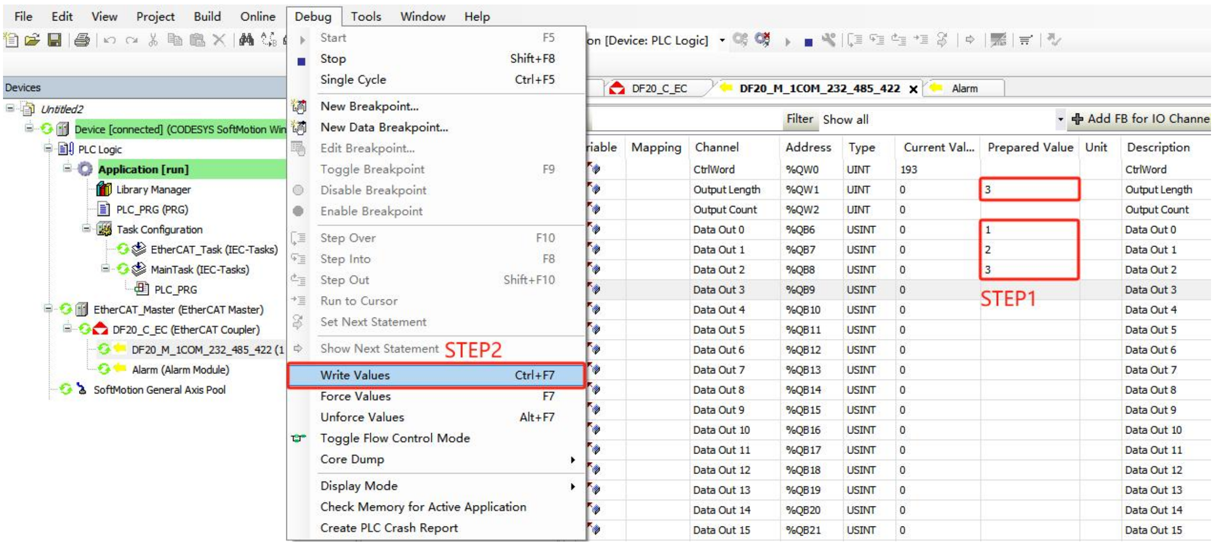


Figure 4-1-54

➢ Set Output Count to 1 and send data to the serial port assistant, as shown in the figure below.

Send data once.

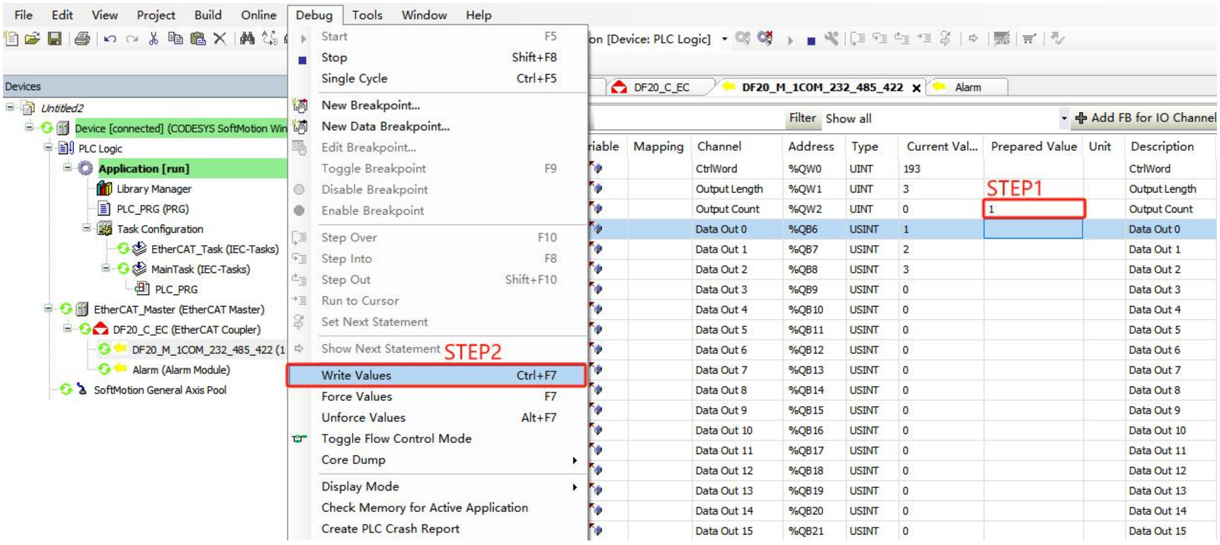


Figure 4-1-55

➢ The data received by the PC is shown in the figure below.

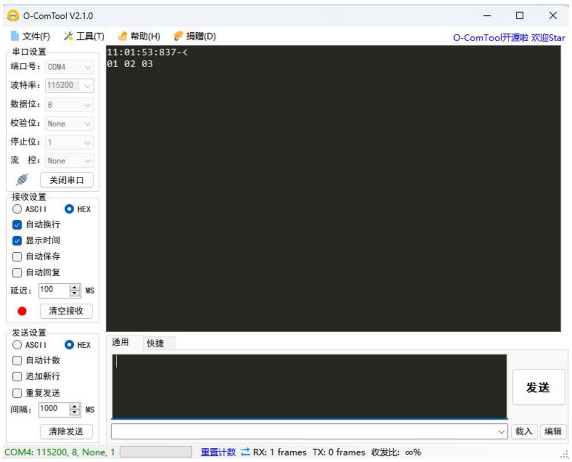


Figure 4-1-56

➢ CtrlWord writes 194 (0x00C2) to configure the module into receive mode.

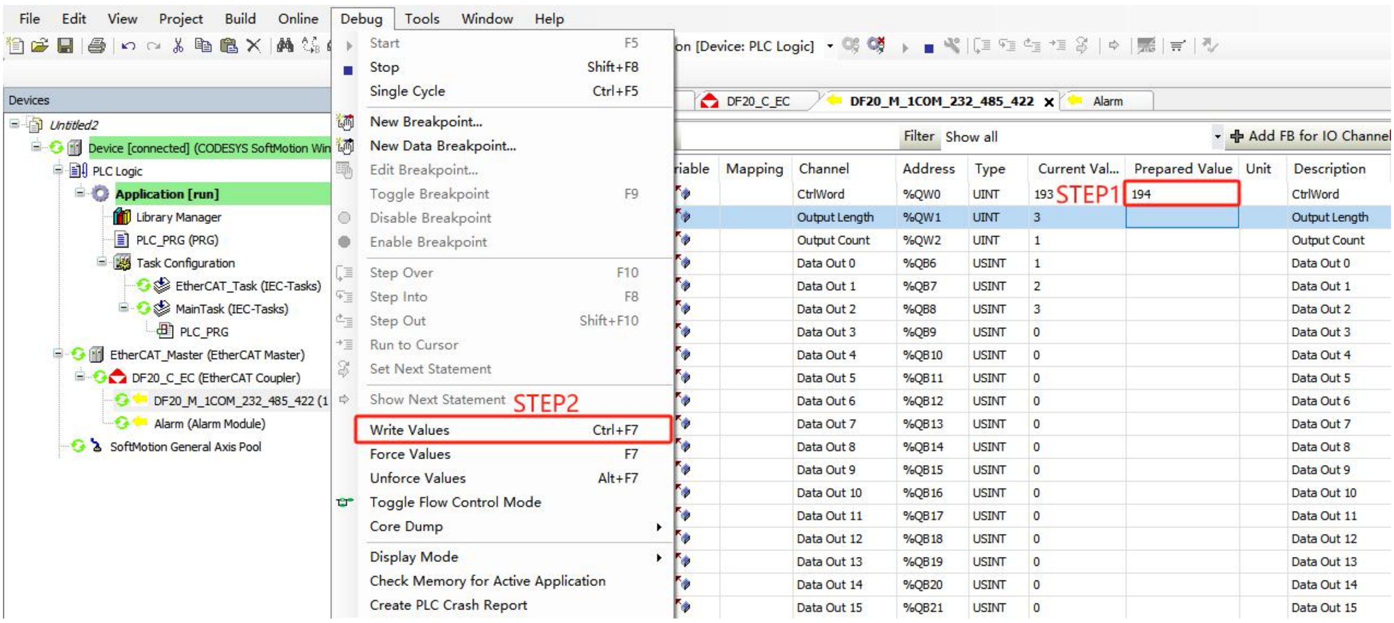
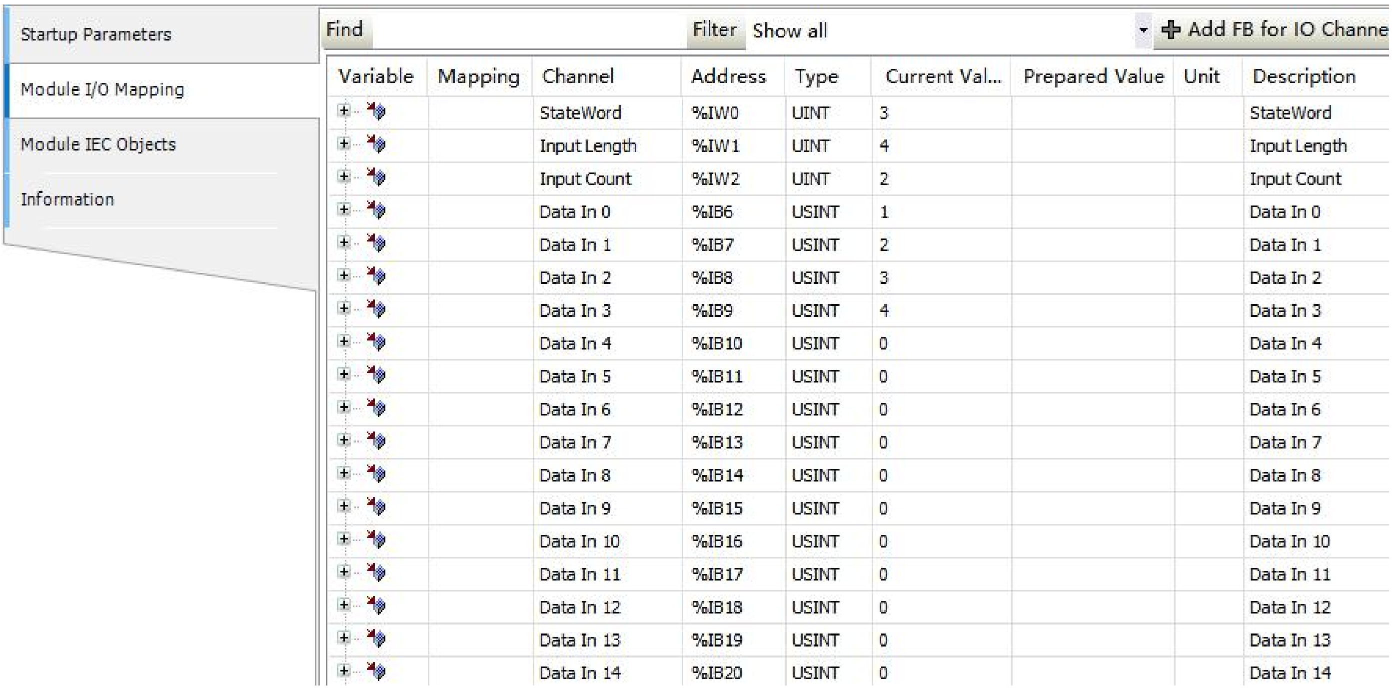


Figure 4-1-57

➢ PC sends 01 02 03 04 through the serial port assistant, and the card input data is as shown in the figure, which is consistent with the actual data.

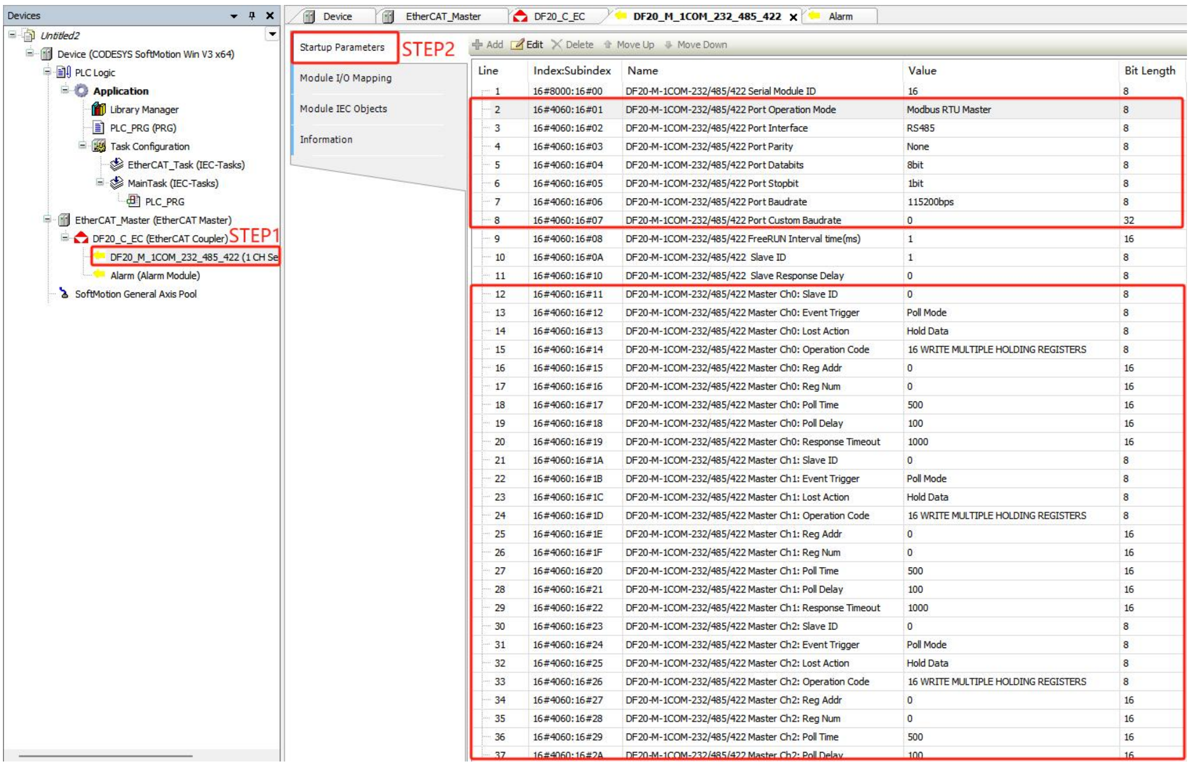


Variable	Mapping	Channel	Address	Type	Current Val...	Prepared Value	Unit	Description
		StateWord	%IW0	UINT	3			StateWord
		Input Length	%IW1	UINT	4			Input Length
		Input Count	%IW2	UINT	2			Input Count
		Data In 0	%IB6	USINT	1			Data In 0
		Data In 1	%IB7	USINT	2			Data In 1
		Data In 2	%IB8	USINT	3			Data In 2
		Data In 3	%IB9	USINT	4			Data In 3
		Data In 4	%IB10	USINT	0			Data In 4
		Data In 5	%IB11	USINT	0			Data In 5
		Data In 6	%IB12	USINT	0			Data In 6
		Data In 7	%IB13	USINT	0			Data In 7
		Data In 8	%IB14	USINT	0			Data In 8
		Data In 9	%IB15	USINT	0			Data In 9
		Data In 10	%IB16	USINT	0			Data In 10
		Data In 11	%IB17	USINT	0			Data In 11
		Data In 12	%IB18	USINT	0			Data In 12
		Data In 13	%IB19	USINT	0			Data In 13
		Data In 14	%IB20	USINT	0			Data In 14

Figure 4-1-58

4.1.11.2 Modbus RTU Master Example

- Modbus RTU Master Configuration
- For the meaning of configuration data, please refer to3.45.4 Configuration parameter definition, the configuration interface of Modbus RTU Master mode is shown in the figure below.



Line	Index:Subindex	Name	Value	Bit Length
1	16#8000:16#00	DF20-M-1COM-232/485/422 Serial Module ID	16	8
2	16#4060:16#01	DF20-M-1COM-232/485/422 Port Operation Mode	Modbus RTU Master	8
3	16#4060:16#02	DF20-M-1COM-232/485/422 Port Interface	RS485	8
4	16#4060:16#03	DF20-M-1COM-232/485/422 Port Parity	None	8
5	16#4060:16#04	DF20-M-1COM-232/485/422 Port Databits	8bit	8
6	16#4060:16#05	DF20-M-1COM-232/485/422 Port Stopbit	1bit	8
7	16#4060:16#06	DF20-M-1COM-232/485/422 Port Baudrate	115200bps	8
8	16#4060:16#07	DF20-M-1COM-232/485/422 Port Custom Baudrate	0	32
9	16#4060:16#08	DF20-M-1COM-232/485/422 FreeRUN Interval time(ms)	1	16
10	16#4060:16#0A	DF20-M-1COM-232/485/422 Slave ID	1	8
11	16#4060:16#10	DF20-M-1COM-232/485/422 Slave Response Delay	0	8
12	16#4060:16#11	DF20-M-1COM-232/485/422 Master Ch0: Slave ID	0	8
13	16#4060:16#12	DF20-M-1COM-232/485/422 Master Ch0: Event Trigger	Poll Mode	8
14	16#4060:16#13	DF20-M-1COM-232/485/422 Master Ch0: Lost Action	Hold Data	8
15	16#4060:16#14	DF20-M-1COM-232/485/422 Master Ch0: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS	8
16	16#4060:16#15	DF20-M-1COM-232/485/422 Master Ch0: Reg Addr	0	16
17	16#4060:16#16	DF20-M-1COM-232/485/422 Master Ch0: Reg Num	0	16
18	16#4060:16#17	DF20-M-1COM-232/485/422 Master Ch0: Poll Time	500	16
19	16#4060:16#18	DF20-M-1COM-232/485/422 Master Ch0: Poll Delay	100	16
20	16#4060:16#19	DF20-M-1COM-232/485/422 Master Ch0: Response Timeout	1000	16
21	16#4060:16#1A	DF20-M-1COM-232/485/422 Master Ch1: Slave ID	0	8
22	16#4060:16#1B	DF20-M-1COM-232/485/422 Master Ch1: Event Trigger	Poll Mode	8
23	16#4060:16#1C	DF20-M-1COM-232/485/422 Master Ch1: Lost Action	Hold Data	8
24	16#4060:16#1D	DF20-M-1COM-232/485/422 Master Ch1: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS	8
25	16#4060:16#1E	DF20-M-1COM-232/485/422 Master Ch1: Reg Addr	0	16
26	16#4060:16#1F	DF20-M-1COM-232/485/422 Master Ch1: Reg Num	0	16
27	16#4060:16#20	DF20-M-1COM-232/485/422 Master Ch1: Poll Time	500	16
28	16#4060:16#21	DF20-M-1COM-232/485/422 Master Ch1: Poll Delay	100	16
29	16#4060:16#22	DF20-M-1COM-232/485/422 Master Ch1: Response Timeout	1000	16
30	16#4060:16#23	DF20-M-1COM-232/485/422 Master Ch2: Slave ID	0	8
31	16#4060:16#24	DF20-M-1COM-232/485/422 Master Ch2: Event Trigger	Poll Mode	8
32	16#4060:16#25	DF20-M-1COM-232/485/422 Master Ch2: Lost Action	Hold Data	8
33	16#4060:16#26	DF20-M-1COM-232/485/422 Master Ch2: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS	8
34	16#4060:16#27	DF20-M-1COM-232/485/422 Master Ch2: Reg Addr	0	16
35	16#4060:16#28	DF20-M-1COM-232/485/422 Master Ch2: Reg Num	0	16
36	16#4060:16#29	DF20-M-1COM-232/485/422 Master Ch2: Poll Time	500	16
37	16#4060:16#2A	DF20-M-1COM-232/485/422 Master Ch2: Poll Delay	100	16

Figure 4-1-59

➢ Configure the process data to 1 Ch Serial Gateway Master.

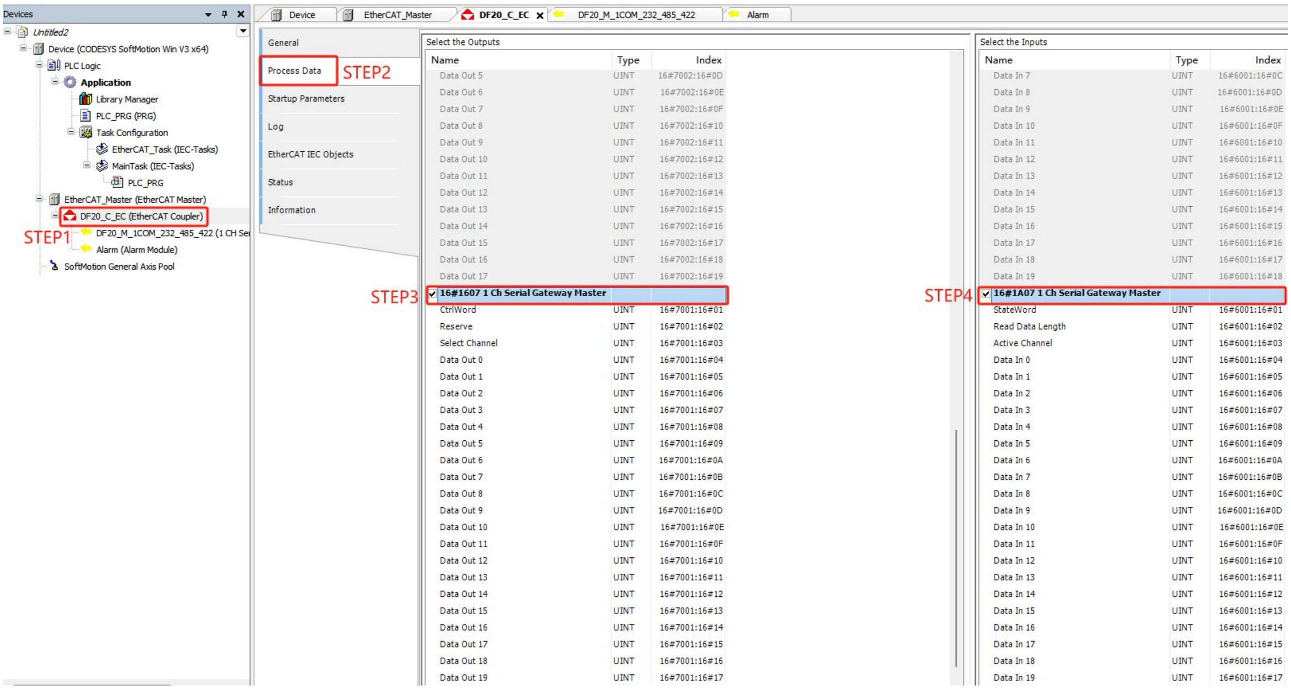


Figure 4-1-60

The parameters of Ch0~Ch11 can be configured according to the communication format of the slave device to be communicated. Different function code read and write operations can be performed on 12 slaves with different IDs. The addresses are 1~12 respectively:

Addresses 1-3 are shown below, and addresses 4-12 have the same configuration structure.

Line	Index:Subindex	Name	Value	Bit Length
12	16#4060:16#11	DF20-M-1COM-232/485/422 Master Ch0: Slave ID	1	8
13	16#4060:16#12	DF20-M-1COM-232/485/422 Master Ch0: Event Trigger	Poll Mode	8
14	16#4060:16#13	DF20-M-1COM-232/485/422 Master Ch0: Lost Action	Hold Data	8
15	16#4060:16#14	DF20-M-1COM-232/485/422 Master Ch0: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS	8
16	16#4060:16#15	DF20-M-1COM-232/485/422 Master Ch0: Reg Addr	0	16
17	16#4060:16#16	DF20-M-1COM-232/485/422 Master Ch0: Reg Num	0	16
18	16#4060:16#17	DF20-M-1COM-232/485/422 Master Ch0: Poll Time	500	16
19	16#4060:16#18	DF20-M-1COM-232/485/422 Master Ch0: Poll Delay	100	16
20	16#4060:16#19	DF20-M-1COM-232/485/422 Master Ch0: Response Timeout	1000	16
21	16#4060:16#1A	DF20-M-1COM-232/485/422 Master Ch1: Slave ID	0	8
22	16#4060:16#1B	DF20-M-1COM-232/485/422 Master Ch1: Event Trigger	Poll Mode	8
23	16#4060:16#1C	DF20-M-1COM-232/485/422 Master Ch1: Lost Action	Hold Data	8
24	16#4060:16#1D	DF20-M-1COM-232/485/422 Master Ch1: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS	8
25	16#4060:16#1E	DF20-M-1COM-232/485/422 Master Ch1: Reg Addr	0	16
26	16#4060:16#1F	DF20-M-1COM-232/485/422 Master Ch1: Reg Num	0	16
27	16#4060:16#20	DF20-M-1COM-232/485/422 Master Ch1: Poll Time	500	16
28	16#4060:16#21	DF20-M-1COM-232/485/422 Master Ch1: Poll Delay	100	16
29	16#4060:16#22	DF20-M-1COM-232/485/422 Master Ch1: Response Timeout	1000	16
30	16#4060:16#23	DF20-M-1COM-232/485/422 Master Ch2: Slave ID	0	8
31	16#4060:16#24	DF20-M-1COM-232/485/422 Master Ch2: Event Trigger	Poll Mode	8
32	16#4060:16#25	DF20-M-1COM-232/485/422 Master Ch2: Lost Action	Hold Data	8
33	16#4060:16#26	DF20-M-1COM-232/485/422 Master Ch2: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS	8
34	16#4060:16#27	DF20-M-1COM-232/485/422 Master Ch2: Reg Addr	0	16
35	16#4060:16#28	DF20-M-1COM-232/485/422 Master Ch2: Reg Num	0	16
36	16#4060:16#29	DF20-M-1COM-232/485/422 Master Ch2: Poll Time	500	16
37	16#4060:16#2A	DF20-M-1COM-232/485/422 Master Ch2: Poll Delay	100	16
38	16#4060:16#2B	DF20-M-1COM-232/485/422 Master Ch2: Response Timeout	1000	16

Figure 4-1-61

Among them, ch2 and ch3 are set to a slave address of 0x03 at the same time, and the holding register of the slave station is written. The writing range is 0~20 and 20~40. This flexible configuration can read and write a maximum of 12ch*20word data to the same slave station.

Line	Index:Subindex	Name	Value	Bit Length
30	16#4060:16#23	DF20-M-1COM-232/485/422 Master Ch2: Slave ID	3	8
31	16#4060:16#24	DF20-M-1COM-232/485/422 Master Ch2: Event Trigger	Poll Mode	8
32	16#4060:16#25	DF20-M-1COM-232/485/422 Master Ch2: Lost Action	Hold Data	8
33	16#4060:16#26	DF20-M-1COM-232/485/422 Master Ch2: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS	8
34	16#4060:16#27	DF20-M-1COM-232/485/422 Master Ch2: Reg Addr	0	16
35	16#4060:16#28	DF20-M-1COM-232/485/422 Master Ch2: Reg Num	20	16
36	16#4060:16#29	DF20-M-1COM-232/485/422 Master Ch2: Poll Time	500	16
37	16#4060:16#2A	DF20-M-1COM-232/485/422 Master Ch2: Poll Delay	100	16
38	16#4060:16#2B	DF20-M-1COM-232/485/422 Master Ch2: Response Timeout	1000	16
39	16#4060:16#2C	DF20-M-1COM-232/485/422 Master Ch3: Slave ID	3	8
40	16#4060:16#2D	DF20-M-1COM-232/485/422 Master Ch3: Event Trigger	Poll Mode	8
41	16#4060:16#2E	DF20-M-1COM-232/485/422 Master Ch3: Lost Action	Hold Data	8
42	16#4060:16#2F	DF20-M-1COM-232/485/422 Master Ch3: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS	8
43	16#4060:16#30	DF20-M-1COM-232/485/422 Master Ch3: Reg Addr	20	16
44	16#4060:16#31	DF20-M-1COM-232/485/422 Master Ch3: Reg Num	20	16
45	16#4060:16#32	DF20-M-1COM-232/485/422 Master Ch3: Poll Time	500	16
46	16#4060:16#33	DF20-M-1COM-232/485/422 Master Ch3: Poll Delay	100	16
47	16#4060:16#34	DF20-M-1COM-232/485/422 Master Ch3: Response Timeout	1000	16

Figure 4-1-62

Taking ch0 and ch1 channels as an example, in the Startup option, configure the mode to Modbus RTU Master mode, set the function of ch0 channel to 03 Read HOLDING REGISTERS, the number of registers is 3, and the read start address is 0; set the function of ch1 channel to 16 WRITE MULTIPLE HOLDING REGISTERS, the number of registers is 3, and the read start address is 0.

Line	Index:Subindex	Name	Value
1	16#8000:16#00	DF20-M-1COM-232/485/422 Serial Module ID	16
2	16#4060:16#01	DF20-M-1COM-232/485/422 Port Operation Mode	Modbus RTU Master
3	16#4060:16#02	DF20-M-1COM-232/485/422 Port Interface	RS485
4	16#4060:16#03	DF20-M-1COM-232/485/422 Port Parity	None
5	16#4060:16#04	DF20-M-1COM-232/485/422 Port Databits	8bit
6	16#4060:16#05	DF20-M-1COM-232/485/422 Port Stopbit	1bit
7	16#4060:16#06	DF20-M-1COM-232/485/422 Port Baudrate	115200bps
8	16#4060:16#07	DF20-M-1COM-232/485/422 Port Custom Baudrate	0
9	16#4060:16#08	DF20-M-1COM-232/485/422 FreeRUN Interval time(ms)	1
10	16#4060:16#0A	DF20-M-1COM-232/485/422 Slave ID	1
11	16#4060:16#10	DF20-M-1COM-232/485/422 Slave Response Delay	0
12	16#4060:16#11	DF20-M-1COM-232/485/422 Master Ch0: Slave ID	1
13	16#4060:16#12	DF20-M-1COM-232/485/422 Master Ch0: Event Trigger	Poll Mode
14	16#4060:16#13	DF20-M-1COM-232/485/422 Master Ch0: Lost Action	Hold Data
15	16#4060:16#14	DF20-M-1COM-232/485/422 Master Ch0: Operation Code	03 READ HOLDING REGISTERS
16	16#4060:16#15	DF20-M-1COM-232/485/422 Master Ch0: Reg Addr	0
17	16#4060:16#16	DF20-M-1COM-232/485/422 Master Ch0: Reg Num	3
18	16#4060:16#17	DF20-M-1COM-232/485/422 Master Ch0: Poll Time	500
19	16#4060:16#18	DF20-M-1COM-232/485/422 Master Ch0: Poll Delay	100
20	16#4060:16#19	DF20-M-1COM-232/485/422 Master Ch0: Response Timeout	1000
21	16#4060:16#1A	DF20-M-1COM-232/485/422 Master Ch1: Slave ID	2
22	16#4060:16#1B	DF20-M-1COM-232/485/422 Master Ch1: Event Trigger	Poll Mode
23	16#4060:16#1C	DF20-M-1COM-232/485/422 Master Ch1: Lost Action	Hold Data
24	16#4060:16#1D	DF20-M-1COM-232/485/422 Master Ch1: Operation Code	16 WRITE MULTIPLE HOLDING REGISTERS
25	16#4060:16#1E	DF20-M-1COM-232/485/422 Master Ch1: Reg Addr	0
26	16#4060:16#1F	DF20-M-1COM-232/485/422 Master Ch1: Reg Num	3
27	16#4060:16#20	DF20-M-1COM-232/485/422 Master Ch1: Poll Time	500
28	16#4060:16#21	DF20-M-1COM-232/485/422 Master Ch1: Poll Delay	100
29	16#4060:16#22	DF20-M-1COM-232/485/422 Master Ch1: Response Timeout	1000

Figure 4-1-63

- ➢ Click Log in to the device again, download the parameters and run it.

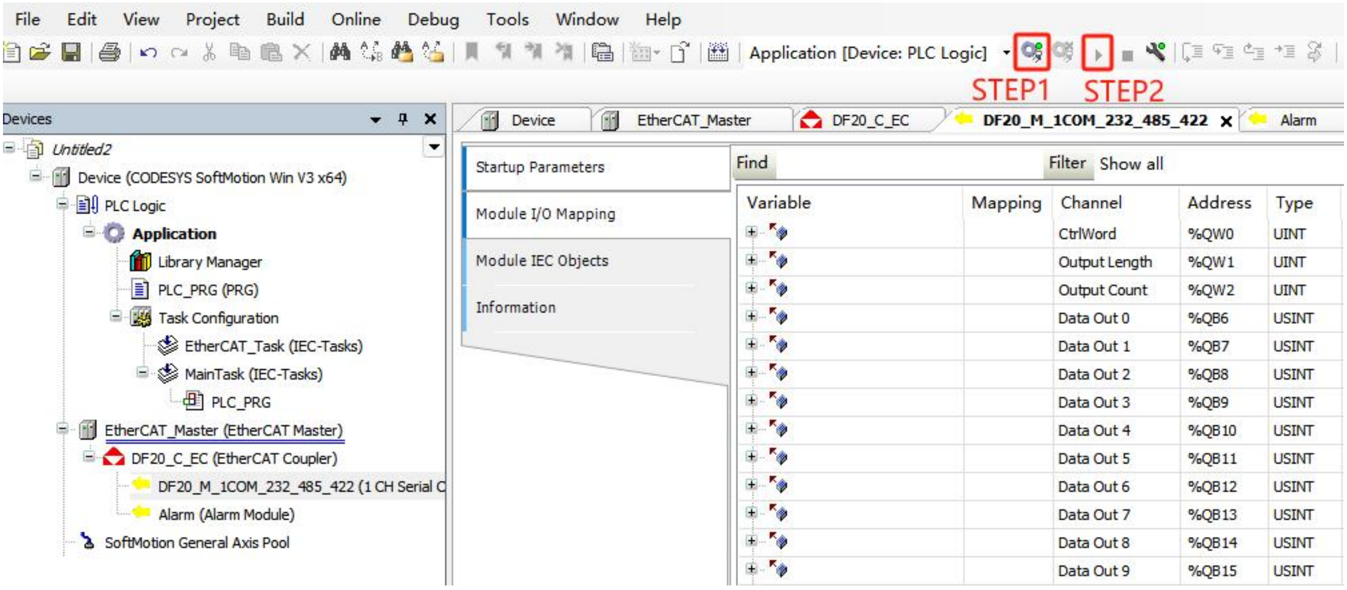
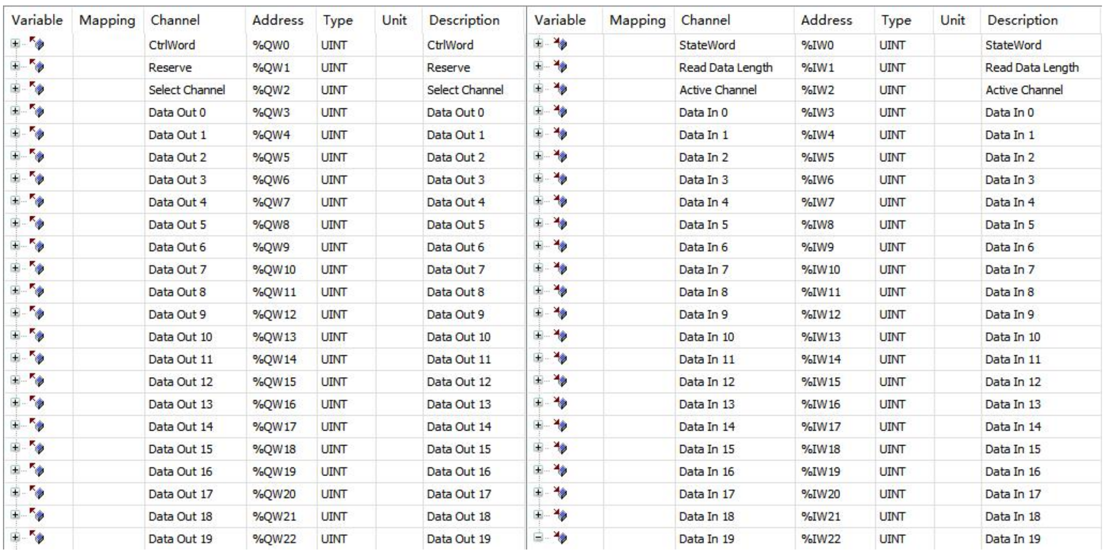


Figure 4-1-64

- ➢ The Master mode input and output data are shown in the figure.



Variable	Mapping	Channel	Address	Type	Unit	Description
		CtrlWord	%QW0	UINT		CtrlWord
		Reserve	%QW1	UINT		Reserve
		Select Channel	%QW2	UINT		Select Channel
		Data Out 0	%QW3	UINT		Data Out 0
		Data Out 1	%QW4	UINT		Data Out 1
		Data Out 2	%QW5	UINT		Data Out 2
		Data Out 3	%QW6	UINT		Data Out 3
		Data Out 4	%QW7	UINT		Data Out 4
		Data Out 5	%QW8	UINT		Data Out 5
		Data Out 6	%QW9	UINT		Data Out 6
		Data Out 7	%QW10	UINT		Data Out 7
		Data Out 8	%QW11	UINT		Data Out 8
		Data Out 9	%QW12	UINT		Data Out 9
		Data Out 10	%QW13	UINT		Data Out 10
		Data Out 11	%QW14	UINT		Data Out 11
		Data Out 12	%QW15	UINT		Data Out 12
		Data Out 13	%QW16	UINT		Data Out 13
		Data Out 14	%QW17	UINT		Data Out 14
		Data Out 15	%QW18	UINT		Data Out 15
		Data Out 16	%QW19	UINT		Data Out 16
		Data Out 17	%QW20	UINT		Data Out 17
		Data Out 18	%QW21	UINT		Data Out 18
		Data Out 19	%QW22	UINT		Data Out 19

Variable	Mapping	Channel	Address	Type	Unit	Description
		StateWord	%IW0	UINT		StateWord
		Read Data Length	%IW1	UINT		Read Data Length
		Active Channel	%IW2	UINT		Active Channel
		Data In 0	%IW3	UINT		Data In 0
		Data In 1	%IW4	UINT		Data In 1
		Data In 2	%IW5	UINT		Data In 2
		Data In 3	%IW6	UINT		Data In 3
		Data In 4	%IW7	UINT		Data In 4
		Data In 5	%IW8	UINT		Data In 5
		Data In 6	%IW9	UINT		Data In 6
		Data In 7	%IW10	UINT		Data In 7
		Data In 8	%IW11	UINT		Data In 8
		Data In 9	%IW12	UINT		Data In 9
		Data In 10	%IW13	UINT		Data In 10
		Data In 11	%IW14	UINT		Data In 11
		Data In 12	%IW15	UINT		Data In 12
		Data In 13	%IW16	UINT		Data In 13
		Data In 14	%IW17	UINT		Data In 14
		Data In 15	%IW18	UINT		Data In 15
		Data In 16	%IW19	UINT		Data In 16
		Data In 17	%IW20	UINT		Data In 17
		Data In 18	%IW21	UINT		Data In 18
		Data In 19	%IW22	UINT		Data In 19

Figure 4-1-65

- ➢ Modbus RTU Master process data description.

Output Data		
name	**length**	**meaning**
CtrlWord	2Byte	Control Word
Reserve	2Byte	reserve
Select Channel	2Byte	Channel operation selection
DataOut 0-19	40Byte	Send data content

- As shown in the table above, SelectChannel is used to switch the communication channel. The value range is 0-11. By default, the Ch0 channel is activated.

If SelectChannel is assigned a value of 1, the communication of the Ch1 channel is activated, and the 485 bus on the serial port module will perform Modbus communication according to the configuration, specific address and function code of the Ch1 channel.

Input Data		
name	**length**	**meaning**
StateWord	2Byte	Status word
ReadDataLength	2Byte	Receive data length
ActiveChannel	2Byte	Current active channels
DataIn 0-19	40Byte	Receive data content

- If the ActiveChannel query of PLC is 1, it means that the current communication is Ch1. ReadDataLength and DataIn 0-19 both indicate Ch1.

The PLC can now take the input value and switch to the next channel communication.

- Open the Modbus Slave software on the PC and create a new project.

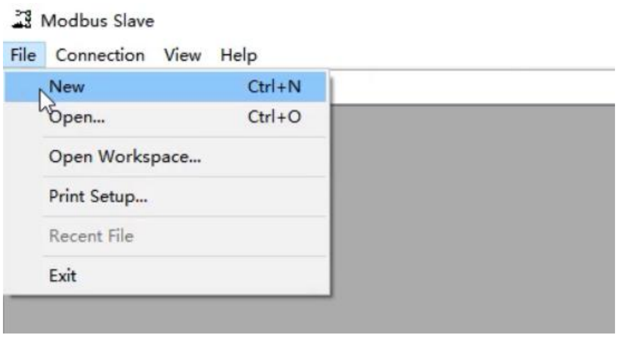


Figure 4-1-66

- Connect to the serial device.

Figure 4-1-67

- Right-click in the blank area to set the slave parameters.

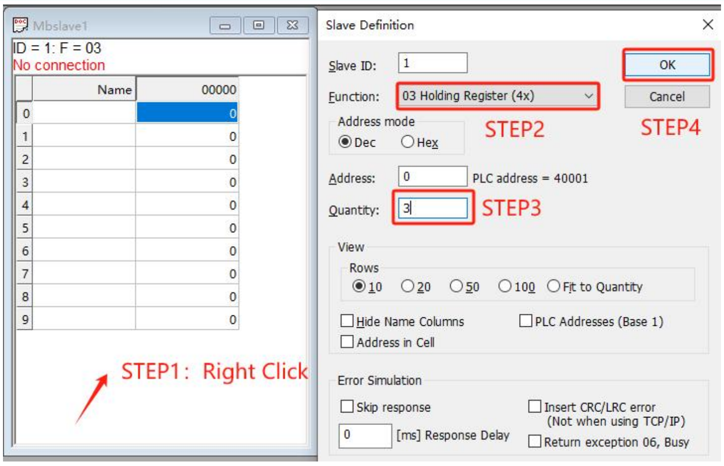


Figure 4-1-68

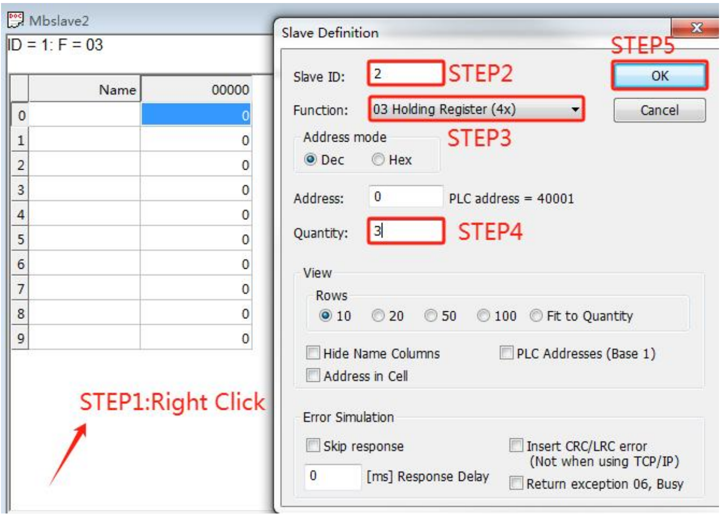


Figure 4-1-69

- Write register data.

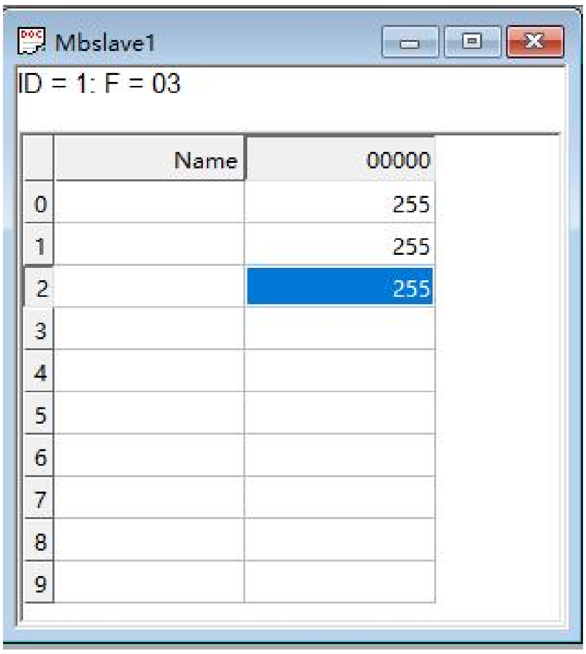


Figure 4-1-70

- CtrlWord command table.

Command Value	Command Name	meaning
16#00A1	CONFIGUREPORT	Port Configuration Commands
16#00B1	COMFIGUREMASTER	MASTER Mode Configuration Commands
16#00B2	OPERATIONMASTER	MASTER mode run command

➢ CtrlWord writes run command 178 (0x00B2).

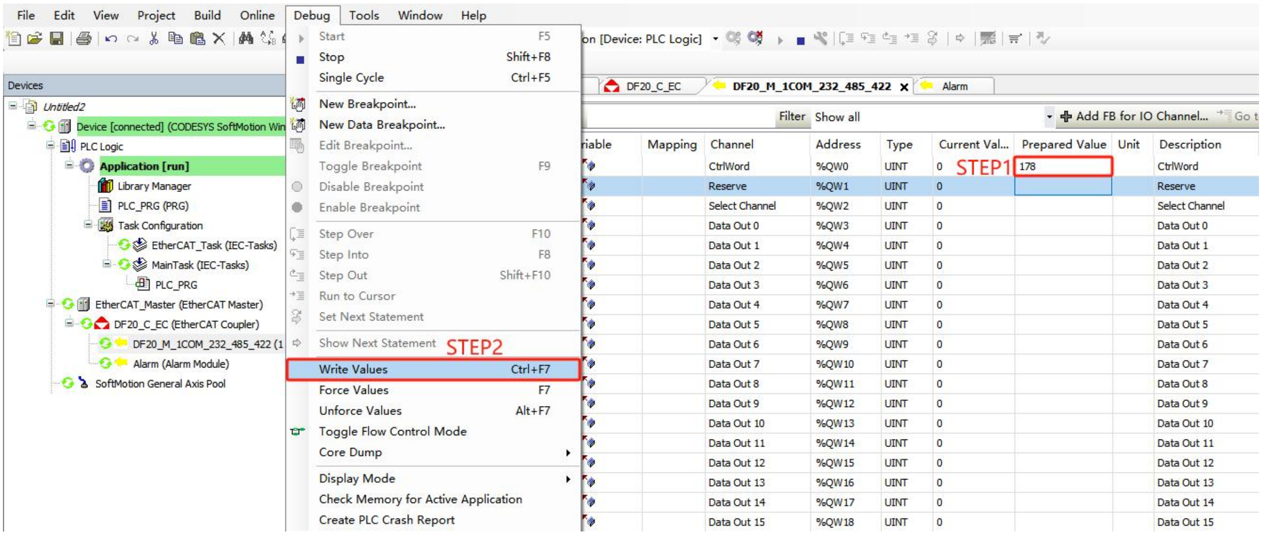
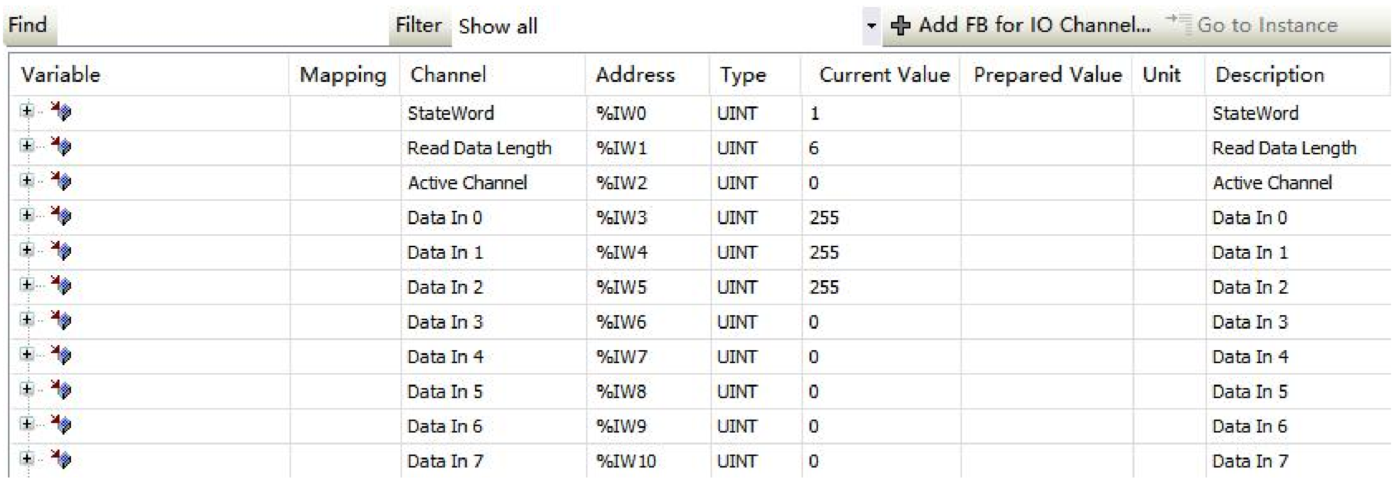


Figure 4-1-71

➢ Check the module input data and the current data is consistent with the sent data.



Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
		StateWord	%IW0	UINT	1			StateWord
		Read Data Length	%IW1	UINT	6			Read Data Length
		Active Channel	%IW2	UINT	0			Active Channel
		Data In 0	%IW3	UINT	255			Data In 0
		Data In 1	%IW4	UINT	255			Data In 1
		Data In 2	%IW5	UINT	255			Data In 2
		Data In 3	%IW6	UINT	0			Data In 3
		Data In 4	%IW7	UINT	0			Data In 4
		Data In 5	%IW8	UINT	0			Data In 5
		Data In 6	%IW9	UINT	0			Data In 6
		Data In 7	%IW10	UINT	0			Data In 7

Figure 4-1-72

➢ Select Channel writes 1 to switch to CH1 channel.

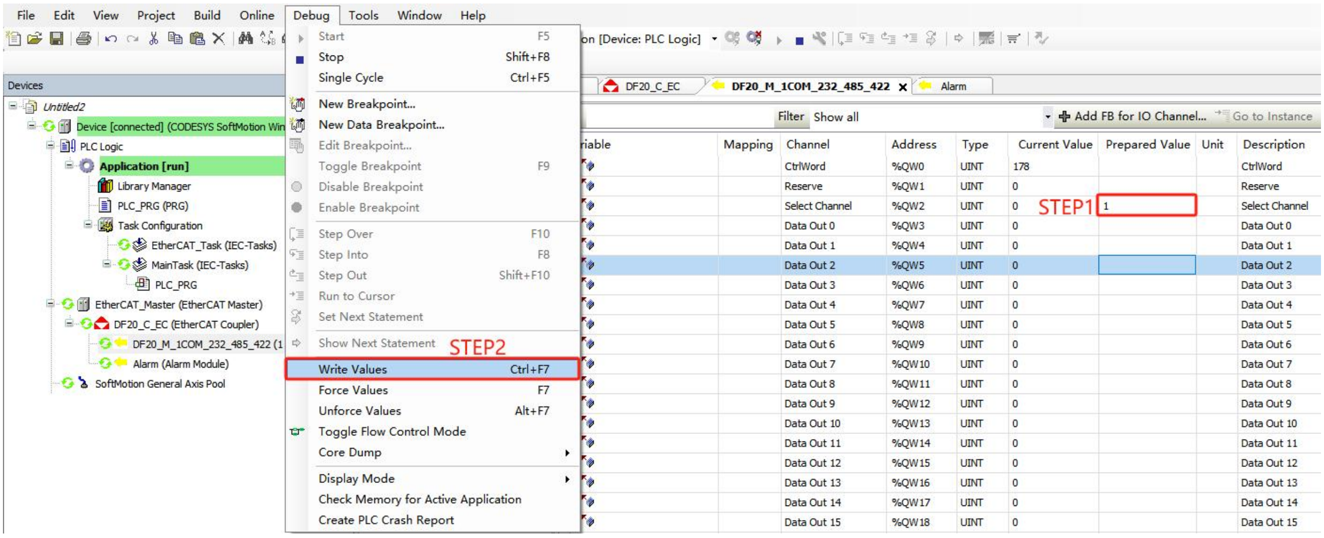
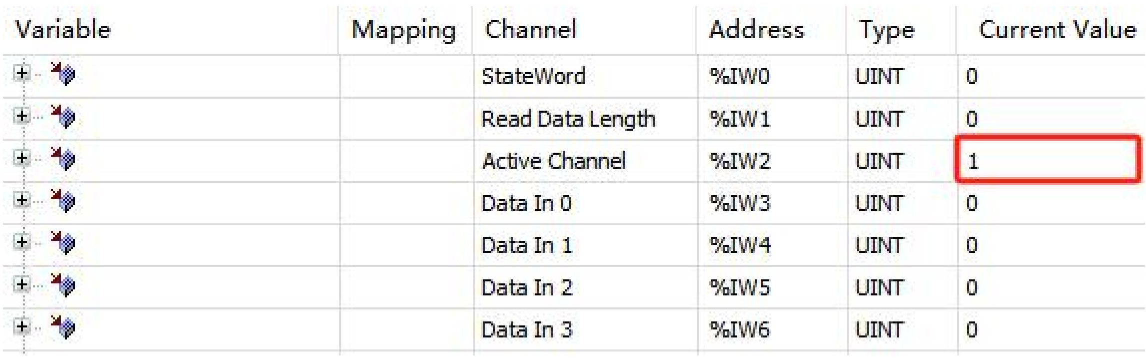


Figure 4-1-73

➢ ActiveChannel shows 1 switching successfully.



Variable	Mapping	Channel	Address	Type	Current Value
		StateWord	%IW0	UINT	0
		Read Data Length	%IW1	UINT	0
		Active Channel	%IW2	UINT	1
		Data In 0	%IW3	UINT	0
		Data In 1	%IW4	UINT	0
		Data In 2	%IW5	UINT	0
		Data In 3	%IW6	UINT	0

Figure 4-1-74

➢ Data Out 0 is written with the transmission data 01, Data Out 1 is written with the transmission data 02, and Data Out 2 is written with the transmission data 03.

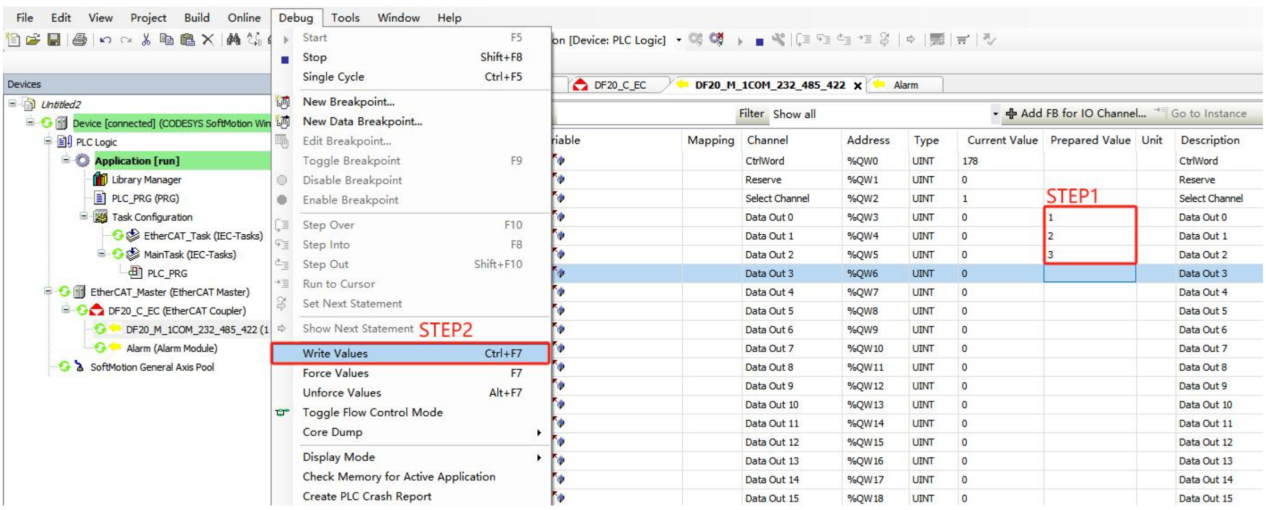


Figure 4-1-75

➢ The data received by Modbus Slave is shown in the figure below.

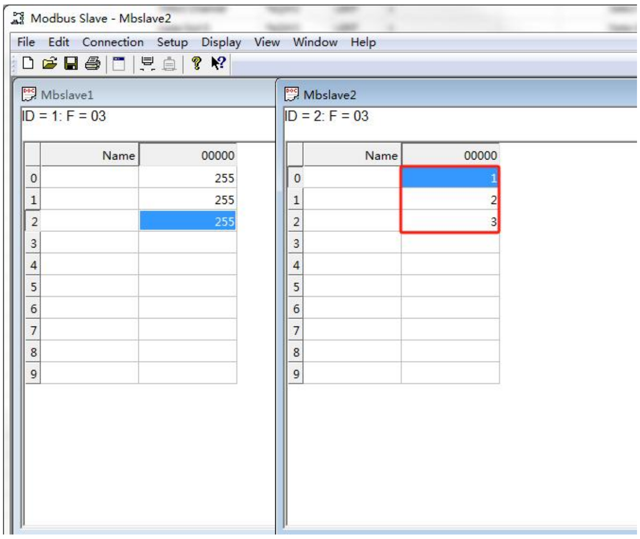


Figure 4-1-76

4.1.11.3 Modbus RTU Slave Example

➢ For the meaning of configuration data, please refer to3.45.4 Configuration parameter definition, the configuration interface of Modbus RTU Slave mode is shown in the figure below.

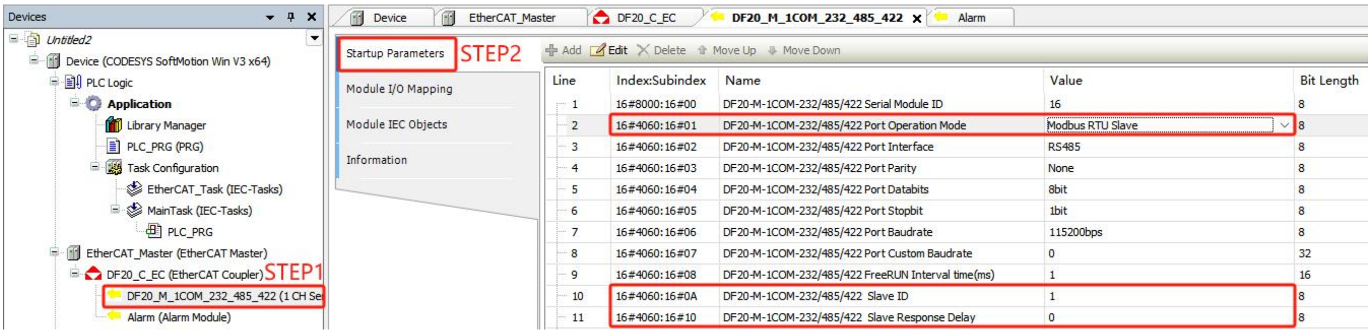
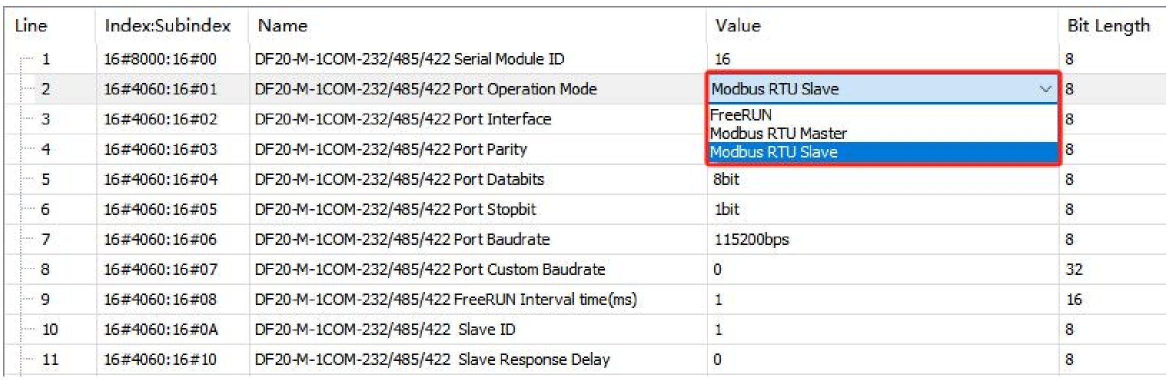


Figure 4-1-77

➢ In the operation mode options, configure the mode to Modbus RTU Slave mode.



Line	Index:Subindex	Name	Value	Bit Length
1	16#8000:16#00	DF20-M-1COM-232/485/422 Serial Module ID	16	8
2	16#4060:16#01	DF20-M-1COM-232/485/422 Port Operation Mode	Modbus RTU Slave	8
3	16#4060:16#02	DF20-M-1COM-232/485/422 Port Interface	FreeRUN Modbus RTU Master Modbus RTU Slave	8
4	16#4060:16#03	DF20-M-1COM-232/485/422 Port Parity		8
5	16#4060:16#04	DF20-M-1COM-232/485/422 Port Databits	8bit	8
6	16#4060:16#05	DF20-M-1COM-232/485/422 Port Stopbit	1bit	8
7	16#4060:16#06	DF20-M-1COM-232/485/422 Port Baudrate	115200bps	8
8	16#4060:16#07	DF20-M-1COM-232/485/422 Port Custom Baudrate	0	32
9	16#4060:16#08	DF20-M-1COM-232/485/422 FreeRUN Interval time(ms)	1	16
10	16#4060:16#0A	DF20-M-1COM-232/485/422 Slave ID	1	8
11	16#4060:16#10	DF20-M-1COM-232/485/422 Slave Response Delay	0	8

Figure 4-1-78

➢ Configure the process data as 1 Ch Serial Gateway Slave.

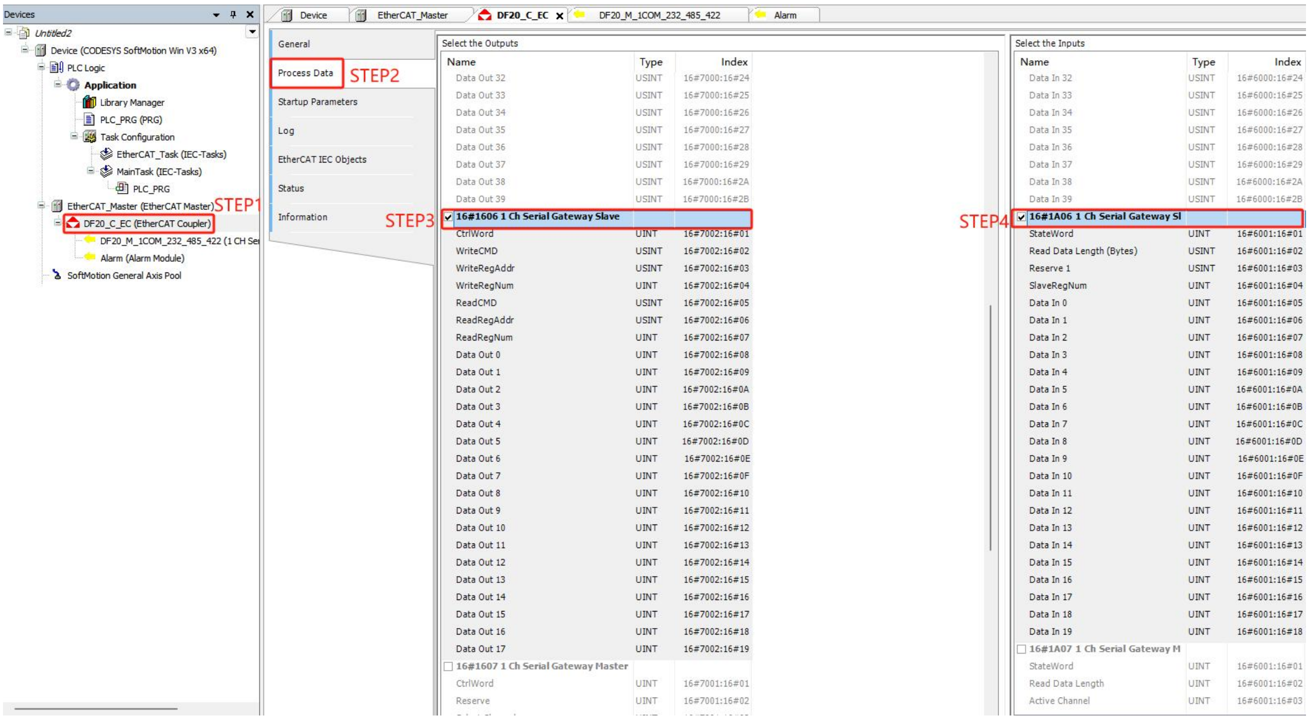


Figure 4-1-79

➢ Click Log in to the device again, download the parameters and run it.

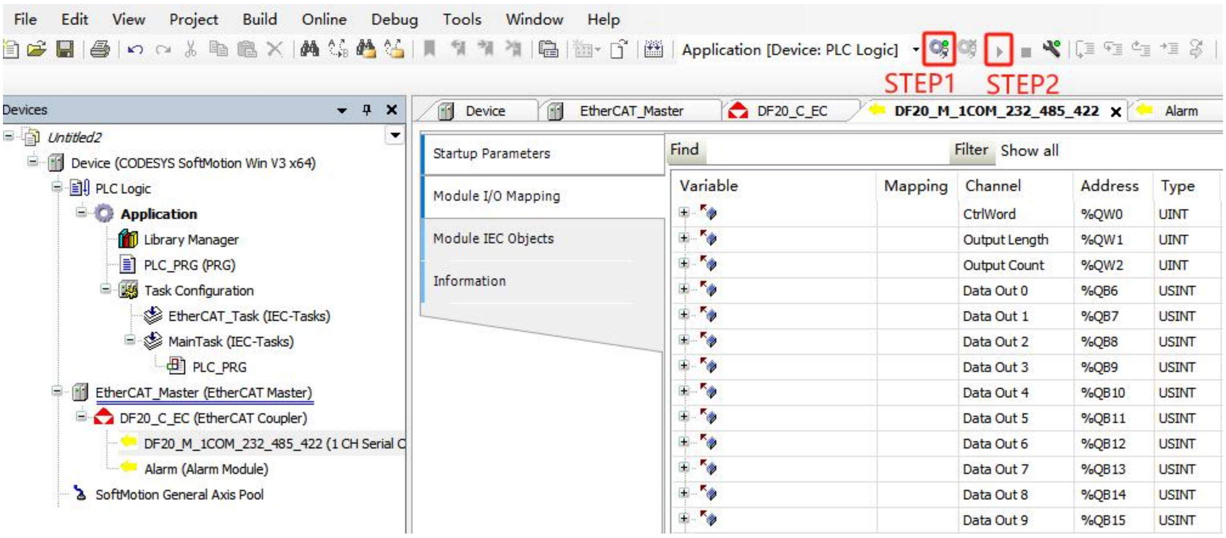


Figure 4-1-80

➢ The input and output data of Modbus RTU Slave mode are shown in the figure below.

变量	映射	通道	地址	类型	单元	描述
		StateWord	%IW0	UINT		StateWord
		Read Data Length (Bytes)	%IB2	USINT		Read Data Length (Bytes)
		Reserve 1	%IB3	USINT		Reserve 1
		SlaveRegNum	%IW2	UINT		SlaveRegNum
		Data In 0	%IW3	UINT		Data In 0
		Data In 1	%IW4	UINT		Data In 1
		Data In 2	%IW5	UINT		Data In 2
		Data In 3	%IW6	UINT		Data In 3
		Data In 4	%IW7	UINT		Data In 4
		Data In 5	%IW8	UINT		Data In 5
		Data In 6	%IW9	UINT		Data In 6
		Data In 7	%IW10	UINT		Data In 7
		Data In 8	%IW11	UINT		Data In 8
		Data In 9	%IW12	UINT		Data In 9
		Data In 10	%IW13	UINT		Data In 10
		Data In 11	%IW14	UINT		Data In 11
		Data In 12	%IW15	UINT		Data In 12
		Data In 13	%IW16	UINT		Data In 13
		Data In 14	%IW17	UINT		Data In 14
		Data In 15	%IW18	UINT		Data In 15
		Data In 16	%IW19	UINT		Data In 16
		Data In 17	%IW20	UINT		Data In 17
		Data In 18	%IW21	UINT		Data In 18
		Data In 19	%IW22	UINT		Data In 19

变量	映射	通道	地址	类型	单元	描述
		CtrlWord	%QW0	UINT		CtrlWord
		WriteCMD	%QB2	USINT		WriteCMD
		WriteRegAddr	%QB3	USINT		WriteRegAddr
		WriteRegNum	%QW2	UINT		WriteRegNum
		ReadCMD	%QB6	USINT		ReadCMD
		ReadRegAddr	%QB7	USINT		ReadRegAddr
		ReadRegNum	%QW4	UINT		ReadRegNum
		Data Out 0	%QW5	UINT		Data Out 0
		Data Out 1	%QW6	UINT		Data Out 1
		Data Out 2	%QW7	UINT		Data Out 2
		Data Out 3	%QW8	UINT		Data Out 3
		Data Out 4	%QW9	UINT		Data Out 4
		Data Out 5	%QW10	UINT		Data Out 5
		Data Out 6	%QW11	UINT		Data Out 6
		Data Out 7	%QW12	UINT		Data Out 7
		Data Out 8	%QW13	UINT		Data Out 8
		Data Out 9	%QW14	UINT		Data Out 9
		Data Out 10	%QW15	UINT		Data Out 10
		Data Out 11	%QW16	UINT		Data Out 11
		Data Out 12	%QW17	UINT		Data Out 12
		Data Out 13	%QW18	UINT		Data Out 13
		Data Out 14	%QW19	UINT		Data Out 14
		Data Out 15	%QW20	UINT		Data Out 15
		Data Out 16	%QW21	UINT		Data Out 16
		Data Out 17	%QW22	UINT		Data Out 17

Figure 4-1-81

- Description of process data in Modbus RTU Slave mode.

Output Data		
name	**length**	**meaning**
CtrlWord	2byte	Control Word
WriteCMD	1byte	Write operation commands to the slave station
WriteRegAddr	1byte	Write register address to slave station
WriteRegNum	2byte	Write register quantity to slave
ReadCMD	1byte	Read operation commands from the slave station
ReadRegAddr	1byte	Read register address from slave
ReadRegNum	2byte	Read the number of registers from the slave
DataOut0-17	36byte	Send data area
Input Data		
name	**length**	**meaning**
StateWord	2byte	Status word
Read Data Length	1byte	Readback data length Byte
Reserve 1	1byte	reserve
SlaveRegNum	2byte	Readback register quantity
DataIn0-19	40byte	Receive data area

- WriteCMD Command Table

WriteCMD			
value	**name**	**length**	**meaning**
3	WriteCoils	1byte	Write coil value
4	WriteDiscrete	1byte	Write discrete quantity
5	WriteHoldReg	1byte	Writing Holding Registers
6	WriteInReg	1byte	Write input register

- ReadCMD Command Table

ReadCMD			
value	**name**	**length**	**meaning**
1	ReadCoils	1byte	Read coil value
2	ReadHoldReg	1byte	Read Holding Registers

- When the module is used as a slave station, the data can be freely read and written by the RTU external master station. The number of input registers is 20, the number of holding registers is 20, the number of coils is 320, and the number of discrete quantities is 320. The read and write mode is controlled by WriteCMD and ReadCMD.
- Open the ModbusPoll software on the PC and create a new project.

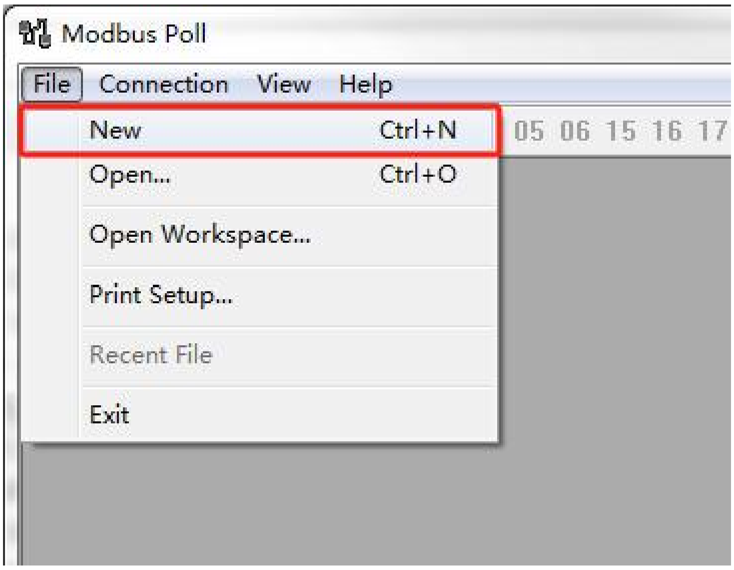


Figure 4-1-82

- Connect to the serial device.

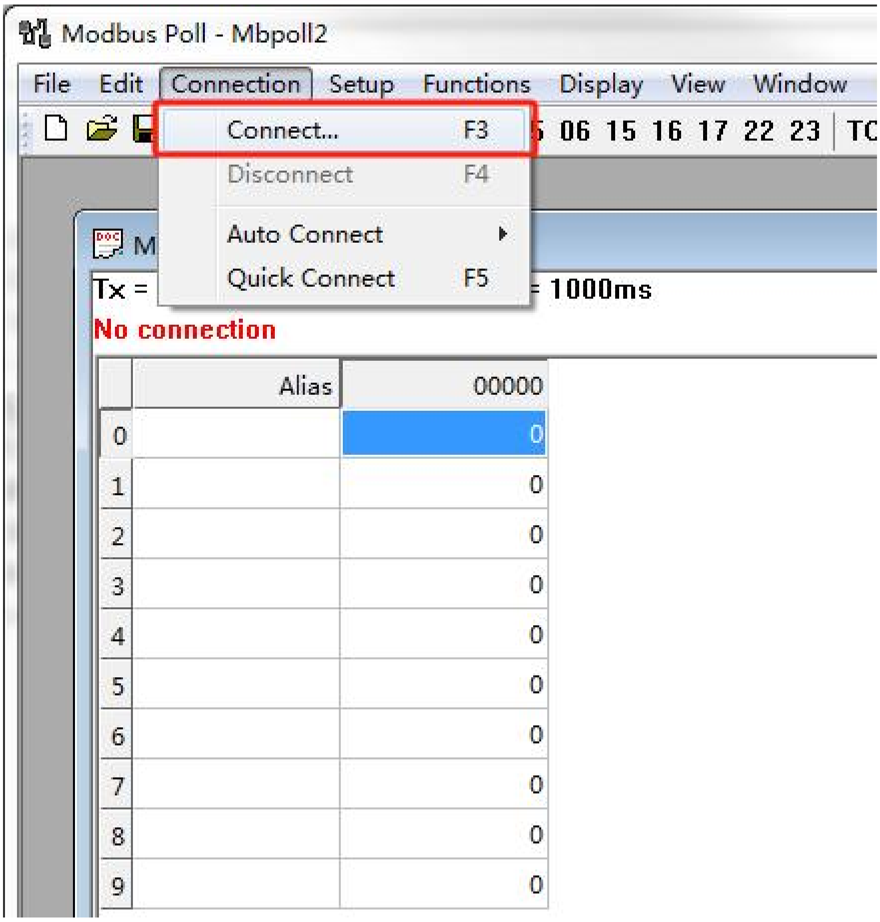


Figure 4-1-83

- ➢ Right-click in a blank area to set parameters.

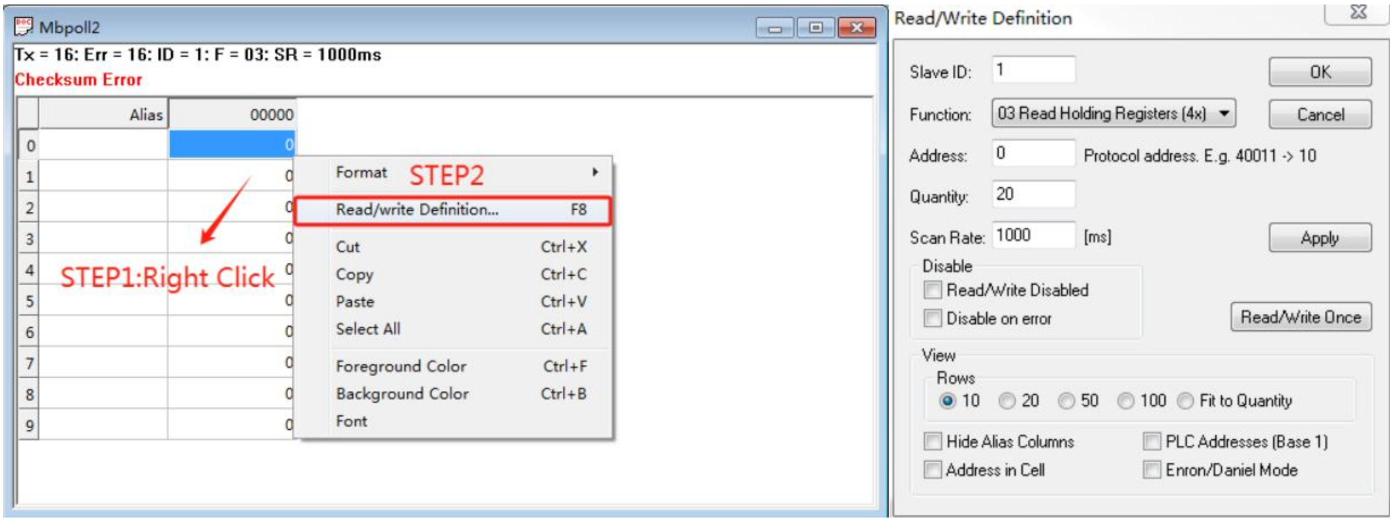


Figure 4-1-84

- ➢ WriteCMD writes command 0x05 (write holding register), WriteRegAddr writes 0, WriteRegNum writes 18, and writes 1234 to all 18 registers.
- ➢ ReadCMD writes command 0x02 (read holding register), ReadRegAddr writes 0, and ReadRegNum writes 20.

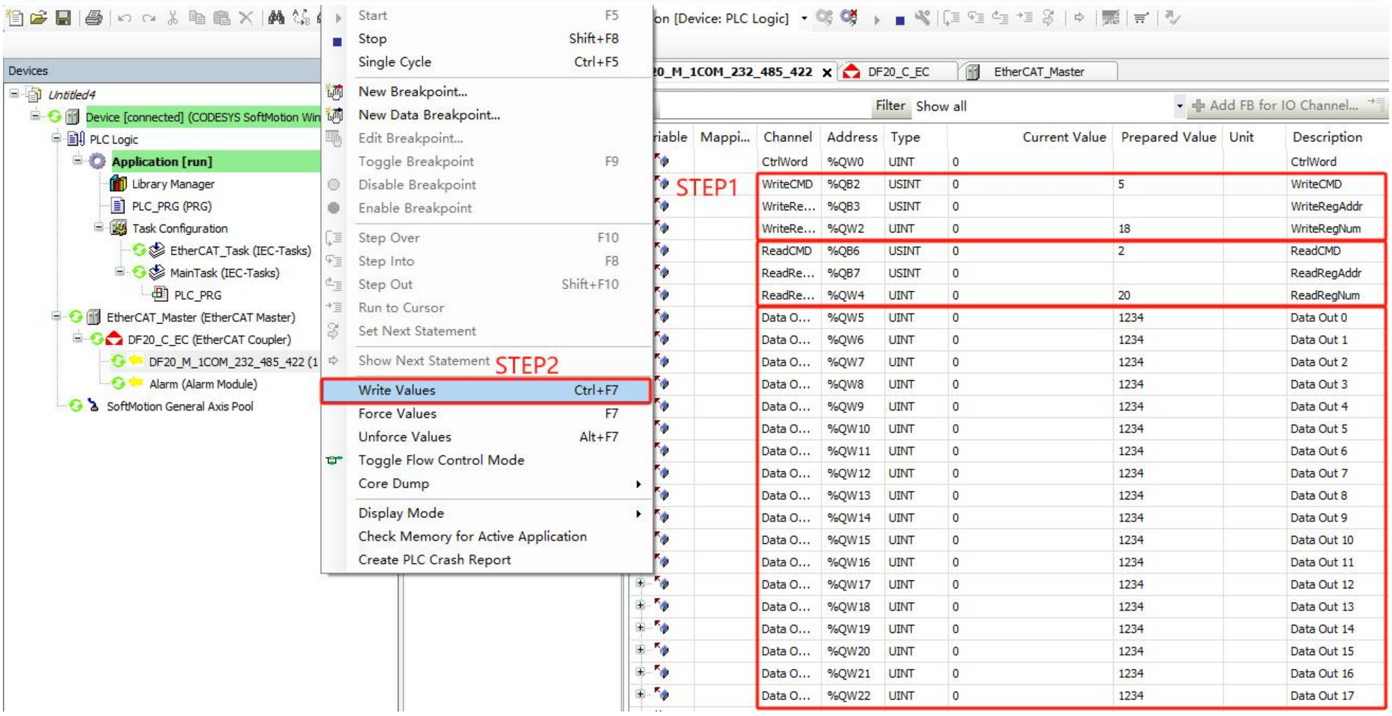


Figure 4-1-85

➢ Open the Modbus Poll software and check whether the received data is consistent with the data written in the configuration.

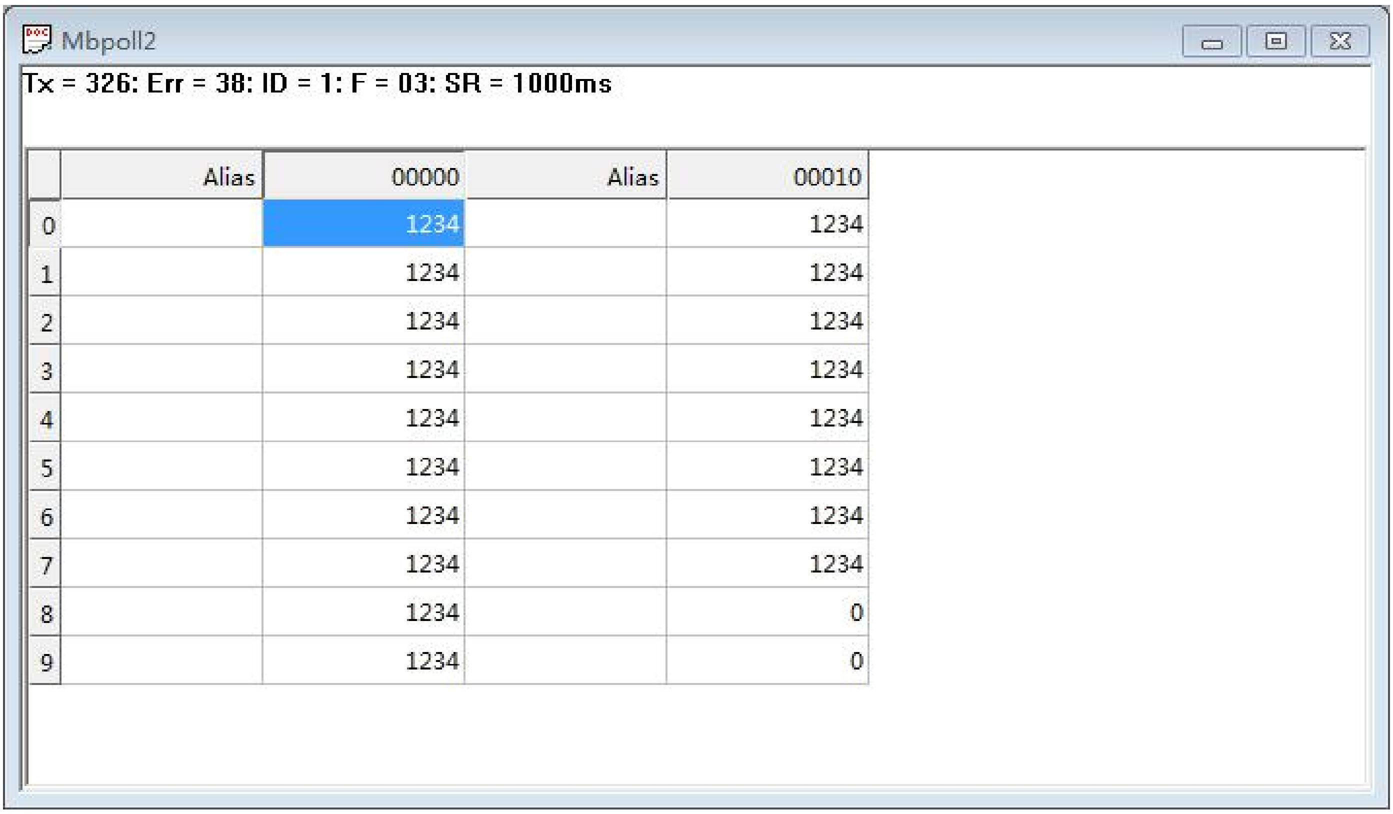


Figure 4-1-86

➢ Looking at the configured TXPDO, the data read is consistent with the data received by Modbus Poll.

变量	映射	通道	地址	类型	当前值	预备值	单元	描述
		StateWord	%IW0	UINT	0			StateWord
		Read Data Length (Bytes)	%IB2	USINT	40			Read Data Length (Bytes)
		Reserve 1	%IB3	USINT	0			Reserve 1
		SlaveRegNum	%IW2	UINT	20			SlaveRegNum
		Data In 0	%IW3	UINT	1234			Data In 0
		Data In 1	%IW4	UINT	1234			Data In 1
		Data In 2	%IW5	UINT	1234			Data In 2
		Data In 3	%IW6	UINT	1234			Data In 3
		Data In 4	%IW7	UINT	1234			Data In 4
		Data In 5	%IW8	UINT	1234			Data In 5
		Data In 6	%IW9	UINT	1234			Data In 6
		Data In 7	%IW10	UINT	1234			Data In 7
		Data In 8	%IW11	UINT	1234			Data In 8
		Data In 9	%IW12	UINT	1234			Data In 9
		Data In 10	%IW13	UINT	1234			Data In 10
		Data In 11	%IW14	UINT	1234			Data In 11
		Data In 12	%IW15	UINT	1234			Data In 12
		Data In 13	%IW16	UINT	1234			Data In 13
		Data In 14	%IW17	UINT	1234			Data In 14
		Data In 15	%IW18	UINT	1234			Data In 15
		Data In 16	%IW19	UINT	1234			Data In 16
		Data In 17	%IW20	UINT	1234			Data In 17
		Data In 18	%IW21	UINT	0			Data In 18
		Data In 19	%IW22	UINT	0			Data In 19

Figure 4-1-87

4.1.12 Four-channel IO-Link communication module usage example

➢ This example uses the DF20-C-EC+DF20-M-4IOL topology. During the power-on phase, the PWR power indicator is always on and the module enters

Working state, STA status indicator flashes. For status indicator and wiring diagram, please refer toSection 3.46.2The module supports 4-channel IO-Link communication, and this section only demonstrates the first channel.

➢ As shown in the figure below, the topology of the routine is scanned on CODESYS.

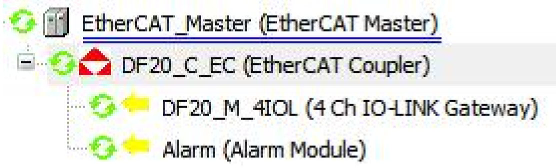
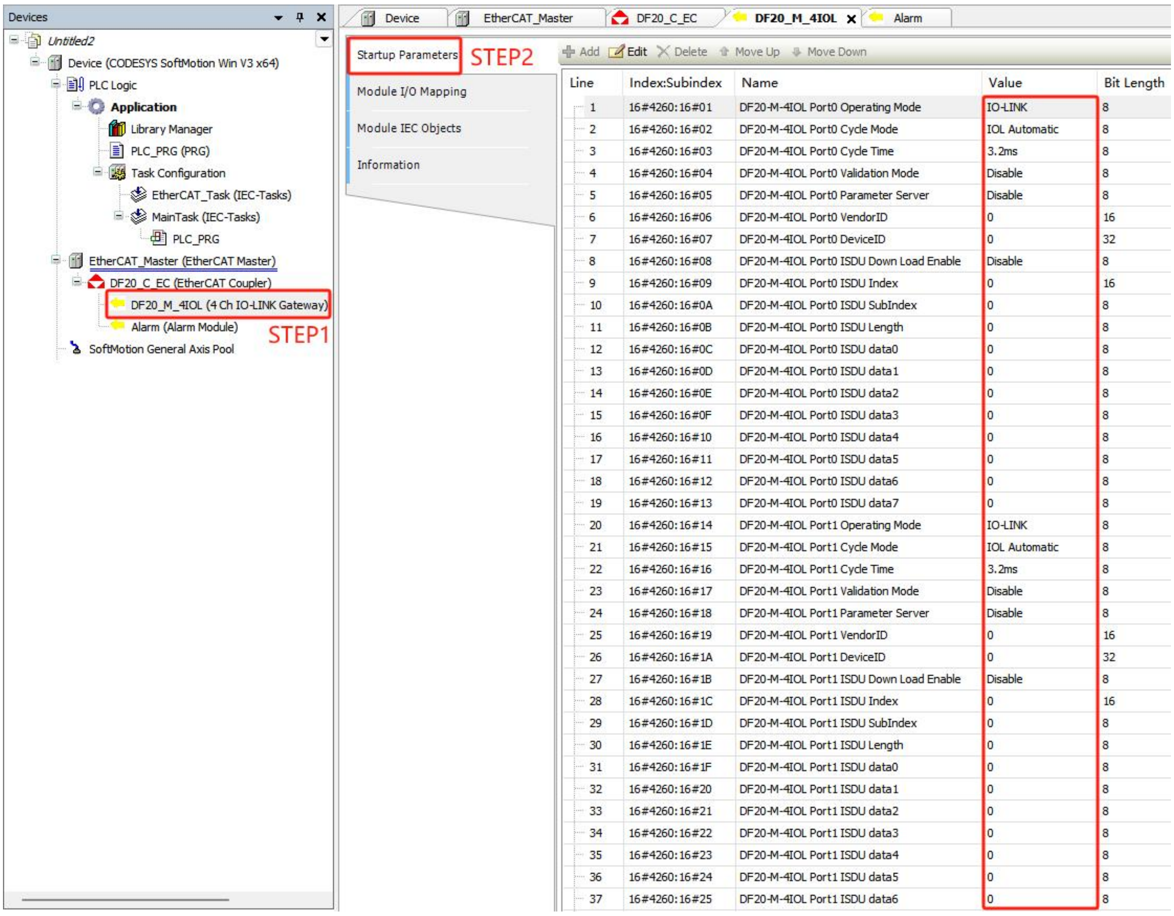


Figure 4-1-88

➢ Double-click the parameter option to change the configuration options, as shown in the figure below.For the meaning of configuration data, please refer to3.46.4 Configuration parameter definition.

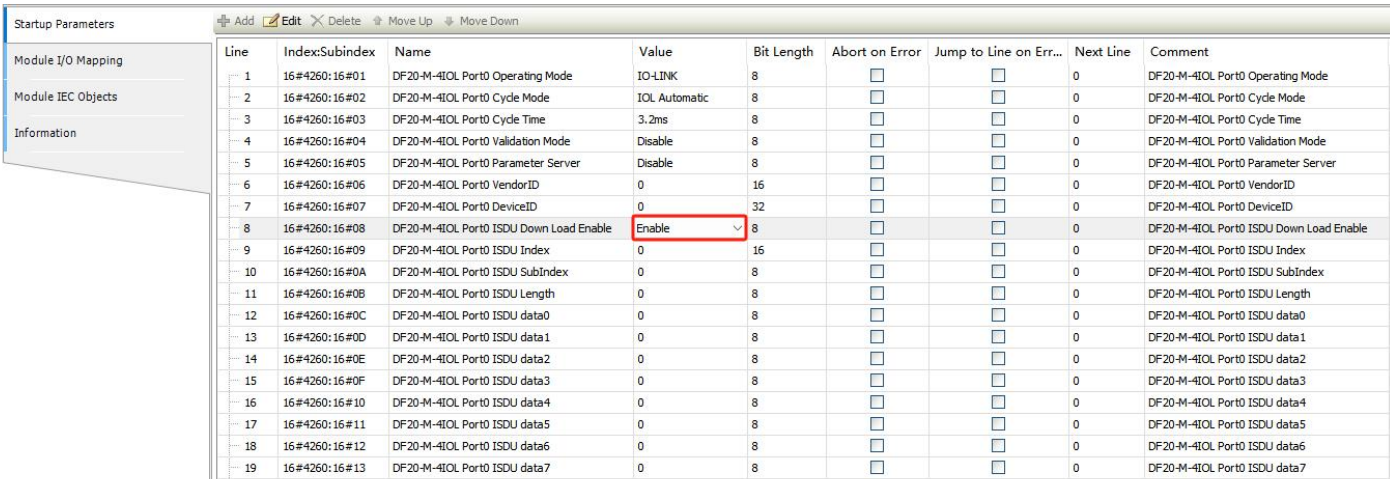


Line	Index:Subindex	Name	Value	Bit Length
1	16#4260:16#01	DF20-M-4IOL Port0 Operating Mode	IO-LINK	8
2	16#4260:16#02	DF20-M-4IOL Port0 Cycle Mode	IOL Automatic	8
3	16#4260:16#03	DF20-M-4IOL Port0 Cycle Time	3.2ms	8
4	16#4260:16#04	DF20-M-4IOL Port0 Validation Mode	Disable	8
5	16#4260:16#05	DF20-M-4IOL Port0 Parameter Server	Disable	8
6	16#4260:16#06	DF20-M-4IOL Port0 VendorID	0	16
7	16#4260:16#07	DF20-M-4IOL Port0 DeviceID	0	32
8	16#4260:16#08	DF20-M-4IOL Port0 ISDU Down Load Enable	Disable	8
9	16#4260:16#09	DF20-M-4IOL Port0 ISDU Index	0	16
10	16#4260:16#0A	DF20-M-4IOL Port0 ISDU SubIndex	0	8
11	16#4260:16#0B	DF20-M-4IOL Port0 ISDU Length	0	8
12	16#4260:16#0C	DF20-M-4IOL Port0 ISDU data0	0	8
13	16#4260:16#0D	DF20-M-4IOL Port0 ISDU data1	0	8
14	16#4260:16#0E	DF20-M-4IOL Port0 ISDU data2	0	8
15	16#4260:16#0F	DF20-M-4IOL Port0 ISDU data3	0	8
16	16#4260:16#10	DF20-M-4IOL Port0 ISDU data4	0	8
17	16#4260:16#11	DF20-M-4IOL Port0 ISDU data5	0	8
18	16#4260:16#12	DF20-M-4IOL Port0 ISDU data6	0	8
19	16#4260:16#13	DF20-M-4IOL Port0 ISDU data7	0	8
20	16#4260:16#14	DF20-M-4IOL Port1 Operating Mode	IO-LINK	8
21	16#4260:16#15	DF20-M-4IOL Port1 Cycle Mode	IOL Automatic	8
22	16#4260:16#16	DF20-M-4IOL Port1 Cycle Time	3.2ms	8
23	16#4260:16#17	DF20-M-4IOL Port1 Validation Mode	Disable	8
24	16#4260:16#18	DF20-M-4IOL Port1 Parameter Server	Disable	8
25	16#4260:16#19	DF20-M-4IOL Port1 VendorID	0	16
26	16#4260:16#1A	DF20-M-4IOL Port1 DeviceID	0	32
27	16#4260:16#1B	DF20-M-4IOL Port1 ISDU Down Load Enable	Disable	8
28	16#4260:16#1C	DF20-M-4IOL Port1 ISDU Index	0	16
29	16#4260:16#1D	DF20-M-4IOL Port1 ISDU SubIndex	0	8
30	16#4260:16#1E	DF20-M-4IOL Port1 ISDU Length	0	8
31	16#4260:16#1F	DF20-M-4IOL Port1 ISDU data0	0	8
32	16#4260:16#20	DF20-M-4IOL Port1 ISDU data1	0	8
33	16#4260:16#21	DF20-M-4IOL Port1 ISDU data2	0	8
34	16#4260:16#22	DF20-M-4IOL Port1 ISDU data3	0	8
35	16#4260:16#23	DF20-M-4IOL Port1 ISDU data4	0	8
36	16#4260:16#24	DF20-M-4IOL Port1 ISDU data5	0	8
37	16#4260:16#25	DF20-M-4IOL Port1 ISDU data6	0	8

Figure 4-1-89

4.1.12.1 ISDU Configuration

- As shown in the figure below, change ISDU Down Load Enable to Enable to enable the ISDU download function. There is only one set of ISDU configuration items. If you need to configure multiple ISDUs, just modify the index address and parameters and download repeatedly.



Startup Parameters | Module I/O Mapping | Module IEC Objects | Information

Add | Edit | Delete | Move Up | Move Down

Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#4260:16#01	DF20-M-4IOL Port0 Operating Mode	IO-LINK	8	☐	☐	0	DF20-M-4IOL Port0 Operating Mode
2	16#4260:16#02	DF20-M-4IOL Port0 Cycle Mode	IOL Automatic	8	☐	☐	0	DF20-M-4IOL Port0 Cycle Mode
3	16#4260:16#03	DF20-M-4IOL Port0 Cycle Time	3.2ms	8	☐	☐	0	DF20-M-4IOL Port0 Cycle Time
4	16#4260:16#04	DF20-M-4IOL Port0 Validation Mode	Disable	8	☐	☐	0	DF20-M-4IOL Port0 Validation Mode
5	16#4260:16#05	DF20-M-4IOL Port0 Parameter Server	Disable	8	☐	☐	0	DF20-M-4IOL Port0 Parameter Server
6	16#4260:16#06	DF20-M-4IOL Port0 VendorID	0	16	☐	☐	0	DF20-M-4IOL Port0 VendorID
7	16#4260:16#07	DF20-M-4IOL Port0 DeviceID	0	32	☐	☐	0	DF20-M-4IOL Port0 DeviceID
8	16#4260:16#08	DF20-M-4IOL Port0 ISDU Down Load Enable	Enable	8	☐	☐	0	DF20-M-4IOL Port0 ISDU Down Load Enable
9	16#4260:16#09	DF20-M-4IOL Port0 ISDU Index	0	16	☐	☐	0	DF20-M-4IOL Port0 ISDU Index
10	16#4260:16#0A	DF20-M-4IOL Port0 ISDU SubIndex	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU SubIndex
11	16#4260:16#0B	DF20-M-4IOL Port0 ISDU Length	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU Length
12	16#4260:16#0C	DF20-M-4IOL Port0 ISDU data0	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data0
13	16#4260:16#0D	DF20-M-4IOL Port0 ISDU data1	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data1
14	16#4260:16#0E	DF20-M-4IOL Port0 ISDU data2	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data2
15	16#4260:16#0F	DF20-M-4IOL Port0 ISDU data3	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data3
16	16#4260:16#10	DF20-M-4IOL Port0 ISDU data4	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data4
17	16#4260:16#11	DF20-M-4IOL Port0 ISDU data5	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data5
18	16#4260:16#12	DF20-M-4IOL Port0 ISDU data6	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data6
19	16#4260:16#13	DF20-M-4IOL Port0 ISDU data7	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data7

Figure 4-1-90

- This example uses a 16-channel DO/DI IO-LINK slave connected to Port 0 as an example. For other slaves, please refer to their manuals. In the slave parameter table, the ISDU index is 64, the sub-index is 0, and the parameter size is 2 bytes, corresponding to the 16-channel digital enable bits.
- Parameter table of slave station:

ISDU		name	length	default value	meaning
Index	SubIndex				
64	0	Digital enable control	2	16#0000	Bit0~bit15 correspond to 16 channel signal enable bits

- The process output data table of the slave station:

Byte	1								0							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Output port 7 pin 2	Output port 7 pin 4	Output port 6 pin 2	Output port 6 pin 4	Output port 5 pin 2	Output port 5 pin 4	Output port 4 pin 2	Output port 4 pin 4	Output port 3 pin 2	Output port 3 pin 4	Output port 2 pin 2	Output port 2 pin 4	Output port 1 pin 2	Output port 1 pin 4	Output port 0 pin 2	Output port 0 pin 4

Figure 4-1-91

- Process input data table of the slave station:

Byte	1								0							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Input port 7 pin 2	Input port 7 pin 4	Input port 6 pin 2	Input port 6 pin 4	Input port 5 pin 2	Input port 5 pin 4	Input port 4 pin 2	Input port 4 pin 4	Input port 3 pin 2	Input port 3 pin 4	Input port 2 pin 2	Input port 2 pin 4	Input port 1 pin 2	Input port 1 pin 4	Input port 0 pin 2	Input port 0 pin 4
Byte	3								2							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Reserve	Reserve	Reserve	Reserve	Reserve	Reserve	Reserve	Reserve	Short circuit port 7	Short circuit port 6	Short circuit port5	Short circuit port 4	Short circuit port 3	Short circuit port 2	Short circuit port 1	Short circuit port 0

Figure 4-1-91

- According to the parameter table of the slave station, we first set ISDU to enable 16-channel digital quantity, as shown in the figure below.

Line	Index:Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Err...	Next Line	Comment
1	16#4260:16#01	DF20-M-4IOL Port0 Operating Mode	IO-LINK	8	☐	☐	0	DF20-M-4IOL Port0 Operating Mode
2	16#4260:16#02	DF20-M-4IOL Port0 Cycle Mode	IOL Automatic	8	☐	☐	0	DF20-M-4IOL Port0 Cycle Mode
3	16#4260:16#03	DF20-M-4IOL Port0 Cycle Time	3.2ms	8	☐	☐	0	DF20-M-4IOL Port0 Cycle Time
4	16#4260:16#04	DF20-M-4IOL Port0 Validation Mode	Disable	8	☐	☐	0	DF20-M-4IOL Port0 Validation Mode
5	16#4260:16#05	DF20-M-4IOL Port0 Parameter Server	Disable	8	☐	☐	0	DF20-M-4IOL Port0 Parameter Server
6	16#4260:16#06	DF20-M-4IOL Port0 VendorID	0	16	☐	☐	0	DF20-M-4IOL Port0 VendorID
7	16#4260:16#07	DF20-M-4IOL Port0 DeviceID	0	32	☐	☐	0	DF20-M-4IOL Port0 DeviceID
8	16#4260:16#08	DF20-M-4IOL Port0 ISDU Down Load Enable	Enable	8	☐	☐	0	DF20-M-4IOL Port0 ISDU Down Load Enable
9	16#4260:16#09	DF20-M-4IOL Port0 ISDU Index	64	16	☐	☐	0	DF20-M-4IOL Port0 ISDU Index
10	16#4260:16#0A	DF20-M-4IOL Port0 ISDU SubIndex	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU SubIndex
11	16#4260:16#0B	DF20-M-4IOL Port0 ISDU Length	2	8	☐	☐	0	DF20-M-4IOL Port0 ISDU Length
12	16#4260:16#0C	DF20-M-4IOL Port0 ISDU data0	255	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data0
13	16#4260:16#0D	DF20-M-4IOL Port0 ISDU data1	255	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data1
14	16#4260:16#0E	DF20-M-4IOL Port0 ISDU data2	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data2
15	16#4260:16#0F	DF20-M-4IOL Port0 ISDU data3	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data3
16	16#4260:16#10	DF20-M-4IOL Port0 ISDU data4	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data4
17	16#4260:16#11	DF20-M-4IOL Port0 ISDU data5	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data5
18	16#4260:16#12	DF20-M-4IOL Port0 ISDU data6	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data6
19	16#4260:16#13	DF20-M-4IOL Port0 ISDU data7	0	8	☐	☐	0	DF20-M-4IOL Port0 ISDU data7

Figure 4-1-92

- You can download the ISDU by logging in and downloading it to the PLC.

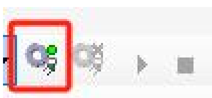


Figure 4-1-93

Figure 4-1-94

4.1.12.2 IO-LINK mode routine

- As shown in the figure below, configure the module Port0 channel to IO-LINK mode, download and start the PLC.

Line	Index:Subindex	Name	Value
1	16#4260:16#01	DF20-M-4IOL Port0 Operating Mode	IO-LINK
2	16#4260:16#02	DF20-M-4IOL Port0 Cycle Mode	IOL Automatic
3	16#4260:16#03	DF20-M-4IOL Port0 Cycle Time	3.2ms
4	16#4260:16#04	DF20-M-4IOL Port0 Validation Mode	Disable
5	16#4260:16#05	DF20-M-4IOL Port0 Parameter Server	Disable

Figure 4-1-95

- As shown in the figure below, data can be sent to the IO-Link slave. For the specific meaning of process data, please refer to[Section 3.46.3](#).

Startup Parameters
Module I/O Mapping
Module IEC Objects
Information

Find Filter Show all Add FB for IO Channel... Go t

Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value
		Port0 Command	%QW0	UINT	0	
		Port0 C/Q DO	%QX2.1	BIT	FALSE	
		Port0 Valid	%QX2.2	BIT	TRUE	TRUE
		Port0 Transmit Len	%QB3	USINT	2	2
		Port0 data0	%QB4	USINT	255	255
		Port0 data1	%QB5	USINT	255	255
		Port0 data2	%QB6	USINT	0	
		Port0 data3	%QB7	USINT	0	
		Port0 data4	%QB8	USINT	0	

Figure 4-1-96

- The received data can be viewed as shown in the figure below.

		Port0 Event Code	%IW0	UINT	0
		Port0 Device Err	%IX2.0	BIT	FALSE
		Port0 I/Q DI	%IX2.1	BIT	FALSE
		Port0 C/Q DI	%IX2.2	BIT	FALSE
		Port0 Valid	%IX2.3	BIT	TRUE
		Port0 Receive Len	%IB3	USINT	4
		Port0 data0	%IB4	USINT	255
		Port0 data1	%IB5	USINT	255
		Port0 data2	%IB6	USINT	0
		Port0 data3	%IB7	USINT	0
		Port0 data4	%IB8	USINT	0

Figure 4-1-97

4.1.12.3 IOL DI mode routine

- As shown in the figure below, configure the module Port0 channel to IOL DI mode, download and start the PLC.

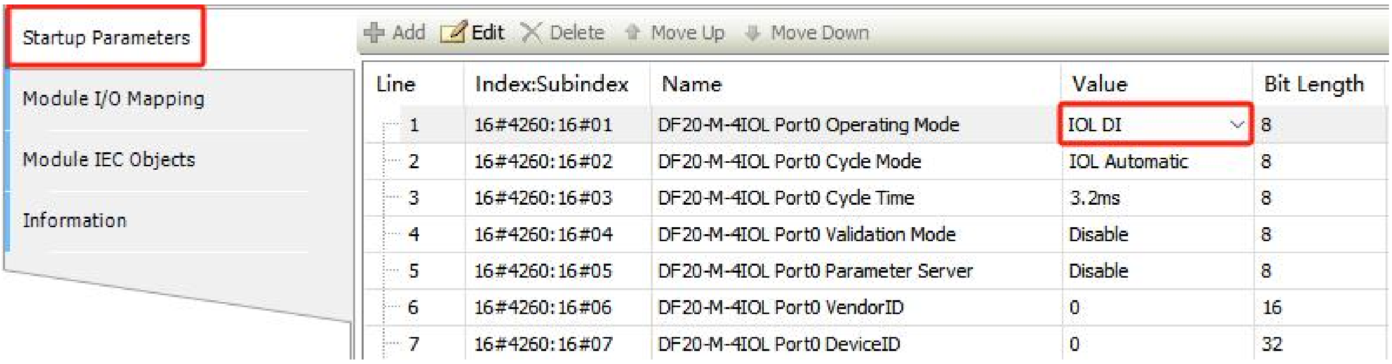


Figure 4-1-98

- Input a 24V signal to Port0 C/Q. As shown in the figure below, you can see that Port0 C/Q DI becomes TRUE.

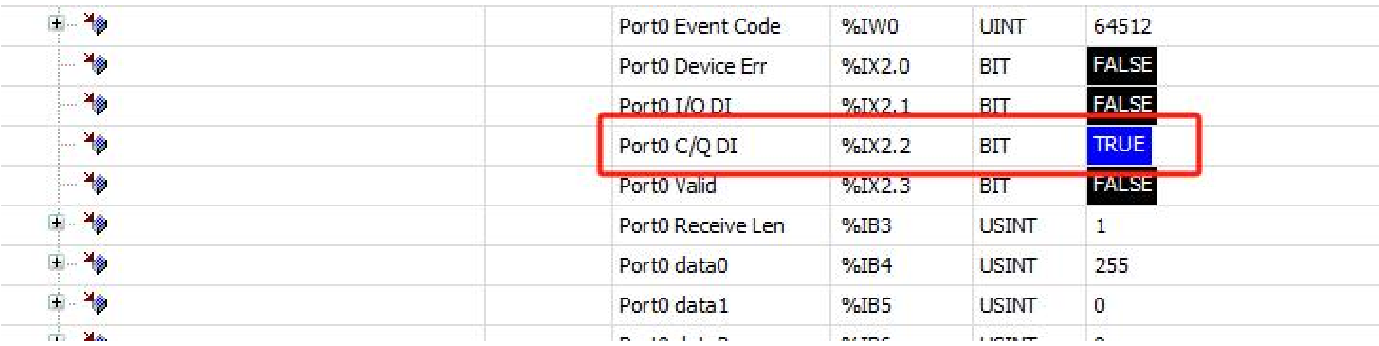


Figure 4-1-99

4.1.12.4 IOL DO mode routine

➢ As shown in the figure below, configure the module Port0 channel to IOL DO mode, download and start the PLC.

Startup Parameters
Module I/O Mapping
Module IEC Objects
Information

Add Edit Delete Move Up Move Down

Line	Index:Subindex	Name	Value	Bit Length
1	16#4260:16#01	DF20-M-4IOL Port0 Operating Mode	IOL DO	8
2	16#4260:16#02	DF20-M-4IOL Port0 Cycle Mode	IOL Automatic	8
3	16#4260:16#03	DF20-M-4IOL Port0 Cycle Time	3.2ms	8
4	16#4260:16#04	DF20-M-4IOL Port0 Validation Mode	Disable	8
5	16#4260:16#05	DF20-M-4IOL Port0 Parameter Server	Disable	8

Figure 4-1-100

➢ As shown in the figure below, Port0 C/Q can input 24V signal.

Port0 Command	%QW0	UINT	0
Port0 C/Q DO	%QX2.1	BIT	TRUE
Port0 Valid	%QX2.2	BIT	FALSE
Port0 Transmit Len	%QB3	USINT	0
Port0 data0	%QB4	USINT	0

Figure 4-1-101

4.1.12.5 I/Q DI Channels

➢ This channel is valid in any mode, as shown in the figure below, indicating that a valid signal is received.

Port0 Event Code	%IW0	UINT	64512
Port0 Device Err	%IX2.0	BIT	FALSE
Port0 I/Q DI	%IX2.1	BIT	TRUE
Port0 C/Q DI	%IX2.2	BIT	FALSE
Port0 Valid	%IX2.3	BIT	FALSE

Figure 4-1-102

4.1.12.6 Port Diagnosis

➢ As shown in the figure below, the Event Code displays data as 0, indicating that there is no error.

Port0 Event Code	%IW0	UINT	16#0000
Port0 Device Err	%IX2.0	BIT	FALSE
Port0 I/Q DI	%IX2.1	BIT	FALSE
Port0 C/Q DI	%IX2.2	BIT	FALSE
Port0 Valid	%IX2.3	BIT	TRUE
Port0 Receive Len	%IB3	USINT	16#04

Figure 4-1-103

➢ As shown in the figure below, the Event Code shows data 16#1800, indicating that the IO-LINK slave is offline. For other event codes, please refer to the port event code table.

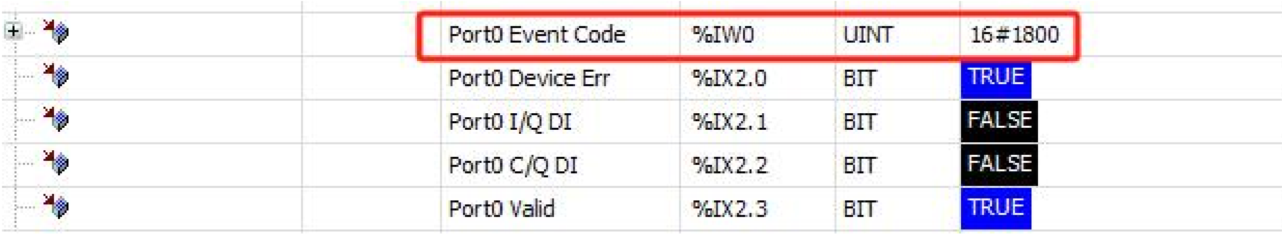


Figure 4-1-104

Table 4.1.1 Port event codes

Event Code	illustrate
0x1800	IO-LINK slave is offline, check the slave connection
0x1801	Wrong startup parameters
0x1802	VendorID does not match
0x1803	DeviceID does not match
0x1804	C/Q short circuit
0x1805	PHY chip overheating
0x1806	L+ L- short circuit
0x1807	L+ overcurrent
0x1808	Device event overflow
0x1809	Backup inconsistent, memory out of range
0x180A	Backup inconsistent, identity verification error
0x180B	Backup inconsistency, non-specific error with data storage
0x180C	Backup inconsistent, upload error
0x180D	Parameters are inconsistent, download failure
0x180E	P24 (Class B) missing or overvoltage
0x180F	Short circuit at P24 (Class B), check wire connections
0x1810	I/Q check line has short circuit
0x1811	C/Q is short-circuited when used as digital output
0x1812	I/Q Overcurrent
0x1813	C/Q overcurrent when used as digital output
0x4000	Slave over temperature
0x5000	Slave hardware failure
0x5100	Slave power failure
0x5101	The slave fuse is blown
0x6320	Slave parameter error
0x6321	Slave parameter missing
other	View slave manual

Table 4.1.2 Port operation codes

Command	illustrate
0x00	Normally obtain the port event code
0x01	Clear port event codes
other	reserve

- As shown in the figure below, writing 1 in Command can clear the current event code.

Figure 4-1-105

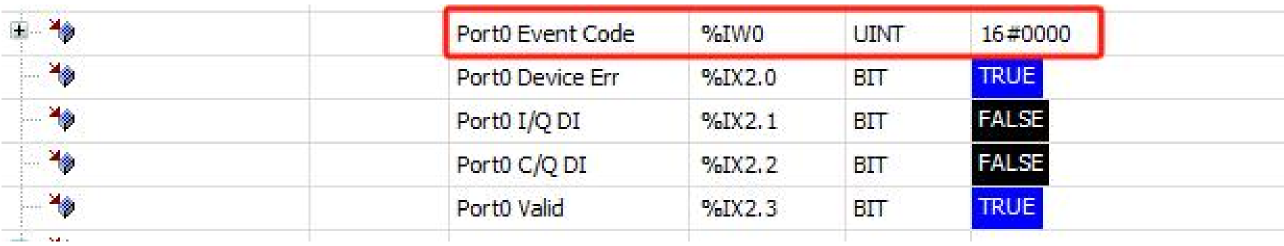


Figure 4-1-106

4.2 Application in Sysmac Studio software environment

- First find the DF20-C-EC EtherCAT Module V3.5.5i120230208 device description file provided by the manufacturer and copy it to

The installation path is "C:\Program Files (x86)\OMRON\SysmacStudio\IODeviceProfiles\EsiFiles\UserEsiFiles".

- Set the IP address of the computer and the IP address of the PLC, and ensure that they are in the same network segment.
- As shown in Figures 4-2-1(a) to 4-2-1(c), add the DF20-C-EC adapter to the created project.

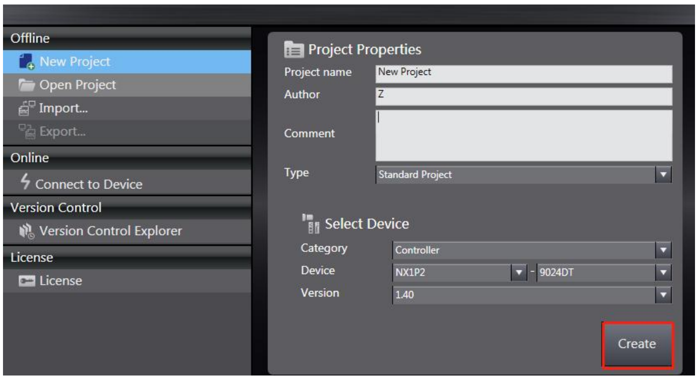


Figure 4-2-1(a)

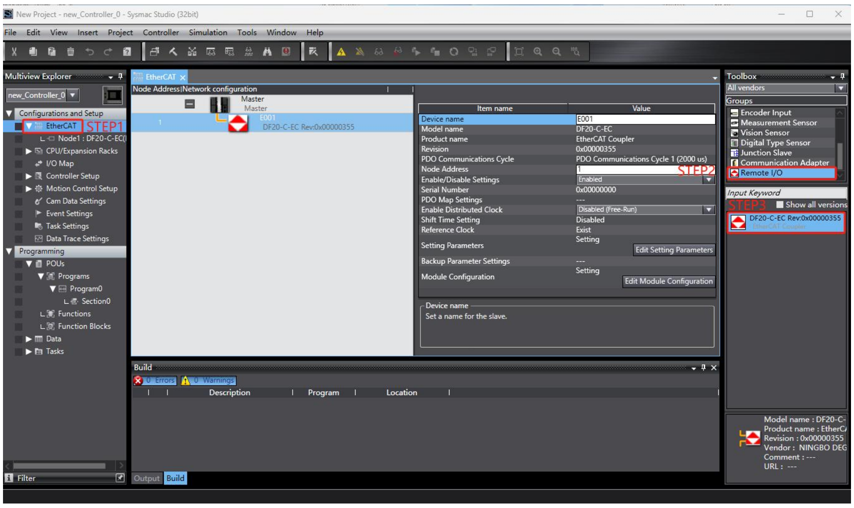


Figure 4-2-1(b)

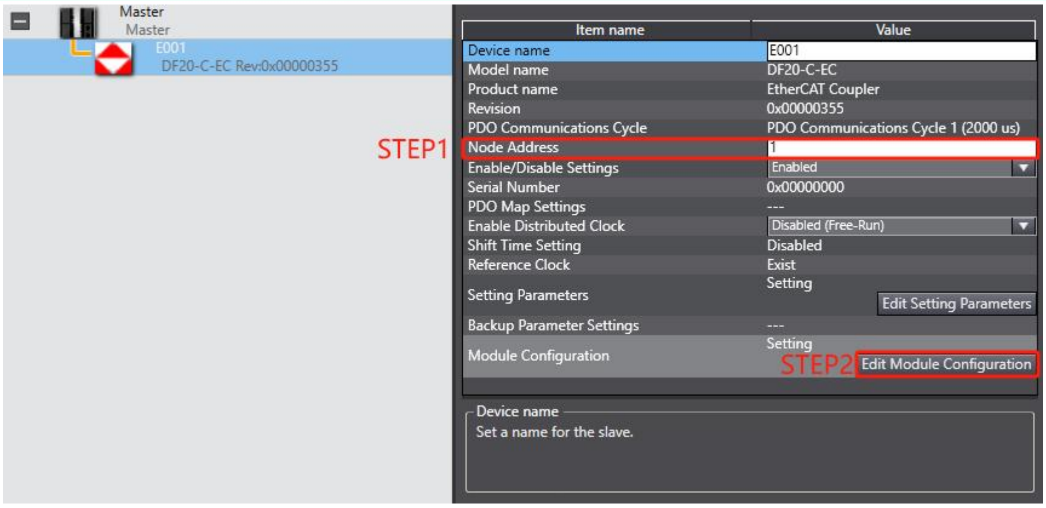


Figure 4-2-1(c)

- As shown in Figure 4-2-1(c), users need to note that in step 1, the device node address in the project is the same as the DF20-C-EC DIP switch.

The switch settings must be consistent, otherwise there will be problems with the configuration. After the DIP switch is set, DF20-C-EC needs to be powered on again.Step 2: Click Edit Module Configuration to add modules to the project based on the actual topology.

4.2.1 Digital Module and Alarm Module Usage Examples

➢ This example uses the DF20-C-EC+DF20-M-16DI-N+DF20-M-16DO-N topology. Users can add

Add module.In addition, after adding the actual module, the user also needs to add an additional "Alarm" module to display error information in the topology structure.

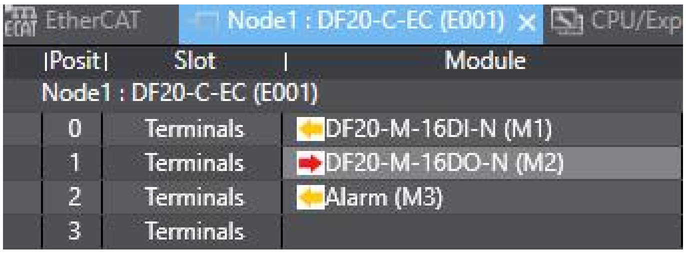


Figure 4-2-2

➢ After adding the adapter DF20-C-EC and IO module, transfer the data to the controller and power on the device.

Into configuration.

➢ As shown in Figure 4-2-3, double-click I/O mapping and select the corresponding I/O module to view and operate the channel data.

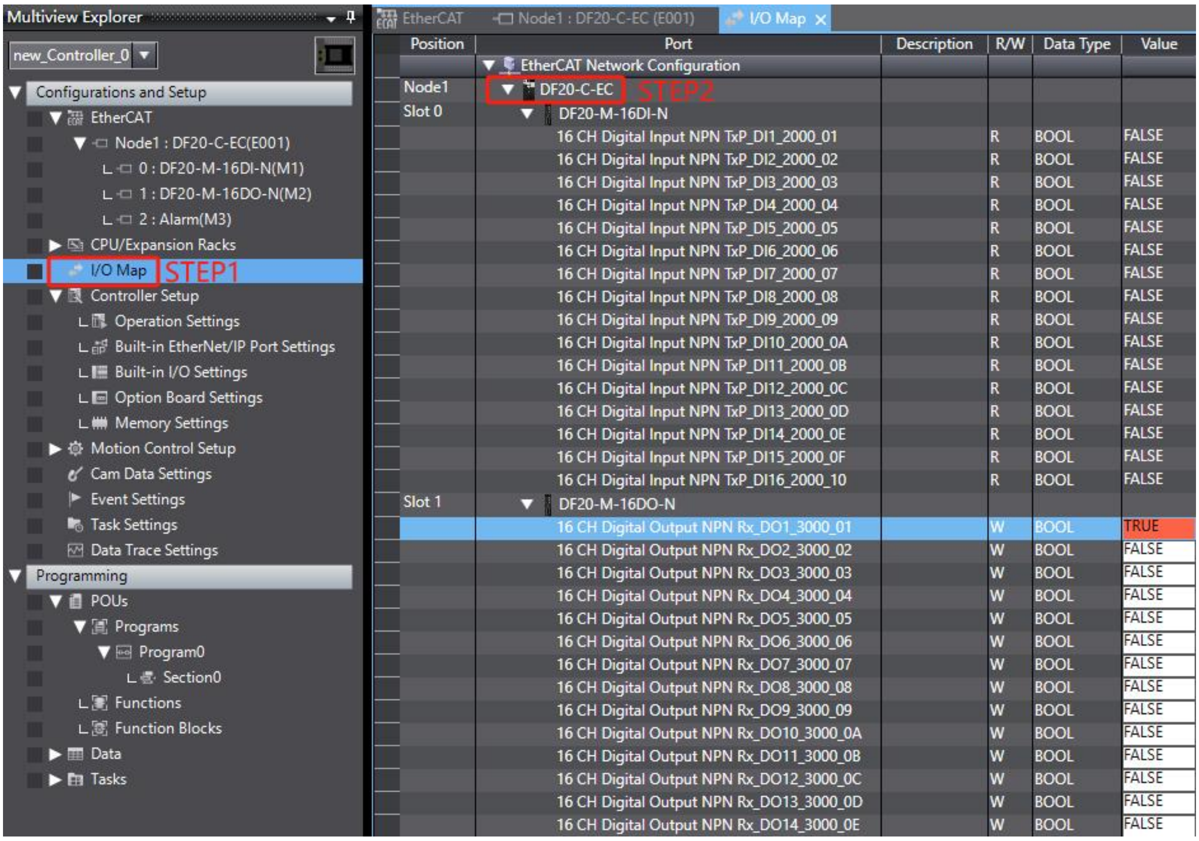


Figure 4-2-3

➢ The Alarm module is the alarm information module of the adapter DF20-C-EC, where "Alarm Stateword" is the module in the topology structure

Error information. As shown in Figure 4-2-4, the value of "Alarm Stateword" is 0x0102 (258), indicating that an error has occurred in the second module. Similarly, when an error has occurred in the first module, the value of "Alarm Stateword" is 0x0101 (257). When all modules are working normally, the value is 0. There is also an "Alarm Ctrlword" object in the Alarm module. When "1" is written to this object, the current error information can be cleared.

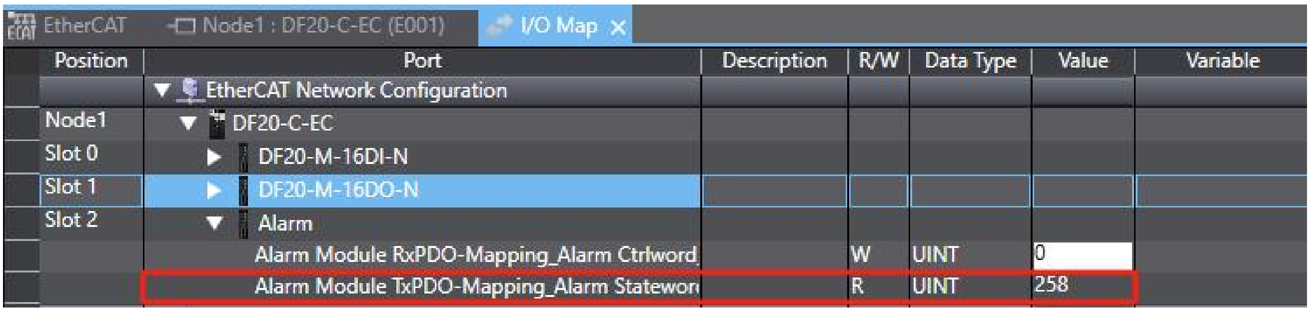


Figure 4-2-4

4.2.2 Universal analog input module usage routine

➢ This example uses the topology of DF20-C-EC+DF20-M-4AI-U-4+DF20-M-4AI-I-5. As shown in Figure 4-2-5, the user

Add modules in order in your project.

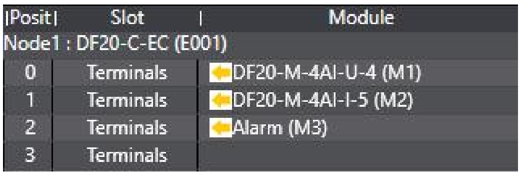


Figure 4-2-5

➢ Analog input module sampling frequency setting: Click “Edit Setting Parameters” as shown in Figure 4-2-6 to enter the analog input module sampling frequency setting as shown in Figure 4-2-7.

The analog input module DF20-M-4AI-U-4 and DF20-M-4AI-I-5 have four sampling frequencies to choose from, and the system default sampling frequency is 20Hz. The analog input module signal detection range setting is shown in Figure 4-2-7.

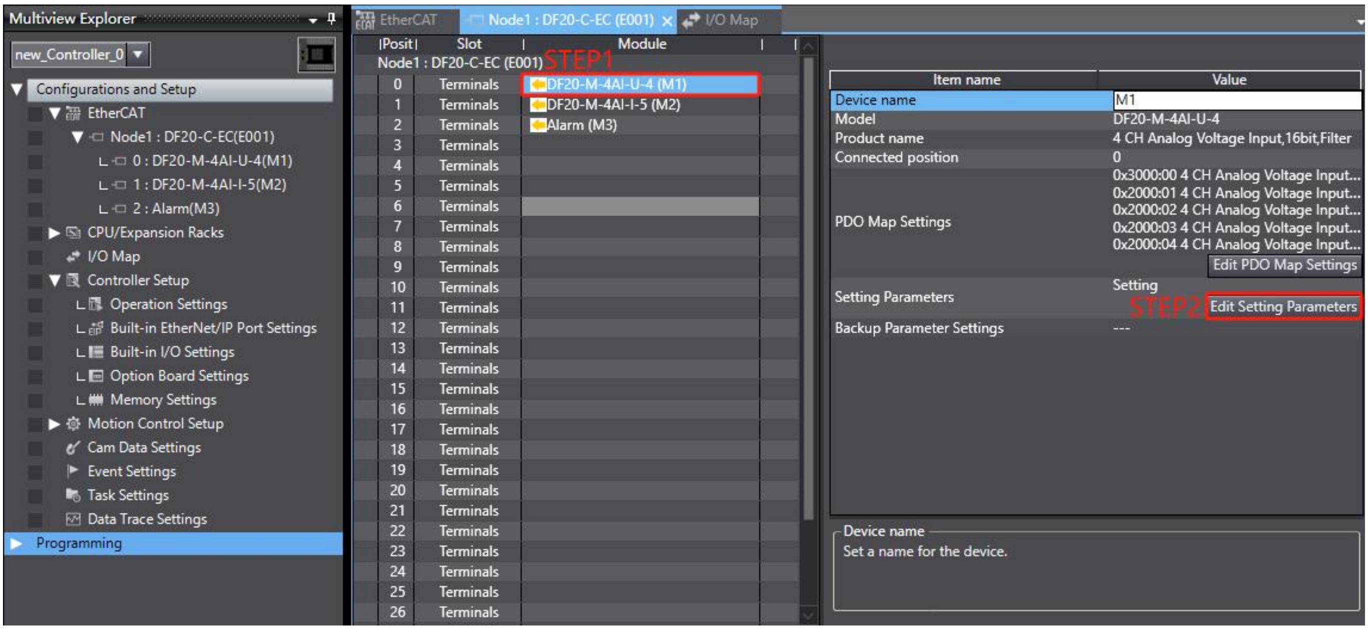


Figure 4-2-6

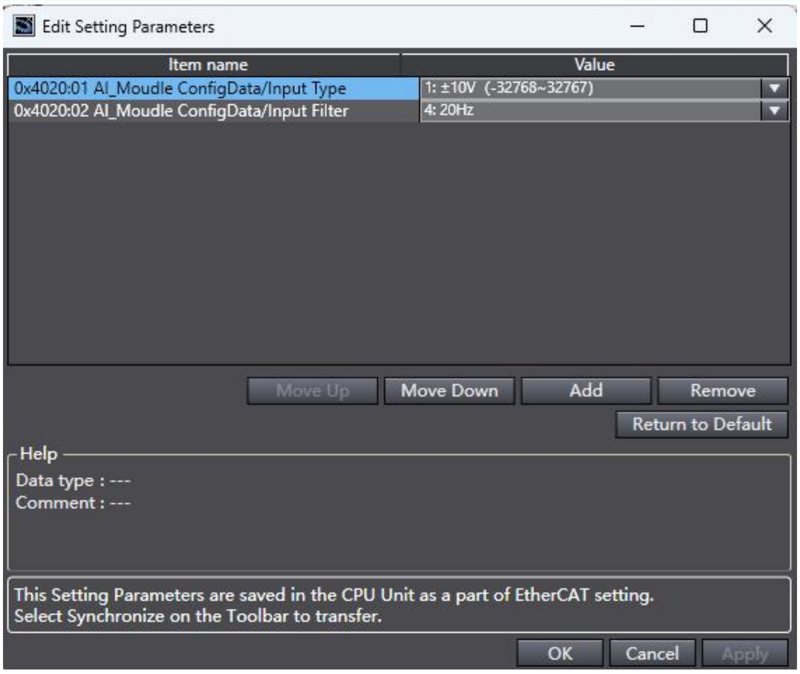


Figure 4-2-7

➢ As shown in Figure 4-2-8, double-click I/O mapping and select the corresponding I/O module to view the channel data.

The object is used for module calibration and users do not need to operate it.

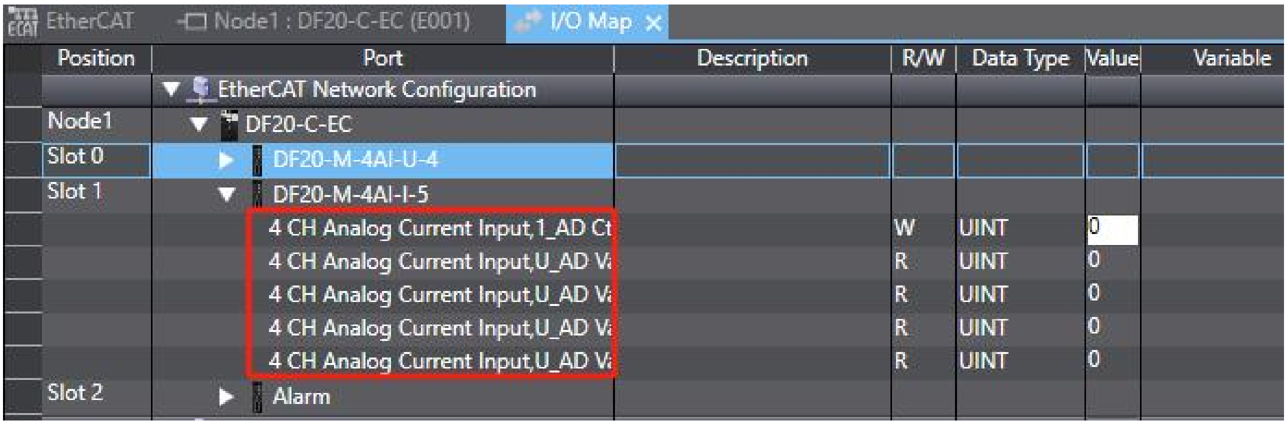


Figure 4-2-8

4.2.3 General analog output module usage routine

➢ This example uses the topology of DF20-C-EC+DF20-M-4AO-U-4+DF20-M-4AO-I-5. As shown in Figure 4-2-9, the user

Add modules in order in your project.

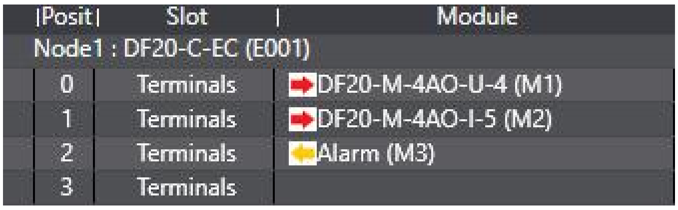


Figure 4-2-9

➢ The analog output module signal range setting is shown in Figure 4-2-10 (a)~(b).

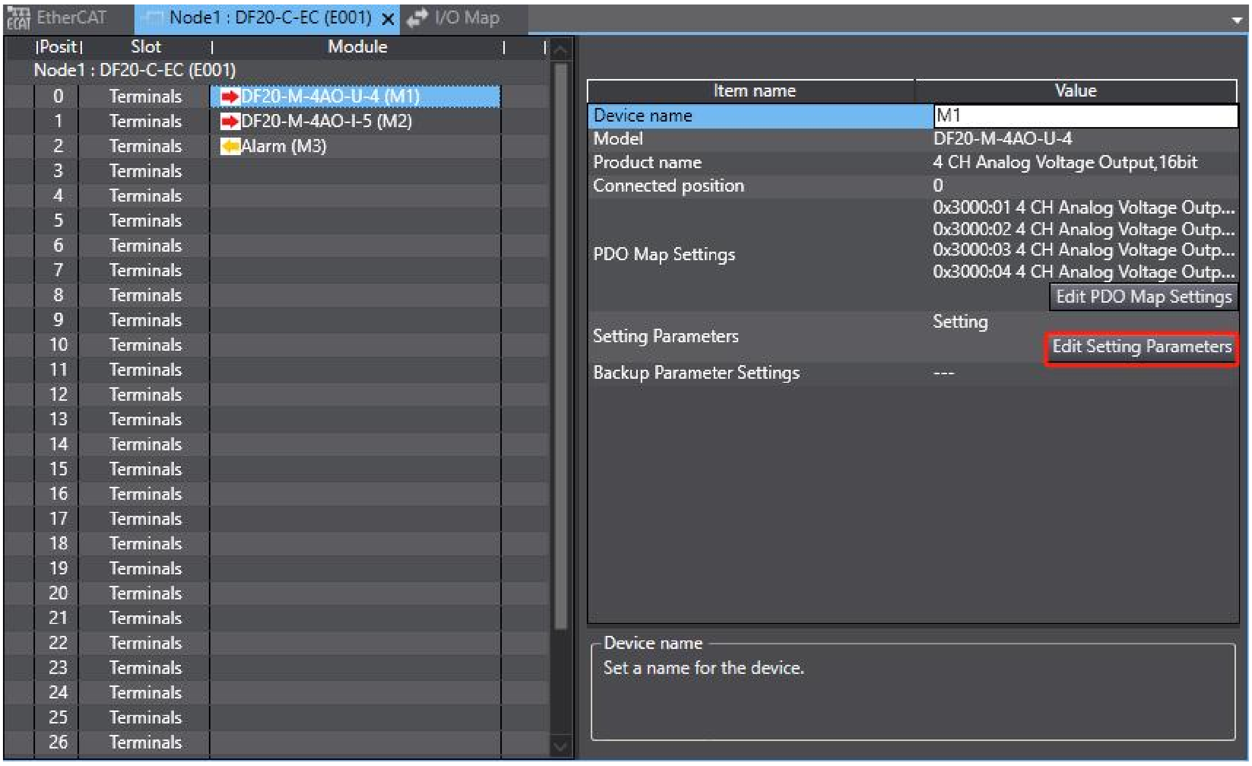


Figure 4-2-10(a)

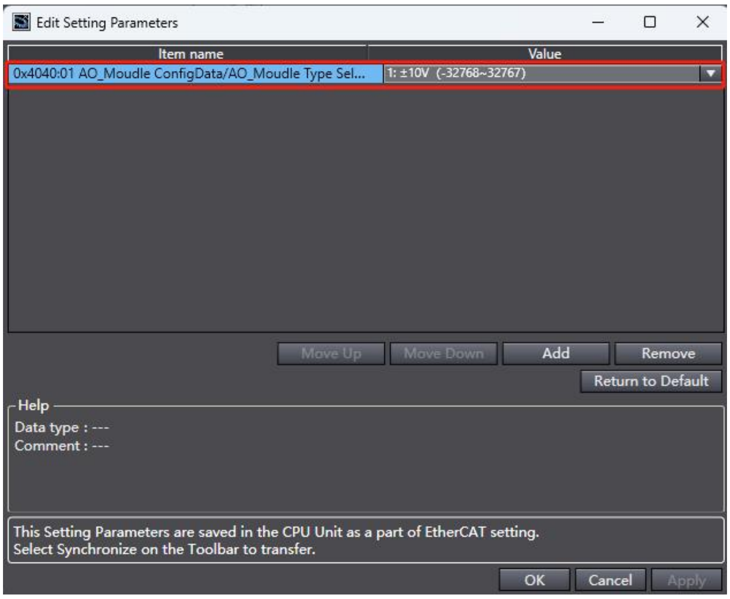


Figure 4-2-10(b)

➢ As shown in Figure 4-2-11, double-click I/O mapping, select the corresponding I/O module, and set the channel data.

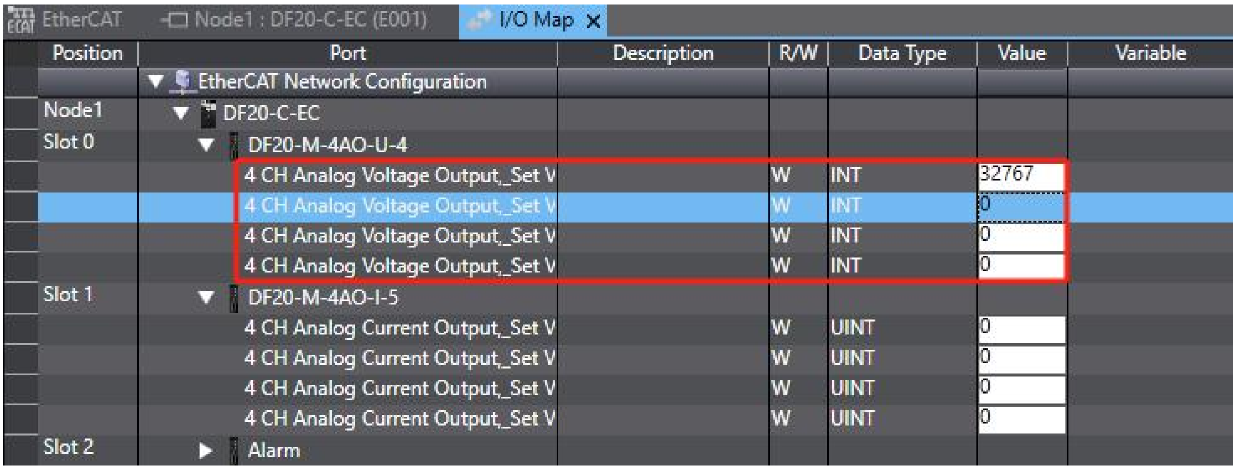


Figure 4-2-11

4.2.4 Pressure sensor data acquisition module usage routine

➢ This example uses the DF20-C-EC+DF20-M-2LC-S-5 topology, as shown in Figure 4-2-12. Users add modules in sequence in the project.

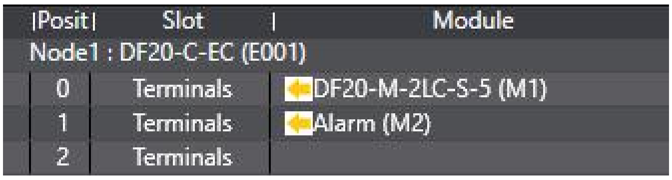


Figure 4-2-12

➢ DF20-M-2LC-S-5 module sampling frequency setting: Click "Edit initialization parameter settings" as shown in Figure 4-2-13 to enter the

As shown in 4-2-13, DF20-M-2LC-S-5 has 4 sampling frequencies to choose from, and the system default sampling frequency is 150Hz.

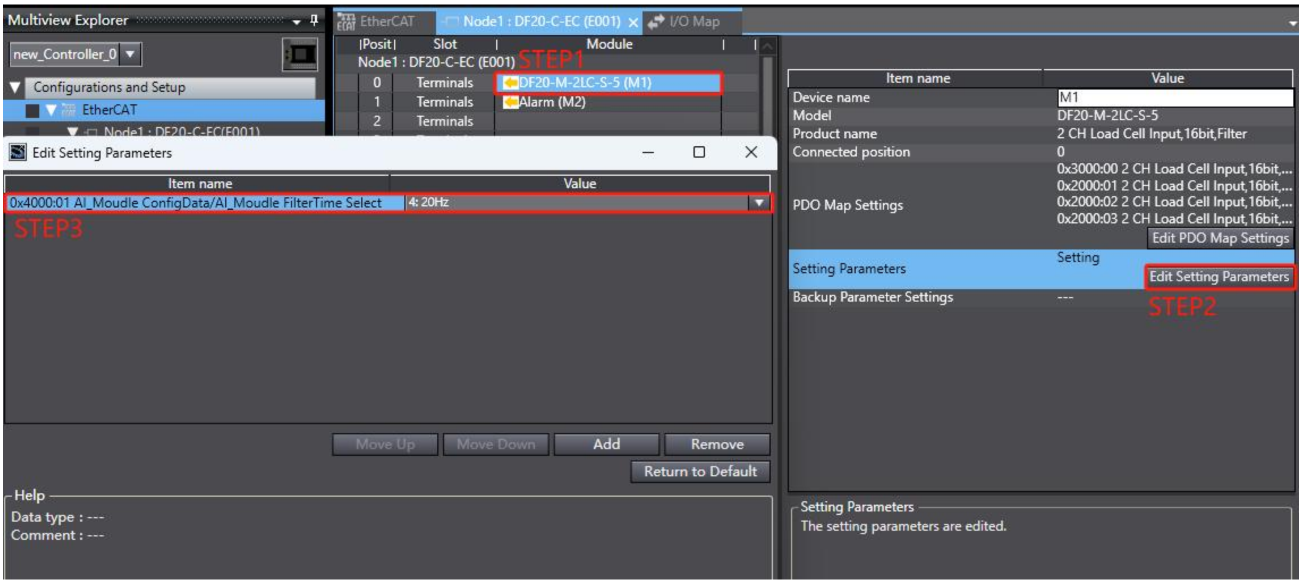


Figure 4-2-13

➢ As shown in Figure 4-2-14, double-click I/O mapping, select the corresponding I/O module, and set the channel data. Data object meaning

Please refer to4.1.4Section.

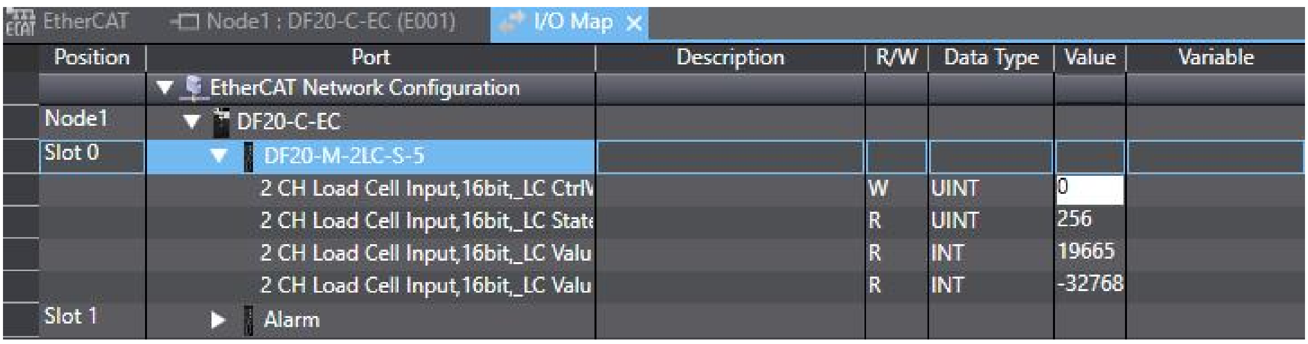


Figure 4-2-14

4.2.5 Routine use of thermal resistance sensor data acquisition module

- This example uses the DF20-C-EC+DF20-M-2RTD-PT+DF20-M-4RTD-PT topology. DF20-M-2RTD-PTandDF20-M-4RTD-PTmodulesupportssensortypesPT100/PT200/PT500/PT1000/Ni100/ Ni120/Ni200/Ni500Ni1000/Cu10/Cu50/Cu53/Cu100/KTY84-130/KTY84-150/KTY84-151,

Ressistor40ohm/Ressistor80ohm/Ressistor150ohm/Ressistor300ohm Ressistor500ohm/Ressistor1000ohm /Ressistor2000ohm/Ressistor4000ohm/KTY83-110/KTY83-120/KTY83-121/KTY83-122/KTY83-150/KTY83-151/NTC-5K/NTC-10K. This type of module has two status indicators. When the module is powered normally, LED1 is always on. When the module enters the working state, LED2 flashes. As shown in Figure 4-2-15, users add modules in order in the project.

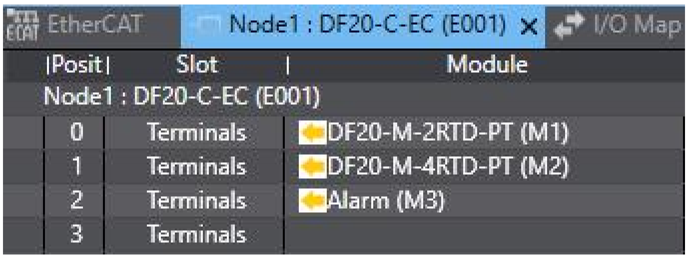


Figure 4-2-15

- If you need to configure the sensor type and filter configuration, as shown in Figure 4-2-16, select the sensor type. The system supports PT100 by default.

Select the filter configuration, the system default is 5Hz_200ms.

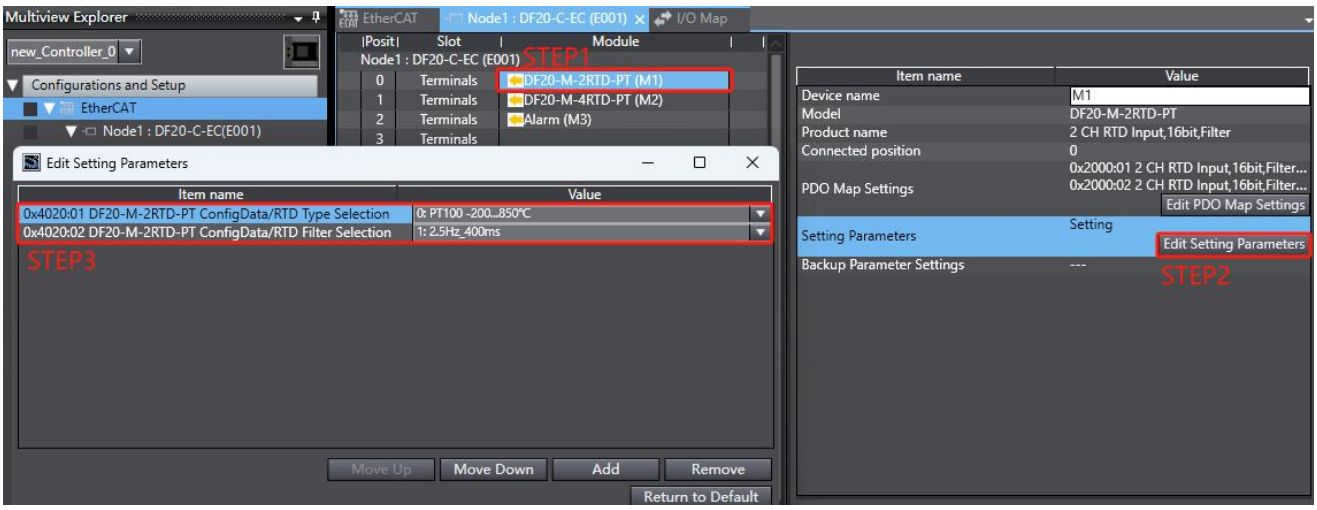


Figure 4-2-16

Table 4.2.7

Object Name	illustrate	Remark
RTD Input CH1	First channel data	If the data values of both channels are -32768, this means that the sensor is disconnected or the sensor type configured by the master station does not match the actual sensor type.
RTD Input CH2	First channel data	

➢ DF20-M-2RTD-PT supports PT100 type sensors by default. As shown in Figure 4-2-17, the first channel is connected to the PT100 sensor.

The second channel is not connected to the sensor. The temperature data is shown in Figure 4-2-17. The first channel reading is 183, representing 18.3°. The second channel is not connected to the sensor and the reading is -32768, indicating a disconnection.

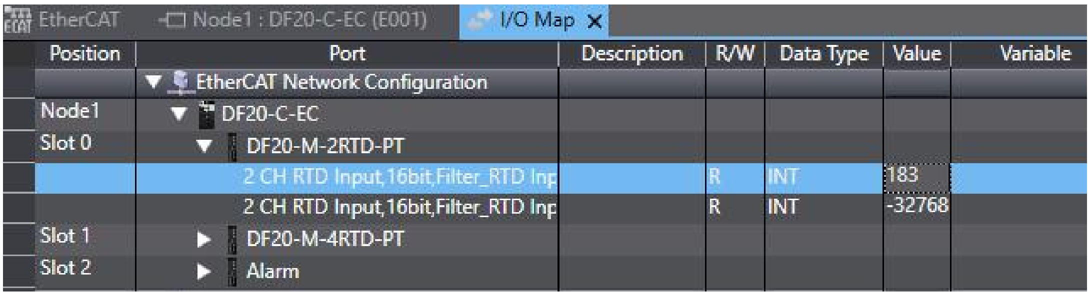


Figure 4-2-17

4.2.6 Thermocouple temperature data acquisition module usage routine

➢ This example uses the DF20-C-EC+DF20-M-4TC-KETJ+DF20-M-8TC-KETJ topology. The sensor types supported by the module are

Type: K/E/T/J/B/S/R/N/C/L thermocouple +/-15.625mv, +/-15.625mv, +/-31.25mv, +/-62.5mv, +/-15.625mv,

+/-31.25mv,+/-62.5mv,+/-125mv,+/-250mv,+/-500mv,+/-1000mv,+/-2000mv. This type of module has two status indicators. When the module is powered normally, LED1 is always on. When the module enters the working state, LED2 flashes. As shown in Figure 4-2-18, users add modules in order in the project.

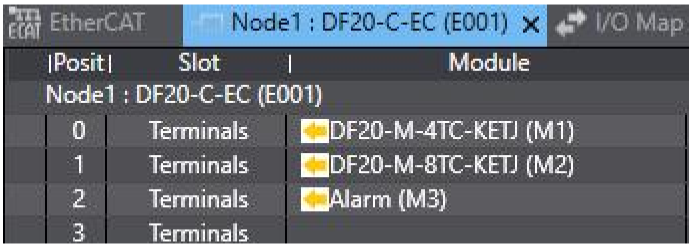


Figure 4-2-18

➢ As shown in Figure 4-2-19, if you need to configure the sensor type, the system supports K-type thermocouple by default; select filter configuration, the system defaults to

4Hz_250ms.

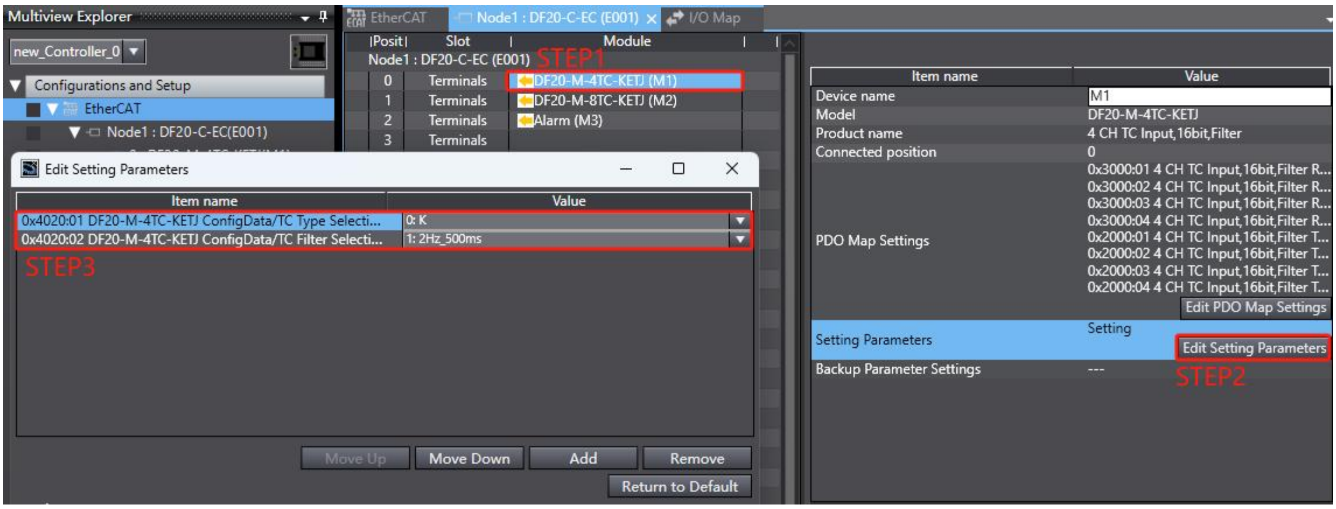


Figure 4-2-19

Table 4.2.8

Object Name	illustrate	Remark
Tc Value CH1	The first channel	The quality of many domestic sensors varies greatly, and the Offset Value is used to compensate for the error of the sensor itself.
Tc Value CH2	Second channel	
Tc Value CH3	The third channel	
Tc Value CH4	The fourth channel	
Offset Value CH1	Temperature	
Offset Value CH2	Second channel	

Offset Value CH3	Temperature	
Offset Value CH4	Temperature	

- DF20-M-4TC-KETJ supports K-type thermocouples by default. As shown in Figure 4-2-20, the first channel is connected to a K-type thermocouple, and the next three channels are connected to a K-type thermocouple.

The temperature data is shown in Figure 4-2-20. The first channel has a reading of 212, which means 21.2°. The last three channels have no sensor connected, and the reading is -32768, which means the line is broken. This example does not perform temperature compensation on the first two channels.

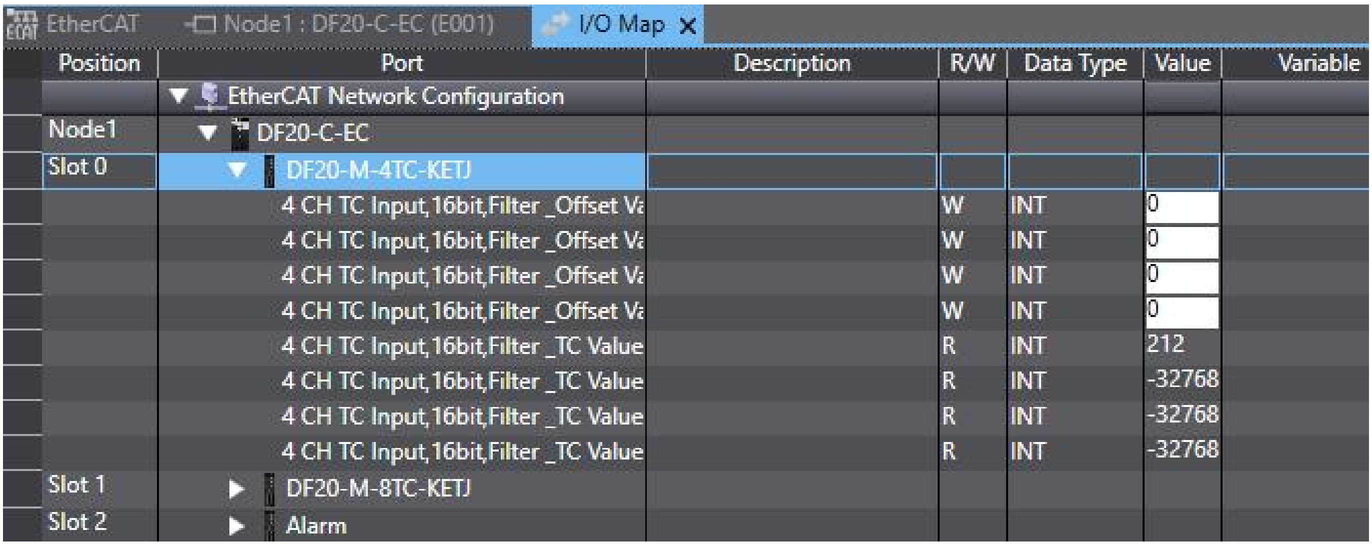


Figure 4-2-20

4.2.7 Single-channel encoder data acquisition module usage routine

➢ The single-channel encoder data acquisition modules are available in two types: DF20-M-1CNT-EL-5 and DF20-M-1CNT-EL-4.

The method is the same as the usage method. The difference is that DF20-M-1CNT-EL-5 is connected to a 5V encoder signal, and DF20-M-1CNT-EL-4 is connected to a 24V encoder signal. This document uses the DF20-M-1CNT-EL-5 module as an example.

➢ DF20-M-1CNT-EL-5 module features:

（1）Quadrature encoder A+/A-, B+/B- differential input, 4 times frequency;

(2) Electron probe input;

(3) Two LED indicator outputs. After the module is powered on, Led1 is always on, indicating that the module is powered on and initialized normally. Different display states of Led2 represent different working states of the module: when the module is running in the data sampling state, Led2 flashes; when the module is running in the idle or clearing sampling data state, Led2 is not on. As shown in Figure 4-2-21, users add modules in order in the project.

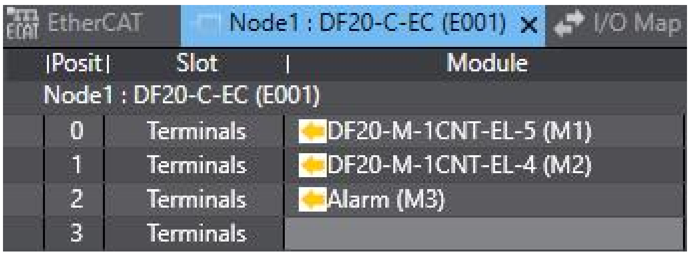


Figure 4-2-21

➢ Figure 4-2-22 shows the PDO process data of the DF20-M-1CNT-EL-5 module:

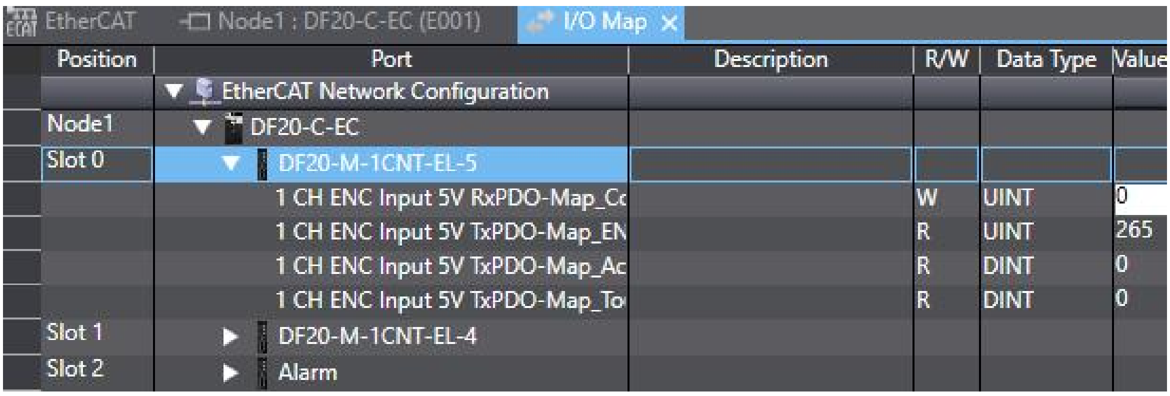


Figure 4-2-22

Table 4.2.10

name	PDO data meaning	Data Types
ENC State	Feedback status word	UINT16
Actual Position	Feedback encoder current position	INT32

Touch Probe Position	Feedback electronic probe latch	INT32
ENC Command	Control command word	UINT16

- Table 4.2.11 shows the module state machine description of DF20-M-1CNT-EL-5.

Table 4.2.11

Control command	meaning	Feedback status	meaning
0x012B	Enter counting state	0x010B	Counting status
0x012C	Clear current count	0x010C	Clear Status
		0x0109	Idle state
		0x010E	Error Status

- The module automatically enters the idle state when powered on. Enter the 0x012B command for ENC Command to make the module enter the counting state.

When the word feedback is 0x010B, the counting is normal; if the pulse count value and the electronic probe latch value need to be cleared, write 0x012C to clear the data in the module. When the status word is judged to be 0x010C, the clearing is completed; then the command object ENC Command is input with 0x012B again, and the module enters the counting state.

4.2.8 Two-channel pulse data acquisition module usage routine

Note: The pulse acquisition module is divided into two types: DF20-M-2CNT-PIL-5 and DF20-M-2CNT-PIL-4. The wiring and usage methods of the two modules are the same. The difference is that DF20-M-2CNT-PIL-5 is connected to a 5V pulse signal, and DF20-M-2CNT-PIL-4 is connected to a 24V pulse signal.

DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module functions:

- Two-channel pulse input and position comparison;
- Two-channel electronic probe input, which can latch the current pulse input value of two channels respectively;
- The current two channel count values can be cleared to zero respectively according to the external trigger signal;
- Two LED indicator outputs. After the module is powered on, LED1 is always on, indicating that the module is powered on and initialized.

The initialization is normal. Different display states of LED2 represent different working states of the module: when the module is running in the data sampling state, LED2 flashes; when the module is running in the idle state, LED2 is off.

DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module wiring instructions:

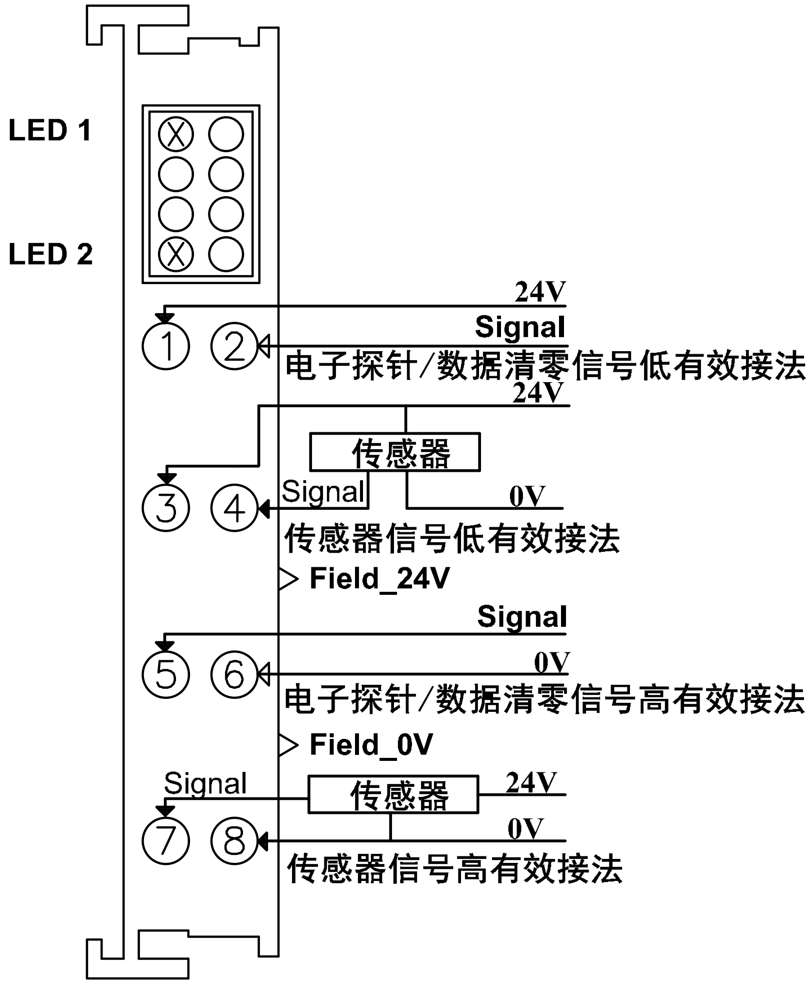


Figure 1 DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) wiring diagram

- As shown in Figure 1, the wiring diagram of DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4): Pins 1 and 2 are the first channel electronic probes.

Note 1:The first channel data reset signal input, the specific function to be selected can be configured according to needs; 5 and 6 pins are the second channel electronic probe

Note 1:The second channel data reset signal input; the usage is the same as the first channel electronic probe/first channel data reset signal input. Pins 3 and 4 are the first pulse input channel, as shown in the figure, the sensor signal is low effective connection; pins 7 and 8 are the second pulse input channel, as shown in the figure, the sensor signal is high effective connection.

Note 1: The latch of the counting module is the electronic probe function that is often found in the servo. After being triggered by an electronic probe signal (such as a photoelectric switch), the card directly latches the current value. This is much faster than using the host computer PLC to determine the probe signal and then latch the position. The host computer has a delay in determining the position and the position is inaccurate. Some packaging industries need to use this function. If not, just ignore it.

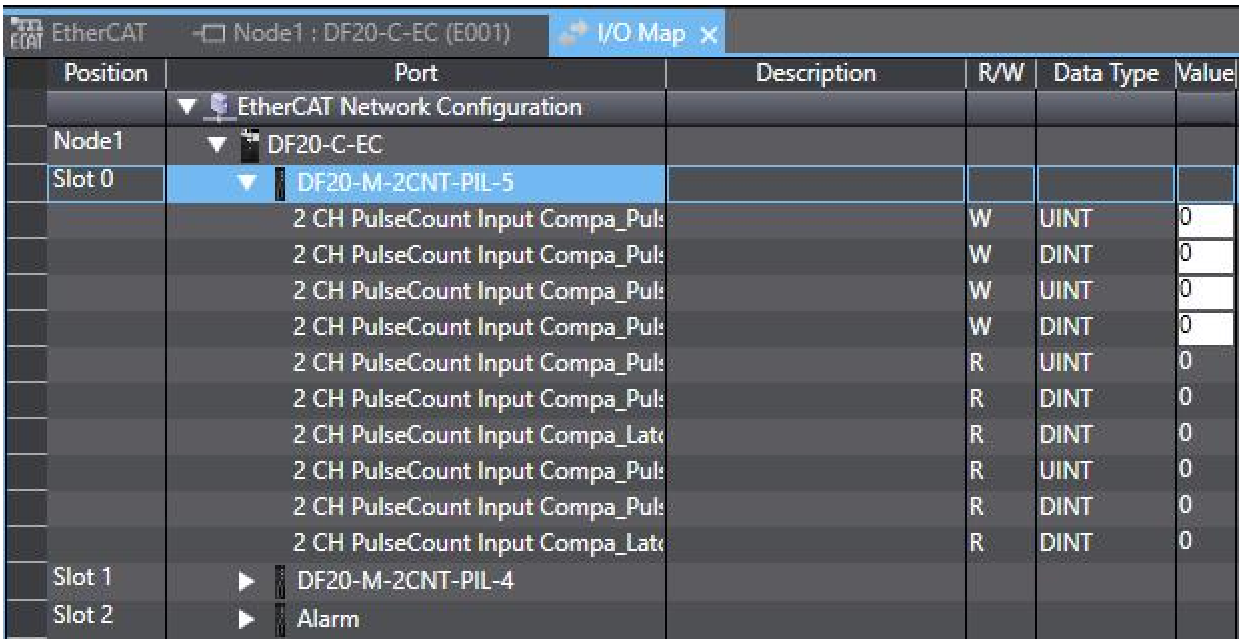
DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module process data description:

- The bus adapter will allocate corresponding input and output addresses according to the different modules connected later;

The table shows the meaning, data length and data type of the input and output data of DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4).

Table 1

输出数据	字节数	数据类型
通道1命令输出数据	1	Uint8
通道1脉冲比较直输出	4	Uint32
通道2命令输出数据	1	Uint8
通道2脉冲比较直输出	4	Uint32
输入数据	字节数	数据类型
通道1状态输入数据	1	Uint8
通道1脉冲数	4	Uint32
通道1锁存脉冲数	4	Uint32
通道2状态输入数据	1	Uint8
通道2脉冲数	4	Uint32
通道2锁存脉冲数	4	Uint32


EtherCAT Node1 : DF20-C-EC (E001) I/O Map

Position	Port	Description	R/W	Data Type	Value
	EtherCAT Network Configuration				
Node1	DF20-C-EC				
Slot 0	DF20-M-2CNT-PIL-5				
	2 CH PulseCount Input Compa_Pul:		W	UINT	0
	2 CH PulseCount Input Compa_Pul:		W	DINT	0
	2 CH PulseCount Input Compa_Pul:		W	UINT	0
	2 CH PulseCount Input Compa_Pul:		W	DINT	0
	2 CH PulseCount Input Compa_Pul:		R	UINT	0
	2 CH PulseCount Input Compa_Pul:		R	DINT	0
	2 CH PulseCount Input Compa_Latc		R	DINT	0
	2 CH PulseCount Input Compa_Pul:		R	UINT	0
	2 CH PulseCount Input Compa_Pul:		R	DINT	0
	2 CH PulseCount Input Compa_Latc		R	DINT	0
Slot 1	DF20-M-2CNT-PIL-4				
Slot 2	Alarm				

➢ Output data meaning

Table 2

Output data meaning	
0byte	
bit7~bit3	Reserved seat
bit2	0: Disable channel 1 comparison value; 1: Enable channel 1 comparison value
bit1	0: Enable the electronic probe function of channel 1; 1: Enable the count clearing function triggered by external signal of channel 1
bit0	0: Channel 1 stops counting and the original count is reset to zero; 1: Channel 1 starts counting
1~4byte	Channel 1 pulse comparison value output, unsigned 32-bit data
5byte	

bit7~bit3	Reserved seat
bit2	0: Disable channel 2 comparison value; 1: Enable channel 2 comparison value
bit1	0: Enable the electronic probe function of channel 2; 1: Enable the count clearing function triggered by external signal of channel 2
bit0	0: Channel 2 stops counting and the original count is cleared; 1: Channel 2 starts counting
6~9byte	Channel 2 pulse comparison value output, unsigned 32-bit data

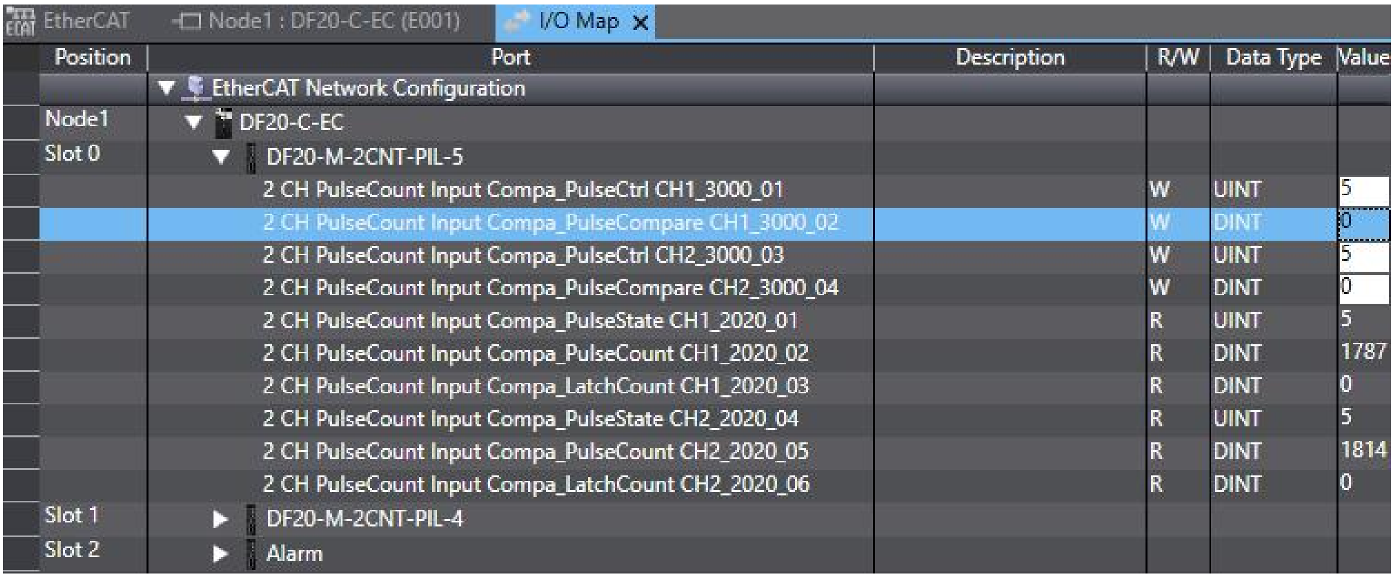
➢ Input data meaning

Table 3

Input data meaning	
0 bytes	
bit7~bit3	Reserved seat
bit2	0: The count value of channel 1 is less than the comparison value; 1: The count value of channel 1 is greater than the comparison value.
bit1	0: No electronic probe/first channel count reset signal; 1: Electronic probe/first channel count reset signal
bit0	0: Channel 1 counting stop state, the original count is cleared; 1: Channel 1 counting state
1~4 bytes	Channel 1 pulse input value, unsigned 32-bit data
5~8 bytes	Channel 1 pulse input latch value, unsigned 32-bit data
9 bytes	
bit7~bit3	Reserved seat
bit2	0: The count value of channel 2 is less than the comparison value; 1: The count value of channel 2 is greater than the comparison value.
bit1	0: No electronic probe/count clear signal on channel 2; 1: Electronic probe/count clear signal on channel 2
bit0	0: Channel 2 counting stop state, the original count is cleared; 1: Channel 2 counting state
10~13 bytes	Channel 2 pulse input value, unsigned 32-bit data
14~17 bytes	Channel 2 pulse input latch value, unsigned 32-bit data

➢ As shown in Figure 4-2-23, this is the usage example of DF20-M-2CNT-PIL-5:

PluseCtrA writes 5 (channel 1 starts counting, enables channel 1 electronic probe function, and enables channel 1 comparison value).



EtherCAT | Node1 : DF20-C-EC (E001) | I/O Map

Position	Port	Description	R/W	Data Type	Value
	EtherCAT Network Configuration				
Node1	DF20-C-EC				
Slot 0	DF20-M-2CNT-PIL-5				
	2 CH PulseCount Input Compa_PulseCtrl CH1_3000_01		W	UINT	5
	2 CH PulseCount Input Compa_PulseCompare CH1_3000_02		W	DINT	0
	2 CH PulseCount Input Compa_PulseCtrl CH2_3000_03		W	UINT	5
	2 CH PulseCount Input Compa_PulseCompare CH2_3000_04		W	DINT	0
	2 CH PulseCount Input Compa_PulseState CH1_2020_01		R	UINT	5
	2 CH PulseCount Input Compa_PulseCount CH1_2020_02		R	DINT	1787
	2 CH PulseCount Input Compa_LatchCount CH1_2020_03		R	DINT	0
	2 CH PulseCount Input Compa_PulseState CH2_2020_04		R	UINT	5
	2 CH PulseCount Input Compa_PulseCount CH2_2020_05		R	DINT	1814
	2 CH PulseCount Input Compa_LatchCount CH2_2020_06		R	DINT	0
Slot 1	DF20-M-2CNT-PIL-4				
Slot 2	Alarm				

Figure 4-2-23

4.3 Application in Beckhoff TwinCAT3 software environment

➢ As shown in Figure 4-3-1, first find the DF20-C-EC EtherCAT Module V3i7i0_240904_1321_B device description provided by the manufacturer.

Copy the above file to the folder of the installation path C:\TwinCAT\3.1\Config\Io\EtherCAT, and then open TwinCAT3. When TwinCAT3 is started, it automatically adds the devices under the EtherCAT file to the device library.

Figure 4-3-1

4.3.1 Digital Module and Alarm Module Usage Examples

➢ This example uses the DF20-C-EC+DF20-M-16DI-N+DF20-M-16DO-N topology. After the system is powered on, use the network cable

Connect the network port of the PC with the TwinCAT3 network card driver to the "IN" network port of DF20-C-EC, and create a new project in TwinCAT3. After scanning the slave station, you will get the result shown in Figure 4-3-2: The 1st and 2nd Modules are the module cards, and the 3rd module is the alarm module (containing a 32-bit Error object, each bit represents the error status of the corresponding card).

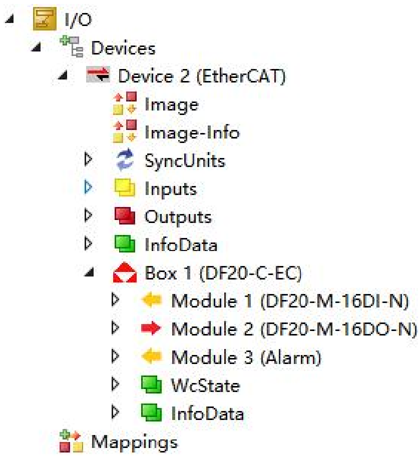


Figure 4-3-2

➢ Select Yes (YES) according to the prompts to enter the FreeRun mode. In FreeRun mode, as shown in Figure 4-3-3

As shown, check the input signal collected by DF20-M-16DI-N;

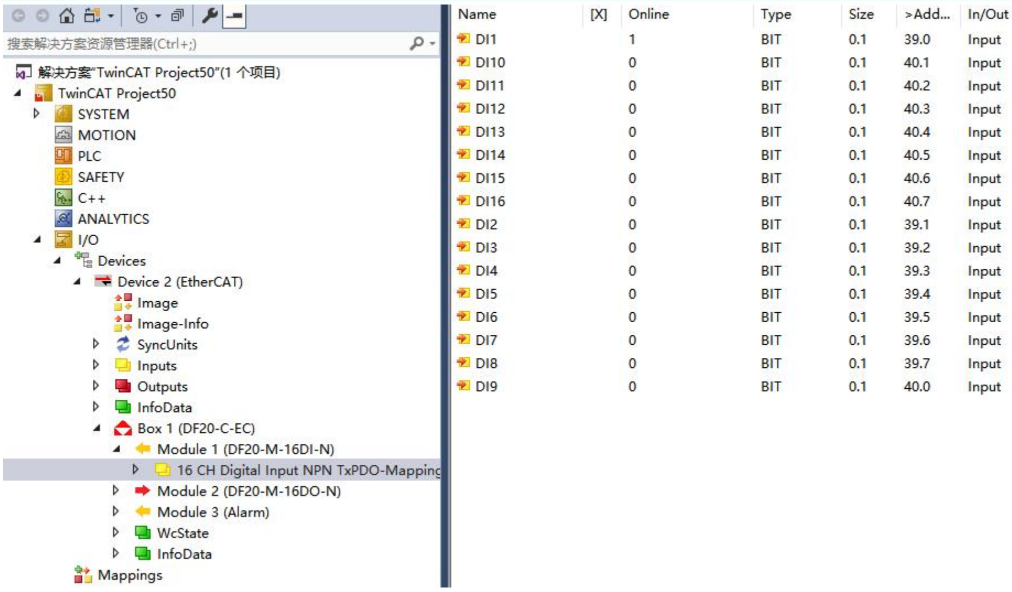


Figure 4-3-3

➢ As shown in Figure 4-3-4, by assigning a value to the output module DF20-M-16DO-N, the output of the module can be controlled.

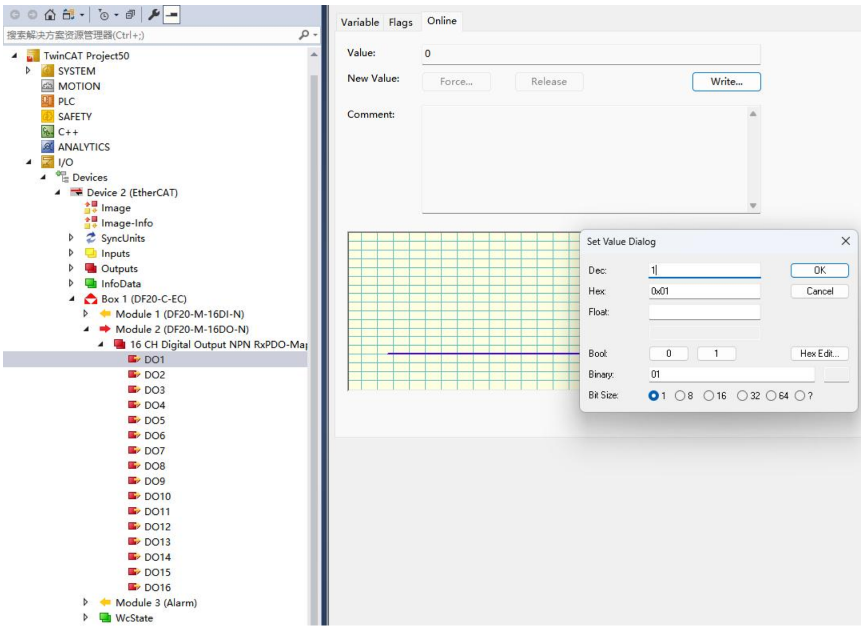


Figure 4-3-4

➢ The Alarm module is the alarm information module of the adapter DF20-C-EC. The "Alarm Stateword" is the module error in the topology structure.

Misinformation.

Alarm Ctrl word	Command meaning	Alarm Stateword	Status meaning
0	Feedback fault code	0x0xxx	Current fault code
1	Clear status information	0x0000	Status information cleared
1000	Feedback software	0x0355	Current firmware

	version		version

➢ As shown in Figure 4-3-5, when the value of "Alarm Ctrlword" is 0x0000 by default, the feedback value of "Alarm Stateword" is 0x0102.

Indicates that the second module after the coupler has an error, and so on; when all modules are working normally, the value is 0. When the "Alarm Ctrlword" object is written with "1", the current error information can be cleared.

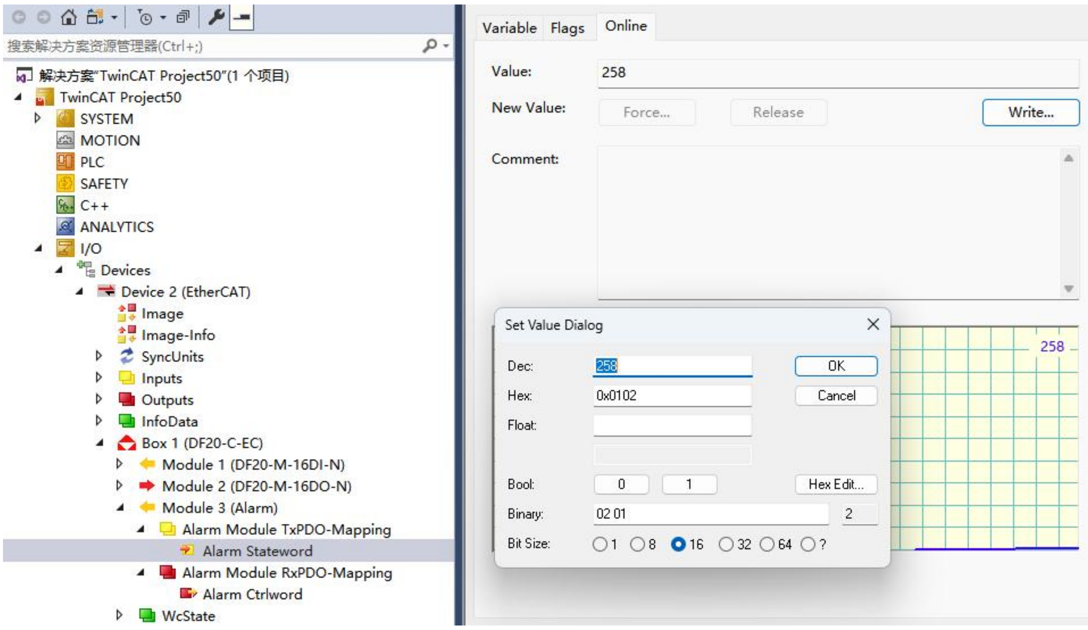


Figure 4-3-5

4.3.2 Universal analog input module usage example

➢ This example uses the topology of DF20-C-EC+DF20-M-4AI-U-4+DF20-M-4AI-I-5. This type of module has two states

Indicator light: When the module is powered normally, LED1 is always on. When the module enters working state, LED2 flashes. As shown in Figure 4-3-6, the topology of the routine scanned on TwinCAT is shown. Take DF20-M-4AI-U-4 as an example.

➢ A module contains four analog data input objects and one command output object. The command object is used during module calibration.

The data objects and functions of the DF20-M-4AI-I-5 module are similar to those of the DF20-M-4AI-U-4.

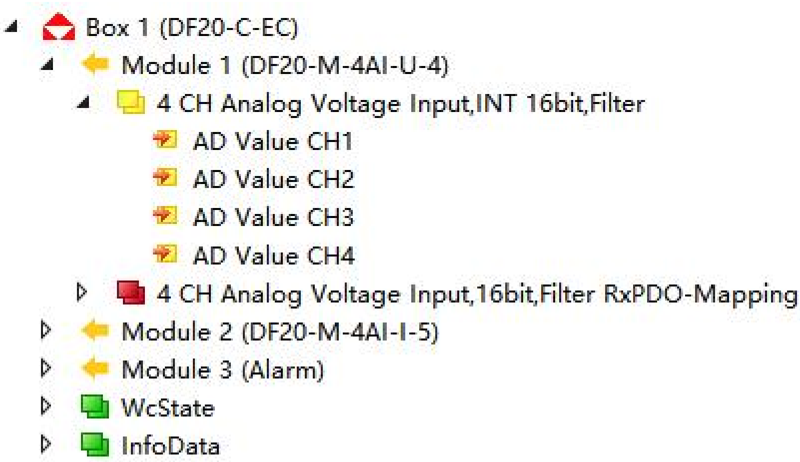
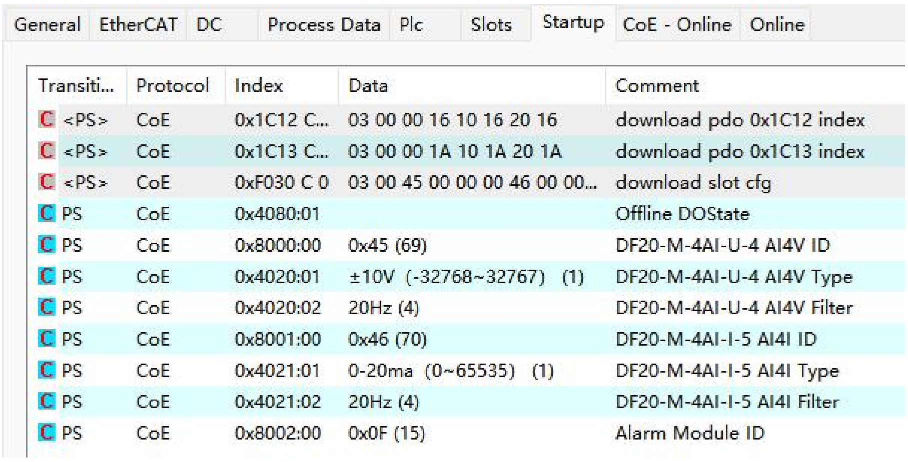


Figure 4-3-6

The SDO data of the topological structure is shown on the right side of Figure 4-3-7, and the specific meaning is shown in Table 4.3.2.



Transiti...	Protocol	Index	Data	Comment
C <PS>	CoE	0x1C12 C...	03 00 00 16 10 16 20 16	download pdo 0x1C12 index
C <PS>	CoE	0x1C13 C...	03 00 00 1A 10 1A 20 1A	download pdo 0x1C13 index
C <PS>	CoE	0xF030 C 0	03 00 45 00 00 00 46 00 00...	download slot cfg
C PS	CoE	0x4080:01		Offline DOState
C PS	CoE	0x8000:00	0x45 (69)	DF20-M-4AI-U-4 AI4V ID
C PS	CoE	0x4020:01	±10V (-32768~32767) (1)	DF20-M-4AI-U-4 AI4V Type
C PS	CoE	0x4020:02	20Hz (4)	DF20-M-4AI-U-4 AI4V Filter
C PS	CoE	0x8001:00	0x46 (70)	DF20-M-4AI-I-5 AI4I ID
C PS	CoE	0x4021:01	0-20ma (0~65535) (1)	DF20-M-4AI-I-5 AI4I Type
C PS	CoE	0x4021:02	20Hz (4)	DF20-M-4AI-I-5 AI4I Filter
C PS	CoE	0x8002:00	0x0F (15)	Alarm Module ID

Figure 4-3-7

Table 4.3.2 SDO data meaning

Index	Data	Comment	illustrate
0x8000	0x45	DF20-M-4AI-U-4 AI4V ID	ID number of DF20-M-4AI-U-4 (read only).
0x4020	±10V	DF20-M-4AI-U-4 AI4V Type	The sampling range of DF20-M-4AI-U-4 (readable and writable), the meaning of the parameter value refers to the corresponding module configuration parameter definition in Chapter 3.
0x4020	150Hz	DF20-M-4AI-U-4 AI4V Filter	The sampling frequency of DF20-M-4AI-U-4 (readable and writable). For the meaning of the parameter value, refer to Table 4.3.3.
0x8001	0x46	DF20-M-4AI-I-5 AI4I ID	ID number of DF20-M-4AI-I-5 (read only).
0x4021	0~20mA	DF20-M-4AI-I-5 AI4I Type	The sampling range of DF20-M-4AI-I-5 (readable and writable), the meaning of the parameter value refers to the corresponding module configuration parameter definition in Chapter 3.

0x4021	150Hz	DF20-M-4AI-I-5 AI4I Filter	The sampling frequency of DF20-M-4AI-I-5 (readable and writable). For the meaning of the parameter value, refer to Table 4.3.3.
0x8002	0x0F	Alarm Module ID	Alarm module ID number.

Table 4.3.3 Meaning of sampling frequency data

Data Value	Sampling frequency meaning
1	300Hz
2	150Hz
3	60Hz
4	20Hz

- As shown in Figure 4-3-8, the default setting value of the signal detection range of the analog input module is ±10V.

The signal detection range of DF20-M-4AI-U-4 is configured to 0~10V. You only need to change the corresponding parameter value and reactivate the project. Similarly, the sampling frequency setting method of the analog input module is the same.

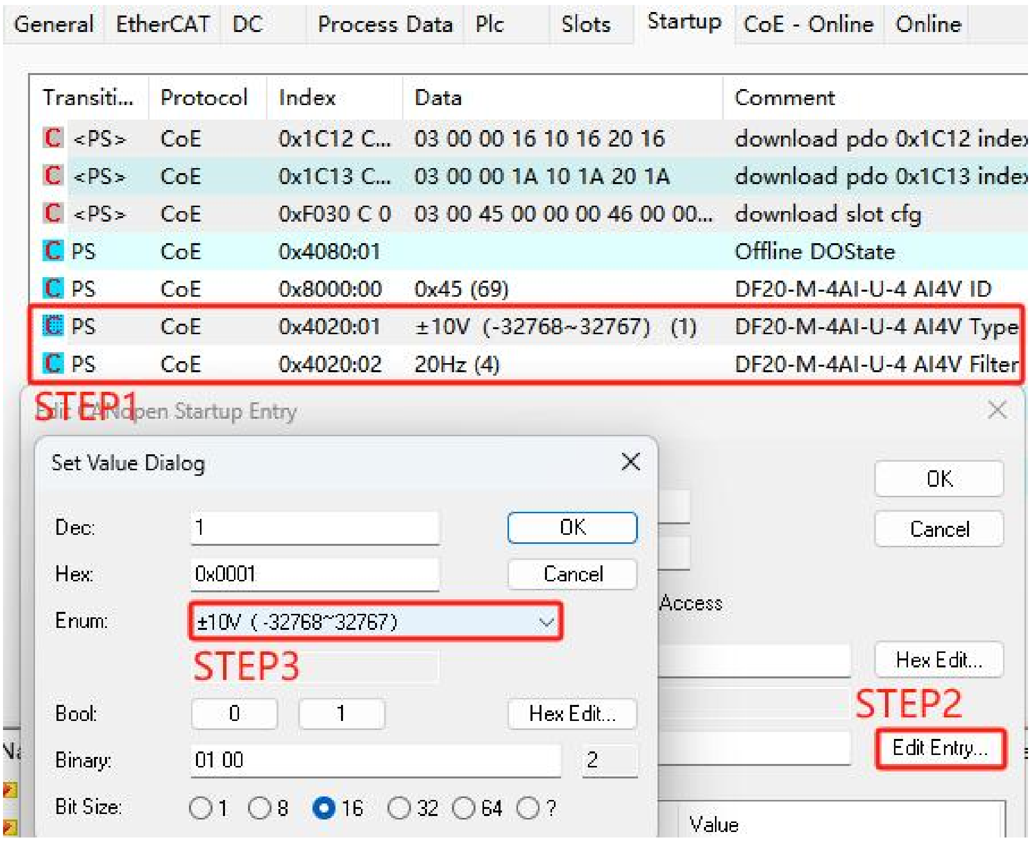


Figure 4-3-8

4.3.3 General analog output module usage examples

- This example uses the topology of DF20-C-EC+DF20-M-4AO-U-4+DF20-M-4AO-I-5. This type of module has two states.

Status indicator light: When the module is powered normally, LED1 is always on; when the module enters working state, LED2 flashes.

- As shown in Figure 4-3-9, the topological structure of the routine scanned on TwinCAT is shown. Taking DF20-M-4AO-U-4 as an example, a module

It contains four analog data output objects "Set Value CH1~Set Value CH4". Users only need to write the digital value corresponding to the output analog value into the object.

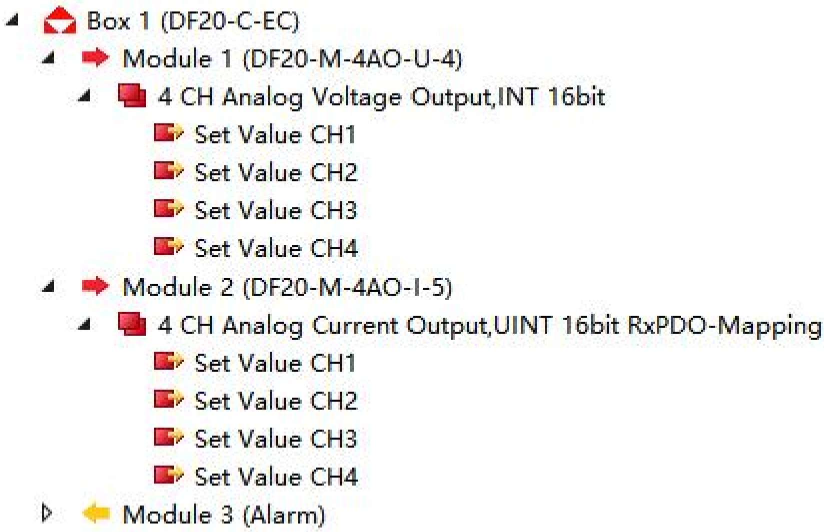


Figure 4-3-9

- The analog output module signal range setting is shown in Figure 4-3-10.

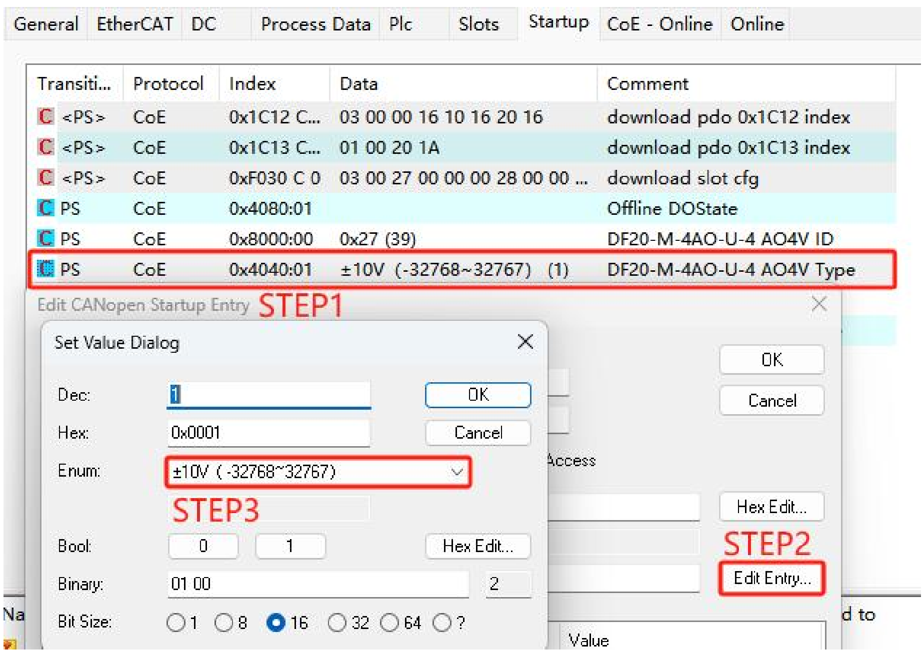


Figure 4-3-10

4.3.4 Pressure sensor data acquisition module usage routine

- This example uses the DF20-C-EC+DF20-M-2LC-S-5 topology. DF20-M-2LC-S-5 can connect to two sets of pressure sensor signals.

This type of module has two status indicators. When the module is powered normally, LED1 is always on. When the module enters the working state, LED2 flashes.

- As shown in Figure 4-3-11, the topological structure of the routine scanned on TwinCAT is shown in Table 4.3.5.

meaning.

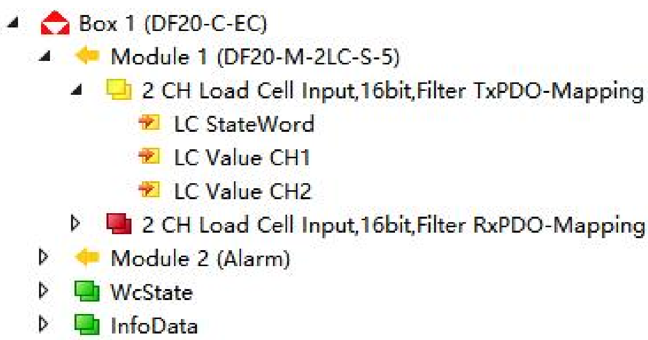


Figure 4-3-11

Table 4.3.5

Object	illustrate
BR State	The working status of DF20-M-2LC-S-5 is described in detail in Table 4.3.6
BR Value CH1	DF20-M-2LC-S-5 first channel data
BR Value CH2	DF20-M-2LC-S-5 second channel data
Command	DF20-M-2LC-S-5 output commands, see Table 4.3.6 for details

- Table 4.3.6 shows the commands and corresponding status feedback descriptions of DF20-M-2LC-S-5.

Table 4.3.6

BR CMD	Command Description	BR State	Status Description	Indicator status
0x0000	sampling	0x0100	Normal sampling status	LED1 is always on, LED2 is flashing
0x0120	idle	0x0000	idle	LED1 is always on, LED2 is always on
0x0121	1 channel zero-level calibration	0x0101	1 channel zero level calibration completed	LED1 flashes
0x0122	1 channel full scale calibration	0x0102	1 channel full scale calibration completed	LED1 is always on
		0x0111	1 channel calibration	LED2 flashes

			error	
0x0123	2-channel zero-level calibration	0x0103	2-channel zero-level calibration completed	LED1 flashes
0x0124	2-channel full-scale calibration	0x0104	2-channel full-scale calibration completed	LED1 is always on
		0x0112	2 channel calibration error	LED2 flashes
		0x0109	During calibration	Maintain the previous state
Other commands		0x0115	Wrong instruction	LED1 flashes, LED2 flashes
		0x0116	Module initialization error	LED2 is always on

➢ DF20-M-2LC-S-5 is factory calibrated and can be used directly. The default sampling command is (0x0000), and the user does not need to operate.

This module can detect voltage range of 0~10mV.

➢ The pressure sensor used in this example has a resolution of 2mV/V, a weight range of 0~5KG, and a DF20-M-2LC-S-5 module excitation power supply.

The voltage signal range of the pressure sensor is 5V, so the voltage signal range of the pressure sensor is 0~10mV, that is, 0~10mV corresponds to 0~32767. As shown in Figure 4-3-12: The data of the first channel is 19667, the voltage value collected by the corresponding channel is 6.002mV, and the corresponding weight value is 3.001KG.

Name	[X]	Online	Type	Size	>Add...	In/Out	Linked to
LC StateWord		0x0100	UINT	2.0	39.0	Input	
LC Value CH1		19667	INT	2.0	41.0	Input	
LC Value CH2		-7636	INT	2.0	43.0	Input	

Figure 4-3-12

➢ If the user needs to recalibrate the DF20-M-2LC-S-5 module, just follow the process below to prepare: Connect the sensor cables and power on to the EtherCAT running state.

First calibration:

1. Zero-level calibration: When the pressure sensor is in the no-load state, the command value is written to 0x0121, and the waiting state value returns to 0x0101. If LED1 flashes at this time, the zero-level calibration of the first channel is completed;

2. Full-scale calibration: When the pressure sensor is fully loaded, write the command value to 0x0122, and wait for the status value to return to 0x0102. If LED1 is always on at this time, the full-scale calibration of the first channel is completed. If the status value returns to 0x0111 and LED2 flashes, the calibration of the

first channel is wrong, and you need to start again from step 1.

Second calibration:

1. Zero-level calibration: When the pressure sensor is in the no-load state, the command value is written to 0x0123, and the waiting state value returns to 0x0103. If LED1 flashes at this time, the zero-level calibration of the second channel is completed;

2. Full-scale calibration: When the pressure sensor is fully loaded, write the command value to 0x0124 and wait for the status value to return to 0x0104. If LED1 is always on at this time, the full-scale calibration of the second channel is completed. If the status value returns to 0x0112 and LED2 flashes, the calibration of the second channel is wrong, and you need to start again from step 1.

4.3.5 Routine use of thermal resistance sensor data acquisition module

- This example uses the DF20-C-EC+DF20-M-2RTD-PT+DF20-M-4RTD-PT topology. DF20-M-2RTD-PT and DF20-M-4RTD-PT module supports sensor types PT100/PT200/PT500/PT1000/Ni100/Ni120 /Ni200/Ni500/Ni1000,Cu10/Cu50/Cu53/Cu100,KTY84-130/KTY84-150/KTY84-151,Ressistor40ohm/ Ressistor80ohm/Ressistor150ohm/Ressistor300ohm ,Ressistor500ohm/Ressistor1000ohm/Ressistor2000ohm/Ressistor4000ohm/KTY83-110/KTY83-120/KTY83-121/KTY83-122/KTY83-150/KTY83-151/NTC-5K/NTC-10K. This type of module has two status indicators. When the module is powered normally, LED1 is always on. When the module enters the working state, LED2 flashes.
- If you need to configure the sensor type and filter configuration, as shown in Figure 4-3-13, select the sensor type. The system supports PT100 by default.

Select the filter configuration, the system default is 5Hz_200ms.

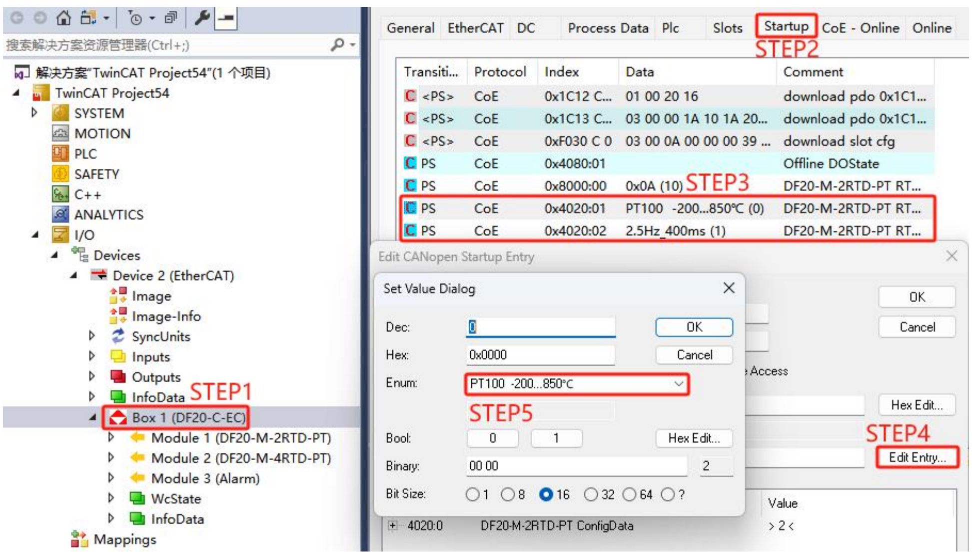


Figure 4-3-13

➢ As shown in Figure 4-3-14, the topological structure of the routine scanned on TwinCAT is shown in Table 4.3.7, and the meaning of the DF20-M-2RTD-PT object is shown.

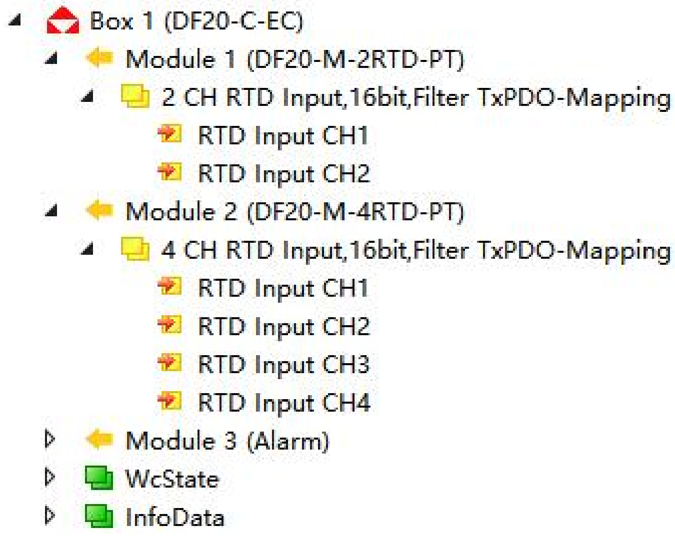


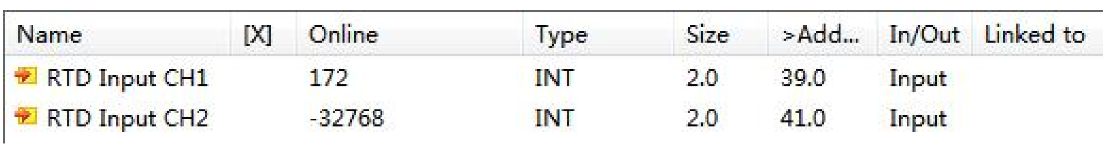
Figure 4-3-14

Table 4.3.7

Object Name	illustrate	Remark
RTD Input CH1	First channel data	If the data values of both channels are -32768, this means that the sensor is disconnected or the sensor type configured by the master station does not match the actual sensor type.
RTD Input CH2	First channel data	

➢ DF20-M-2RTD-PT supports PT100 type sensors by default. As shown in Figure 4-3-15, the first channel is connected to the PT100 sensor.

The second channel is not connected to the sensor. The temperature data is shown in Figure 4-3-15. The reading of the first channel is 172, which means 17.2°. The second channel is not connected to the sensor and the reading is -32768, which means the line is broken.



Name	[X]	Online	Type	Size	>Add...	In/Out	Linked to
RTD Input CH1		172	INT	2.0	39.0	Input	
RTD Input CH2		-32768	INT	2.0	41.0	Input	

Figure 4-3-15

4.3.6 Thermocouple temperature data acquisition module usage routine

- This example uses the DF20-C-EC+DF20-M-4TC-KETJ+DF20-M-8TC-KETJ topology, DF20-M-4TC-KETJ

The sensor types supported by the DF20-M-8TC-KETJ module are: K/E/T/J/B/S/R/N/C/L thermocouples +/-15.625mv, +/-31.25mv, +/-62.5mv, +/-125mv, +/-250mv, +/-500mv, +/-1000mv, +/-2000mv. This type of module has two status indicators. When the module is powered normally, LED1 is always on. When the module enters the working state, LED2 flashes.

- As shown in Figure 4-3-16, the topological structure of the routine scanned on TwinCAT is shown in Table 4.3.8.

The meaning of elephant.

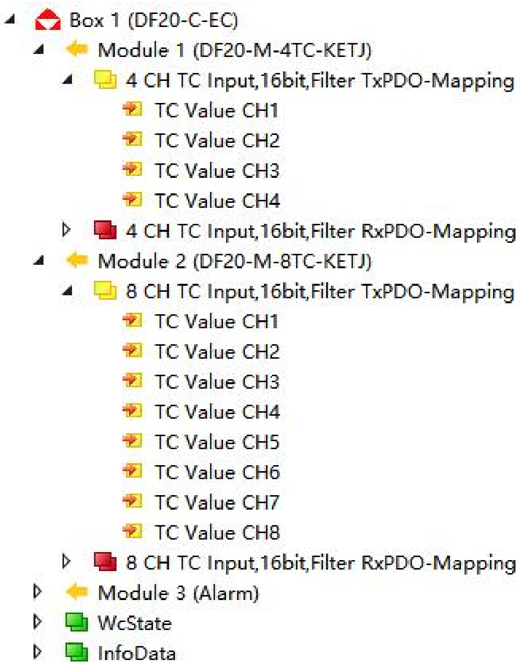


Figure 4-3-16

- As shown in Figure 4-3-17, if you need to configure the sensor type, the system supports K-type thermocouple by default; select filter configuration, the system defaults to

4Hz_250ms.

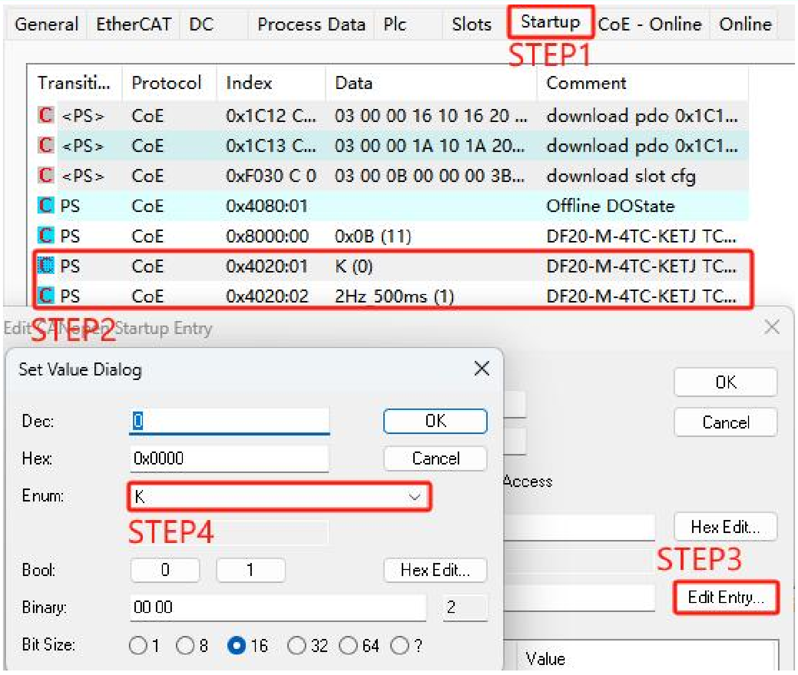


Figure 4-3-17

Table 4.3.8

Object Name	illustrate	Remark
Tc Value CH1	The first channel	The quality of many domestic sensors varies greatly, and the Offset Value is used to compensate for the error of the sensor itself.
Tc Value CH2	Second channel	
Tc Value CH3	The third channel	
Tc Value CH4	The fourth channel	
Offset Value CH1	Temperature	
Offset Value CH2	Second channel	
Offset Value CH3	Temperature	
Offset Value CH4	Temperature	

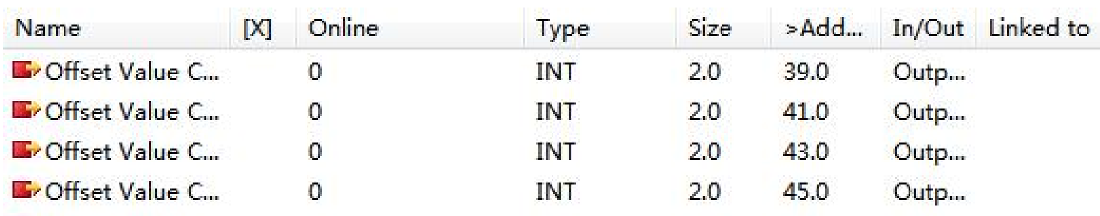
➢ DF20-M-4TC-KETJ supports K-type thermocouples by default. As shown in Figure 4-3-18, the first channel is connected to a K-type thermocouple, and the next three channels are connected to a K-type thermocouple.

If the channels are not connected to sensors, the temperature data is displayed as shown in Figure 4-3-18. The reading of the first channel is 169, which means 16.9°. The last three channels are not connected to sensors, and the readings are -32768, which means the line is broken.

Name	[X]	Online	Type	Size	>Add...	In/Out	Linked to
TC Value CH1		169	INT	2.0	39.0	Input	
TC Value CH2		-32768	INT	2.0	41.0	Input	
TC Value CH3		-32768	INT	2.0	43.0	Input	
TC Value CH4		-32768	INT	2.0	45.0	Input	

Figure 4-3-18

➢ As shown in Fig. 4-3-19, this example does not perform temperature compensation on the first two channels.



Name	[X]	Online	Type	Size	>Add...	In/Out	Linked to
Offset Value C...		0	INT	2.0	39.0	Outp...	
Offset Value C...		0	INT	2.0	41.0	Outp...	
Offset Value C...		0	INT	2.0	43.0	Outp...	
Offset Value C...		0	INT	2.0	45.0	Outp...	

Figure 4-3-19

4.3.7 Single-channel encoder data acquisition module usage routine

➢ The single-channel encoder data acquisition modules are available in two types: DF20-M-1CNT-EL-5 and DF20-M-1CNT-EL-4.

The method is the same as the usage method. The difference is that DF20-M-1CNT-EL-5 is connected to a 5V encoder signal, and DF20-M-1CNT-EL-4 is connected to a 24V encoder signal. This document uses the DF20-M-1CNT-EL-5 module as an example.

➢ DF20-M-1CNT-EL-5 module features:

（2）Quadrature encoder A+/A-, B+/B- differential input, 4 times frequency;

(2) Electron probe input;

(3) Two LED indicator outputs. After the module is powered on, Led1 is always on, indicating that the module is powered on and initialized normally. Different display states of Led2 represent different working states of the module: when the module is running in the data sampling state, Led2 flashes; when the module is running in the idle or clearing sampling data state, Led2 is not on.

➢ Figure 4-3-20 shows the PDO process data of the DF20-M-1CNT-EL-5 module:

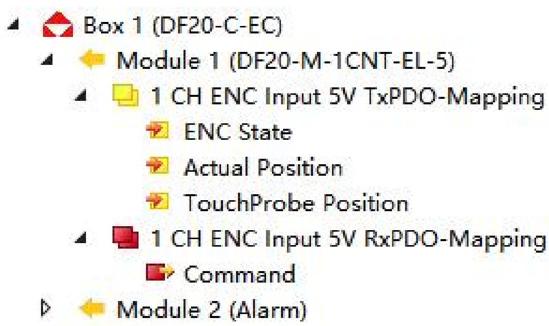


Figure 4-3-20

Table 4.3.10

name	PDO data meaning	Data Types
ENC State	Feedback status word	UINT16
Actual Position	Feedback encoder current position	INT32
TouchProbe Position	Feedback electronic probe latch	INT32
ENC Command	Control command word	UINT16

➢ Table 4.3.11 shows the module state machine description of DF20-M-1CNT-EL-5.

Table 4.3.11

Control command	meaning	Feedback status	meaning
0x012B	Enter counting state	0x010B	Counting status
0x012C	Clear current count	0x010C	Clear Status
		0x0109	Idle state
		0x010E	Error Status

➢ The module automatically enters the idle state when powered on. Enter the 0x012B command for ENC Command to make the module enter the counting state.

When the word feedback is 0x010B, the counting is normal; if the pulse count value and the electronic probe latch value need to be cleared, write 0x012C to clear the data in the module. When the status word is judged to be 0x010C, the clearing is completed; then the command object ENC Command is input with 0x012B again, and the module enters the counting state.

4.3.8 Two-channel pulse data acquisition module usage routine

Note: The pulse acquisition module is divided into two types: DF20-M-2CNT-PIL-5 and DF20-M-2CNT-PIL-4. The wiring and usage methods of the two modules are the same. The difference is that DF20-M-2CNT-PIL-5 is connected to a 5V pulse signal, and DF20-M-2CNT-PIL-4 is connected to a 24V pulse signal.

DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module functions:

- Two-channel pulse input and position comparison;
- Two-channel electronic probe input, which can latch the current pulse input value of two channels respectively;
- The current two channel count values can be cleared to zero respectively according to the external trigger signal;
- Two LED indicator outputs. After the module is powered on, LED1 is always on, indicating that the module is powered on and initialized.

The initialization is normal. Different display states of LED2 represent different working states of the module: when the module is running in the data sampling state, LED2 flashes; when the module is running in the idle state, LED2 is off.

DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module wiring instructions:

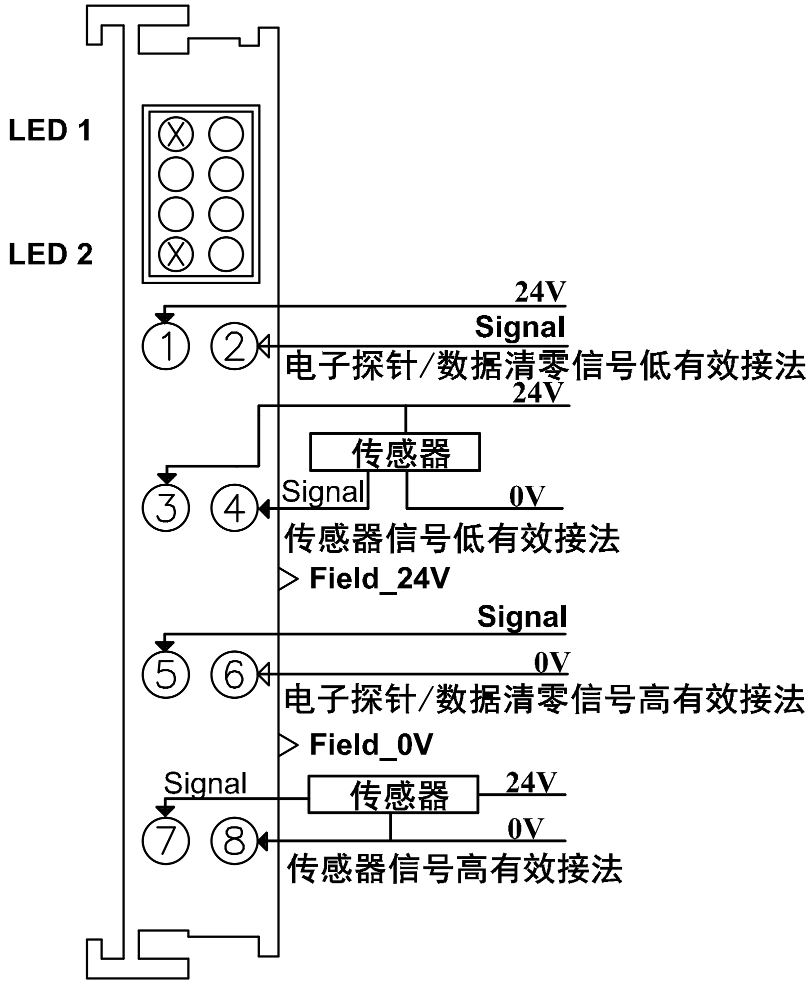


Figure 1 DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) wiring diagram

- As shown in Figure 1, the wiring diagram of DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4): Pins 1 and 2 are the first channel electronic probes.

Note 1:The first channel data reset signal input, the specific function to be selected can be configured according to needs; 5 and 6 pins are the second channel electronic probe

Note 1:The second channel data reset signal input; the usage is the same as the first channel electronic probe/first channel data reset signal input. Pins 3 and 4 are the first pulse input channel, as shown in the figure, the sensor signal is low effective connection; pins 7 and 8 are the second pulse input channel, as shown in the figure, the sensor signal is high effective connection.

Note 1: The latch of the counting module is the electronic probe function that is often found in the servo. After being triggered by an electronic probe signal (such as a photoelectric switch), the card directly latches the current value. This is much faster than using the host computer PLC to determine the probe signal and then latch the position. The host computer has a delay in determining the position and the position is inaccurate. Some packaging industries need to use this function. If not, just ignore it.

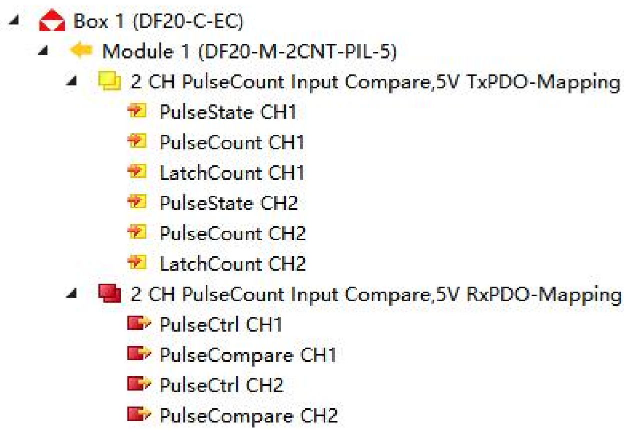
DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) module process data description:

- The bus adapter will allocate corresponding input and output addresses according to the different modules connected to it; as shown in the table

DF20-M-2CNT-PIL-5 (DF20-M-2CNT-PIL-4) input and output data meaning, data length and data type.

Table 1

输出数据	字节数	数据类型
通道1命令输出数据	1	Uint8
通道1脉冲比较直输出	4	Uint32
通道2命令输出数据	1	Uint8
通道2脉冲比较直输出	4	Uint32
输入数据	字节数	数据类型
通道1状态输入数据	1	Uint8
通道1脉冲数	4	Uint32
通道1锁存脉冲数	4	Uint32
通道2状态输入数据	1	Uint8
通道2脉冲数	4	Uint32
通道2锁存脉冲数	4	Uint32



- Output data meaning

Table 2

Output data meaning	
0byte	
bit7~bit3	Reserved seat
bit2	0: Disable channel 1 comparison value; 1: Enable channel 1 comparison value
bit1	0: Enable the electronic probe function of channel 1; 1: Enable the count clearing function triggered by external signal of channel 1
bit0	0: Channel 1 stops counting and the original count is reset to zero; 1: Channel 1 starts counting
1~4byte	Channel 1 pulse comparison value output, unsigned 32-bit data
5byte	
bit7~bit3	Reserved seat
bit2	0: Disable channel 2 comparison value; 1: Enable channel 2 comparison value
bit1	0: Enable the electronic probe function of channel 2; 1: Enable the count clearing function triggered by external signal of channel 2
bit0	0: Channel 2 stops counting and the original count is cleared; 1: Channel 2 starts counting
6~9byte	Channel 2 pulse comparison value output, unsigned 32-bit data

- Input data meaning

Table 3

Input data meaning	
0 bytes	
bit7~bit3	Reserved seat
bit2	0: The count value of channel 1 is less than the comparison value; 1: The count value of

	channel 1 is greater than the comparison value.
bit1	0: No electronic probe/first channel count reset signal; 1: Electronic probe/first channel count reset signal
bit0	0: Channel 1 counting stop state, the original count is cleared; 1: Channel 1 counting state
1~4 bytes	Channel 1 pulse input value, unsigned 32-bit data
5~8 bytes	Channel 1 pulse input latch value, unsigned 32-bit data
9 bytes	
bit7~bit3	Reserved seat
bit2	0: The count value of channel 2 is less than the comparison value; 1: The count value of channel 2 is greater than the comparison value.
bit1	0: No electronic probe/count clear signal on channel 2; 1: Electronic probe/count clear signal on channel 2
bit0	0: Channel 2 counting stop state, the original count is cleared; 1: Channel 2 counting state
10~13 bytes	Channel 2 pulse input value, unsigned 32-bit data
14~17 bytes	Channel 2 pulse input latch value, unsigned 32-bit data

- As shown in Figure 4-3-21, this is the usage example of DF20-M-2CNT-PIL-5:
- The functionality currently required is

PluseCtrlA writes 5 (channel 1 starts counting, enables channel 1 electronic probe function, and enables channel 1 comparison value).

Name	[X]	Online	Type	Size	>Add...	In/Out	Linked to
PulseCompareA		0	DINT	4.0	41.0	Outp...	
PulseCompareB		0	DINT	4.0	47.0	Outp...	
PulseCtrlA		5	UINT	2.0	39.0	Outp...	
PulseCtrlB		0	UINT	2.0	45.0	Outp...	

Figure 4-3-21 (a)

Name	[X]	Online	Type	Size	>Add...	In/Out	Linked to
LatchCountA		2691	DINT	4.0	45.0	Input	
LatchCountB		0	DINT	4.0	55.0	Input	
PulseCountA		6670	DINT	4.0	41.0	Input	
PulseCountB		0	DINT	4.0	51.0	Input	
PulseStateA		5	UINT	2.0	39.0	Input	
PulseStateB		0	UINT	2.0	49.0	Input	

Figure 4-3-21 (b)