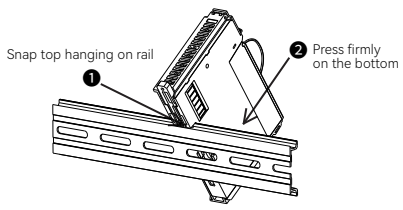
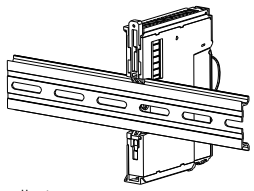
4.1.3 (Un)Installation of guide rails

• Rails installation

1 Align the bottom of HCQX-HC04-D with the 35MM international guide rail, and then press down hard, when you can hear a "click", it indicates that the bottom of the mounting hook has been connected to the international guide rail. Then the HCQX-HC04-D installation completed (Before installation, ensure that the mounting hook is in good state, otherwise it may cause installation failure)

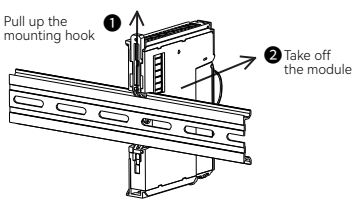


2 After the installation is completed, as shown in the figure below:



• Rails uninstallation

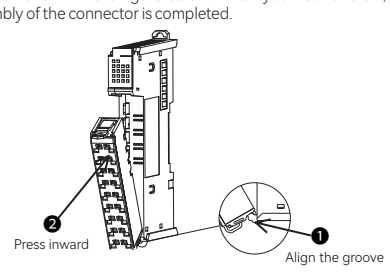
First remove the 35MM international guide rail dovetail groove fixing parts installed on the two sides of the machine, and then pull upwards at a distance of about 5.8 mm (when you pull upward, you can clearly hear the "click"), at this time you can directly take off the machine to complete the disassembly (you can use the accessories, such as screwdrivers, etc., when pulling)



4.1.4 (Un)installation of connector

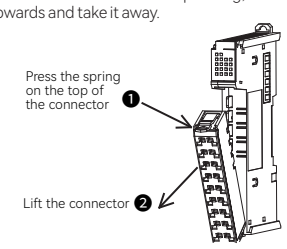
• Installation of connectors

Align the bottom of the connector with the bottom of the extension module. After aligning, press down on the top of the terminal in the direction shown in the figure below. When you hear a "click", the assembly of the connector is completed.

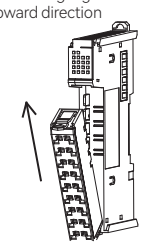


• Connector uninstallation

1 Use your index finger or your middle finger to firmly press the top spring of the connector down to separate the top of the connector from the extension module, and use your thumb to press the rear part of the connector. While pressing, lift the top of the connector upwards and take it away.



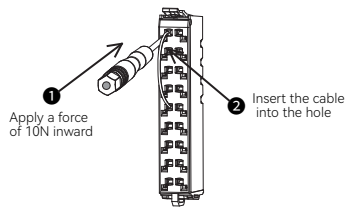
2 Lift the top of the connector to make the connector and the extension module at an angle greater than 45°, and finally remove the connector in upward direction



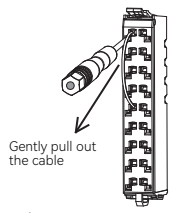
4.1.5 (Dis)connection of cables

• (Dis)connection of cables

1 First insert a small screwdriver into the hole, apply a force of 10N inward, and then insert the cable into the hole. Pull out the small screwdriver after the cable is inserted.

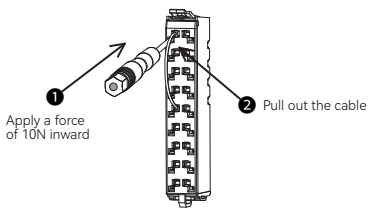


2 After the installation is complete, gently pull out the cable, the installation is complete if the cable does not fall off.



• Cable disconnection

Insert a small screwdriver into the hole, apply a force of 10N inward, then pull out the cable, and finally take out the screwdriver.



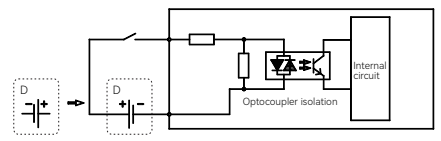
4.2 Wiring description

4.2.1 Cable selection

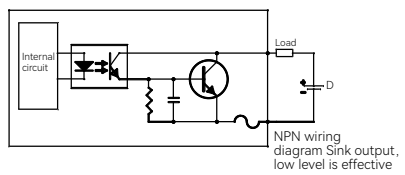
Item		Specifications
Installation method		Push-in
Push force per contact		10N
Cable type		Copper wire only (aluminum cable is not allowed)
Cable length		7~9 mm
Cross section	Single-stranded	0.08~1.50 mm2/28~16 AWG
	Multi-stranded	0.25~1.50 mm2 /24~16 AWG
	Sleeve	0.25~0.75 mm2 /24~20 AWG

4.2.2 Internal wiring description

◆ Input internal circuit

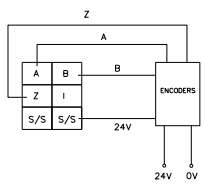


◆ Output internal circuit

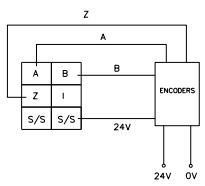


4.2.3 External wiring description

• Sink wiring diagram



• Source wiring diagram



◆ Wiring precautions

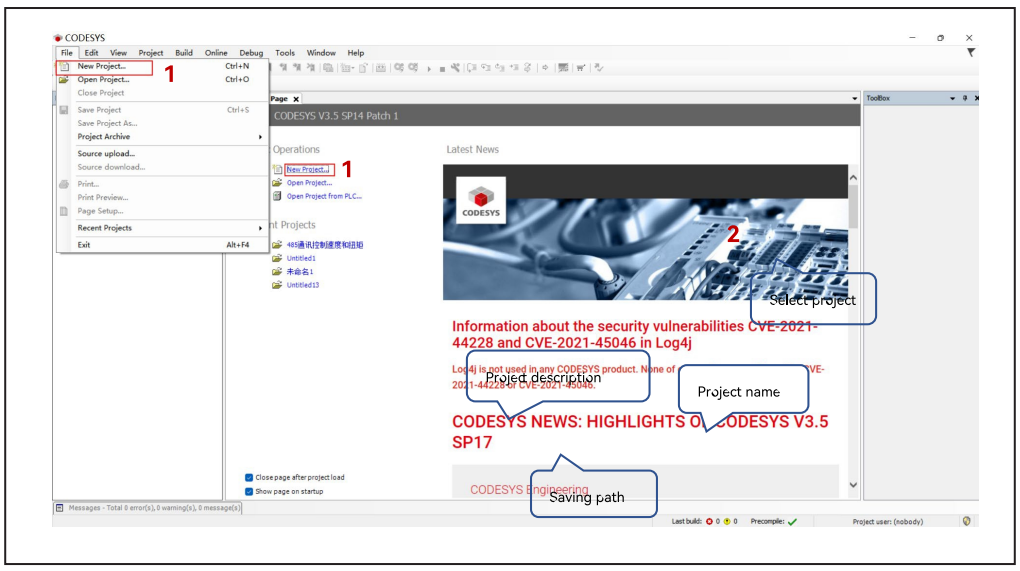
L K

- Distinguish the input/output cables and make the wiring separately.
- If the power cable is close to I/O signal cable, error may occur because of high-voltage/current. The distance between I/O signal cable and power cable should be more than 100mm.
- 24VDC I/O cable should be laid separately from AC power cable. When using piping for wiring, make sure that the piping is well-grounded.

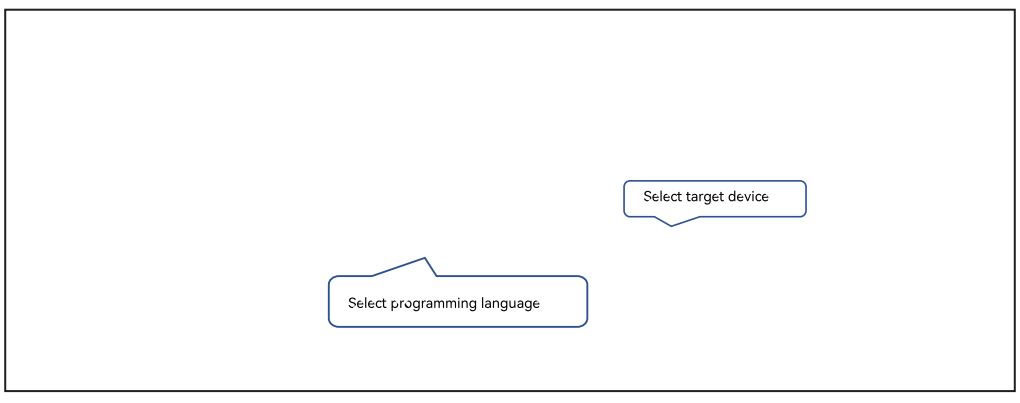
5. Module programming examples

This example uses the CPU unit HCQ1-1300-D + coupler module HCQX-EC + high-speed counter module HCQX-HC04-D as an example to illustrate: (Q1 connection has been described briefly here. For more details, refer to Q1 Software Manual.)

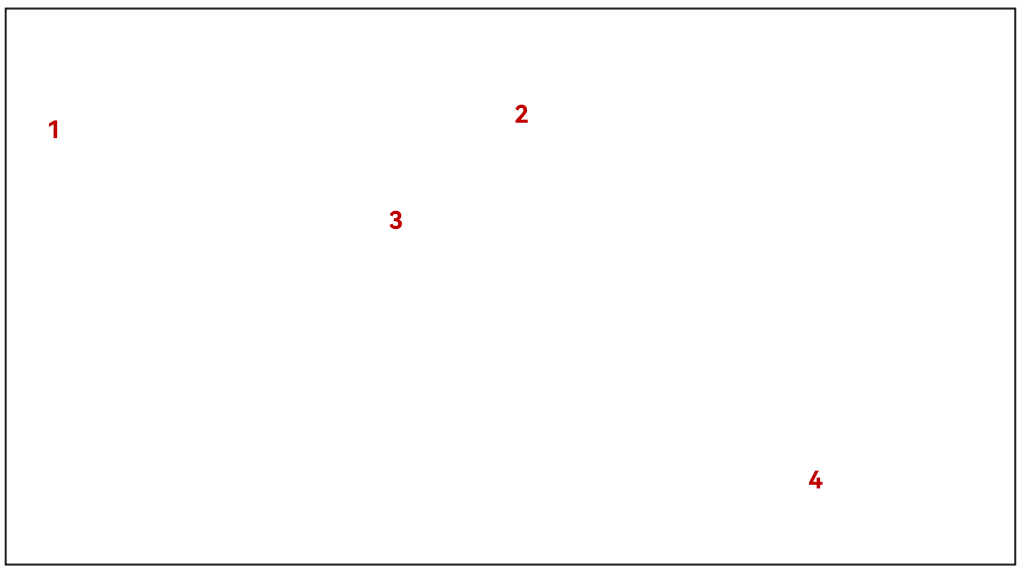
1) Open CODESYS V3.5 SP14, select New project
The user can select the project type they want, enter the name and save path, and then click "OK".



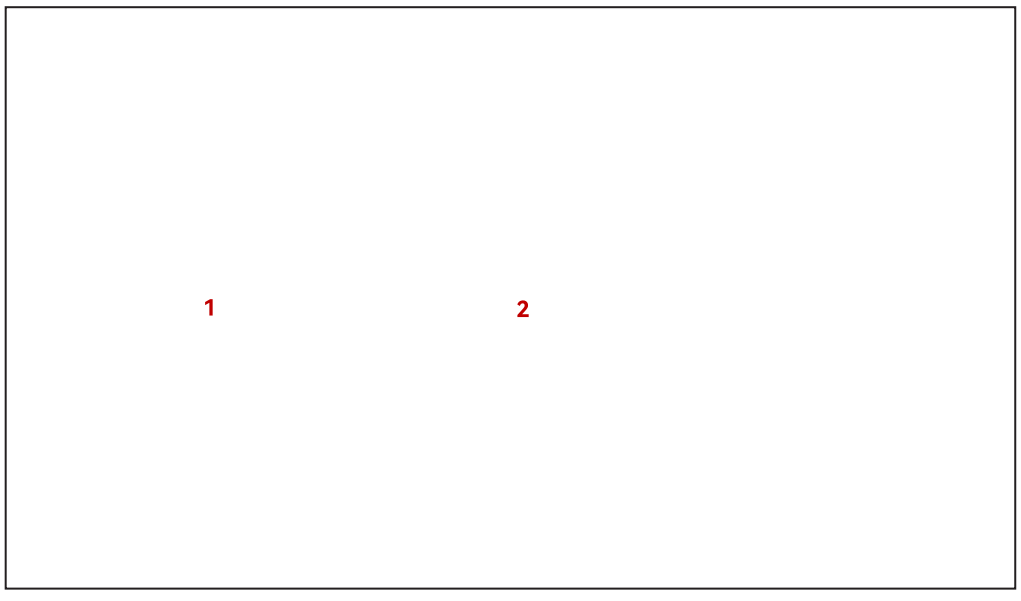
2) Follow the CODESYS guide, select the target device and main program PLC_PRG programming language. Q1 device is not installed by default, so you need to install the device description file first, otherwise the correct target device cannot be selected.



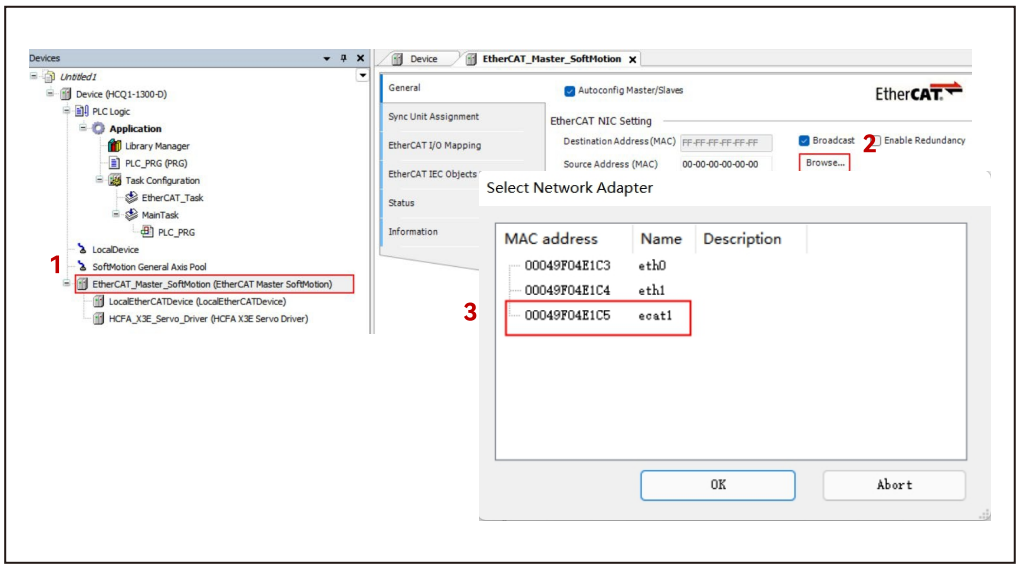
3) Double click Device→Scan network, then select the Q1 device and click "OK".



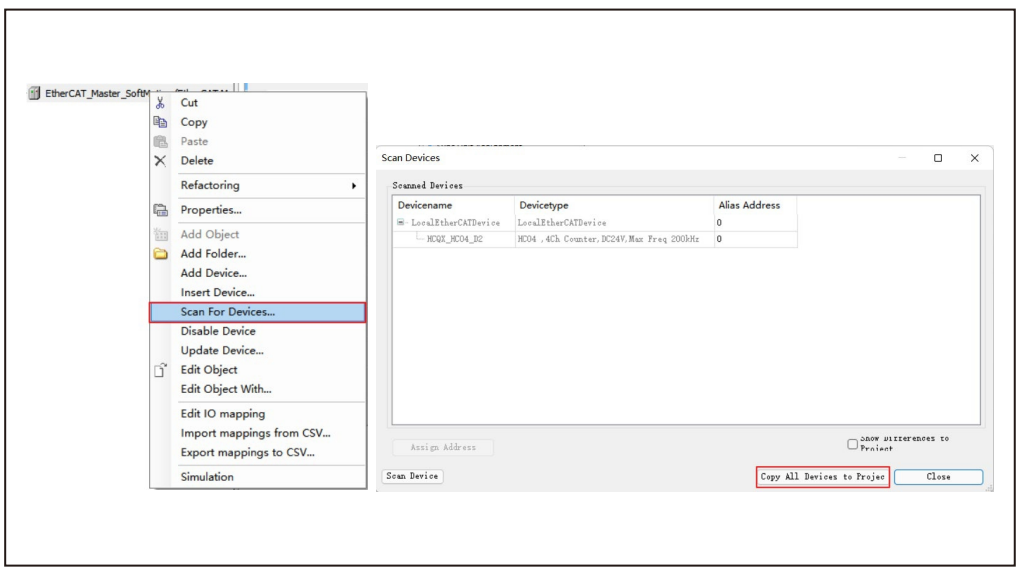
4) After communicating with Q1 device, click Device→Add device→EtherCAT Master SoftMotion



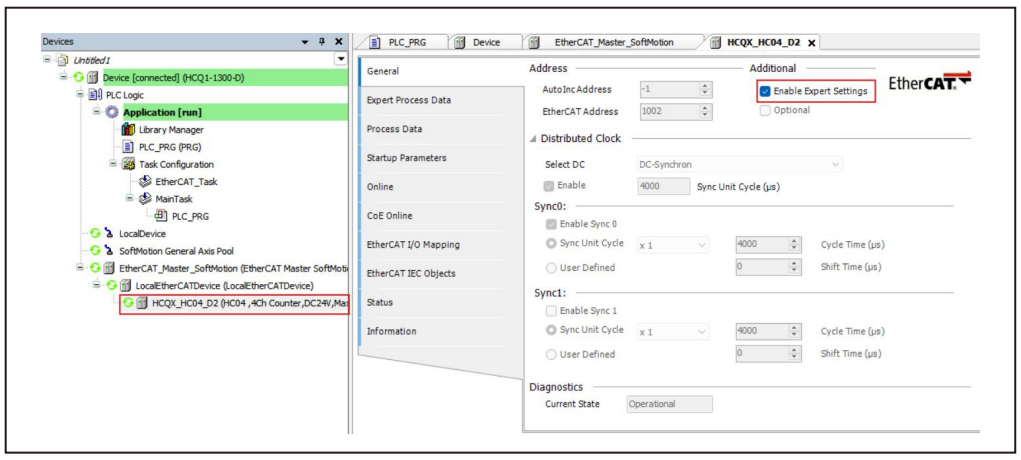
5) Double click EtherCAT Master SoftMotion， and find the "Source Address (Mac)" under the "General" on the right and select the correct EtherCAT network card.



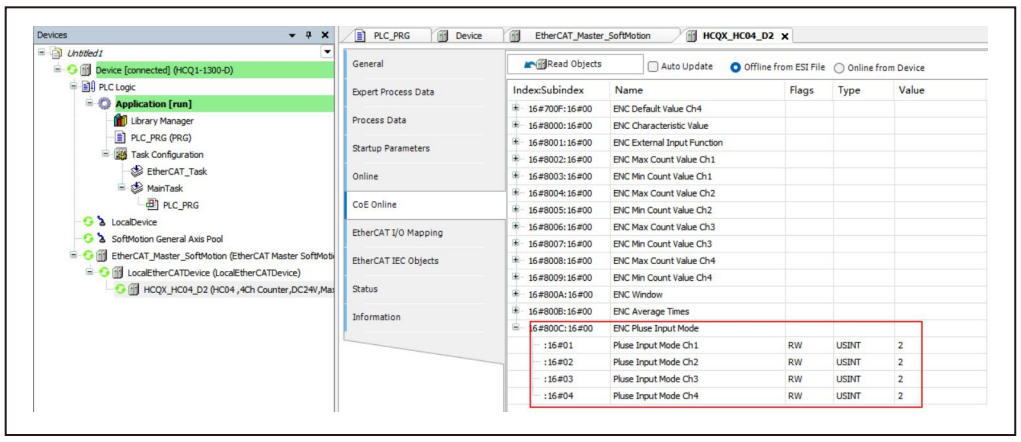
6) Right-click EtherCAT Master SoftMotion to select the scan device and for the module, which works normally and has established communication, find it in the " Scan device" and click the "Copy all devices to the project" in the lower right corner to add the module to the project.



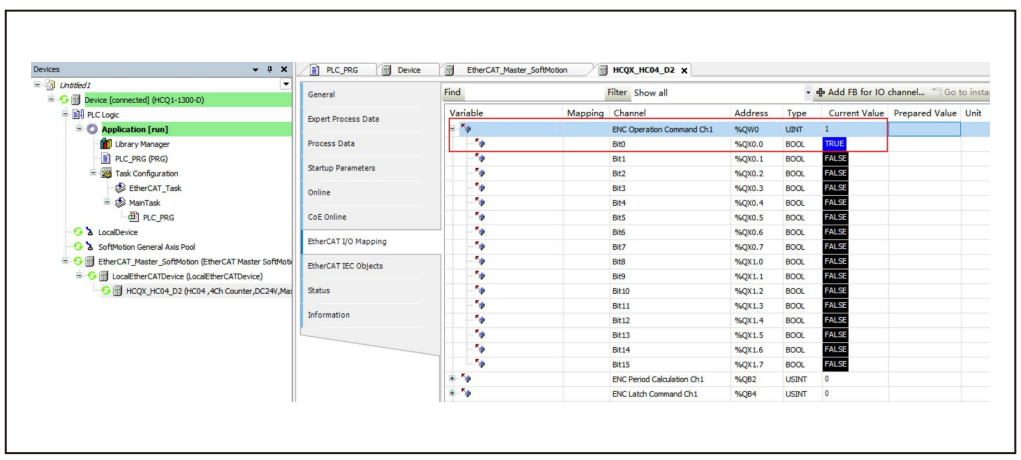
7) Log in and run the program, select the module HCQX-HC04-D, and tick "Enable Expert Mode" in "General"



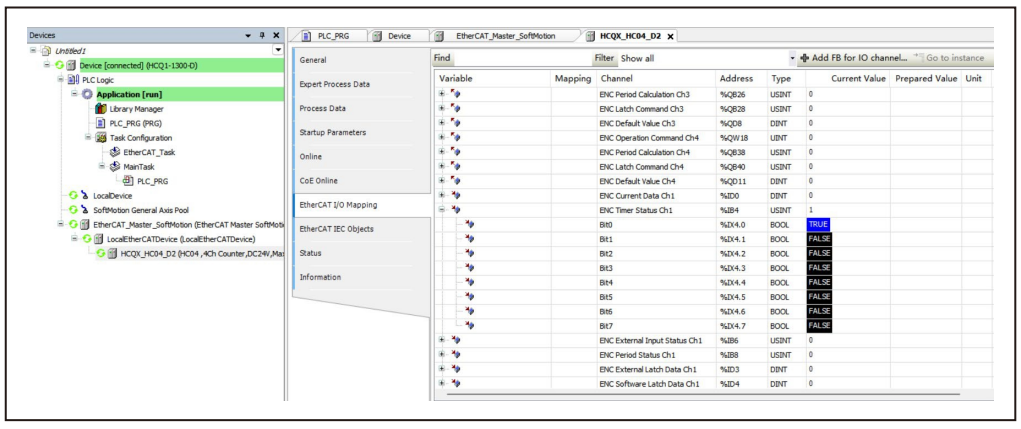
8) On the CoE online page 16#800C, set the corresponding channel Pluse Input Mode of ENC Pluse Input Mode to 2. For detailed parameter settings, please refer to the appendix.



9) On the EtherCAT I/O mapping interface, set bit0 in the ENC Operation Command to 1. For detailed parameter settings, please refer to the appendix.



10) At this time, in the EtherCAT I/O mapping interface, bit0 of the counter status ENC Timer Status changes to 1, and the current count value is stored in ENC Current Data.



Appendix: Object dictionary

Object dictionary	Subindex	Name	Attribute	Type	Range	Default	Remark
0x1000	0	Device type	R	UDINT		402	
0x1008	0	Device name	R	STRING			HCQX_HC04-D2
0x1009	0	Hardware version	R	STRING		0.7	
0x100A	0	Software version	R	STRING		5.1	
0x1018	00	Object identify					
	01	Supplier ID	R	UDINT		9	
	02	Product Code	R	UDINT		37458	
	03	Revised No.	R	UDINT		1	
	04	Serial No.	R	UDINT		1	
Ch1							
0x7000		Operation command	UINT			R	
	0	CENn Counter enabled	BIT	0	1 or 0	R/W	1: Counter enabled 0: Counter disabled
	1	INRSn Software (built-in) reset	BIT	0	1 or 0	R/W	0~1: Reset the current counter value
	2	INLAn Software latch	BIT	0	1 or 0	R/W	0~1: Internal latch enabled
	3	PSETn Software preset	BIT	0	1 or 0	R/W	0~1: Set the current counter value to the preset value
	4	ERENn External reset enabled	BIT	0	1 or 0	R/W	1: External terminal reset enabled 0: External terminal reset disabled
	5	ZSCRn Z-phase reset enabled	BIT	0	1 or 0	R/W	1: Z-phase reset enabled 0: Z-phase reset disabled
	6	ERCRn External reset complete flag cleared	BIT	0	1 or 0	R/W	0~1: Clear external reset complete flag
	7	ZSCRn Z-phase reset complete flag cleared	BIT	0	1 or 0	R/W	0~1: Clear Z-phase reset complete flag
	8	UPCRn Clear upper limit flag	BIT	0	1 or 0	R/W	0~1: Flag cleared
	9	DOWNCRn Clear lower limit flag	BIT	0	1 or 0	R/W	0~1: Flag cleared
0x7001		Pulse period measurement	USNIT			R	
	1	PPENn Pulse period measurement enabled	BIT	0	1 or 0	R/W	1: Pulse period measurement enabled 0: Pulse period measurement disabled
	2	PPCARn Pulse period measurement value clear	BIT	0	1 or 0	R/W	0~1: Pulse period measurement value cleared
	3	PPOFn Pulse period measurement overlimit flag clear	BIT	0	1 or 0		0~1: Pulse period measurement overlimit flag clear
0x7002		Latch function	USINT			R	
	1	LENn External latch input enabled	BIT	0	1 or 0	R/W	1: External latch input enabled 0: External latch input disabled
	2	LTRGn External latch trigger condition	BIT	0	1 or 0	R/W	0: Trigger once 1: Trigger continuously The effective time is that LENn , change from 0 to 1
	3	LSELn Latch input terminal selection	BIT	0	1 or 0	R/W	0: External input 1: Z phase of the channel The effective time is that LENn ,change from 0 to 1. If the latch terminal selects phase Z, the reset function of phase Z is disabled.
0x7003		Preset value	DINT	0	214748368 ~214748367	R/W	
Ch2							
0x7004		Operation command	UINT			R	
	0	CENn Counter enabled	BIT	0	1 or 0	R/W	1: Counter enabled 0: Counter disabled
	1	INRSn Software (built-in) reset	BIT	0	1 or 0	R/W	0~1: Reset the current counter value
	2	INLAn Software latch	BIT	0	1 or 0	R/W	0~1: Internal latch enabled
	3	PSETn Software preset	BIT	0	1 or 0	R/W	0~1: Set the current counter value to the preset value
	4	ERENn External reset enabled	BIT	0	1 or 0	R/W	1: External reset enabled 0: External reset disabled
	5	ZSCRn Z-phase reset enabled	BIT	0	1 or 0	R/W	1: Z-phase reset enabled 0: Z-phase reset disabled
	6	ERCRn External reset complete flag cleared	BIT	0	1 or 0	R/W	0~1: Clear external reset complete flag

Object dictionary	Subindex	Name	Attribute	Type	Range	Default	Remark
0x7004	7	ZSCRn Z-phase reset complete flag cleared	BIT	0	1 or 0	R/W	0~1: Clear Z-phase reset complete flag
	8	UPCRn Clear upper limit flag	BIT	0	1 or 0	R/W	0~1: Flag cleared
	9	DOWNCRn Clear lower limit flag	BIT	0	1 or 0	R/W	0~1: Flag cleared
0x7005		INLAn Pulse period measurement	USNIT			R	
	1	PPENn Pulse period measurement enabled	BIT	0	1 or 0	R/W	1: Pulse period measurement enabled 0: Pulse period measurement disabled
	2	PPCARn Pulse period measurement value clear	BIT	0	1 or 0	R/W	0~1: Pulse period measurement value cleared
	3	PPOFn Pulse period measurement overlimit flag clear	BIT	0	1 or 0		0~1: Pulse period measurement overlimit flag clear
0x7006		Latch function	USINT	0	1 or 0	R	
	1	LENn External latch input enabled	BIT	0	1 or 0	R/W	1: External latch input enabled 0: External latch input disabled
	2	LTRGn External latch trigger condition	BIT	0	1 or 0	R/W	0: Trigger once 1: Trigger continuously The effective time is that LENn , change from 0 to 1
	3	LSELn Latch input terminal selection	BIT	0	1 or 0	R/W	0: External input 1: Z phase of the channel The effective time is that LENn ,change from 0 to 1. If the latch terminal selects phase Z, the reset function of phase Z is disabled.
0x7007		Preset value	DINT	0	214748368 ~214748367	R/W	
Ch3							
0x7008		Operation command	UINT			R	
	0	CENn Counter enabled	BIT	0	1 or 0	R/W	1: Counter enabled 0: Counter disabled
	1	INRSn Software (built-in) reset	BIT	0	1 or 0	R/W	0~1: Reset the current counter value
	2	INLAn Software latch	BIT	0	1 or 0	R/W	0~1: Internal latch enabled
	3	PSETn Software preset	BIT	0	1 or 0	R/W	0~1: Set the current counter value to the preset value
	4	ERENn External reset enabled	BIT	0	1 or 0	R/W	1: External terminal reset enabled 0: External terminal reset disabled
	5	ZSCRn Z-phase Reset enabled	BIT	0	1 or 0	R/W	1: Z-phase reset enabled 0: Z-phase reset disabled
	6	ERCRn External reset complete flag cleared	BIT	0	1 or 0	R/W	0~1: Clear external reset complete flag
	7	ZSCRn Z-phase reset complete flag cleared	BIT	0	1 or 0	R/W	0~1: Clear Z-phase reset complete flag
	8	UPCRn Clear upper limit flag	BIT	0	1 or 0	R/W	0~1: Flag cleared
	9	DOWNCRn Clear lower limit flag	BIT	0	1 or 0	R/W	0~1: Flag cleared
0x7009		Pulse period measurement	USNIT			R	
	1	PPENn Pulse period measurement enabled	BIT	0	1 or 0	R/W	1: Pulse period measurement enabled 0: Pulse period measurement disabled
	2	PPCARn Pulse period measurement value clear	BIT	0	1 or 0	R/W	0~1: Pulse period measurement value cleared
	3	PPOFn Pulse period measurement overlimit flag clear	BIT	0	1 or 0		0~1: Pulse period measurement overlimit flag clear
0x700A		Pulse period measurement	USINT			R	
	1	PPENn Pulse period measurement enabled	BIT	0	1 or 0	R/W	1: Pulse period measurement enabled 0: Pulse period measurement disabled
	2	PPCARn Pulse period measurement value clear	BIT	0	1 or 0	R/W	0~1: Pulse period measurement value cleared
	3	PPOFn Pulse period measurement overlimit flag clear	BIT	0	1 or 0	R/W	0~1: Pulse period measurement overlimit flag clear
0x700B		Preset value	DINT	0	~214748368 ~214748367	R/W	

Object dictionary	Subindex	Name	Attribute	Type	Range	Default	Remark
Ch4							
0x700C		Operation command	UINT			R	
	0	CENn Counter enabled	BIT	0	1 or 0	R/W	1: Counter enabled 0: Counter disabled
	1	INRSn Software (built-in) reset	BIT	0	1 or 0	R/W	0~1: Reset the current counter value
	2	INLAn Software latch	BIT	0	1 or 0	R/W	0~1: Internal latch enabled
	3	PSETn Software preset	BIT	0	1 or 0	R/W	0~1: Set the current counter value to the preset value
	4	ERENn External reset enabled	BIT	0	1 or 0	R/W	1: External reset enabled 0: External reset disabled
	5	ZSCRn Z-phase reset enabled	BIT	0	1 or 0	R/W	1: Z-phase reset enabled 0: Z-phase reset disabled
	6	ERCRn External reset complete flag cleared	BIT	0	1 or 0	R/W	0~1: Clear external reset complete flag
	7	ZSCRn Z-phase reset complete flag cleared	BIT	0	1 or 0	R/W	0~1: Clear Z-phase reset complete flag
	8	UPCRn Clear upper limit flag	BIT	0	1 or 0	R/W	0~1: Flag cleared
	9	DOWNCRn Clear lower limit flag	BIT	0	1 or 0	R/W	0~1: Flag cleared
0x700D		Pulse period measurement	USNIT			R	
	1	PPENn Pulse period measurement enabled	BIT	0	1 or 0	R/W	1: Pulse period measurement enabled 0: Pulse period measurement disabled
	2	PPCARn Pulse period measurement value clear	BIT	0	1 or 0	R/W	0~1: Pulse period measurement value cleared
	3	PPOFn Pulse period measurement overlimit flag clear	BIT	0	1 or 0		0~1: Pulse period measurement overlimit flag clear
0x700E		Latch function	USINT			R	
	1	LENn External latch input enabled	BIT	0		R/W	1: External latch input enabled 0: External latch input disabled
	2	LTRGn External latch trigger condition	BIT	0	1 or 0	R/W	0: Trigger once 1: Trigger continuously The effective time is that LENn , change from 0 to 1
	3	LSELn Latch input terminal selection	BIT	0	1 or 0	R/W	0: External input 1: Z phase of the channel The effective time is that LENn ,change from 0 to 1. If the latch terminal selects phase Z, the reset function of phase Z is disabled.
0x700F		Preset value	DINT	0	~214748368 ~214748367	R/W	
0x1C00	0	Synchronization manager communication type					
	1	Communication type SM0	R	USINT		1	
	2	Communication type SM01	R	USINT		2	
	3	Communication type SM2	R	USINT		3	
	4	Communication type SM3	R	USINT		4	
0x1C12	0	Sync Manager 2PDO distribution					
	01~10	PDO mapping	R	UINT		5632~5647	
0x1C13	0	Sync Manager 3PDO distribution					
	01~21	PDO mapping	R	UINT			
0x8000	0	Characteristic Parameters					
	1	I1 logic state selection	R/W	BOOL	0 or 1	0	0: Normally-open 1: Normally-closed
	2	I2 logic state selection	R/W	BOOL	0 or 1	0	0: Normally-open 1: Normally-closed
	3	I3 logic state selection	R/W	BOOL	0 or 1	0	0: Normally-open 1: Normally-closed
	4	I4 logic state selection	R/W	BOOL	0 or 1	0	0: Normally-open 1: Normally-closed
	5	Channel 1 Counting type	R/W	BOOL	0 or 1	0	0: Ring counter 1: linear counter
	6	Channel 2 Counting type	R/W	BOOL	0 or 1	0	0: Ring counter 1: linear counter
	7	Channel 3 Counting type	R/W	BOOL	0 or 1	0	0: Ring counter 1: linear counter
	8	Channel 4 Counting type	R/W	BOOL	0 or 1	0	0: Ring counter 1: linear counter
	9	Channel 1 Encoding counting direction	R/W	BOOL	0 or 1	0	0: A phase as the positive direction 1: B phase as the positive direction

Object dictionary	Subindex	Name	Attribute	Type	Range	Default	Remark
0x8000	0A	Channel 2 Encoding counting direction	R/W	BOOL	0 OR 1	0	0: A phase as the positive direction 1: B phase as the positive direction
	0B	Channel 3 Encoding counting direction	R/W	BOOL	0 OR 1	0	0: A phase as the positive direction 1: B phase as the positive direction
	0C	Channel 4 Encoding counting direction	R/W	BOOL	0 OR 1	0	0: A phase as the positive direction 1: B phase as the positive direction
0x8001	0	External pin function					
	1	I1 logic state selection	R/W	USINT	0 ~ 5	0	0: Disable 1: General input 2: Latch input 3: Gate input 4: Preset input 5: Reset input
	2	I2 logic state selection	R/W	USINT	0 ~ 5	0	0: Disable 1: General input 2: Latch input 3: Gate input 4: Preset input 5: Reset input
	3	I3 logic state selection	R/W	USINT	0 ~ 5	0	0: Disable 1: General input 2: Latch input 3: Gate input 4: Preset input 5: Reset input
	4	I4 logic state selection	R/W	USINT	0 ~ 5	0	0: Disable 1: General input 2: Latch input 3: Gate input 4: Preset input 5: Reset input
0x8002	0	Ch1 Max. value	R/W	DINT	1~2147483647	2147483647	
0x8003	0	Ch1 Mini. value	R/W	DINT	-2147483647~0	-2147483647	
0x8004	0	Ch2 Max. value	R/W	DINT	1~2147483647	2147483647	
0x8005	0	Mini. value Ch2 index address					
	1	Mini. value	R/W	DINT	-2147483647~0	-2147483647	
0x8006	0	Ch3 Max. value	R/W	DINT	1~2147483647	2147483647	
0x8007	0	Ch3 Mini. value	R/W	DINT	-2147483647~0	-2147483647	
0x8008	0	Ch4 Max. value	R/W	DINT	1~2147483647	2147483647	
0x8009	0	Ch4 Mini. value	R/W	DINT	-2147483647~0	-2147483647	
0x800A	0	Speed measurement window					
	1	Pulse rate measurement Time window	R/W	UINT	0~65535	0	When the setting is not 0, the pulse rate measurement function is turned on. Unit: ms
0x800B	0	Speed measurement average times					
	1	Pulse rate measurement Average times	R/W	INT	0~100	0	When the setting is not 0, the average times is turned on. Unit: Times
0x800C	0	Pulse input mode					
	1	Channel 1 Pulse input mode	R/W	USINT	1~4	2	0: Not supported 1: ×2 orthogonal phase pulse 2: ×4 orthogonal phase pulse 3: Pulse + direction 4: Up/down pulse
	2	Channel 2 Pulse input mode	R/W	USINT	1~4	2	0: Not supported 1: ×2 orthogonal phase pulse 2: ×4 orthogonal phase pulse 3: Pulse + direction 4: Up/down pulse
	3	Channel 3 Pulse input mode	R/W	USINT	1~4	2	0: Not supported 1: ×2 orthogonal phase pulse 2: ×4 orthogonal phase pulse 3: Pulse + direction 4: Up/down pulse
	4	Channel 4 Pulse input mode	R/W	USINT	1~4	2	0: Not supported 1: ×2 orthogonal phase pulse 2: ×4 orthogonal phase pulse 3: Pulse + direction 4: Up/down pulse