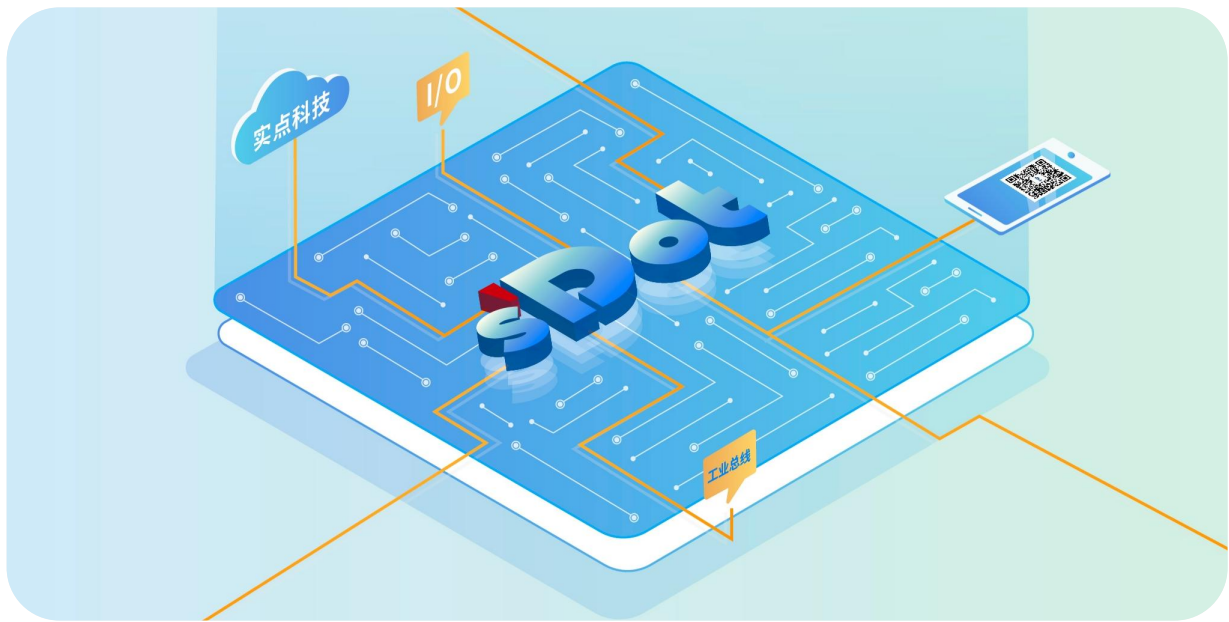




EC4S-P04D

Pulse Output Module

User Manual



Nanjing Solidot Electronic Technology Co., Ltd.

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1 Product Overview

1.1 Product Introduction

The EC4S-P04D is a 4-channel pulse output and 16-channel digital input module that uses the EtherCAT industrial Ethernet bus.

This manual mainly describes the specifications, technical parameters, and usage methods of the EC4S-P04D.



2 Product Parameters

2.1 General parameters

Interface parameters	
Product Model	EC4S-P04D
Bus Protocol	EtherCAT
Transmission rate	100 Mbps
Bus interface	Bottom bus
Technical parameters	
Configuration method	via the main site
power supply	5 VDC (powered by the system)
CiA402	support
Distributed clock	support
Number of axes	≤4
Output frequency	≤400KHz
Synchronization period	≥1ms
Limit input	16Bit
Limit signal	NPN
Limiting filter	3ms
drive signal	Differential signaling
indicator lights	green
power contacts	Maximum 24V DC/Maximum 10A
Electrical isolation	500V(Power contacts / Power supply voltage /Ethernet)
Specifications and dimensions	113×98×28.3mm
weight	150g
Operating temperature	-10℃~+60℃
Storage temperature	-20℃~75℃
relative humidity	95%, no condensation
Protection level	IP20

3 panel

3.1 Panel structure

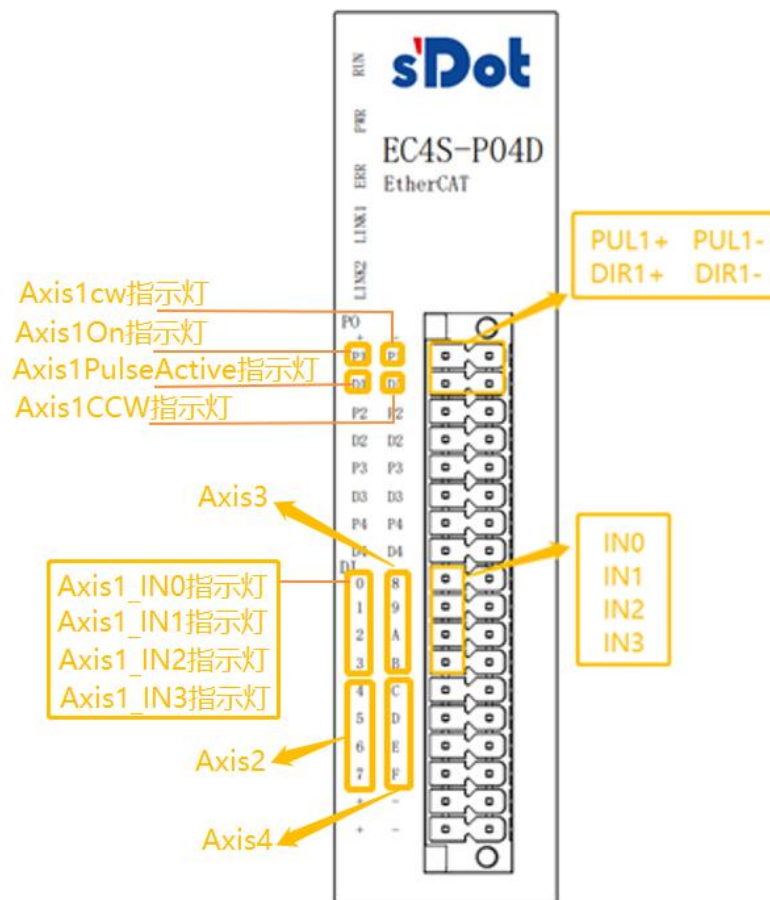
Product Parts Names



3.2 Indicator light function

name	logo	color	state	Status Description
Power indicator light	PWR	green	Chang Liang	Power supply is normal
			Extinguish	The product is not powered on or the power supply is abnormal.
Operation indicator light	RUN	green	Chang Liang	The module is in normal operating condition.
			flickering 1Hz	Safe operating status
			flickering 2Hz	Pre-running status
			Extinguish	The module is in its initial state.
Fault indicator light	ERR	red	blinking	Module malfunction or communication connection failure
			Extinguish	The module is working without any issues.
Input signal indicator	0~F	green	Chang Liang	The module detection channel has a signal input.
			Extinguish	The module channel has no signal input or the signal input is abnormal.

Port definition description



When the 402 state machine of axis Axis1 is enabled, the Axis1ON light illuminates; when axis Axis1 has a pulse output, the Axis1PulseActive light illuminates; when rotating clockwise, the Axis1CW light illuminates; when rotating counterclockwise, the Axis1CCW light illuminates; other axes are similar.

Axis1_IN0~3 corresponds to the lower 4 bits of PDO: Digital inputs for axis 1.

For example, if there is a signal input at Axis1_IN0, then Digital inputs = 0x0001;

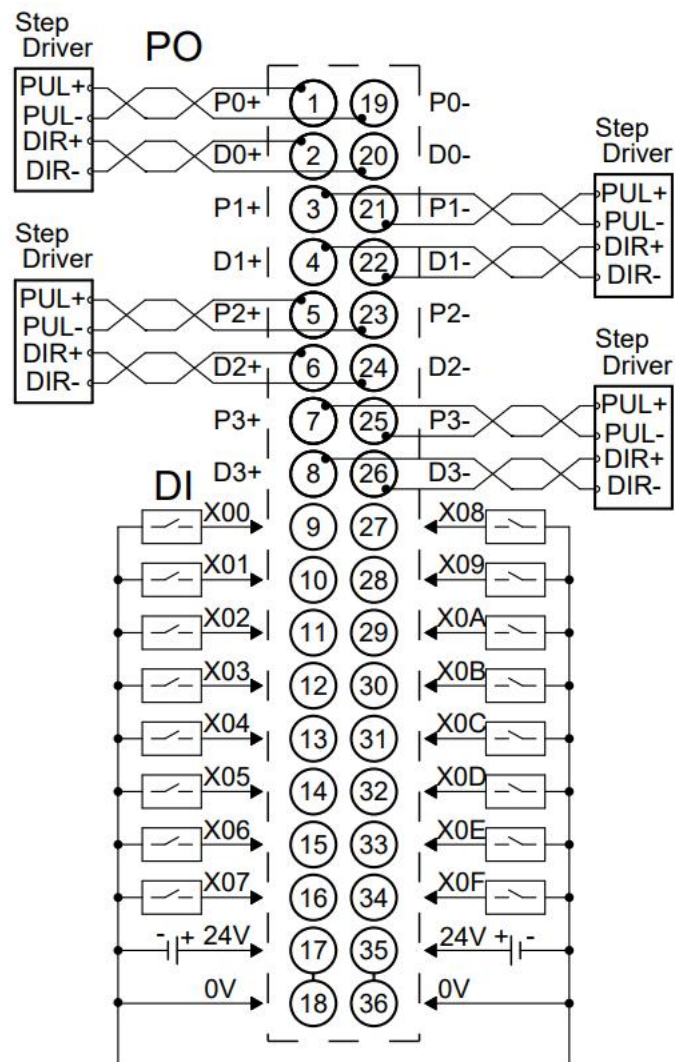
If Axis1_IN1 has a signal input, then Digital inputs = 0x0002;

If Axis1_IN2 has a signal input, then Digital inputs = 0x0004;

If there is a signal input to Axis1_IN3, then Digital inputs = 0x0008.

4 wiring

4.1 Wiring diagram



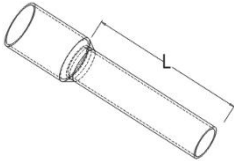
*24V internal conduction; 0V internal conduction

4.2 Wiring terminals and wiring instructions

Terminal blocks		
Signal line terminals	Extreme number	36P
	wire diameter	26~16 AWG 0.2~1.5 mm ²

● Wiring method

- The signal and power terminals feature a screwless design; cable installation and removal are performed using a flathead screwdriver (tip width: ≤ 3 It can be completed in mm.
- Recommended wire stripping length: 10mm.
- For a single-strand rigid wire, after stripping the wire to the corresponding length, press the button simultaneously...Single-strand guideWireinsert.
- Multi-strand flexible wires, after being stripped to the corresponding length, can be directly connected or used with corresponding standard cold-pressed terminals.(Tube-type insulated terminals, see table below)Press down the button and simultaneously pull the lineinsert.

Specifications of tubular insulated ends		
Specifications	model	conductor cross-sectional area (mm ²)
 Tubular insulated terminalsLThe length is ≥ 10 mm	E0510	0.5
	E7510	0.75
	E7512	
	E1010	1.0
	E1012	
	E1510	1.5

5 use

5.1 Application in the TwinCAT3 software environment

1、Preparation

- **Hardware environment**

- **Module model EC4S-P04D**
- **One computer, pre-installed with TwinCAT3 software.**
- **EtherCAT dedicated shielded cable**
- **One switching power supply**
- **Module mounting rails and rail fasteners**
- **Device configuration file**

Configuration file retrieval

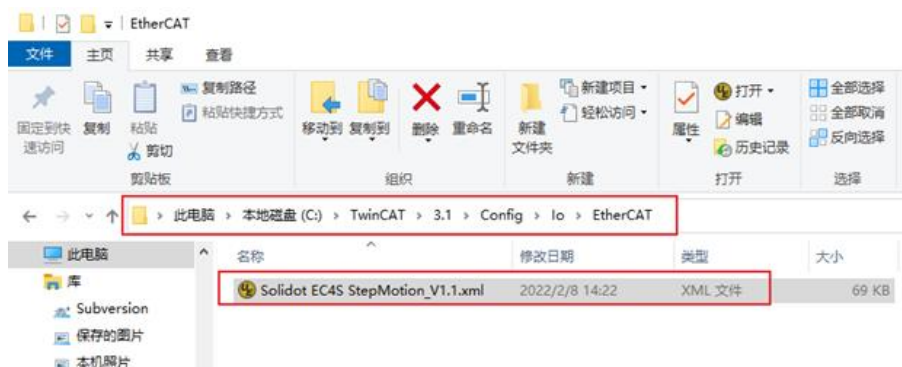
address:<https://www.solidotech.com/cn/resources/configuration-files>

- **Hardware configuration and wiring**

Please follow the instructions.[4. Wiring](#) "Required Operation"

2、Pre-configured configuration files

Place the ESI configuration file (Solidot EC4S StepMotion_V1.1.xml) in the TwinCAT installation directory "C:\TwinCAT\3.1\Config\Io\EtherCAT", as shown in the figure below.

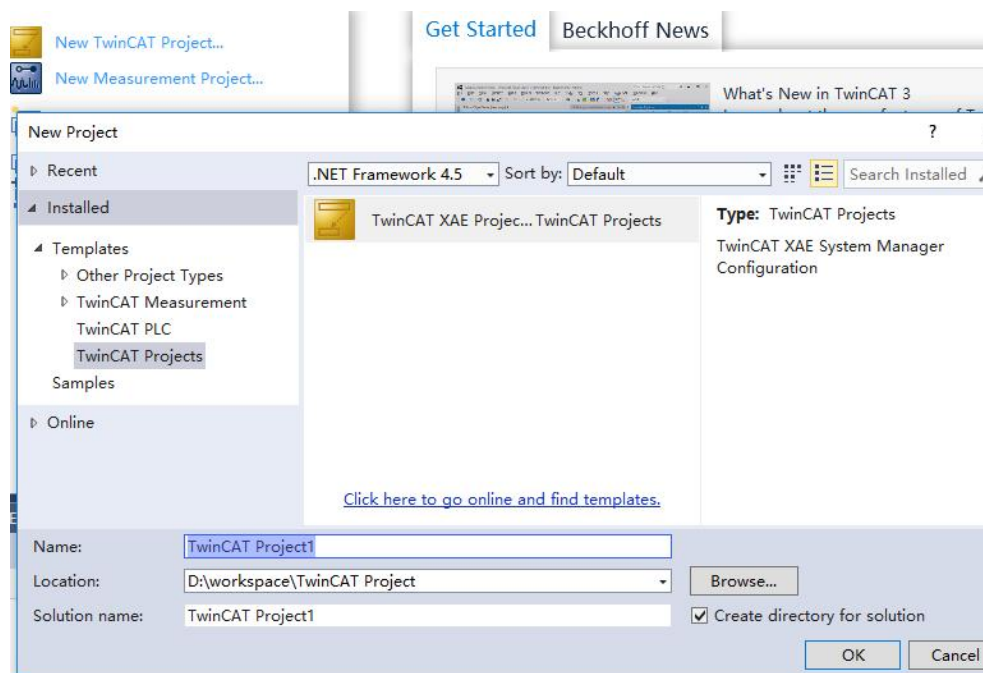


3. Create a project

- a. Click the TwinCAT icon in the lower right corner of the desktop, select "TwinCAT XAE (VS xxxx)" to open the TwinCAT software, as shown in the image below.

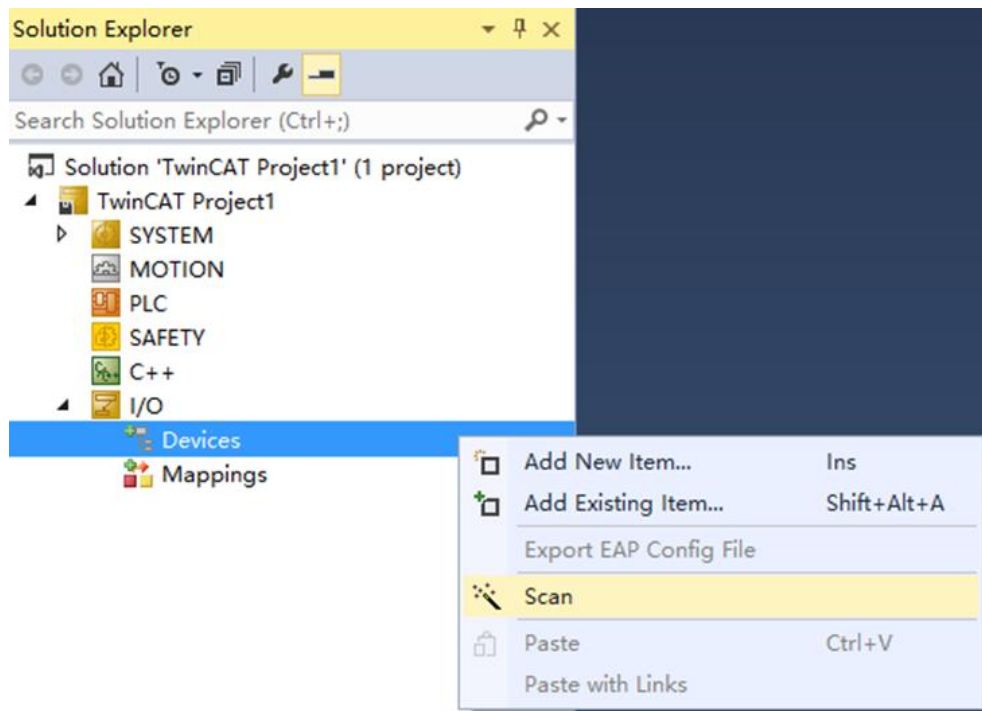


- b. Click "New TwinCAT Project". In the pop-up window, "Name" and "Solution name" correspond to the project name and solution name, respectively, and "Location" corresponds to the project path. These three items can be left as default. Then click "OK". The project will be created successfully, as shown in the figure below.

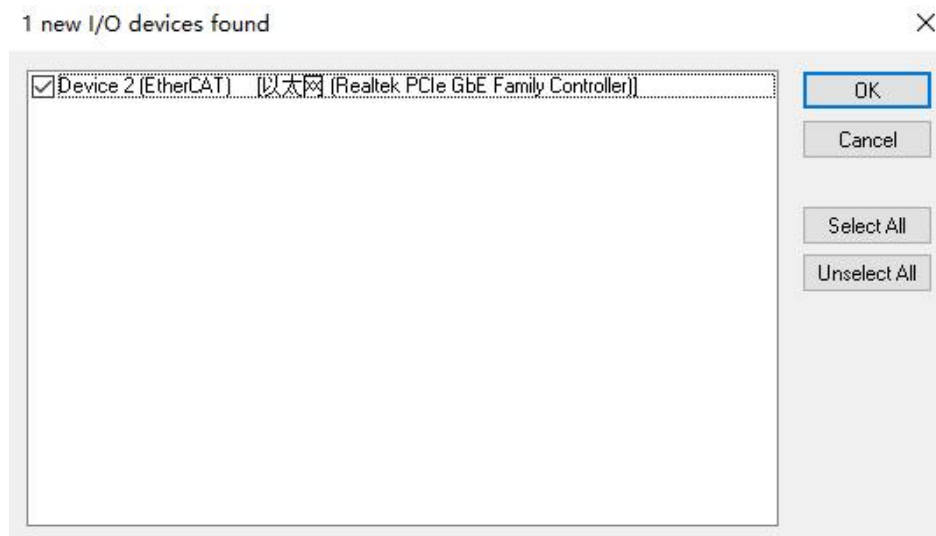


4. Scanning equipment

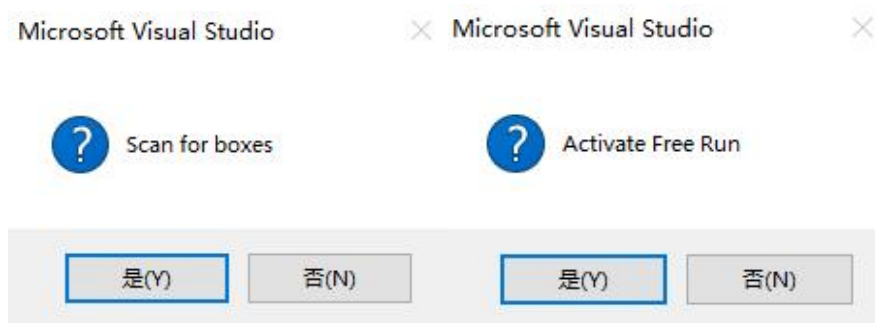
- a. After creating the project, right-click the "Scan" option under "I/O -> Devices" to scan for slave devices, as shown in the figure below.



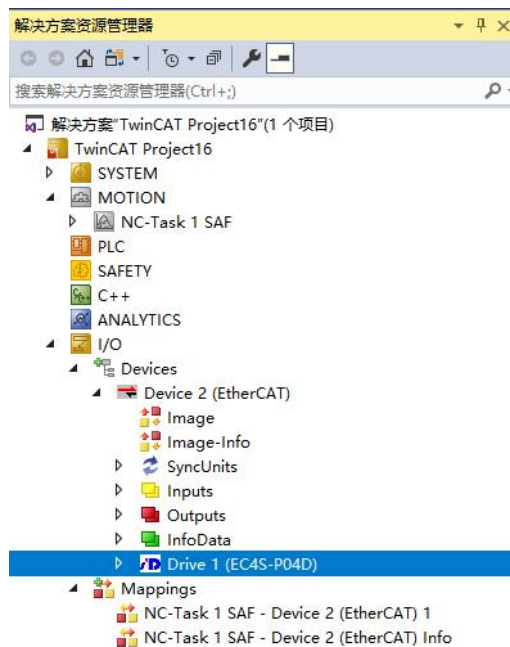
- b. Select the "Local Area Connection" network adapter, as shown in the image below.



- c. In the pop-up window "Scan for boxes", click "Yes"; in the pop-up window "Activate Free Run", click "Yes", as shown in the image below.

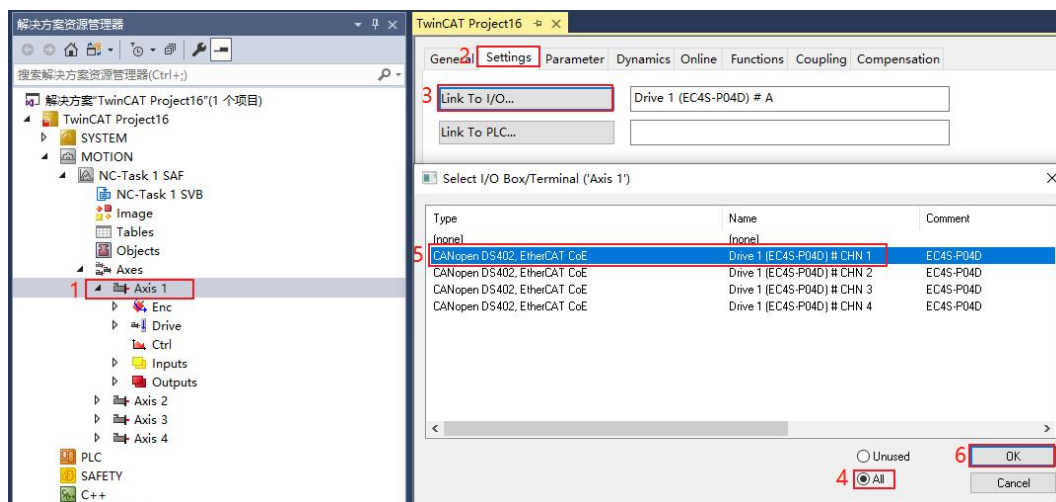


- d. After the device is scanned, EC4S-P04D can be seen in the navigation tree on the left. Under "Online", TwinCAT can be seen to be in "OP" state. The RUN light of the slave device can be observed to be constantly lit, as shown in the figure below.

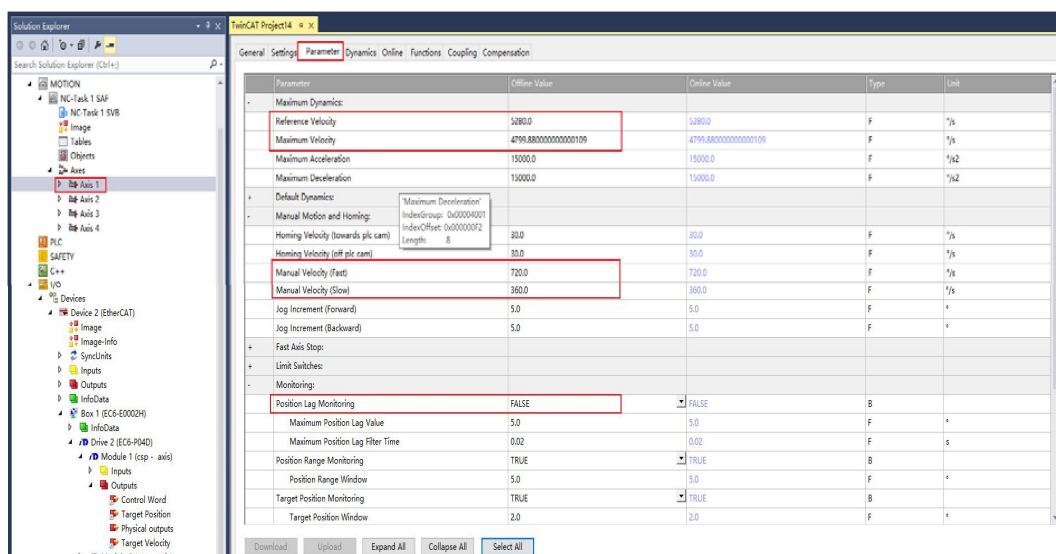


5. Configure NC axis parameters

- a. Taking Axis1 as an example, double-click Axis1 to open the Settings tab, and associate the axis, as shown in the figure below.



- b. Open the Parameter tab and set the Axis1 parameter as follows: As shown in the figure below.



* **Reference Velocity:** The reference speed is generally 110% of the Maximum Velocity.

* **Maximum Velocity:** Maximum shaft speed (In this example, the default encoder pulse count for one revolution of the motor is 10,000, the maximum motor speed is set to 800 rpm, and one revolution of the motor is 360°. The unit in the parameters is seconds, so the maximum shaft speed = (800/60) * 360)

* **Default Dynamics:** Acceleration/deceleration settings

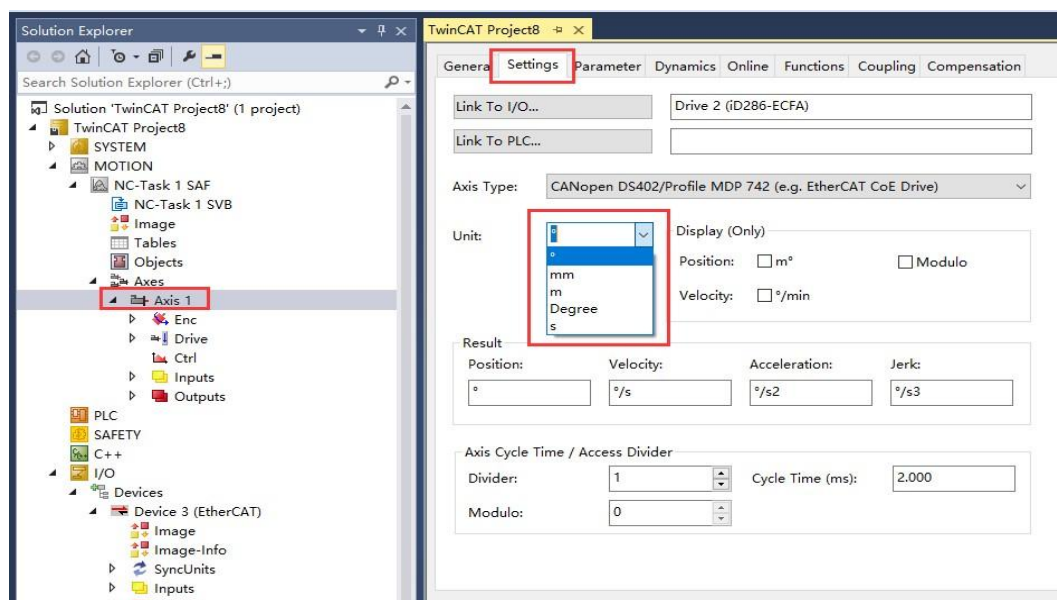
* **Manual Motion and Homing:** Set jog and parameter search speed. The Manual Velocity (Fast) and Manual Velocity (Slow) here refer to the high-speed and low-speed jogging speeds in the online control interface, respectively.

* **Fast Axis Stop:** The axis rapid stop parameters can be set.

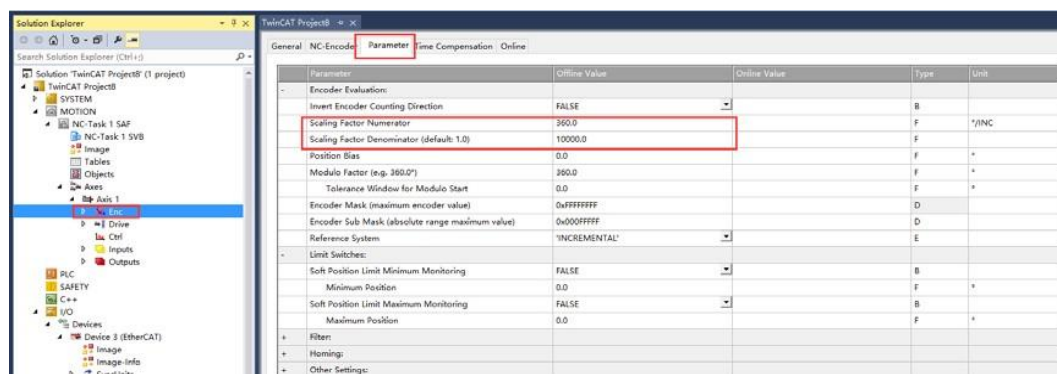
* **Limit Switches:** Soft limit can be enabled.

* **Monitoring:** Set axis following error. Position Lag Monitoring needs to be changed to FALSE here; otherwise, alarms may occur during manual debugging..

- c. beatopenSettingstabs,CanSetting up the engineering unit for motor operationAs shown in the figure below.



- d. Double-click Enc under Axis1 to open the Parameter tab and set the parameters for Enc (this parameter must be set).As shown in the figure below.

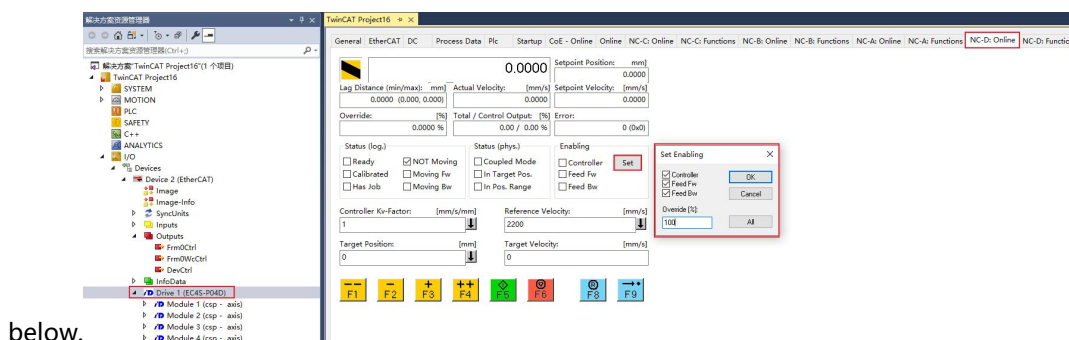


***Scaling Factor Numerator:**The final amount of engineering movement per revolution of the motor

***Scaling Factor Denominator:**Encoder feedback pulse count

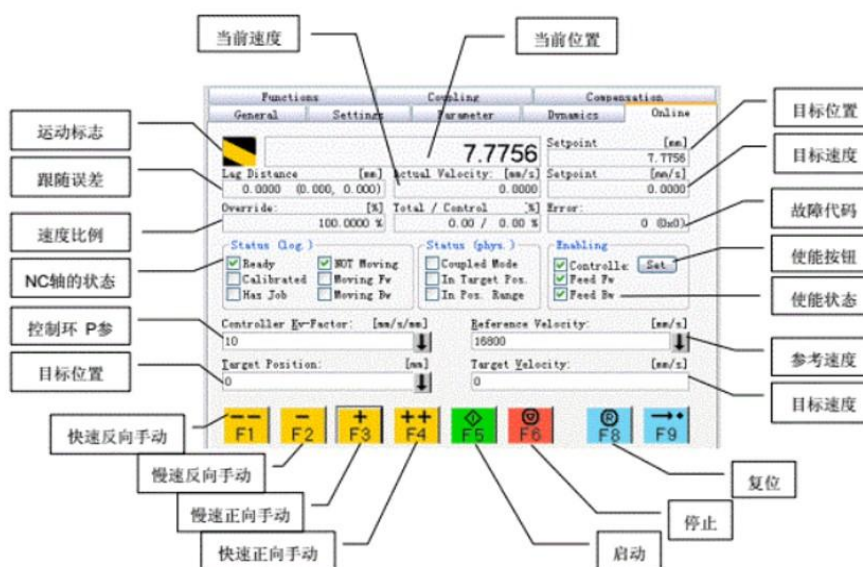
For example:If a motor rotates one revolution, it moves a circular load 360°. Therefore, the Scaling Factor Numerator = 360°. In this example, the default pulse quantity for one revolution of the encoder is 10000, so the Scaling Factor Denominator = 10000..

- e. Click  (Activate Configuration) Activate the configuration, then click "Drive".1(EC)4S-P04D), switch to "NC: In the "Online" tab, make the following settings.As shown in the figure



- f. Click "SET" and manually check the box.Controller(Enable),Feed Fw(Positive jog)Feed Bw(Reverse jog), and setOverride(Speed ratio), then clickOKOr click directly.ALLEnable the axis and automatically set the speed ratio.100%.
- g. This is now controllable.F1-F4The axis can be jogged, and a target speed (limited by the Manual Velocity (Fast) parameter) and target position can also be set by clicking.F5Start running,F6Stop running.F9This is an automatic zeroing function; it is not used when there is no reference point.Controller Kv-FactorFor axis positioning compensation, if the axis positioning is inaccurate during jogging, the adjustment can be increased appropriately (not exceeding...).20).
- h. Introduction to Debug Page

此为调试页面，仅当当前配置文件与目标系统的实际配置文件一致，且目标系统处于Runing 模式时才可用。因此，配置好 NC 轴后，应保存，然后登入目标系统并激活配置，切入运行模式。



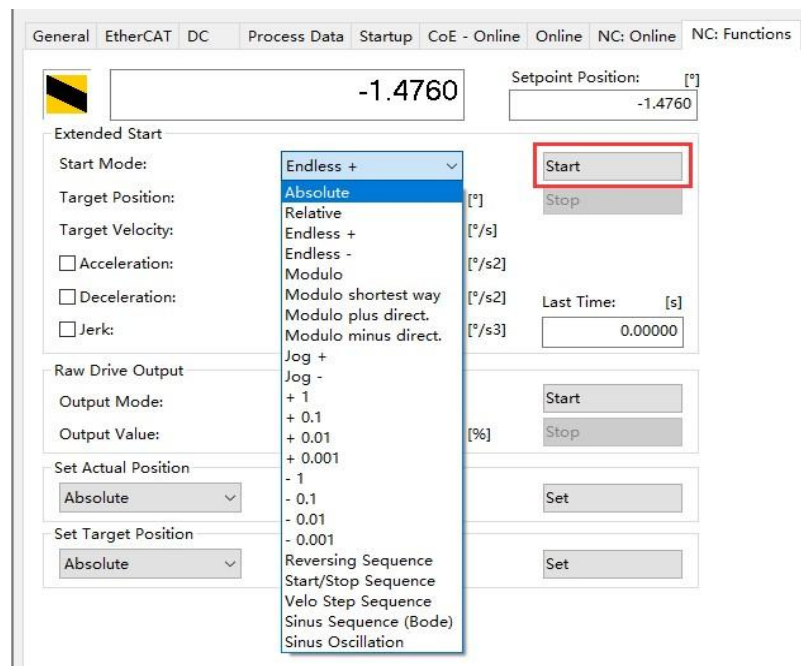
Functions

- 1) Switch to NC: The Functions tab allows you to modify the current position of the axis using the Set Actual Position option. If you set the current position to 0, the current position is the origin. This position will be lost after TwinCAT restarts. If it is an absolute encoder type feedback, the actual feedback position of the encoder will be used as the current position after restarting.

The screenshot shows the 'NC: Functions' tab in the TwinCAT software. At the top, there are tabs for General, EtherCAT, DC, Process Data, Startup, CoE - Online, Online, NC: Online, and NC: Functions. The current position is displayed as -1.4760. Below this, there are several sections:

- Extended Start:** Includes Start Mode (Endless +), Target Position (1000), Target Velocity (4799), and checkboxes for Acceleration, Deceleration, and Jerk. There are Start and Stop buttons.
- Raw Drive Output:** Includes Output Mode (Percent) and Output Value (0). There are Start and Stop buttons.
- Set Actual Position:** This section is highlighted with a red box. It includes a dropdown menu set to 'Absolute' and a text input field with the value '0'. There is a 'Set' button.
- Set Target Position:** Includes a dropdown menu set to 'Absolute' and a text input field with the value '0'. There is a 'Set' button.

- 2) The Start Mode menu offers many debugging methods for a single axis, with commonly used ones including Absolute (absolute position movement), Relative (relative position movement), Endless+- (infinite forward and reverse rotation), Modulo (modulus movement), Reversing Sequence, Start/Stop Sequence, and Velo Step Sequence.



***Target Position:**Target location

***Target Velocity:**Target speed

After setting these two parameters, click "Start" and "Stop" to control the start and stop. The target speed set here is not limited by the Manual Velocity (Fast) parameter..

6、 Function Introduction

a. saveCurrent settings

Object 1010 is used to store configuration parameters.,The current version can only save 2004.,2804,3004andObject 3804 is written to the main station using either object 1010:01 or object 1010:04 in ASCII encoding. "save: 0x**65766173**Then, the current configuration value will be written to FLASH.,Saves data even after power failure,After a successful write, the 1010:01 or 1010:04 object will return the value 0x00000001.

b. Factory reset

The main station can write ASCII encoding via 1011:01 or 1011:04 objects. "load: 0x**64616f6c**,The module then restores its factory settings and writes the factory settings to the FLASH

memory. After a successful write, the 1011:01 or 1011:04 object will return a value of

Index	Name	Flags	Value
1010:0	Save Parameters	RW	> 4 <
1010:01	Store all parameters	RW	0x00000000 (0)
1010:02	Store communication paramet...	RW	0x00000000 (0)
1010:03	Store application parameters	RW	0x00000000 (0)
1010:04	Store manufacturer parameters	RW	0x00000000 (0)
1011:0	Load Parameters	RW	> 4 <
1011:01	Restore all default parameters	RW	0x00000000 (0)
1011:02	Restore communication defaul...	RW	0x00000000 (0)
1011:03	Restore application default pa...	RW	0x00000000 (0)
1011:04	Restore manufacturer default ...	RW	0x00000001 (1)
1018:0	Identity		> 4 <
10F1:0	Error Settings		> 2 <
1600:0	CSP/CSV RxPDO0	RW	> 4 <
1601:0	CSP RxPDO	RW	> 4 <
1602:0	CSV RxPDO2	RW	> 3 <
1A00:0	CSP/CSV TXPDO0	RW	> 4 <
1A01:0	CSV TXPDO	RW	> 4 <
1A02:0	CSV TXPDO2	RW	> 3 <
1C00:0	Sync manager type		> 4 <
1C12:0	SyncManager 2 assignment		> 4 <
1C13:0	SyncManager 3 assignment		> 4 <
1C32:0	SM output parameter		> 32 <
1C33:0	SM input parameter		> 32 <
2004	Axis 1 Input IO Configuration	RW	0x000F (15)
2804	Axis 2 Input IO Configuration	RW	0x000F (15)
3004	Axis 3 Input IO Configuration	RW	0x000F (15)
3804	Axis 4 Input IO Configuration	RW	0x000F (15)

0x00000001.

c. DISignal mapping function

Taking axis 1 as an example, the values of DI 0-3 are mapped to object 60FD by default.:bit0-3, object 2004h:Bits 0-3 are the remapping enable bits for DI 0-3. Object 2004h....The value of bit0 is changed to 0, and the value of DI0 is changed from the default 60FD.:bit0 is mapped to 60FD:Bit 16, and the remaining DI signals can be controlled for remapping in the same way. This parameter is not retained after power loss."Keep settings enabled" It can retain power even when power is lost.

d. DINormally open/normally closed signal setting

Taking axis 1 as an example, the mapping value of DI 0-3 is 0 by default (normally open). Modify object 2004h.:When bits 8-11 are 1, the mapped value of DI 0-3 is 1 (normally closed), and the mapped address is determined by..."The "DI signal mapping function" setting indicates that this parameter is not retained after power loss. The "Keep Settings" function allows settings to be retained even after power loss.

		2004h	60FD映射	2004h	60FD映射	2004h	开关类型	2004h	开关类型
DI 0	轴1	bit:0 = 1	bit0	bit:0 = 0	bit16	bit:8 = 0	常开	bit:8 = 1	常闭
DI 1		bit:1 = 1	bit1	bit:1 = 0	bit17	bit:9 = 0	常开	bit:9 = 1	常闭
DI 2		bit:2 = 1	bit2	bit:2 = 0	bit18	bit:10 = 0	常开	bit:10 = 1	常闭
DI 3		bit:3 = 1	bit3	bit:3 = 0	bit19	bit:11 = 0	常开	bit:11 = 1	常闭
		2804h	68FD映射	2804h	68FD映射	2804h	开关类型	2804h	开关类型
DI 4	轴2	bit:0 = 1	bit0	bit:0 = 0	bit16	bit:8 = 0	常开	bit:8 = 1	常闭
DI 5		bit:1 = 1	bit1	bit:1 = 0	bit17	bit:9 = 0	常开	bit:9 = 1	常闭
DI 6		bit:2 = 1	bit2	bit:2 = 0	bit18	bit:10 = 0	常开	bit:10 = 1	常闭
DI 7		bit:3 = 1	bit3	bit:3 = 0	bit19	bit:11 = 0	常开	bit:11 = 1	常闭
		3004h	70FD映射	3004h	70FD映射	3004h	开关类型	3004h	开关类型
DI 8	轴3	bit:0 = 1	bit0	bit:0 = 0	bit16	bit:8 = 0	常开	bit:8 = 1	常闭
DI 9		bit:1 = 1	bit1	bit:1 = 0	bit17	bit:9 = 0	常开	bit:9 = 1	常闭
DI A		bit:2 = 1	bit2	bit:2 = 0	bit18	bit:10 = 0	常开	bit:10 = 1	常闭
DI B		bit:3 = 1	bit3	bit:3 = 0	bit19	bit:11 = 0	常开	bit:11 = 1	常闭
		3804h	78FD映射	3804h	78FD映射	3804h	开关类型	3804h	开关类型
DI C	轴4	bit:0 = 1	bit0	bit:0 = 0	bit16	bit:8 = 0	常开	bit:8 = 1	常闭
DI D		bit:1 = 1	bit1	bit:1 = 0	bit17	bit:9 = 0	常开	bit:9 = 1	常闭
DI E		bit:2 = 1	bit2	bit:2 = 0	bit18	bit:10 = 0	常开	bit:10 = 1	常闭
DI F		bit:3 = 1	bit3	bit:3 = 0	bit19	bit:11 = 0	常开	bit:11 = 1	常闭

4个输入IO可根据2004h对象低4位bit0-3进行重映射功能，也可以通过bit8-11进行常开常闭开关设置
默认bit0-3不偏移