

# EC4S -P04D

# **Quick User Manual**



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# 1 Product introduction

The EC4S-P04D is a 4-channel pulse output and a 16-channel digital quantity input module, using the Ether CAT industrial Ethernet bus.

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



### 2 Panel

Name and functional description of the parts of the module



### Indicator light description

PWR	green	On	The working power supply is normal
		Off	The product is not powered up or the power
			supply module is abnormal
RUN	green	On	The module is in the normal operation state
		Off	The module is in the initial state
		Flashing	2Hz: Pre-operation state 1Hz: safe
			operation state

ERR	red	Flashing	Module working operation or
			communication connection
		Off	The module works without exception
Input the signal	green	On	The module detection channel has a signal
indicator			input
		Off	The module channel has no signal input or
			abnormal signal input

Port definition description



The Axis1ON light is on the 402 state machine of the shaft Axis 1; the Axis1PulseActive light when the shaft Axis 1 has pulse output; the Axis1CW light when turning clockwise; the Axis1CCW light when turning counterclockwise; the other axes are similar.

Axis 1 \_ IN 0 ~ 3 corresponds to the PDO of axis 1: Digital inputs low 4 bits.

For example, if Axis 1 \_ IN 0 has a signal input, then Digital inputs = 0x0001;

If Axis 1 \_ IN 1 has a signal input, then Digital inputs = 0x0002;

If Axis 1 \_ IN 2 has a signal input, then Digital inputs = 0x0004;

If Axis 1 \_ IN 3 has a signal input, then Digital inputs = 0x0008.

## **3 Product parameters**

interface parame	ters ·
bus protocol	EtherCAT
transmission	100 Mbps
speed	
BI	Bottom bus
technical parame	ter
Configuration	Through the main station
mode	
source	5 VDC (powered by the system)
Ci A402	support
Distribution	support
clock	
number of axles	<=4
output	<=400KH z
frequency	
synchronizing	>= 1ms
cycle	
Limit input	16 The
Limit signal	N PN
Limit filter	3ms
driving signal	Differential signal
pilot lamp	green
Power contact	Max. 24V DC / max. 10A
Electrical	500V (power supply contact / power supply voltage / E thernet)
isolation	
specification	113×98×28.3mm
and dimension	
weight	150g

working		-10~+60°C
temperature		
Storage		-20°C~75°C
temperature		
relative		95%, with no condensation
humidity		
levels	of	IP20
protection		

### 4 The wiring

### .1 4 Wiring diagram



\*24V内部导通;0V内部导通

### 4.2 Terminal terminal and wiring instructions

binding post			
Signal line terminal	number of poles	36 P	
	Line diameter	26~16 AWG	0.2~1.5 mm²

### • Wiring method

- The signal and power terminal are screw-free design, and the installation and disassembly of the cable can be completed by using a one-character screwdriver (knife head width: 3 mm).
- > The recommended stripping length is 10mm.
- Single strand hard wire, after stripping the corresponding length of the wire, the pressure button will insert the single wire at the same time.
- Multiple flexible wire, after stripping the corresponding length of the wire, can be directly connected or matched with the corresponding standard specifications of the cold pressure end (pipe insulation terminal, the following table), and the pressure button will insert the line at the same time.

Specification table of pipe-typ	Specification table of pipe-type insulated end head				
Specification requirements	model	Lead boundary			
		area is mm²			
<u>م</u>	E 0510	0.5			
	E7510	0.75			
L L	E 7512	0.75			
	E 1010	1.0			
	E 1012	1.0			
The length of the tube-type	E 1510				
insulated terminal L is	E 1518	1.5			
≥10mm					

### 5 Use

### .1 5 Preparations

This paper introduces the application of EC4S-P04D module in TwinCAT3 software environment as an example.

- 1. Equipment preparation
- One computer, pre-installed with TwinCAT3 software
- > EtherCAT Special shielding cable
- Switch power supply
- Device profile file Solidot EC4S StepMotion\_V1.1.xml
- > One E C4S-P04D module

### 2. Add the device configuration file

Place the XML file of the module into the installation directory of the TwinCAT under: C: \ TwinCAT \ 3.1 \ Config \ Io \ EtherCAT.



### .2 5 Module use

### 1. Scan equipment

• Run the TwinCAT software

Click the TwinCAT icon in the lower right corner of the desktop, select "TwinCAT XAE (VS xxxx)" to open the TwinCAT software.

• Create the project

Click "New TwinCAT Project" to create a new project, as shown in the figure below.

New TwinCAT I	Project ment Project	Get Started Beckhoff Ne	WS What's New in TwinCAT 3
New Project		The second	? ×
▶ Recent		.NET Framework 4.5 - Sort by: Default	- 🏢 \Xi Search Installed 🔎
<ul> <li>Installed</li> <li>Templates         <ul> <li>Other Proje</li> <li>TwinCAT Me</li> <li>TwinCAT PLI</li> <li>TwinCAT Pro</li> <li>Samples</li> </ul> </li> <li>Online</li> </ul>	ct Types asurement C ojects	TwinCAT XAE Projec TwinCAT Projects	Type: TwinCAT Projects TwinCAT XAE System Manager Configuration
Name:	TwinCAT Proj	ect1	
Location:	D:\workspace	TwinCAT Project	Browse
Solution name:	TwinCAT Proj	ect1	Create directory for solution

scanner

Right-click "I / O-> Devices" and click "Scan" option to scan the station equipment, as

shown in the figure below.



Check the "Local Connection" network card, and click the "OK" option, as shown in the figure below.



Select Yes in the displayed Scan for boxes dialog box, as shown in the figure below.



Select the associated NC axis and click the "OK" option as shown in the following below.

EtherCAT drive(s) add	ded	×
Append linked axis to:	NC - Configuration	OK
	O CNC - Configuration	Cancel

Select Yes in the dialog of "Activate for Run", as shown in the following below.



Scan to the module E C4S-P04D, as shown in the figure below.



### 2. Configure the NC axis parameters

• In axis 1, for example, double-click Axis 1, open the Settings tab, and associate the

axis

解决方案资源管理器	<sup>II</sup> × TwinCAT Project16 → ×		
◎ ◎ 🏠 🖬 - 🐻 - 🗃 🏓	Gene2al Settings Parameter Dyn	amics Online Functions Coupling Compens	ation
<ul> <li>□ 解決方室"TwinCAT Project16"(1 个项目)</li> <li>▲ WinCAT Project16</li> <li>▶ ▲ SYSTEM</li> <li>▲ ▲ MOTION</li> <li>▲ NC-Task 1 SAF</li> </ul>	3 Link To I/O Link To PLC	Drive 1 (EC4S-P04D) # A	
Im NC-Task 1 SVB	Type (none) 5 DANogen DS402 EtherCAT CoE	Name (none) Drive 1 (EC45-P04D) # CHN 1	Comment EC4S-P04D
▲      ▲	CANopen DS402, EtherCAT CoE CANopen DS402, EtherCAT CoE CANopen DS402, EtherCAT CoE	Drive 1 (EC4S-P04D) # CHN 2 Drive 1 (EC4S-P04D) # CHN 3 Drive 1 (EC4S-P04D) # CHN 4	EC45-P04D EC45-P04D EC45-P04D
Avis 4     PLC     SAFETY     Got C++		) Unused 4	6 OK Cancel

• Open the Parameter tab and set the following for the Axis1

parameter
-----------

Solution Explorer • 4	X TwinCA	T Project14 @ X						
0 0 û 0 - 0 <i>F</i> -	Gene	ral Settings Parameter Dynamics Online Europhyse Counting Com	menution					
Search Solution Explorer (Ctrl+;)	ρ.	systems count records coupling count	promo-					
<ul> <li>MOTION</li> </ul>	^							
<ul> <li>MC-Task 1 SAF</li> </ul>		Maximum Dynamics:						
In NC-Task 1 SVB		Reference Velocity	5280.0		5280.0	F	*/s	
Tables	11.1	Maximum Velocity	4759.88000000000109		4799.88000000000109	F	%	
Objects	11.1	Maximum Acceleration	15000.0		15000.0	F	°/s2	
Axes	111	Maximum Deceleration	15000.0		15000.0	F	*/52	
P mar Auss 1 P mar Auss 2		Default Dynamics: "Maximum Darelegation"						
Int Auis 3		Manual Motion and Homing: IndexGroup: 0x00004001						
b Bate Auris 4	11.7	Homing Velocity (towards plc cam) IndexOffset 0x000000F2	30.0		30.0	F	*/s	
PLC SATETY	11.1	Homing Velocity (off plc cam)	30.0		30.0	F	*/5	
G C++	11.1	Manual Velocity (Fast)	720.0	1	720.0	F	*/5	
- 🔤 1/0	10.1	Manual Velocity (Slow)	360.0		360.0	F	'/s	
<ul> <li>The Devices</li> <li>A The Device 2 (EtherCAT)</li> </ul>	11.7	Jog Increment (Forward)	5.0		5.0	F	E.	
image	11.1	Jog Increment (Backward)	5.0		5.0	F		
1mage-Info	+	Fast Axis Stop:						
P Z SyncUnits	+	Limit Switches:						
Imputs		Monitoring:						
🕨 🖷 InfoData	11.0	Position Lag Monitoring	FALSE		FALSE	В		
▲ 🔮 Box 1 (EC6-E0002H)	11.2	Maximum Position Lag Value	5.0		5.0	F		
<ul> <li>InfoData</li> <li>Drive 2 (EC6-P04D)</li> </ul>	11.2	Maximum Position Lag Filter Time	0.02		0.02	F	5	
/ D Module 1 (csp - axis)		Position Range Monitoring	TRUE		TRUE	В		
Inputs		Position Range Window	5.0		5.0	F	¥	
<ul> <li>Gottputs</li> <li>Control Word</li> </ul>		Target Position Monitoring	TRUE	8	TRUE	В		
Target Position		Target Position Window	2.0		2.0	F	1	
Physical outputs	11.5							
F Target Velocity	E.	Download Upload Expand All Collapse All S	ielect All					

### \* Reference Velocity: Reference speed, generally 110% of Maximum Velocity

\* Maximum Velocity: Maximum speed of the shaft (in this case, the default pulse volume of the motor rotation encoder is 10000, the maximum speed of the motor is 800 rpm, the amount of the motor rotation is 360°, the parameter unit is seconds, so

the maximum speed of the shaft = (800 / 60) \* 360)

- \* Default Dynamics: acceleration and deceleration setting
- \* Manual Motion and Homing: Set the point movement and parameter search

speed. The Manual Velocity (Fast) and Manual Velocity (Slow) are the high speed and

low speed of the Online control interface respectively

- \* Fast Axis Stop: The axis quick stop parameter can be set
- \* Limit Switches: Open soft limit position can be set
- \* Monitoring: Set the axis following error. Here Position Lag Monitoring needs to be

changed to FALSE, otherwise an alarm may occur during manual debugging

• Open the Settings tab to set the engineering unit when the motor

runs

Solution Explorer 🔹 👎 🗙	TwinCAT Project8 👒	×			
Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q	General Settings	Parameter Dy	mamics Or	nline Functions Co	oupling Compensation
Search Solution Explorer (Ctrl+;)		<u> </u>			
Solution 'TwinCAT Project8' (1 project)     TwinCAT Project8     SYSTEM     MOTION	Link To I/O Link To PLC		Drive 2 (iD	286-ECFA)	
<ul> <li>MOLTASK 1 SAF</li> <li>NC-Task 1 SVB</li> </ul>	Axis Type: CA	ANopen DS402/F	02/Profile MDP 742 (e.g. EtherCAT CoE Drive) 🗸 🗸		
Image Image Objects Ares	Unit:	m agree	Display (O Position: Velocity:	nly) m° "/min	Modulo
<ul> <li>Inputs</li> <li>Outputs</li> <li>PLC</li> </ul>	e	°/s		°/s2	°/s3
<ul> <li>SAFETY</li> <li>C++</li> <li>C++</li> </ul>	Axis Cycle Time	/ Access Divider	·		
	Divider:	1	÷	Cycle Time (ms):	2.000
<ul> <li>■ Device 3 (EtherCAT)</li> <li>■ Image</li> <li>■ Image</li> </ul>	Modulo:	0	× ·		
Z SyncUnits     Inputs     Durbute					

• Double-click Enc under Axis1 to open the Parameter tab to set the parameter for Enc (this parameter must be set)



\* Scaling Factor Numerator: The final engineering movement of the motor to turn around

### \* Scaling Factor Denominator: Number of encoder feedback pulses

For example, if the motor turns a circular load to move by 360°, then Scaling Factor Numerator =360°. In this case, the pulse volume of the default encoder is 10000, so Scaling Factor Denominator =10000.

Click (Activate Configuration) to activate the configuration, then click Drive 1



(EC 4S-P04D) to switch to the NC: Online tab for the following settings:

Click "SET", manually select Controller (enable), Feed Fw (forward), Feed Bw (reverse), and set Override (speed ratio), then click OK; or directly click ALL to enable axis, automatically set the speed ratio to 100%.

At this time, F1-F4 can be controlled to control the axis, set the target speed (limited by Manual Velocity (Fast) parameters) and target position, click F5 to start operation, F6 stops running, F9 is automatically returned to zero function, and not used when there is no reference point. Controller Kv-Factor is the axis positioning compensation. If the axis positioning is not accurate when the point moves, it can be adjusted appropriately (no more than 20).

#### • Introduction of the function of the debugging page





 Switch to NC: Functions tab, Set Actual Position can modify the current position of the axis. If the current position is set to 0, the current position is the origin, which will be lost after the TwinCAT restart. If it is the feedback of the absolute encoder type, then the restart is followed by the actual feedback position of the encoder as the current position.

	-1.476	0 -	etpoint Position: [°]	
			-1.4760	
dended Start		_		
tart Mode:	Endless +	~	Start	
arget Position:	1000	[°]	Stop	
arget Velocity:	4799	[°/s]		
Acceleration:	0	[°/s2]		
Deceleration:	300	[°/s2]	Last Time: [s]	
] Jerk:	0	[°/s3]	0.00000	
aw Drive Output				
Dutput Mode:	Percent	$\sim$	Start	
Output Value:	0	[%]	Stop	
et Actual Position	441 - 241			
Absolute	/ 0		Set	

2) Start Mode There are many debugging methods for single axis, commonly used as Absolute (absolute position movement), Relative (relative position movement), Endless + - (infinite forward and reverse), Modulo (modular value movement), Reversing Sequence (round trip sequence), Start / Stop Sequence (start and stop sequence), Velo Step Sequence (speed step sequence).

eneral	EtherCAT	DC	Process Data	Startup	CoE	- Online	Online	NC: Online	NC: Function	
-1.4760						Setpoint Position: [°] -1.4760				
Exten	ded Start						-			
Start	Mode:		Endless	+	~		Start			
Target Position: Target Velocity: Acceleration: Deceleration: Jerk:		Absolute Relative Endless Modulo Modulo Modulo Modulo	Absolute Relative Endless + Endless - Modulo Modulo shortest way Modulo plus direct. Modulo minus direct.			Stop Last Time: [5] 0.00000				
Raw E Outp Outp	Drive Outpu out Mode: out Value:	t	Jog + Jog - + 1 + 0.1 + 0.01 + 0.001	Jog + Jog - + 1 + 0.1 + 0.01 + 0.001 - 1 - 0.1 - 0.01			Start Stop Set			
Set A	ctual Positic olute arget Positi	on	- 1 - 0.1 - 0.01							
Abse	olute		<ul> <li>0.001</li> <li>Reversin Start/Sto</li> <li>Velo Step Sinus See Sinus Os</li> </ul>	g Sequen p Sequen p Sequence quence (B cillation	ce ce ce ode)		Set			

- \* 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) parameters.

### 3. Function introduction

Save the current settings

Where object 1010 is the save configuration parameter, the current version can only save 2004,2804,3004 and 3804 objects to save: 0x 65766173 after written through the 1010:01 object or 1010:04 object, the current configuration value will be written to FLASH, the power can be saved, and the 1010:01 or 1010:04 object will return 0x00000001 value.

• factory data reset

The main station can write the ASCII code "load": 0x 64616f 6c through 1011:01 or 1011:04 objects, then the module restores the factory setting parameters and writes the factory parameters to the FLASH, and the 1011:01 or 1011:04 objects will return 0x00000001 value.

Index		Name	Flags	Value		
Ė.	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	0x0000001 (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 Configration	RW	0x000F (15)		
	2804	Axis 2 Input IO Configration	RW	0x000F (15)		
	3004	Axis 3 Input IO Configration	RW	0x000F (15)		
1	3804	Axis 4 Input IO Configration	RW	0x000F (15)		

### • The DI signal mapping function

In axis 1, for example, the value of DI 0-3 is mapped to object 60 FD: bit0-3 by default, and object 2004h: bit0-3 is the remapping enable bit of DI 0-3. Modify the value of object 2004h: bit0 to 0, the value of DI 0 is mapped by the default 60 FD: bit0 to 60 FD: bit16, and the remaining DI signals can control the remapping in the same way. This parameter does not maintain power, using the "keep setting function" can achieve power retention.

#### • DI signal open on / closed setting

Take axis 1 as an example, the mapping value of DI 0-3 is 0 (normally open), the value of modified object 2004h: bit 8-11 is 1, the mapping value of DI 0-3 is 1 (normally closed), the mapping address is set by the "DI signal mapping function", the parameter is not maintained, using the "keep setting function" can achieve the power retention.

			2004h	60FD映射	2004h	60FD映射	2004h	开关类型	2004h	开关类型
DI	0		bit:0 = 1	bit0	bit:0 = 0	bit16	bit:8 = 0	常开	bit:8 = 1	常闭
DI	1	轴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		bit:0 = 1	bit0	bit:0 = 0	bit16	bit:8 = 0	常开	bit:8 = 1	常闭
DI	5	轴2	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	300 <b>4</b> h	开关类型	300 <b>4</b> h	开关类型
DI	8		bit:0 = 1	bit0	bit:0 = 0	bit16	bit:8 = 0	常开	bit:8 = 1	常闭
DI	9	轴3	bit:1 = 1	bit1	bit:1 = 0	bit17	bit:9 = 0	常开	bit:9 = 1	常闭
DI	Α		bit:2 = 1	bit2	bit:2 = 0	bit18	bit:10 = 0	常开	bit:10 = 1	常闭
DI	В		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	С		bit:0 = 1	bit0	bit:0 = 0	bit16	bit:8 = 0	常开	bit:8 = 1	常闭
DI	D	轴4	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2004b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