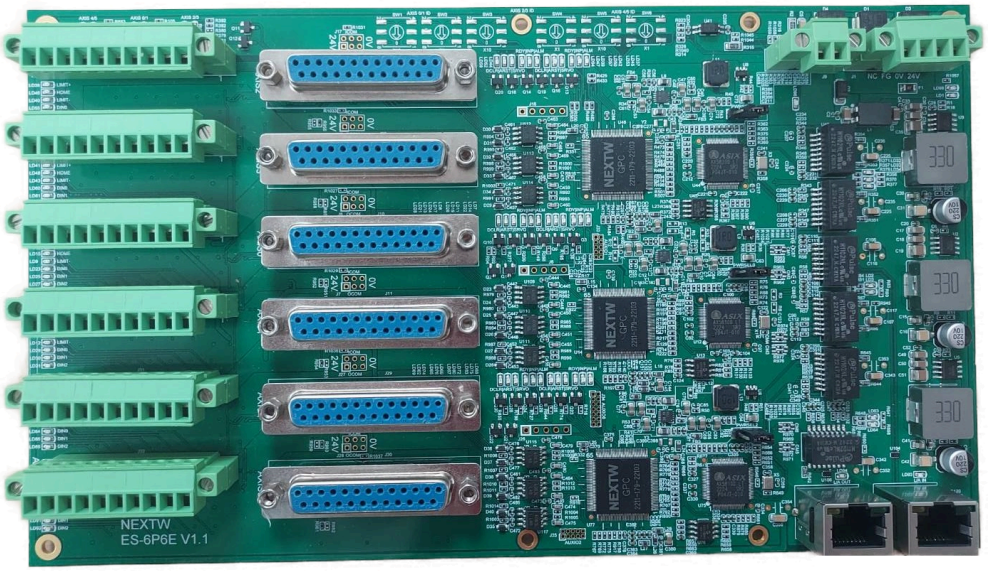
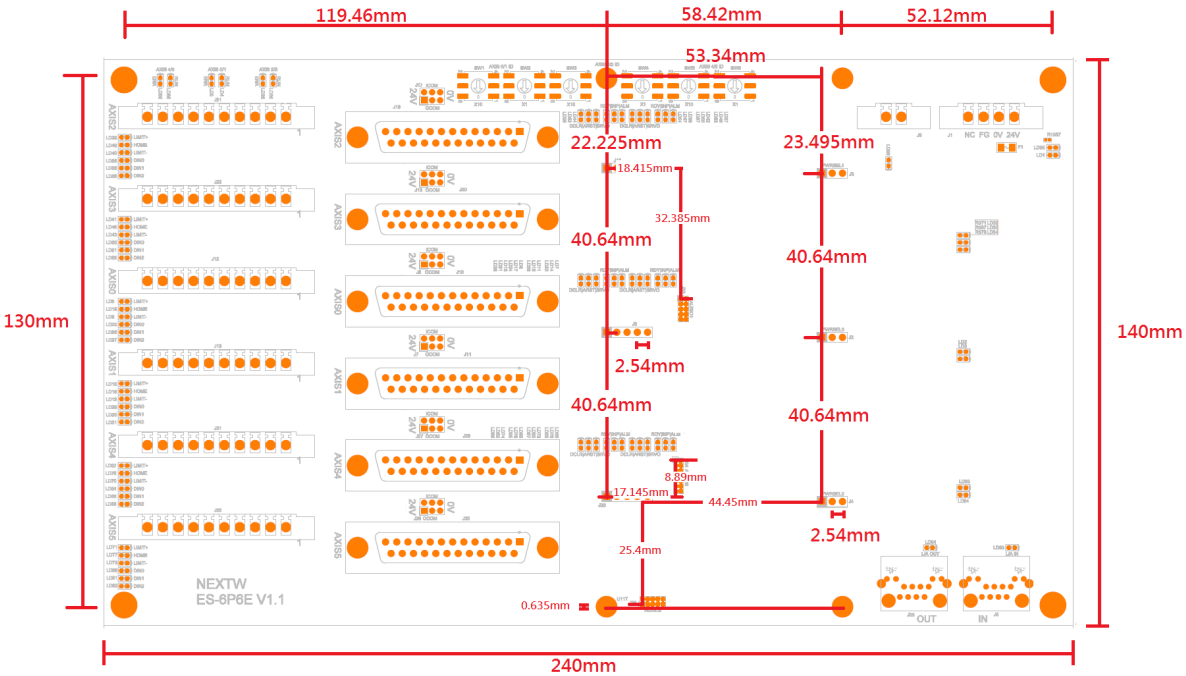
NEXTW
ES-6P6E
User Guide
V1.2

Chapter 1: Product Introduction





Overview

ES-6P6E is a pulse type EtherCAT slave module, featuring EtherCAT communication and CiA 402 device profile for machine automation applications requiring multi-axis synchronization control. With pulse type commands, ES-6P6E supports 6 sets pulse output, 6 sets encoder input, dedicated I/O points for servo control and mechanism to facilitate building up whole machines.

Key Features

- Multi-purpose EtherCAT module
- LED indicators for I/O status
- Supports EtherCAT Distributed Clock (DC)
- DI with 3,750 Vrms isolation
- DO with 1,500 Vrms isolation
- Quadrature encoder interface
- Support six motor drivers

1.1 Hardware Specifications

Pulse Output

- 6 sets of High Speed Pulse output
- Format: CW/CCW, Pulse/Direction

Quadrature Encoder Input

- 6 sets of Quadrature Encoder Input
- Type: Incremental
- Format: AB
- Index input
- Data length: 32bits

Digital Input and Output

- Input Voltage Range: 10V~30V
- Optical isolated

Power Requirements

- DC input range: DC 24V ±2V with over-voltage and reversed-voltage protection

EtherCAT

- Data transfer medium: Ethernet cable (CAT5e), shield type: S/STP or S/UTP
- Ethernet interface: 2x RJ-45
- Data transfer rate: 100Mbps, full duplex
- Protocol: EtherCAT
- Device profile: CiA 402

Environment

- Operating temperature: 0°C to 50°C
- Relative humidity:
  - 35~85%, non-condensation, operating
  - 10~90%, non-condensation, non-operating
- Dimension (mm): 140(W) x 240(L)

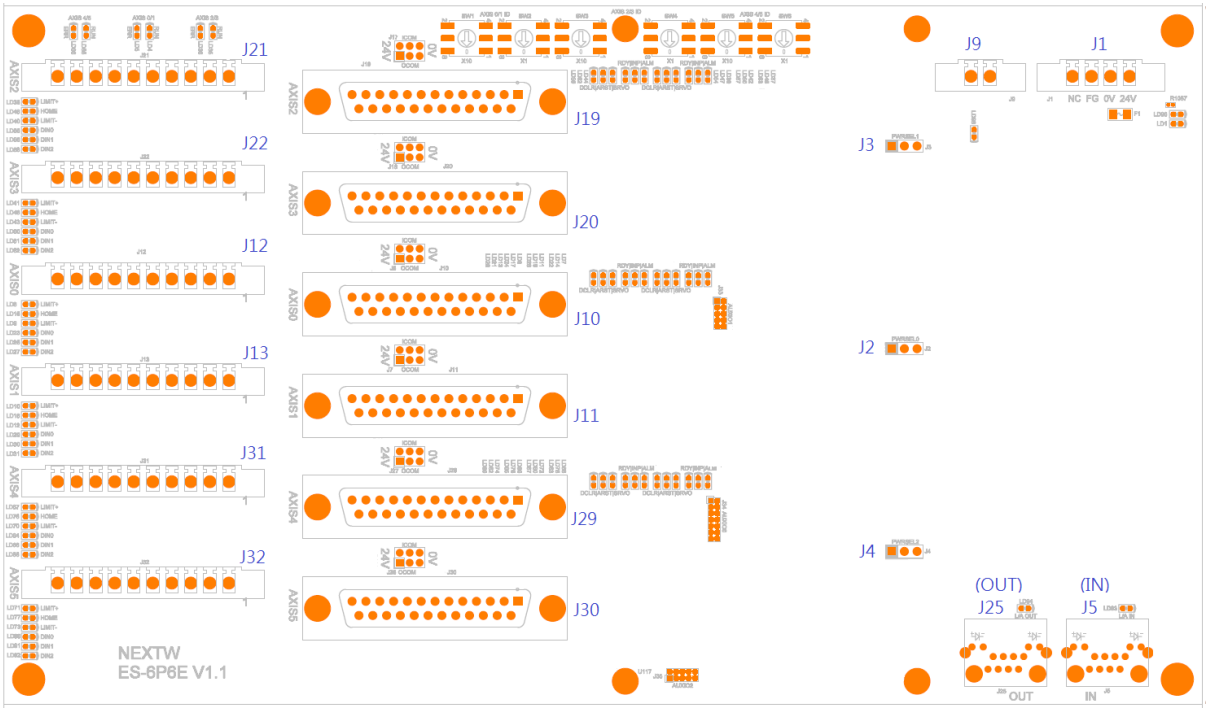
Chapter 2: Connector Pinout Assignments and Wiring Diagrams

2.1 Before You Begin

- Ensure you have a stable, clean working environment.
- Before working on any components, make sure that the power is off.
- Ground yourself before touching any components.
- Static electricity can damage many of the electronic components.

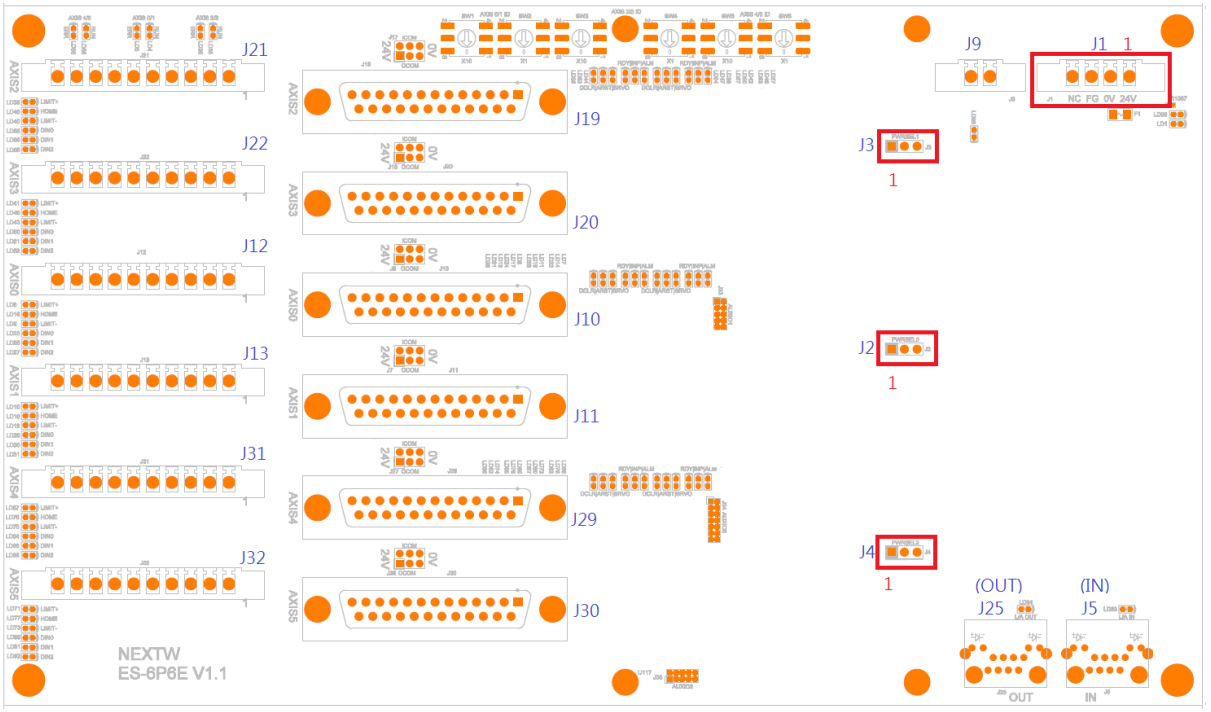
2.2 Locations of the Jumpers and Connectors

ES-6P6E (Mainboard/FRONT)



2.3 ES-6P6E Power Connector(J1)

J1



Pin Definition:

PIN	4	3	2	1
Type	IN	IN	IN	IN
Name	5V*	Earth Gnd	GND/0V	24V*

CAUTION:

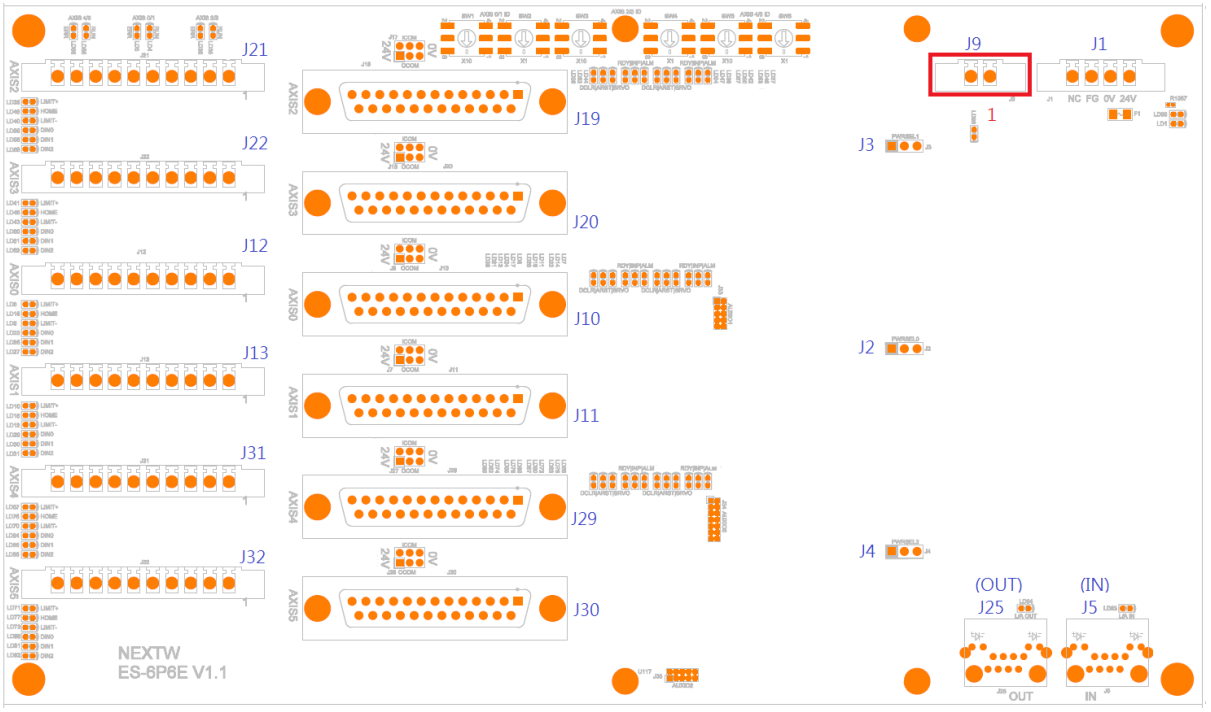
Case 1 : Using 24V

*** J1 PIN1 connect to 24V IN.**
*** J1 PIN4 unconnect to anything.**
*** J2 PIN2 and PIN3 must be short.**
*** J3 PIN2 and PIN3 must be short.**
*** J4 PIN2 and PIN3 must be short.**

Case 2 : Using 5V

*** J1 PIN4 connect to 5V IN.**
*** J1 PIN1 unconnect to anything.**
*** J2 PIN1 and PIN2 must be short.**
*** J3 PIN1 and PIN2 must be short.**
*** J4 PIN1 and PIN2 must be short.**

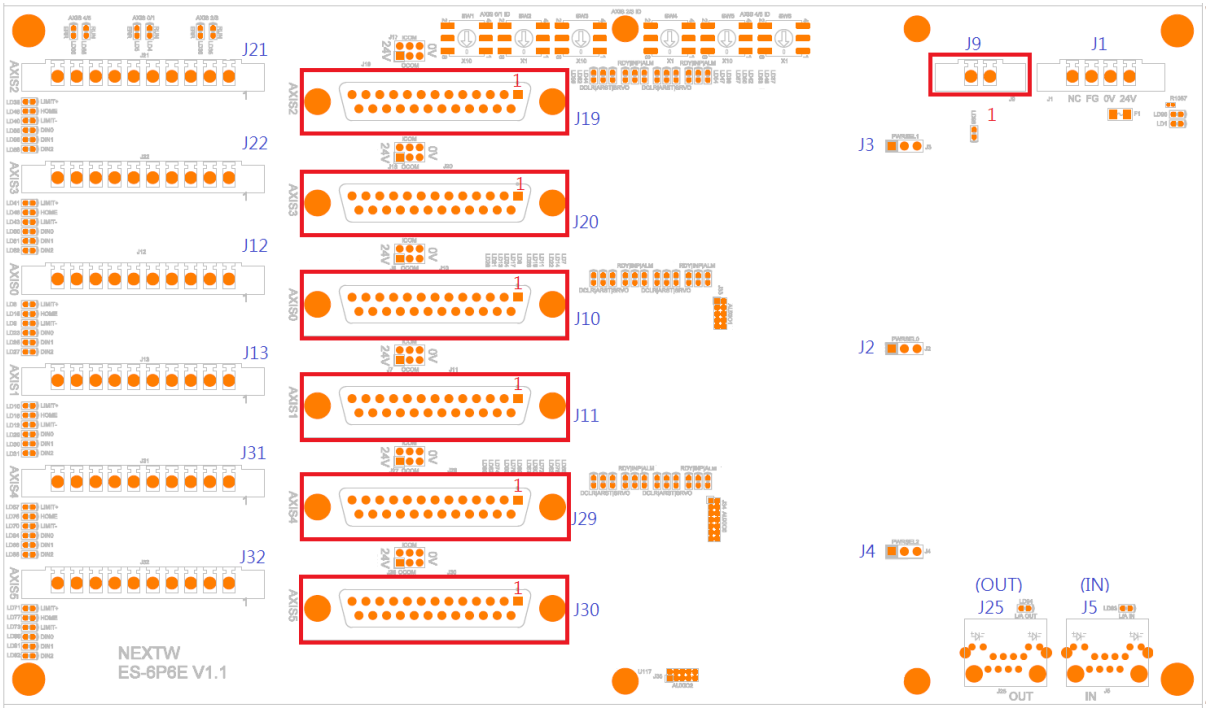
2.4 ES-6P6E ESTOP Connector(J9)



J9 Pin Definition:

PIN	2	1
Type	IN	IN
Name	ESTOP-	ESTOP+
Description	Emergency Stop Input -	Emergency Stop Input +

2.5 ES-6P6E DB25 Connector(J10 J11 J19 J20 J29 J30)



J10,J11,J19,J20,J29,J30 Pin Definition:

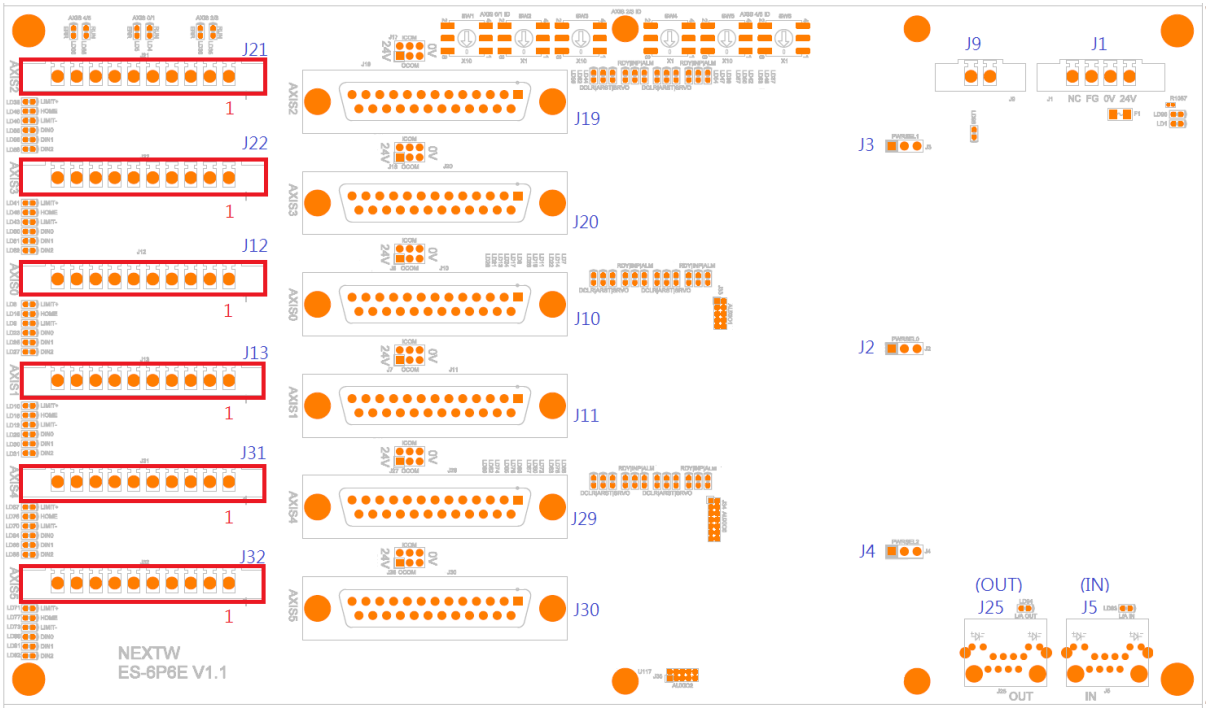
PIN	13	12	11	10	9	8	7	6	5	4	3	2	1
Type	PWR	IN	OUT	PWR	OUT	PWR	PWR	IN	IN	IN	OUT	IN	PWR
Name	GND	INP	PAN	GND	PBP	OCOM	ICOM	EZN	EBN	EAN	SERVO	ALM	GND

PIN	25	24	23	22	21	20	19	18	17	16	15	14
Type	OUT	PWR	OUT	OUT	PWR	PWR	IN	IN	IN	IN	OUT	PWR
Name	DCLR	GND	PAP	PBN	GND	GND	ECP	EBP	EAP	RDY	ARST	24V

Pin	Symbol	Definition	Pin	Symbol	Definition
1	GND	Digital ground	2	ALM	Alarm input
3	SERVO	Servo enable output	4	EAN	Differential encoder signal A, Negative
5	EBN	Differential encoder signal B, Negative	6	EZN	Differential encoder signal Z, Negative
7	ICOM	Input COM	8	OCOM	Output COM
9	PBP	Differential command signal DIR, Positive	10	GND	Digital ground

11	PAN	Differential command signal PULSE, Negative	12	INP	In-position input
13	GND	Digital ground	14	24V	24V output
15	ARST	Alarm reset output	16	RDY	Servo ready input
17	EAP	Differential encoder signal A, Positive	18	EBP	Differential encoder signal B, Positive
19	ECP	Differential encoder signal Z, Positive	20	GND	Digital ground
21	GND	Digital ground	22	PBN	Differential command signal DIR, Negative
23	PAP	Differential command signal PULSE, Positive	24	GND	Digital ground
25	DCLR	Deviation counter clear output			

2.6 ES-6P6E 1X10 Connector(J21 J22 J12 J13 J31 J32)

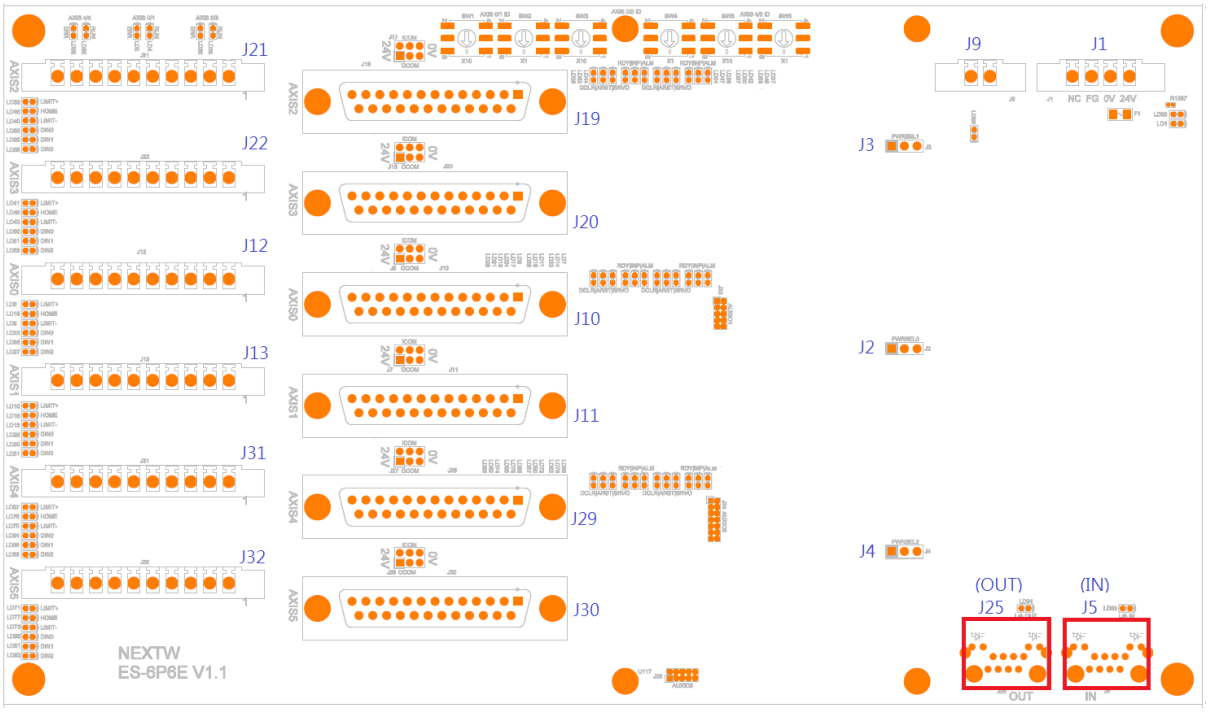


J21,J22,J12,J13,J31,J32 Pin Definition:

PIN	10	9	8	7	6	5	4	3	2	1
Type	PWR	OUT	OUT	IN	IN	IN	IN	IN	IN	PWR
Name	GND	COMP-	COMP+	DIN2	DIN1	DIN0	Limit-	Home	Limit+	24V

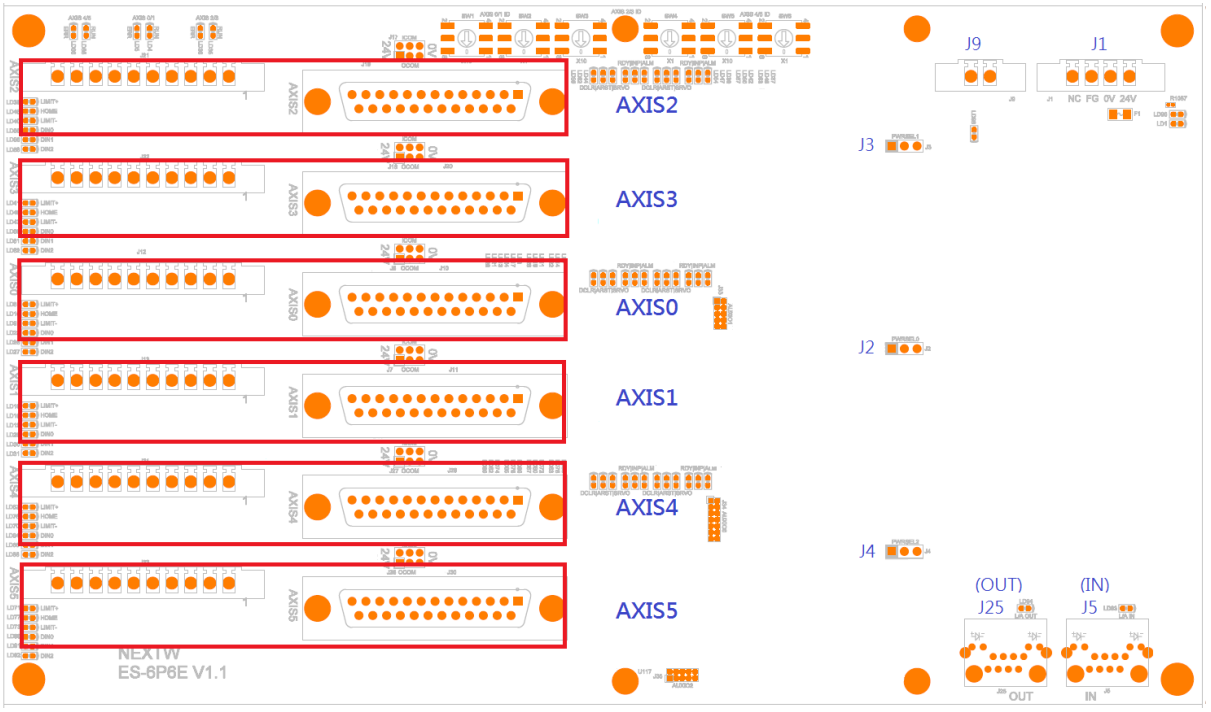
Pin	Symbol	Definition
1	24V	24V output
2	Limit+	Forward Limit sensor input
3	Home	Home sensor input
4	Limit-	Reverse Limit sensor input
5	DIN0	Uncommitted digital input 0
6	DIN1	Uncommitted digital input 1
7	DIN2	Uncommitted digital input 2
8	COMP+	Compare Trigger Output (COMP+)
9	COMP-	Compare Trigger Output (COMP-)
10	GND	Digital ground

2.7 ES-6P6E EtherCAT Connector(J25 J5)



J5: EtherCAT IN
J25: EtherCAT OUT

2.8 ES-6P6E AXIS



AXIS	DB25	1X10 PIN HEADER
AXIS0	J10	J12
AXIS1	J11	J13
AXIS2	J19	J21
AXIS3	J20	J22
AXIS4	J29	J31
AXIS5	J30	J32

Chapter 3: Operation with TwinCAT and ECM-SK

3.1 EtherCAT Slave Information (ESI)

According to EtherCAT standard document ETG.2000, every EtherCAT slave must be delivered an ESI file (a XML format to describe EtherCAT slave information) for the EtherCAT Master. The ESI file contains the necessary communication settings for the ES-6P6E.

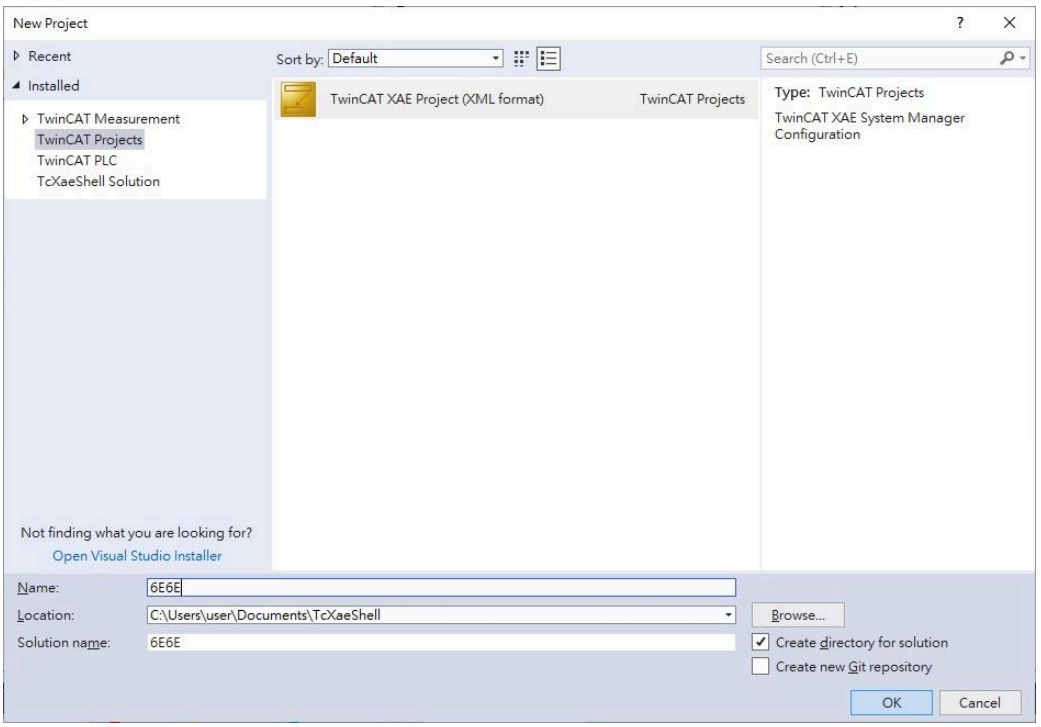
3.2 Using TwinCAT 3 to Control ES-6P6E

STEP1. Check the ESI file is loaded into TwinCAT Specified path.
Default path is **C:\TwinCAT\3.x\Config\Io\EtherCAT**

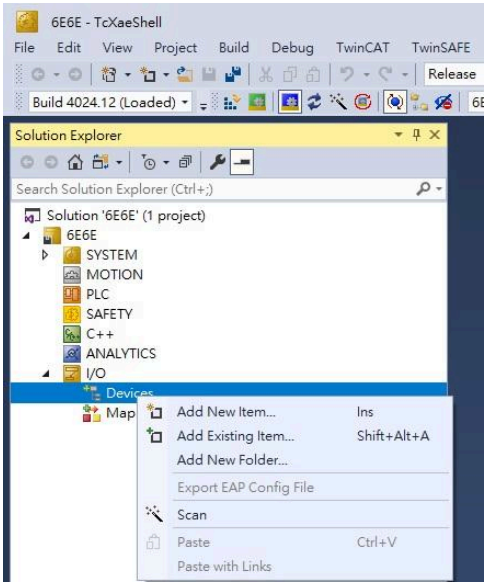
STEP2. Open TwinCAT XAE

STEP3. Create a new TwinCAT project
Select **File>New>Project** in the menu bar.

STEP4. Enter the new project name, click “OK”

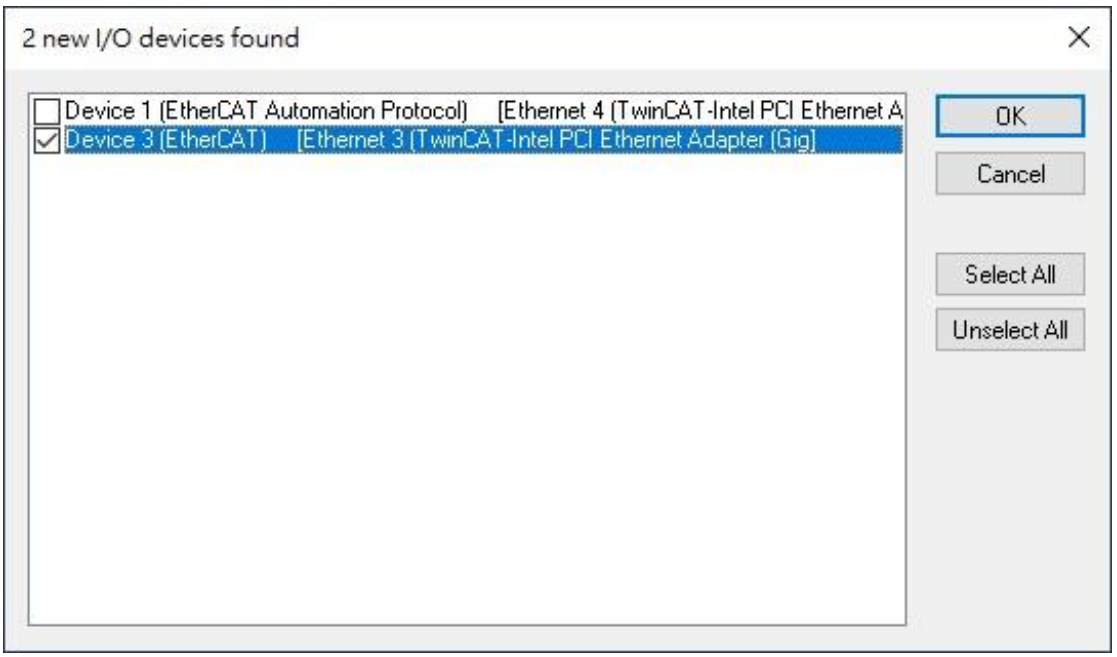


STEP5. Check the ethernet cable is correctly connected and then right click the Devices, click “Scan”

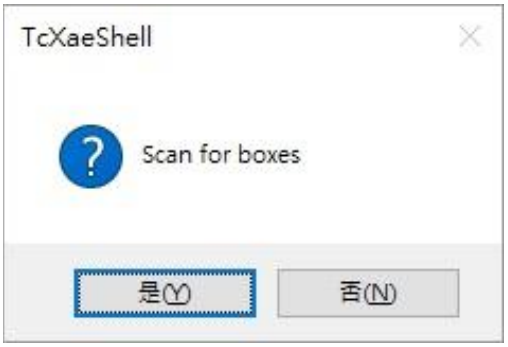


STEP6. Click “OK”

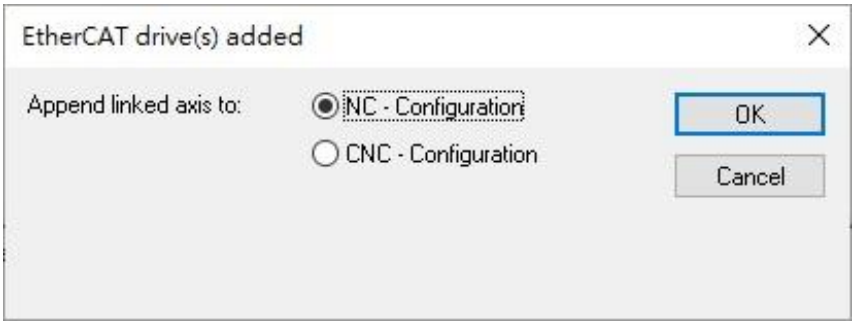
STEP7. Keeping the checkbox checked, click “OK”



STEP8. Click “OK”



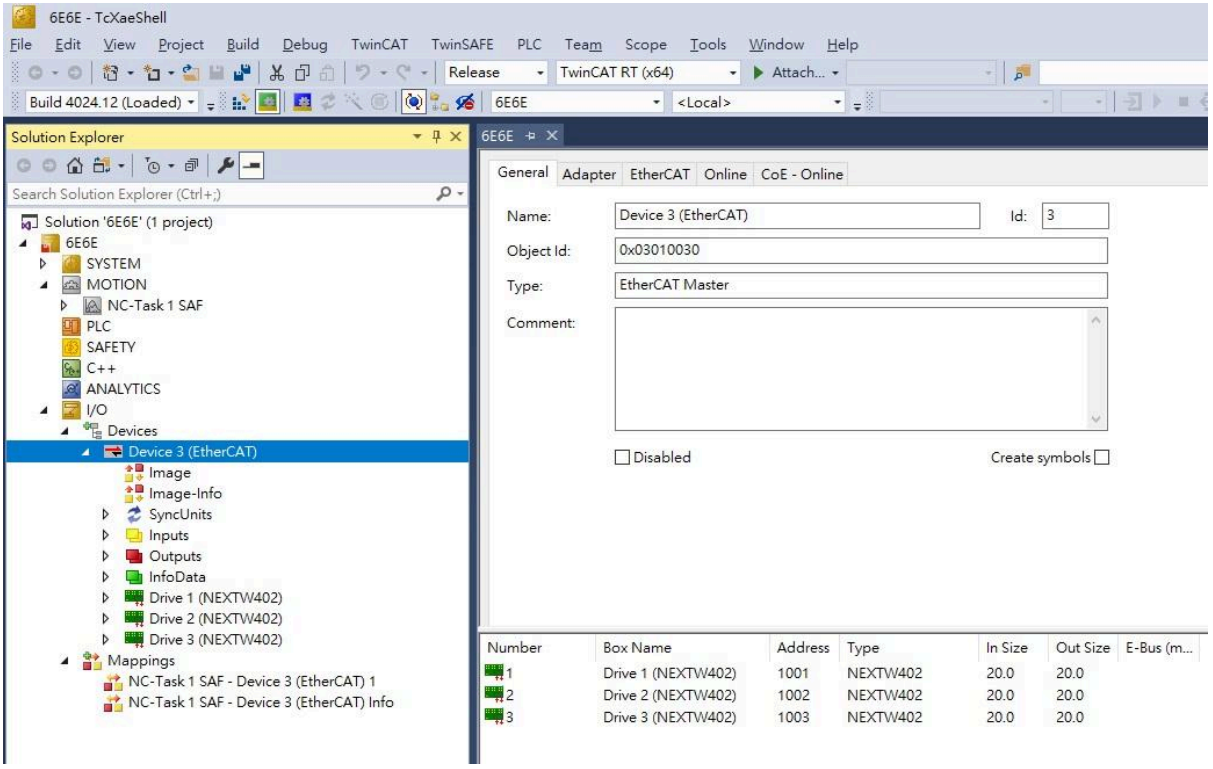
STEP9. EtherCAT driver(s) added, tick the suitable Configuration, click “OK”



STEP10. Activate Free Run

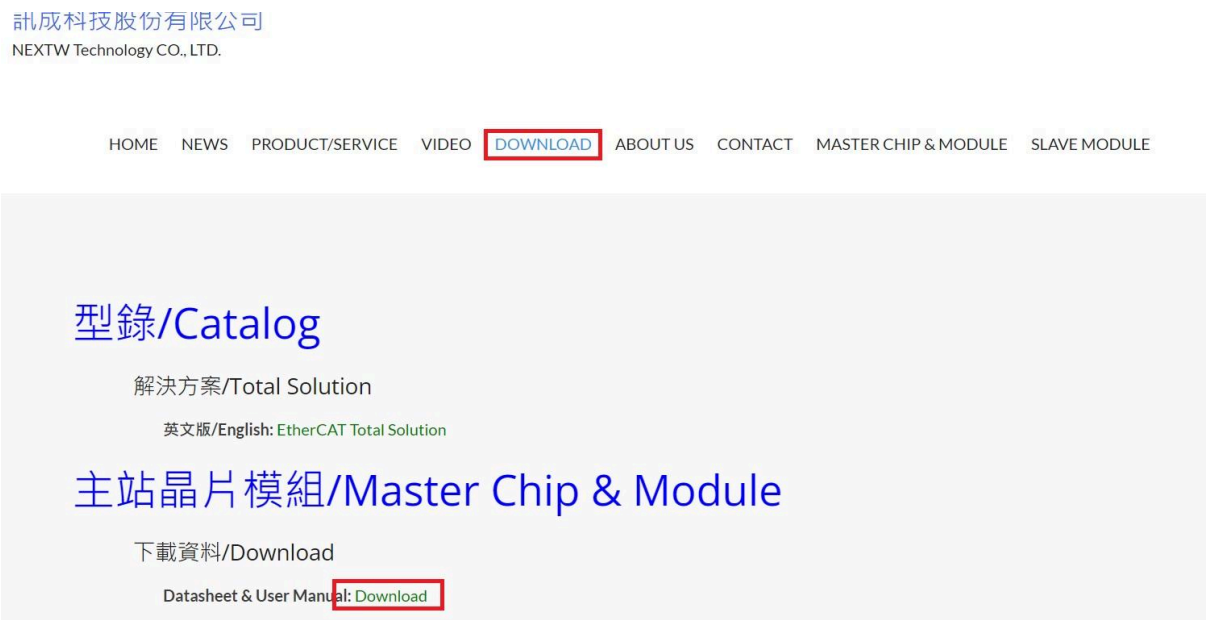
STEP11. After successful scanning, you can see three NEXTW402 drives in TwinCAT project.

STEP12. Select **TwinCAT>Activate Configuration** in the menu bar to active run mode.



3.3 Using NEXTW ECM-XFU-SK to control ES-6P6E

STEP1. Browse NEXTW webpage (https://www.nextw.com.tw), go to download page, and then click the link below.

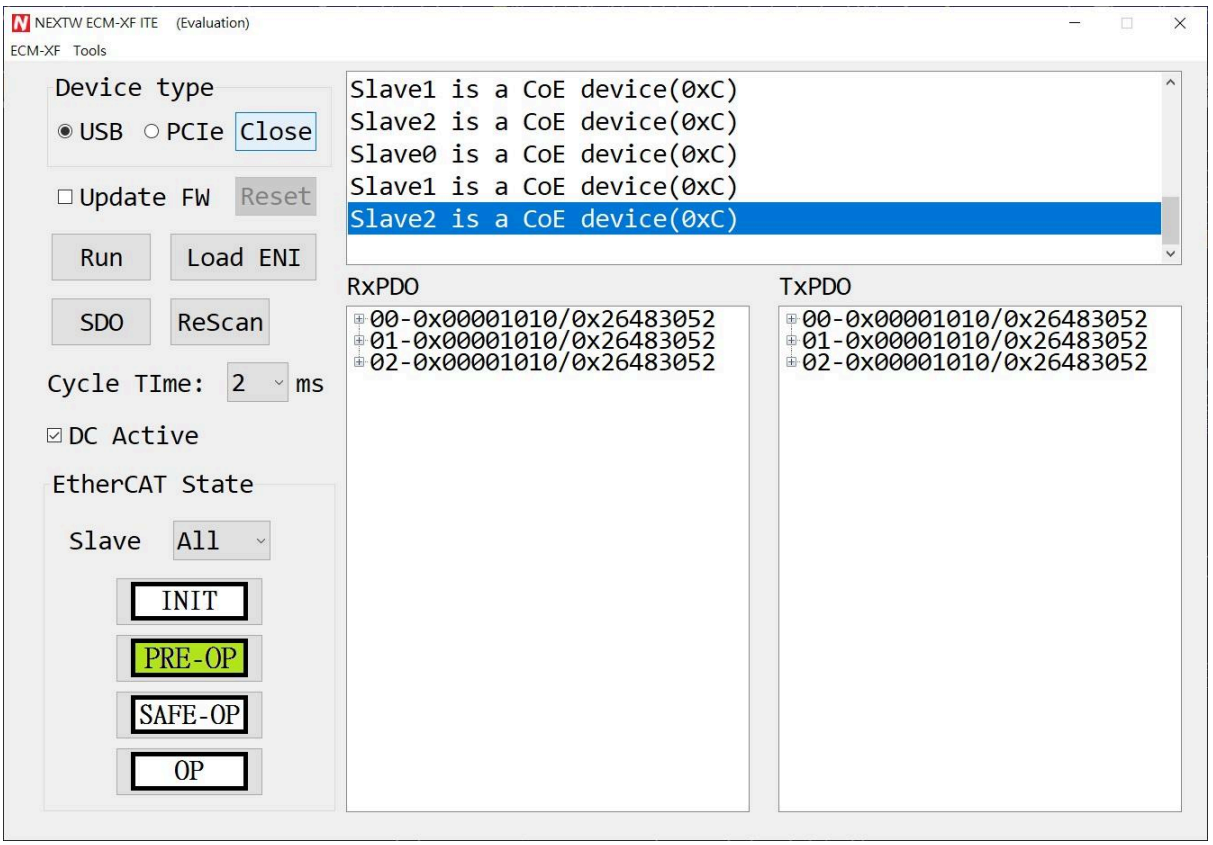


Search ‘ECM_XFU_XF_ITE.zip’, and click it to start downloading.

STEP2. Extract ‘ECM_XFU_XF_ITE.zip’, and then execute EcmITE.exe

STEP3. Connect NEXTW ECM-XFU-SK and EtherCAT slave with an ethernet cable. Connect PC and NEXTW ECM-XFU-SK with a USB cable.

STEP4. Clicking the “Open” button, theECM-XFU-SK should find three slaves.



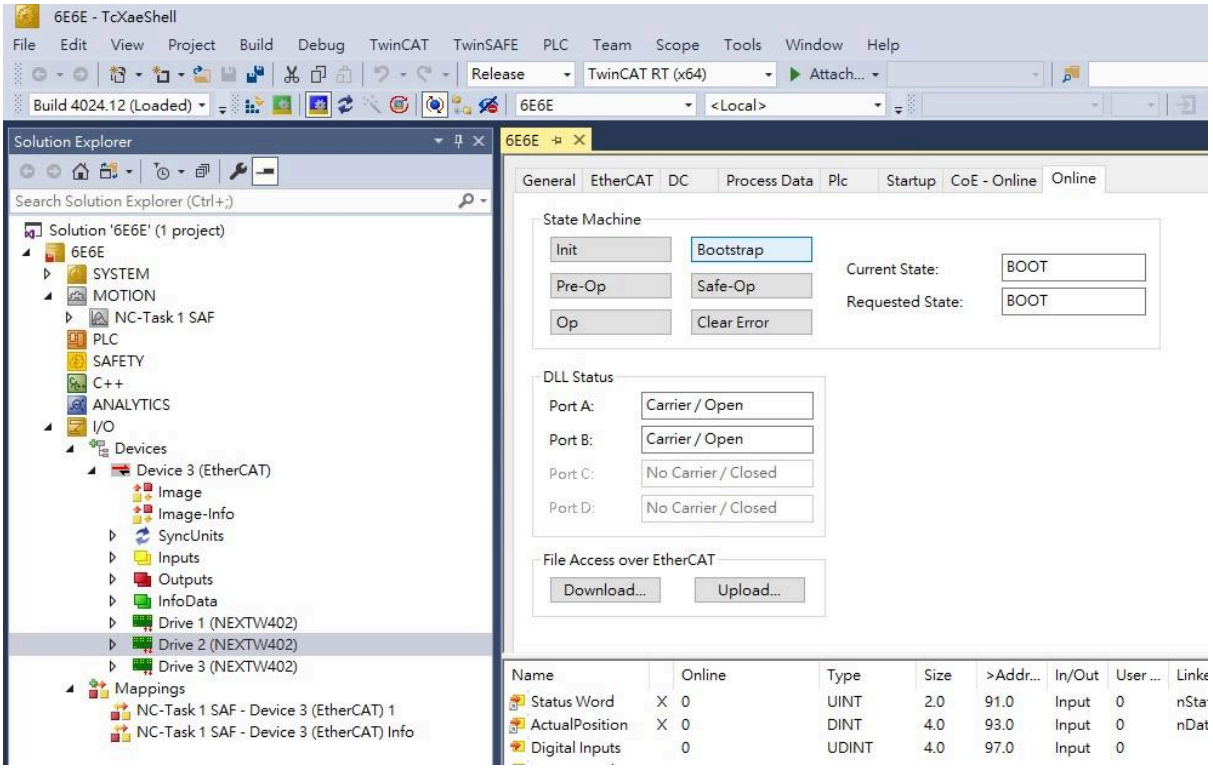
STEP5. Clicking the ‘SAFE-OP’ button, then clicking the ‘OP’ button, the slaves will enter OP state.

3.4 Update Firmware via TwinCAT 3

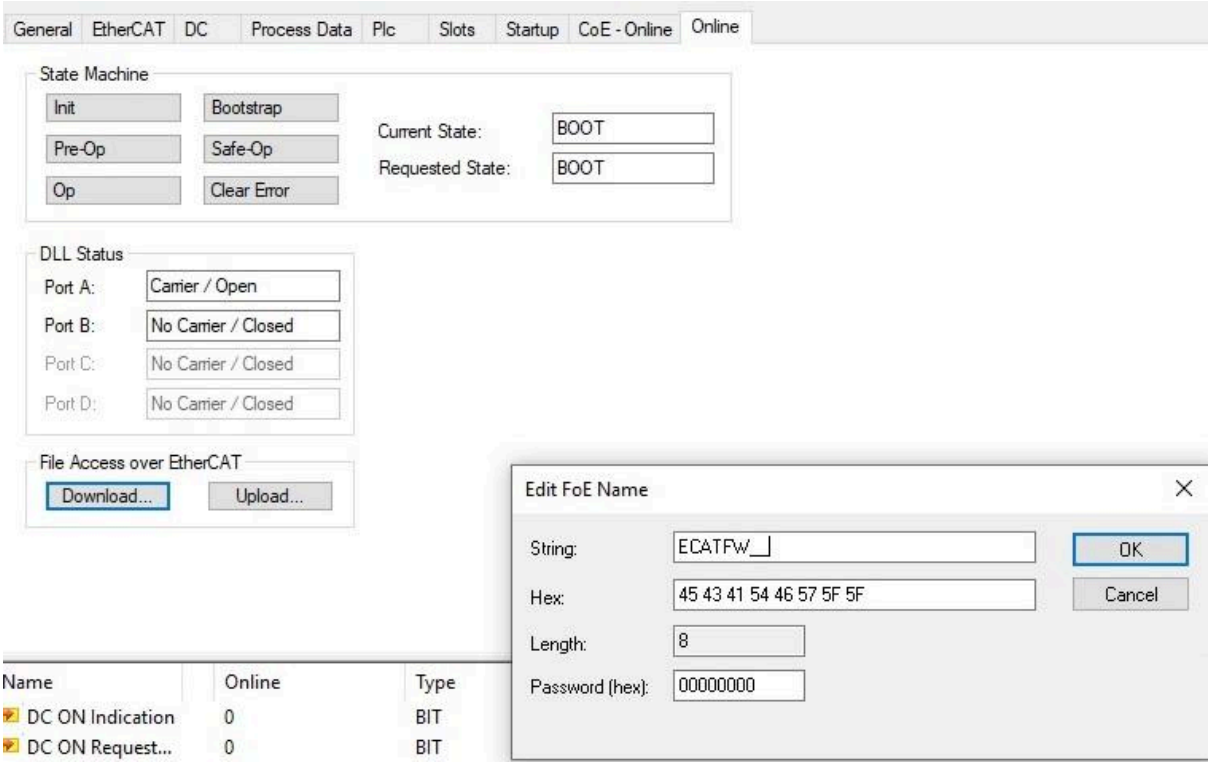
STEP1. Connect PC and ES-6P6E, open TwinCAT project, and scan slaves (refer to Chapter 3.2)

STEP2. Select drive in the left side menu, and then goto the ‘Online’ page in the mainframe.

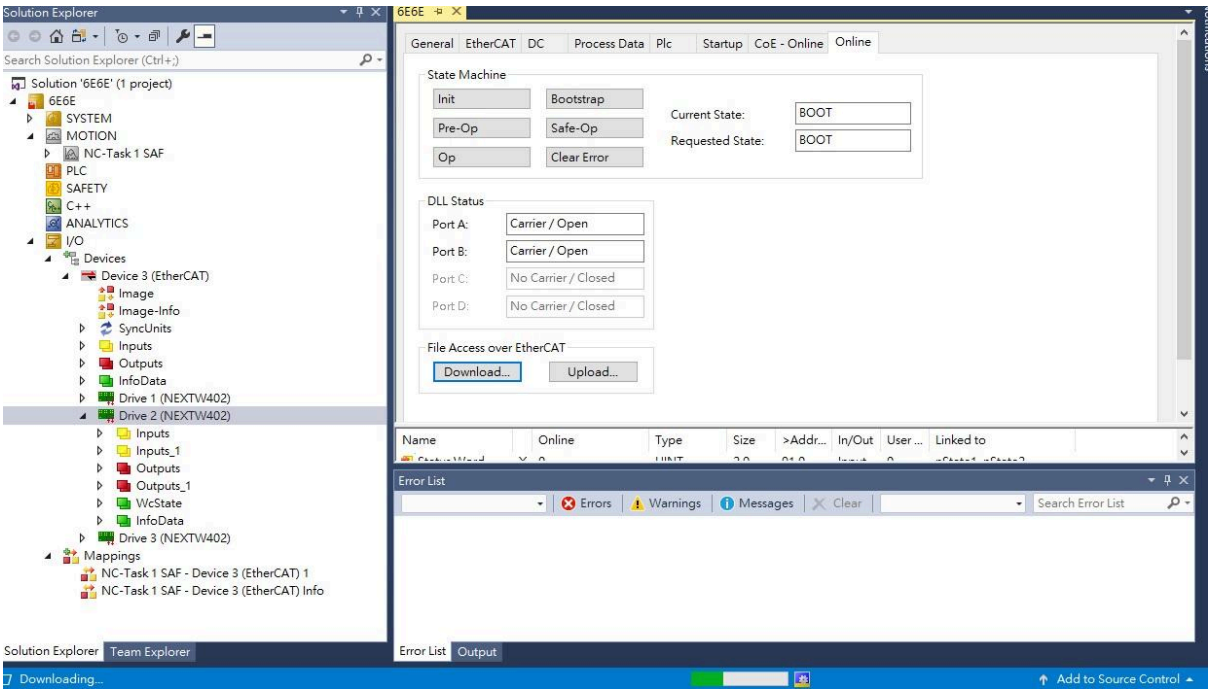
STEP3. Click the ‘Init’ button and then click the ‘Bootstrap’ button.



STEP4. Click the ‘Download’ button and choose the firmware file. Edit FoE Name to **ECATFW__** and click the ‘OK’ button.



STEP5. Wait downloading complete, and click the ‘Init’ button to finish firmware uploading.



Chapter 4: Object Dictionary

4.1 Architecture of Object Dictionary

Index (Hex)	Meaning
0x0000~0x0FFF	Reserved
0x1000~0x1FFF	CoE communication objects
0x2000~0x5FFF	Manufacturer Specific Objects
0x6000~0x7FFF	CANOpen CiA 402 Profile Specific Objects

4.2 Object Type and Attributes

Code	C/C++ type	Description	Size (byte)	Range
USINT	uint8_t	unsigned byte	1	0~255
UINT	uint16_t	unsigned short integer	2	0~65535

UDINT	**uint32_t**	**unsigned long integer**	**4**	**0~4294967295**
SINT	**int8_t**	**signed byte**	**1**	**-128~127**
INT	**int16_t**	**signed short integer**	**2**	**-32768~32767**
DINT	**int32_t**	**signed long integer**	**4**	**-2147483648~ 2147483647**
STRING	**-**	**string value**	**-**	**-**

Attribute	**Description**
RO	**This object is only for read.**
WO	**This object is only for write.**
RW	**This object can be read and write.**

4.3 Object Dictionary List

Object Dictionaries		**Refer to**
General Objects	**Device Type (1000h)**	**4.4**
	Manufacturer Device Name (1008h)	**4.4**
	Manufacturer Hardware Version (1009h)	**4.4**
	Manufacturer Software Version (100Ah)	**4.4**
	Identity Object (1018h)	**4.4**

	Error Settings(10F1h)	**4.4**
PDO Mapping Objects	**Receive PDO Mapping (1600h to 1602h) &(1610h to 1612h)**	**4.4**
	Transmit PDO Mapping (1A00h to 1A02h) &(1A10h to 1A12h)	**4.4**
Sync Manager Communication Objects	**Sync Manager Type (1C00h)**	**4.4**
	RxPDO assign (1C12h)	**4.4**
	TxPDO assign (1C13h)	**4.4**
	SM output parameter (1C32h)	**4.4**
	SM input parameter (1C33h)	**4.4**
Manufacturer Specific Objects	**Pulse Mode (2000h)**	**4.5**
	Acceleration Divisor (2001h)	**4.5**
	Encoder Enable (2004h)	**4.5**
	Digital Input Setting (2005h)	**4.5**
	Digital Input Active Level (2006h)	**4.5**
	Digital Output Setting (2007h)	**4.5**
	Digital Output Active Level (2008h)	**4.5**
	Pulse Mode (2800h)	**4.5**
	Acceleration Divisor (2801h)	**4.5**
	Encoder Enable (2804h)	**4.5**
	Digital Input Setting (2805h)	**4.5**
	Digital Input Active Level (2806h)	**4.5**
	Digital Output Setting (2807h)	**4.5**
	Digital Output Active Level (2808h)	**4.5**

Device Control	Error Code (603Fh)	4.6
	Control Word (6040h)	4.6
	Status Word (6041h)	4.6
	Quickstop Option Code (605Ah)	4.6
	Shutdown Option Code (605Bh)	4.6
	Disable Operation Option Code (605Ch)	4.6
	Halt Option Code (605Dh)	4.6
	Fault Reaction Code (605Eh)	4.6
	Modes of Operation (6060h)	4.6
	Modes of Operation Display (6061h)	4.6
	Supported Drive Modes (6502h)	4.6
	Error Code (683Fh)	4.6
	Control Word(6840h)	4.6
	Status Word(6841h)	4.6
	Quickstop Option Code(685Ah)	4.6
	Shutdown Option Code (685Bh)	4.6
	Disable Operation Option Code (685Ch)	4.6
	Halt Option Code (685Dh)	4.6
	Fault Reaction Code (685Eh)	4.6
	Modes of Operation (6860h)	4.6
	Modes of Operation Display (6861h)	4.6
	Supported Drive Modes(6d02h)	4.6
Cyclic Synchronous Position Mode/ Cyclic Synchronous Velocity Mode	Position Actual Value (6064h)	4.6
	Velocity Actual Value (606Ch)	4.6
	Target Position (607Ah)	4.6
	Software Position Limit (607Dh)	4.6
	Profile Acceleration (6083h)	4.6

	Profile Deceleration (6084h)	4.6
	Quick stop Deceleration (6085h)	4.6
	Target Velocity (60FFh)	4.6
	Interpolation Time (60C2h)	4.6
	Position Actual Value (6864h)	4.6
	Velocity Actual Value (686Ch)	4.6
	Target Position (687Ah)	4.6
	Software Position Limit (687Dh)	4.6
	Profile Acceleration (6883h)	4.6
	Profile Deceleration (6884h)	4.6
	Quickstop Declaration (6885h)	4.6
	Target Velocity(68FFh)	4.6
	Interpolation Time (68C2h)	4.6
Homing Mode	Homing Offset (607Ch)	4.6
	Homing Method (6098h)	4.6
	Homing Speed(6099h)	4.6
	Homing Acceleration (609Ah)	4.6
	Homing Offset(687Ch)	4.6
	Homing Method(6898h)	4.6
	Homing Speed(6899h)	4.6
	Homing Acceleration (689Ah)	4.6
Digital Inputs/Outputs	Digital Inputs(60FDh)	4.6
	Digital Outputs(60FEh)	4.6
	Digital Inputs(68FDh)	4.6
	Digital Outputs(68FEh)	4.6

4.4 CoE Communication Objects (0x1000~0x1FFF)

Device type

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1000	00	Device type	UDINT	RO	N	0x192

• 0x1000:00 Device type: 0x192 (DS402 device)

Device name

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1008	00	Device name	STRING	RO	N	ES-6P6E

Hardware version

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1009	00	Hardwar e version	STRING	RO	N	1.0

Software version

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x100A	00	Software version	STRING	RO	N	-

Identity

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1018	00	Count	USINT	RO	N	4
	01	Vendor ID	UDINT	RO	N	0x1010
	02	Product code	UDINT	RO	N	0x200
	03	Revision	UDINT	RO	N	0

	04	Serial number	UDINT	RO	N	0

Error Settings

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x10F1	00	Count	USINT	RO	N	2
	01	Local Error Reaction	Reserved	-	-	-
	02	Sync Error Counter Limit	UINT	RW	N	4

• 0x10F1:02 Sync Error Counter Limit:
In DC mode, if the local error counter reaches the limit, the EtherCAT state machine will change to SAFEOP state. The local error counter is set to 0 when the state machine changing to OP state. If the slave miss an SM2 event between two Sync0 event, the local error counter increases by 3; otherwise, the counter decreases by 1.

CSP/CSV RxPDO of Axis 0

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1600	00	Count	USINT	RO	N	5
	01	The 1st RxPDO entry	UDINT	RO	N	0x60400010
	02	The 2nd RxPDO entry	UDINT	RO	N	0x607A0020
	03	The 3rd RxPDO entry	UDINT	RO	N	0x60FF0020
	04	The 4th RxPDO entry	UDINT	RO	N	0x60600008

	05	The 5th RxPDO entry	UDINT	RO	N	0x00000008

• 0x1600:01 The 1st RxPDO entry: 0x6040:00 (Control word of Axis 0)
• 0x1600:02 The 2nd RxPDO entry: 0x607A:00 (Target position of Axis 0)
• 0x1600:03 The 3rd RxPDO entry: 0x60FF:00 (Target velocity of Axis 0)
• 0x1600:04 The 4th RxPDO entry: 0x6060:00 (Mode of operation of Axis 0)
• 0x1600:05 The 5th RxPDO entry: padding byte

CSP RxPDO of Axis 0

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1601	00	Count	USINT	RO	N	3
	01	The 1st RxPDO entry	UDINT	RO	N	0x60400010
	02	The 2nd RxPDO entry	UDINT	RO	N	0x607A0020
	03	The 3rd RxPDO entry	UDINT	RO	N	0x60FE0120

• 0x1601:01 The 1st RxPDO entry: 0x6040:00 (Control word of Axis 0)
• 0x1601:02 The 2nd RxPDO entry: 0x607A:00 (Target position of Axis 0)
• 0x1601:03 The 3rd RxPDO entry: 0x60FE:00 (Digital outputs of channel 0 to 7)

CSV RxPDO of Axis 0

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1602	00	Count	USINT	RO	N	3
	01	The 1st RxPDO entry	UDINT	RO	N	0x60400010

	02	The 2nd RxPDO entry	UDINT	RO	N	0x60FF0020
	03	The 3rd RxPDO entry	UDINT	RO	N	0x60FE0120

• 0x1602:01 The 1st RxPDO entry: 0x6040:00 (Control word of Axis 0)
• 0x1602:02 The 2nd RxPDO entry: 0x60FF:00 (Target velocity of Axis 0)
• 0x1602:03 The 3rd RxPDO entry: 0x60FE:00 (Digital outputs of channel 0 to 7)

CSP/CSV RxPDO of Axis 1

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1610	00	Count	USINT	RO	N	5
	01	The 1st RxPDO entry	UDINT	RO	N	0x68400010
	02	The 2nd RxPDO entry	UDINT	RO	N	0x687A0020
	03	The 3rd RxPDO entry	UDINT	RO	N	0x68FF0020
	04	The 4th RxPDO entry	UDINT	RO	N	0x68600008
	05	The 5th RxPDO entry	UDINT	RO	N	0x00000008

• 0x1610:01 The 1st RxPDO entry: 0x6840:00 (Control word of Axis 1)
• 0x1610:02 The 2nd RxPDO entry: 0x687A:00 (Target position of Axis 1)
• 0x1610:03 The 3rd RxPDO entry: 0x68FF:00 (Target velocity of Axis 1)
• 0x1610:04 The 4th RxPDO entry: 0x6860:00 (Mode of operation of Axis 1)
• 0x1610:05 The 5th RxPDO entry: padding byte

CSP RxPDO of Axis 1

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1611	00	Count	USINT	RO	N	3
	01	The 1st RxPDO entry	UDINT	RO	N	0x68400 010
	02	The 2nd RxPDO entry	UDINT	RO	N	0x687A0 020
	03	The 3rd RxPDO entry	UDINT	RO	N	0x68FE0 120

• 0x1611:01 The 1st RxPDO entry: 0x6840:00 (Control word of Axis 1)
• 0x1611:02 The 2nd RxPDO entry: 0x687A:00 (Target position of Axis 1)
• 0x1611:03 The 3rd RxPDO entry: 0x68FE:00 (Digital outputs of channel 8 to 15)

CSV RxPDO of Axis 1

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1612	00	Count	USINT	RO	N	3
	01	The 1st RxPDO entry	UDINT	RO	N	0x68400 010
	02	The 2nd RxPDO entr	UDINT	RO	N	0x68FF0 020
	03	The 3rd RxPDO entry	UDINT	RO	N	0x68FE0 120

• 0x1612:01 The 1st RxPDO entry: 0x6840:00 (Control word of Axis 1)
• 0x1612:02 The 2nd RxPDO entry: 0x68FF:00 (Target velocity of Axis 1)
• 0x1612:03 The 3rd RxPDO entry: 0x68FE:00 (Digital outputs of channel 8 to 15)

CSP/CSV TxPDO of Axis 0

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1A00	00	Count	USINT	RO	N	5
	01	The 1st TxPDO entry	UDINT	RO	N	0x60410 010
	02	The 2nd TxPDO entry	UDINT	RO	N	0x60640 020
	03	The 3rd TxPDO entry	UDINT	RO	N	0x606C0 020
	04	The 4th TxPDO entry	UDINT	RO	N	0x60610 008
	05	The 5th TxPDO entry	UDINT	RO	N	0x00000 008

- 0x1A00:01 The 1st TxPDO entry: 0x6041:00 (Status word of Axis 0)
- 0x1A00:02 The 2nd TxPDO entry: 0x6064:00 (Actual position of Axis 0)
- 0x1A00:03 The 3rd TxPDO entry: 0x606C:00 (Actual velocity of Axis 0)
- 0x1A00:04 The 4th TxPDO entry: 0x6061:00 (Mode of operation display of Axis 0)
- 0x1A00:05 The 5th TxPDO entry: padding byte

csp TxPDO of Axis 0

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1A01	00	Count	USINT	RO	N	3
	01	The 1st TxPDO entry	UDINT	RO	N	0x60410 010

	02	The 2nd TxPDO entry	UDINT	RO	N	0x60640020
	03	The 3rd TxPDO entry	UDINT	RO	N	0x60FD0020

• 0x1A01:01 The 1st TxPDO entry: 0x6041:00 (Status word of Axis 0)
• 0x1A01:02 The 2nd TxPDO entry: 0x6064:00 (Target position of Axis 0)
• 0x1A01:03 The 3rd TxPDO entry: 0x60FD:00 (Digital inputs of channel 0 to 7)

CSV TxPDO of Axis 0

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1A02	00	Count	USINT	RO	N	3
	01	The 1st TxPDO entry	UDINT	RO	N	0x60410010
	02	The 2nd TxPDO entry	UDINT	RO	N	0x60640020
	03	The 3rd TxPDO entry	UDINT	RO	N	0x60FD0020

• 0x1A02:01 The 1st TxPDO entry: 0x6041:00 (Status word of Axis 0)
• 0x1A02:02 The 2nd TxPDO entry: 0x6064:00 (Target position of Axis 0)
• 0x1A02:03 The 3rd TxPDO entry: 0x60FD:00 (Digital inputs of channel 0 to 7)

CSP/CSV TxPDO of Axis 1

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1A10	00	Count	USINT	RO	N	5
	01	The 1st TxPDO entry	UDINT	RO	N	0x68410010

	02	The 2nd TxPDO entry	UDINT	RO	N	0x68640 020
	03	The 3rd TxPDO entry	UDINT	RO	N	0x686C0 020
	04	The 4th TxPDO entry	UDINT	RO	N	0x68610 008
	05	The 5th TxPDO entry	UDINT	RO	N	0x00000 008

• 0x1A10:01 The 1st TxPDO entry: 0x6841:00 (Status word of Axis 0)
• 0x1A10:02 The 2nd TxPDO entry: 0x6864:00 (Actual position of Axis 0)
• 0x1A10:03 The 3rd TxPDO entry: 0x686C:00 (Actual velocity of Axis 0)
• 0x1A10:04 The 4th TxPDO entry: 0x6861:00 (Mode of operation display of Axis 0)
• 0x1A10:05 The 5th TxPDO entry: padding byte

csp TxPDO of Axis 2

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1A11	00	Count	USINT	RO	N	3
	01	The 1st TxPDO entry	UDINT	RO	N	0x68410 010
	02	The 2nd TxPDO entry	UDINT	RO	N	0x68640 020
	03	The 3rd TxPDO entry	UDINT	RO	N	0x68FD0 020

• 0x1A11:01 The 1st TxPDO entry: 0x6841:00 (Status word of Axis 1)
• 0x1A11:02 The 2nd TxPDO entry: 0x6864:00 (Target position of Axis 1)
• 0x1A11:03 The 3rd TxPDO entry: 0x68FD:00 (Digital inputs of channel 8 to 15)

CSV TxPDO of Axis 2

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1A12	00	Count	USINT	RO	N	3
	01	The 1st TxPDO entry	UDINT	RO	N	0x68410 010
	02	The 2nd TxPDO entry	UDINT	RO	N	0x68640 020
	03	The 3rd TxPDO entry	UDINT	RO	N	0x68FD0 020

- 0x1A12:01 The 1st TxPDO entry: 0x6841:00 (Status word of Axis 1)
- 0x1A12:02 The 2nd TxPDO entry: 0x6864:00 (Target position of Axis 1)
- 0x1A12:03 The 3rd TxPDO entry: 0x68FD:00 (Digital inputs of channel 8 to 15)

<u>Sync Manager Type</u>

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1C00	00	Count	USINT	RO	N	4
	01	Communication type of SM0	USINT	RO	N	1
	02	Communication type of SM1	USINT	RO	N	2
	03	Communication type of SM2	USINT	RO	N	3
	04	Communication	USINT	RO	N	4

		type of SM3				

• 0x1C00:01 Communication type of SM0: 1 (mailbox out)
• 0x1C00:02 Communication type of SM1: 2 (mailbox in)
• 0x1C00:03 Communication type of SM2: 3 (process data out)
• 0x1C00:04 Communication type of SM3: 4 (process data in)

RxPDO assign

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1C12	00	Number of RxPDO	USINT	RW*	N	2
	01	1st RxPDO	UINT	RW*	N	0x1601
	02	2nd RxPDO	UINT	RW*	N	0x1611

*Writable in only pre-operation state
• 0x1C12:00 Number of RxPDO: 0 to 2
Set to 1 for one-axis mode, or 2 for two-axis mode.
• 0x1C12:01 1st RxPDO: 0x1600 to 0x1602
Set to 0x1600 for CSP/CSV mode, 0x1601 for CSP mode, or 0x1602 for CSV mode.
• 0x1C12:02 2nd RxPDO: 0x1610 to 0x1612
Set to 0x1610 for CSP/CSV mode, 0x1611 for CSP mode, or 0x1612 for CSV mode.

Setup Procedure of RxPDO Mapping:

1. Set object 0x1C12:00 to 0.
2. Set object 0x1C12:01 or 0x1C12:02 if necessary.
3. Set object 0x1C12:00 to 1 for one-axis mode, or 2 for two-axis mode.

TxPDO assign

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1C13	00	Number of TxPDO	USINT	RW*	N	2

	01	1st TxPDO	UINT	RW*	N	0x1A01
	02	2nd TxPDO	UINT	RW*	N	0x1A11

*Writable in only pre-operation state

• 0x1C13:00 Number of TxPDO: 0 to 2

Set to 1 for one-axis mode, or 2 for two-axis mode.

• 0x1C13:01 1st TxPDO: 0x1A00 to 0x1A02

Set to 0x1A00 for CSP/CSV mode, 0x1A01 for CSP mode, or 0x1A02 for CSV mode.

• 0x1C13:02 2nd TxPDO: 0x1A10 to 0x1A12

Set to 0x1A10 for CSP/CSV mode, 0x1A11 for CSP mode, or 0x1A12 for CSV mode.

Setup Procedure of TxPDO Mapping:

4. Set object 0x1C13:00 to 0.
5. Set object 0x1C13:01 or 0x1C13:02 if necessary.
6. Set object 0x1C13:00 to 1 for one-axis mode, or 2 for two-axis mode.

<u>SM output parameter</u>

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1C32	00	Count	USINT	RO	N	32
	01	Synchronization Type	UINT	RO	N	0
	02	Cycle Time	UDINT	RO	N	0
	03	Reserved	-	-	-	-
	04	Reserved	-	-	-	-
	05	Minimum Cycle Time	UDINT	RO	N	250000
	06	Reserved	-	-	-	-
	07	Reserve	-	-	-	-

		d				
	08	Reserved	-	-	-	-
	09	Delay Time	UDINT	RO	N	0
	0a	Sync0 Cycle Time	UDINT	RO	N	0
	0b	SM-Event Missed	UINT	RO	N	0
	0c	Reserved	-	-	-	-
	0d~1f	Reserved	-	-	-	-
	20	Sync Error	BOOL	RO	N	0

• 0x1C32:01 Synchronization Type: 0 for free-run mode, 1 for SM-sync mode, or 2 for DC-sync mode.
• 0x1C32:02 Cycle Time: Time between Sync0 events [ns]
• 0x1C32:05 Minimum Cycle Time: 250000 [ns]
• 0x1C32:0B SM-Event Missed: Referred to object 0x10F1
• 0x1C32:20 Sync Error: 1 for sync error ocurrs.

SM input parameter

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x1C33	00	SubIndex 000	uint8	RO	N	32
	01	Synchronization Type	UINT	RO	N	0
	02	Cycle Time	UDINT	RO	N	0
	03	SubIndex 003	Reserved	-	-	-
	04	Synchronization	Reserved	-	-	-

		Types supported				
	05	Minimum Cycle Time	UDINT	RO	N	250000
	06	Calc and Copy Time	Reserved	-	-	-
	07	SubIndex 007	Reserved	-	-	-
	08	Get Cycle Time	uint16	RO	N	0
	09	Delay Time	UDINT	RO	N	0
	0a	Sync0 Cycle Time	UDINT	RO	N	0
	0b	SM-Event Missed	UINT	RO	N	0
	0c	Cycle Time Too Small	UINT	RO	N	0
	0d	Shift Time Too Short	Reserved	-	-	-
	0e~1f	-	Reserved	-	-	-
	20	Sync Error	BOOL	RO	N	0

- 0x1C33:01 Synchronization Type: 0 for free-run mode, 1 for SM-sync mode, or 2 for DC-sync mode.
- 0x1C33:02 Cycle Time: Time between Sync0 events [ns]
- 0x1C33:05 Minimum Cycle Time: 250000 [ns]
- 0x1C33:0B SM-Event Missed: Referred to object 0x10F1
- 0x1C33:20 Sync Error: 1 for sync error occurs.

4.5 Manufacturer Specific Objects –General (0x2000~0x2FFF)

Pulse Mode

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2000	00	Pulse Mode	USINT	RW	N	0

• 0x2000:00 Pulse Mode of Axis 0: 0 to 1
0: Pulse/direction mode
1: CW/CCW mode
Note: This object is loaded from and written to data flash.

Accelaration Divisor

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2001	00	Accelera tion Divisor	UDINT	RW	N	1000

• 0x2001:00 Acceleration Divisor of Axis 0: 1 to 0xFFFFFFFF
The divisor of profile acceleration, homing acceleration, and quick stop acceleration.
Note: This object is loaded from and written to data flash.

Encoder Enable

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2004	00	Encoder Enable	USINT	RW	N	1

• 0x2004:00 Encoder Enable of Axis 0:
Bit 0 to bit 1 (encoder mode):
0: Disable encoder mode.
1: Enable X4 encoder mode.
2: Enable X2 encoder mode.
3: Enable X1 encoder mode.
Bit 2 to bit 3: Reserved. Each bit shall be zero.
Bit 4 (Inverse A):
0: disable channel A inverse.
1: enable channel A inverse.
Bit 5 (Inverse B):
0: disable channel B inverse.
1: enable channel B inverse.

Bit 6 (Inverse index):
0: disable channel index inverse.
1: enable channel index inverse.
Bit 7: Reserved. This bit shall be zero.

Note: This object is loaded from and written to data flash.

Digital Input Setting

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2005	00	Digital Input Setting	UDINT	RW	N	0

• 0x2005:00 Digital Input Setting of Axis 0

Bit 22 (ALM input setting): if this bit is 1, the CiA 402 state will be changed to fault state when ALM is active. If this bit is 0, ALM has no effects.

Bit 25 (RDY input setting): if this bit is 1, the CiA 402 state will NOT be changed to operation enable state when RDY is not active. If this bit is 0, RDY has no effects.

Bit 0 to 21, 23, 24, 26 to 31: Reserved, each bit shall be zero.

Digital Input Active Level

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2006	00	Digital Input Active Level	UDINT	RW	N	0

• 0x2006:00 Digital Input Active Level of Axis 0

Bit 0 (Limit- active level setting): if this bit 1, Limit- is low-active; if this bit 0, Limit- is high-active.

Bit 1 (Limit+ active level setting): if this bit 1, Limit+ is low-active; if this bit 0, Limit+ is high-active.

Bit 2 (Home active level setting): if this bit 1, Home is low-active; if this bit 0, Home is high-active.

Bit 22 (ALM active level setting): if this bit 1, ALM is low-active; if this bit is 0, ALM is high-active.

Bit 25 (RDY active level setting): if this bit 1, RDY is low-active; if this bit is 0, RDY is high-active.

Bit 3 to 21, 23, 24, 26 to 31: Reserved, each bit shall be zero.

Digital Output Setting

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2007	00	Digital Output Setting	UDINT	RW	N	0

• 0x2007:00 Digital Output Setting of Axis 0

Bit 8 to bit 14 (ARST pulse width): ARST pulse width is (1+bit[14:8]) milliseconds.

Bit 24 (SVON output setting): If this bit is 0, SVON is controlled by digital output object (see object 0x60FE). If this bit is 1, SVON is controlled by CiA 402 state. SVON is active if Axis 0 is in operation enable state (see object 0x6040).

Bit 25 (ARST output setting): If this bit is 0, ARST is controlled by digital output object (see object 0x60FE). If this bit is 1, ARST is controlled by CiA 402 state. ARST is active if axis-n leaves fault state (see object 0x6040).

Bit 0 to 7, 15 to 23, 26 to 31: Reserved, each bit shall be zero.

Digital Output Active Level

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2008	00	Digital Output Active Level	UDINT	RW	N	0

• 0x2008:00 Digital Output Active Level of Axis 0

Bit 0 to bit 23: Reserved, each bit shall be zero.

Bit 24 (SVON active level setting): if this bit is 1, SVON is low-active; if this bit is 0, SVON is high-active.

Bit 25 (ARST active level setting): if this bit is 1, ARST is low-active; if this bit is 0, ARST is high-active.

Bit 26 to bit 31: Reserved, each bit shall be zero.

Pulse Mode

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2800	00	Pulse Mode	USINT	RW	N	0

• 0x2800:00 Pulse Mode of Axis 1: Referred to Object 0x2000:00

Accelaration Divisor

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2801	00	Accelera tion Divisor	UDINT	RW	N	1000

• 0x2801:00 Acceleration Divisor of Axis 1: Referred to Object 0x2001:00
Note: This object is loaded from and written to data flash.

Encoder Enable

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2804	00	Encoder Enable	USINT	RW	N	1

• 0x2804:00 Encoder Enable of Axis 1: Referred to Object 0x2004:00
Note: This object is loaded from and written to data flash.

Digital Input Setting

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2805	00	Digital Input Setting	UDINT	RW	N	0

• **0x2805:00 Digital Input Setting of Axis 1: Referred to Object 0x2005:00**

Digital Input Active Level

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2806	00	Digital Input Active Level	UDINT	RW	N	0

• **0x2806:00 Digital Input Active Level of Axis 1: Referred to Object 0x2006:00**

Digital Output Setting

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2807	00	Digital Output Setting	UDINT	RW	N	0

• **0x2807:00 Digital Output Setting of Axis 1: Referred to Object 0x2007:00**

Digital Output Active Level

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x2808	00	Digital Output Active Level	UDINT	RW	N	0

• **0x2808:00 Digital Output Active Level of Axis 1: Referred to Object 0x2008:00**

4.6 CANOpen CiA 402 Profile Specific Objects (0x6000~0x7FFF)

Error Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value

0x603F	00	Error Code	UINT	RO	N	0

• 0x603F:00 Error code of Axis 0:

• 0x7500: communication error. It occurs when slave leaves OP state with axis 0 in operation enable state.

• 0xFF01: EMG error. It occurs if EMG is active

• 0xFF02: ALM error. It occurs if ALM is active.

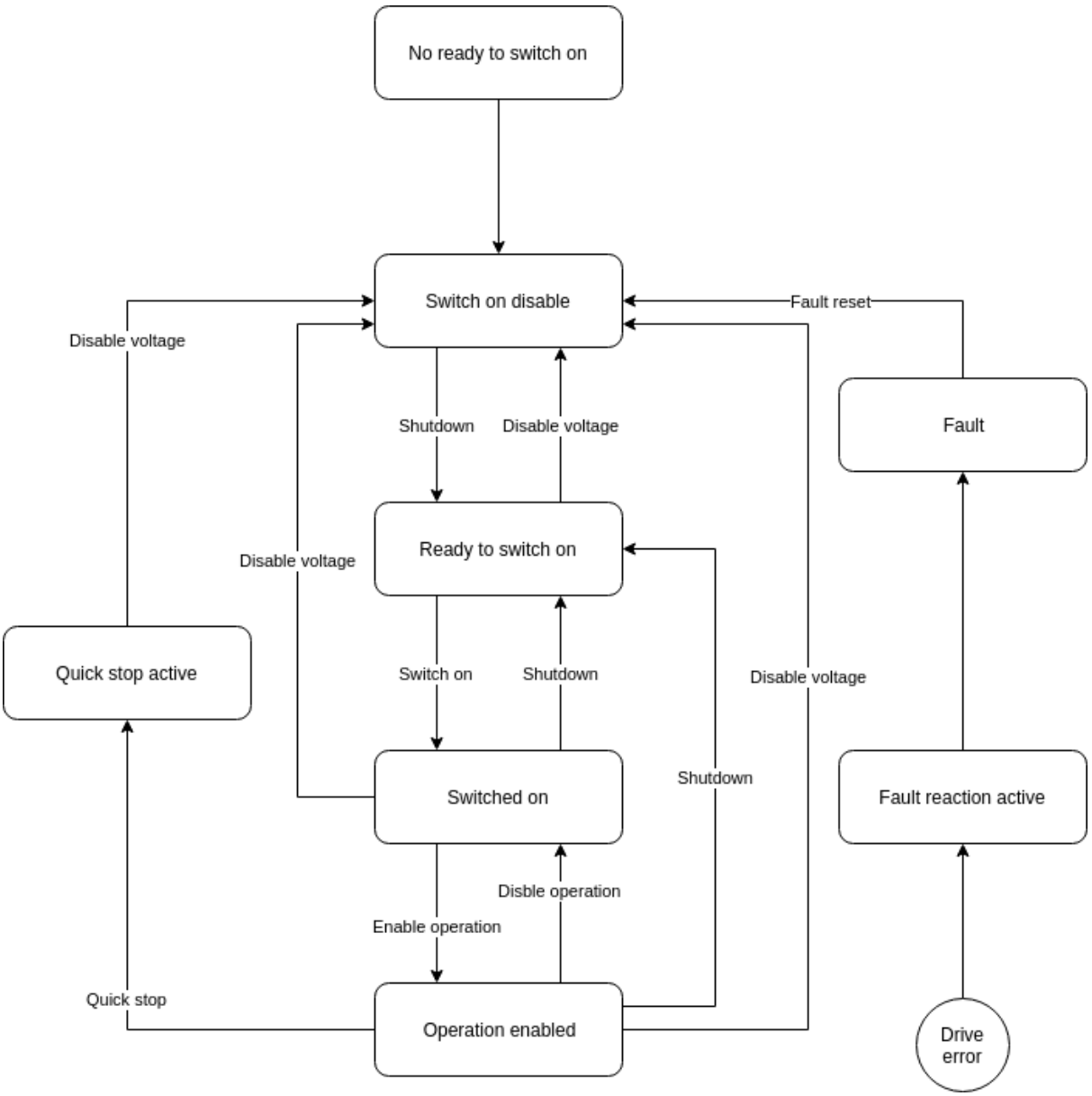
Control Word

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6040	00	Control Word	UINT	RW	Y	0

• 0x6040:00 Control Word of Axis 0:

Bit 0 to 3 and bit 7: for the controlling command of the drive state

Command	bit 7	bit 3	bit 2	bit 1	bit 0
Shutdown	0	-	1	1	0
Switch on	0	0	1	1	1
Disable voltage	0	-	-	0	-
Quick stop	0	-	0	1	0
Disable operation	0	0	1	1	1
Enable operation	0	1	1	1	1
Fault reset	0→1	-	-	-	-



🔼 **DS402 state machine**

Bit 4, 5, 6, 8 and 9: for the controlling of Homing mode

Bit	Function	Value	Description
4	Homing operation start	0	Stop homing procedure
		1	Start or continue homing procedure
5	-	0	Reserved
6	-	0	Reserved
8	Halt	0	Do not halt homing procedure
		1	Halt homing procedure

9	-	0	Reserved

Bit 4, 5, 6, 8 and 9: for the controlling of CSP/CSV/PV mode

Bit	Function	Value	Description
4	-	0	Reserved
5	-	0	Reserved
6	-	0	Reserved
8	Halt	0	Do not halt CSP/CSV/PV procedure
		1	Halt CSP/CSV/PV procedure
9	-	0	Reserved

Bit 10 to 15: reserved. These bits should be set to 0.

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6041	00	Status Word	UINT	RO	Y	*(See below)

• 0x6041:00 Status Word of Axis 0:

Bit 0 to 3 and bit 5 to 6: for the current state of the drive

Command	bit 6	bit 5	bit 3	bit 2	bit 1	bit 0
Not ready to switch on	0	0	0	0	0	0
Switch on disabled	1	0	0	0	0	0
Ready to switch on	0	1	0	0	0	1
Switched on	0	1	0	0	1	1
Operation enabled	0	1	0	1	1	1
Quick stop active	0	0	0	1	1	1
Fault reaction	0	0	1	1	1	1

active						
Fault	**0**	**0**	**1**	**0**	**0**	**0**

Bit 10, 12 and 13: for Homing mode

Bit	Status	Value	Description
10	Target reached	0	Halt (Bit 8 in Controlword) = 0: Target not reached Halt (Bit 8 in Controlword) = 1: Axis decelerates
		1	Halt (Bit 8 in Controlword) = 0: Target reached Halt (Bit 8 in Controlword) = 1: Velocity of axis is 0
12	Homing attained	0	Homing mode not yet complete
		1	Homing mode complete successfully
13	-	-	Reserved

Bit 10, 12 and 13: for Profile velocity mode

Bit	Status	Value	Description
10	Target reached	0	Halt (Bit 8 in Controlword) = 0: Target not reached Halt (Bit 8 in Controlword) = 1: Axis decelerates
		1	Halt (Bit 8 in Controlword) = 0: Target reached Halt (Bit 8 in Controlword) = 1: Velocity of axis is 0
12	-	-	Reserved
13	-	-	Reserved

Quickstop Option Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x605A	00	Quicksto	INT	RW	N	2

		p Option Code				

• 0x605A:00 Quickstop Option Code of Axis 0:
0: Disable driver function (turns the servo OFF)
1: Slow down on slow down ramp and stay in Operation Enabled. The slow down deceleration is defined as the following object.
    • Cyclic Position, Cyclic Velocity mode: Object 0x6084
    • Homing mode: Object 0x609A
2: Slow down on quick stop ramp and stay in Operation Enabled.
Others: Reserve.

Shutdown Option Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x605B	00	Shutdown Option Code	INT	RW	N	0

• 0x605B:00 Shutdown Option Code of Axis 0:
0: Disable driver function (turns the servo OFF)
1: Slow down on slow down ramp and stay in Operation Enabled. The slow down deceleration is defined as the following object.
    • Cyclic Position, Cyclic Velocity mode: Object 0x6084
    • Homing mode: Object 0x609A
Others: Reserved.

Disable Operation Option Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x605C	00	Disable Operation Option Code	INT	RW	N	1

• 0x605C:00 Disable Operation Option Code of Axis 0:
0: Disable driver function (turns the servo OFF)
1: Slow down on slow down ramp and stay in Operation Enabled. The slow down deceleration is defined as the following object.
    • Cyclic Position, Cyclic Velocity mode: Object 0x6084
    • Homing mode: Object 0x609A
Others: Reserved.

Halt Option Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x605D	00	Halt	INT	RW	N	1

		Option Code				

• 0x605D:00 Halt Option Code of Axis 0:
0: Disable driver function (turns the servo OFF)
1: Slow down on slow down ramp and stay in Operation Enabled. The slow down deceleration is defined as the following object.
    • Cyclic Position, Cyclic Velocity mode: Object 0x6084
    • Homing mode: Object 0x609A
2: Slow down on quick stop ramp and stay in Operation Enabled.
Others: Reserved.

Fault Reaction Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x605E	00	Fault Reaction Code	INT	RW	N	2

• 0x605E:00 Fault Reaction Code of Axis 0:
0: Disable driver function (turns the servo OFF)
1: Slow down on slow down ramp and stay in Operation Enabled. The slow down deceleration is defined as the following object.
    • Cyclic Position, Cyclic Velocity mode: Object 0x6084
    • Homing mode: Object 0x609A
2: Slow down on quick stop ramp and stay in Operation Enabled.
Others: Reserved.

Modes of Operation

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6060	00	Modes of Operation	SINT	RW	Y	0

• 0x6060:00 Modes of Operation of Axis 0:
3: Profile velocity mode.
5: Homing mode.
8: Cyclic synchronous position mode.
9: Cyclic synchronous velocity mode.
Others: Reserved.

Modes of Operation Display

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6061	00	Modes of	SINT	RO	Y	0

		Operation Display				

• 0x6061:00 Modes of Operation Display of Axis 0:
3: Profile velocity mode.
5: Homing mode.
8: Cyclic synchronous position mode.
9: Cyclic synchronous velocity mode.
Others: Reserved.

Position Actual Value

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6064	00	Position Actual Value	DINT	RO	Y	0

• 0x6064:00 Position Actual Value of Axis 0: −2147483648 to 2147483647 $[pulse]$

Velocity Actual Value

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x606C	00	Velocity Actual Value	DINT	RO	Y	0

• 0x606C:00 Velocity Actual Value of Axis 0: −2147483648 to 2147483647

$$Actual\ velocity\ = \frac{Object[0x606C{:}00]}{cycle\ time}\ [pulse/sec]$$

Target Position

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x607A	00	Target Position	DINT	RW	Y	0

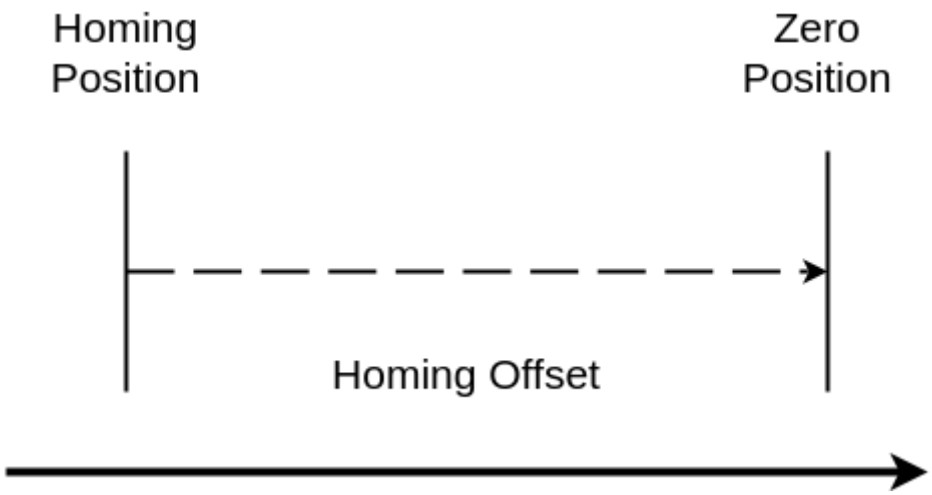
• 0x607A:00 Target Position of Axis 0: −2147483648 to 2147483647 $[pulse]$

Homing Offset

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x607C	00	Homing Offset	UDINT	RW	N	0

• 0x607C:00 Homing Offset of Axis 0: −2147483648 to 2147483647 $[pulse]$

The homing offset = zero position - homing position



Software Position Limit

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x607D	00	Count	USINT	RO	N	2
	01	Min position limit	DINT	RW	N	-2000000000
	02	Max position limit	DINT	RW	N	2000000000

• 0x607D:01 Minimun position limit of Axis 0: −2147483648 to 2147483647 $[pulse]$

• 0x607D:02 Maximun position limit of Axis 0: −2147483648 to 2147483647 $[pulse]$

If $Object[0x607D{:}\,01] \geq Object[0x607D{:}\,02]$**, the software limit is disabled.**

Profile Acceleration

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6083	00	Profile Acceleration	UDINT	RW	N	1

• 0x6083:00 Profile Acceleration of Axis 0: 1 to 4294967295

$$Profile\ Acceleration\ = \frac{Object[0x6083{:}00]/Object[0x2001{:}00]}{cycle\ time}\left[pulse/sec^2\right]$$

Profile Deceleration

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6084	00	Profile Deceleration	UDINT	RW	N	1

• 0x6084:00 Profile Deceleration of Axis 0: 1 to 4294967295

$$Profile\ Deceleration\ = \frac{Object[0x6084{:}00]/Object[0x2001{:}00]}{cycle\ time}\left[pulse/sec^2\right]$$

Quick stop Deceleration

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6085	00	Quick stop Deceleration	DINT	RW	N	10

• 0x6085:00 Quick stop acceleration of Axis 0: 1 to 4294967295

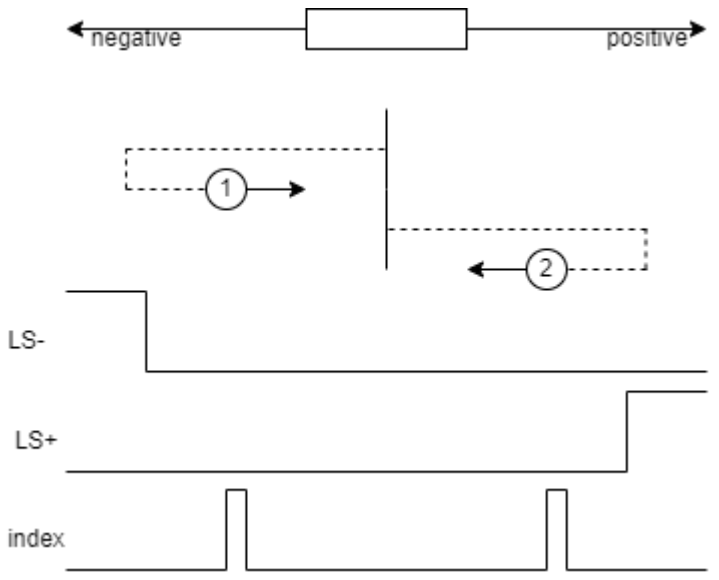
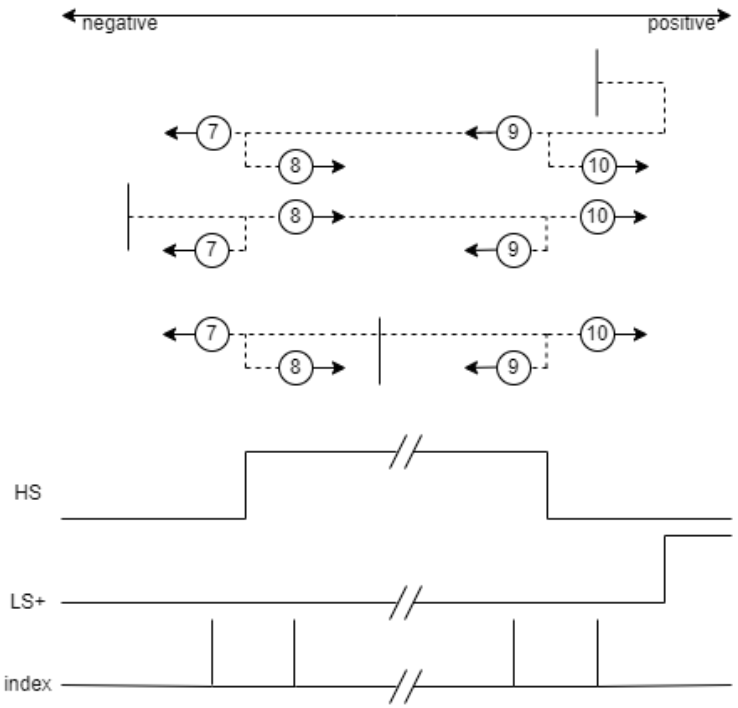
$$Quick\ stop\ acceleration\ = \frac{Object[0x6085{:}00]/Object[0x2001{:}00]}{cycle\ time}\left[pulse/sec^2\right]$$

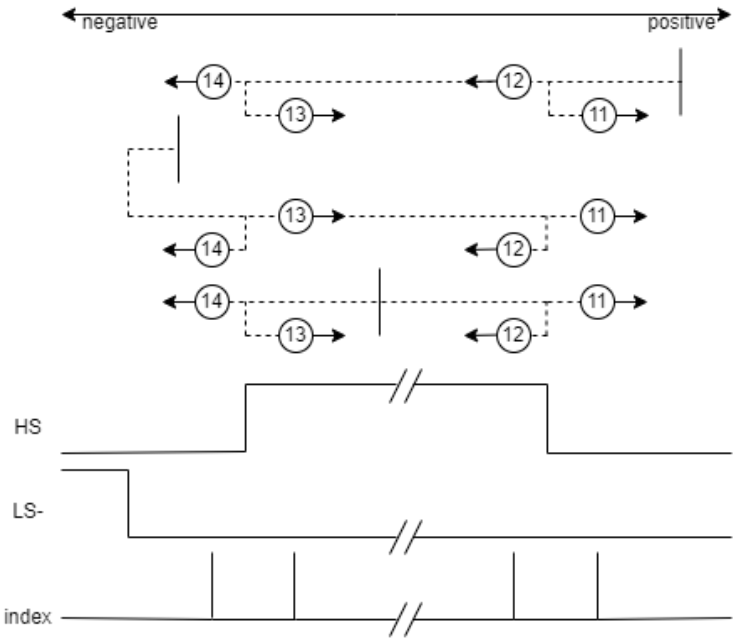
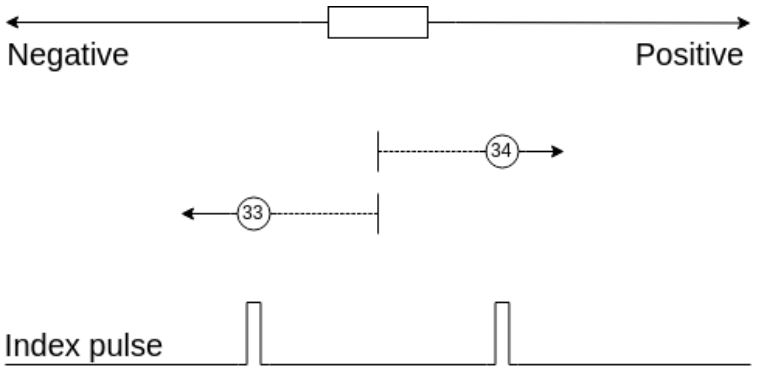
Homing Method

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6098	00	Homing Method	USINT	RW	N	0

• 0x6098:00 Home Method of Axis 0: 33 to 35.

Value	Definition	Description

1	**Homing on the negative limit switch and index pulse**	
2	**Homing on the positive limit switch and index pulse**	
7-10	**Homing on home switch and index pulse (positive initial motion)**	

11-14	**Homing on home switch and index pulse (negative initial motion)**	
33,34	**Homing on index pulse**	
35	**Homing on the current position**	**In this method, the current position shall be taken to be the home position.**

<u>Homing Speeds</u>

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6099	00	SubInde x 000	USINT	RO	N	2
	01	Switch Speed	UDINT	RW	N	1
	02	Zero Speed	UDINT	RW	N	1

• 0x6099:01 Switch Speed of Axis 0: 1 to 4294967295

$$Finding\ limit\ switch\ speed\ = \frac{Object[0x6099{:}01]}{cycle\ time}\ [pulse/sec]$$

• 0x6099:02 Zero Speed of Axis 0: 1 to 4294967295

$$Finding\ Zero\ switch\ speed\ = \frac{Object[0x6099{:}02]}{cycle\ time}\ [pulse/sec]$$

Homing Acceleration

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x609A	00	Homing Acceleration	UDINT	RW	N	1

• 0x609A:00 Homing acceleration of Axis 0: 1 to 4294967295

$$Homing\ acceleration\ = \frac{Object[0x609A{:}00]/Object[0x2001{:}00]}{cycle\ time}\ \left[pulse/sec^2\right]$$

Interpolation Time

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x60C2	00	Count	USINT	RO	N	2
	01	Interpolation period	USINT	RW	N	1
	02	Interpolation Index	SINT	RW	N	-3

• 0x60C2:01 Interpolation Period of Axis 0: 1 to 250
• 0x60C2:02 Interpolation Index of Axis 0: -6 to -3

$$Interpolation\ time\ = Object[0x60C2{:}\ 01] \times 10^{Object[0x60C2{:}02]}\ [sec]$$

This object must be set properly in free run mode.

Digital Inputs

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x60FD	00	Digital Inputs	UDINT	RO	Y	-

• 0x60FD:00 Digital Inputs of Axis 0:
Bit 0: Limit-
Bit 1: Limit+
Bit 2: Home
Bit 3-18: Reserved

Bit 19: DIN0
Bit 20: DIN1
Bit 21: DIN2
Bit 22: ALM
Bit 23: INP
Bit 24: Reserved
Bit 25: RDY
Bit 26: EMG
Bit 27-31: Reserved

Digital Output

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x60FE	00	SubIndex 000	USINT	RO	N	2
	01	Physical outputs	UDINT	RW	Y	0
	02	Bit mask	UDINT	RW	N	0x7000000

• 0x60FE:01 Physical outputs:
Bit 24 (SVON output) If this bit is 1, SVON is switched-on. If this bit is 0, SVON is switched-off.
Bit 25 (ARST output) If this bit is 1, ARST is switched-on. If this bit is 0, ARST is switched-off.
Bit 26 (DCLR output) If this bit is 1, DCLR is switched-on. If this bit is 0, DCLR is switched-off.

• 0x60FE:02 Bit mask:
Bit 24 (SVON mask) if this bit is 1, enable SVON0 physical output. if this bit is 0, disable SVON physical output.
Bit 25 (ARST mask) if this bit is 1, enable ARST0 physical output. if this bit is 0, disable ARST physical output.
Bit 26 (DCLR mask) if this bit is 1, enable DCLR0 physical output. if this bit is 0, disable DCLR physical output.

Target Velocity

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x60FF	00	Target Velocity	DINT	RW	Y	0

• 0x60FF:00 Target Velocity of Axis 0: 0 to 4294967295

$$Target\ velocity\ = \frac{Object[0x60FF{:}00]}{cycle\ time}\ [pulse/sec]$$

Supported Drive Modes

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6502	00	Supported Drive Modes	UDINT	RO	N	*(See below)

• 0x6502:00 Supported Drive Modes of Axis 0:
For CSV/CSP PDO mapping, PV/CSV/CSP/Homing modes are supported. (value=0x1a4)
For CSP PDO mapping, CSP/Homing modes are supported. (value=0xa0)
For CSV PDO mapping, PV/CSV/Homing modes are supported. (value=0x124)

Error Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x683F	00	Error Code	UINT	RO	N	0

• 0x683F:00 Error code of Axis 1: Referred to Object 0x603F:00

Control Word

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6840	00	Control Word	UINT	RW	Y	0

• 0x6840:00 Control Word of Axis 1: Referred to Object 0x6040:00

Status Word

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6841	00	Status Word	UINT	RO	Y	*

• 0x6841:00 Status Word of Axis 1: Referred to Object 0x6041:00

Quickstop Option Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x685A	00	Quicksto	INT	RW	N	2

		p Option Code				

• 0x685A:00 Quickstop Option Code of Axis 1: Referred to Object 0x605A:00

Shutdown Option Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x685B	00	Shutdow n Option Code	INT	RW	N	0

• 0x685B:00 Shutdown Option Code of Axis 1: Referred to Object 0x605B:00

Disable Operation Option Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x685C	00	Disable Operatio n Option Code	INT	RW	N	1

• 0x685C:00 Disable Operation Option Code of Axis 1: Referred to Object 0x605C:00

Halt Option Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x685D	00	Halt Option Code	INT	RW	N	1

• 0x685D:00 Halt Option Code of Axis 1: Referred to Object 0x605D:00

Fault Reaction Code

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x685E	00	Fault Reaction Code	INT	RW	N	2

• 0x685E:00 Fault Reaction Code of Axis 1: Referred to Object 0x605E:00

Modes of Operation

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value

0x6860	00	Modes of Operation	SINT	RW	Y	0

• 0x6860:00 Modes of Operation of Axis 1: Referred to Object 0x6060:00

Modes of Operation Display

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6861	00	Modes of Operation Display	SINT	RO	Y	0

• 0x6861:00 Modes of Operation Display of Axis 1: Referred to Object 0x6061:00

Position Actual Value

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6864	00	Position Actual Value	DINT	RO	Y	0

• 0x6864:00 Position Actual Value of Axis 1: Referred to Object 0x6064:00

Velocity Actual Value

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x686C	00	Velocity Actual Value	DINT	RO	Y	0

• 0x686C:00 Velocity Actual Value of Axis 1: Referred to Object 0x606C:00

Target Position

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x687A	00	Target Position	DINT	RW	Y	0

• 0x687A:00 Target Position of Axis 1: Referred to Object 0x607A:00

Homing Offset

Index	Sub	Name	Data	Access	PDO	Default

			Type		Mapping	Value
0x687C	00	Homing Offset	DINT	RW	N	0

• 0x687C:00 Homing Offset of Axis 1: Referred to Object 0x607C:00

Software Position Limit

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x687D	00	SubIndex 000	USINT	RO	N	2
	01	Min position limit	DINT	RW	N	-2000000000
	02	Max position limit	DINT	RW	N	2000000000

• 0x687D:01 Minimum position limit of Axis 1: Referred to Object 0x607D:01
• 0x687D:02 Minimum position limit of Axis 1: Referred to Object 0x607D:02

Profile Acceleration

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6883	00	Profile Acceleration	UDINT	RW	N	1

• 0x6883:00 Profile Acceleration of Axis 1: Referred to Object 0x6083:00

Profile Deceleration

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6884	00	Profile Deceleration	UDINT	RW	N	1

• 0x6884:00 Profile Deceleration of Axis 1: Referred to Object 0x6084:00

Quickstop Declaration

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value

0x6885	00	Quickstop Declaration	DINT	RW	N	10

• 0x6885:00 Quickstop acceleration of Axis 1: Referred to Object 0x6085:00

Homing Method

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6898	00	Homing Method	SINT	RW	N	0

• 0x6898:00 Home Method of Axis 1: Referred to Object 0x6098:00

Homing Speeds

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x6899	00	SubIndex 000	USINT	RO	N	2
	01	Switch Speed	UDINT	RW	N	1
	02	Zero Speed	UDINT	RW	N	1

• 0x6899:01 Switch Speed of Axis 1: Referred to Object 0x6099:01
• 0x6899:02 Zero Speed of Axis 1: Referred to Object 0x6099:02

Homing Accelaration

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x689A	00	Homing Accelaration	UDINT	RW	N	1

• 0x689A:00 Homing acceleration of Axis 1: Referred to Object 0x609A:00

Interpolation Time

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x68C2	00	SubIndex 000	USINT	RO	N	2
	01	Interpola	USINT	RW	N	1

		tion period				
	02	Interpolation Index	SINT	RW	N	-3

• 0x68C2:01 Interpolation Period of Axis 1: Referred to Object 0x60C2:01
• 0x68C2:02 Interpolation Index of Axis 1: Referred to Object 0x60C2:02

Digital Inputs

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x68FD	00	Digital Inputs	UDINT	RO	Y	-

• 0x68FD:00 Digital Inputs of Axis 1: Referred to Object 0x60FD:00

Digital Outputs

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x68FE	00	SubIndex 000	USINT	RO	N	2
	01	Physical Outputs	UDINT	RW	Y	0
	02	Bit Mask	UDINT	RW	N	0x7000000

• 0x68FE:01 Physical Outputs of Axis 1: Referred to Object 0x60FE:01
• 0x68FE:02 Bit Mask of Axis 1: Referred to Object 0x60FE:02

Target Velocity

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value
0x68FF	00	Target Velocity	DINT	RW	Y	0

• 0x68FF:00 Target Velocity of Axis 1: Referred to Object 0x60FF:00

Supported Drive Modes

Index	Sub	Name	Data Type	Access	PDO Mapping	Default Value

0x6D02	**00**	**Supported Drive Modes**	**UDINT**	**RO**	**N**	*****

• 0x6D02:00 Supported Drive Modes of Axis 1: Referred to Object 0x6502:00

Chapter 5: Troubleshooting

5.1 Troubleshooting of the EtherCAT

Error code	Description	Corretive action
0x7500	**Communication error**	**● Check the connection between ES-6P6E and the EtherCAT controller device ● Correct the EtherCAT controller so that it updates the process data in regular cycle ● Leave OP-state in CiA402 switch on disabled state**
0xFF01	**EMG error**	**● Deactivate emergency stop**
0xFF02	**ALM error**	**● Check wiring between ES-6P6E and the motor ● Check the ALM active level setting ● Disable ALM input setting**

Chapter 6: Revision History

2023/04/14 v1.2 - Update Chapter 3
2023/02/01 v1.1 - First release