# Content

Chapter 1 Telegram introduction	1
1.1 Supported telegram	1
1.2 I/O data signal	2
1.3 Control word and status word	
1.3.1 STW1 and ZSW1	3
1.3.2 STW2 and ZSW2	4
1.3.3 SATZANW、AKTSATZ、MDI_MOD	5
1.3.4 POS_STW1、POS_STW2、POS_ZSW1、POS_ZSW2	
1.3.5 G1_STW、G1_ZSW、MELDW	7
Chapter 2 Application description	9
Chapter 3 Acyclic communication	
3.1 Drive IP and device name setting	10
3.2 Project configuration	
3.3 SINA_PARA_S (FB287) introduction	13
3.4 Read-write parameters using FB287	
3.5 Read-write parameters using WRREC and RDREC	
3.6 Fault diagnosis function	
Chapter 4 Application class 1	
4.1 Overview	
4.2 Project configuration	
4.3 SINA_SPEED (FB285) introduction	
Chapter 5 Application class 3	
5.1 Overview	
5.2 Project configuration	
5.3 SINA_POS (FB284) introduction	
5.4 FB284 function description	
5.4.1 Operating condition and setting	
5.4.2 Operating mode 1 (Relative positioning)	
5.4.3 Operating mode 2 (Absolute positioning)	
5.4.4 Operating mode 4 (Active homing)	
5.4.5 Operating mode 5 (Direct homing)	
5.4.6 Operating mode 7 (Jog at the specified speed)	
Chapter 6 Application class 4	
6.1 Overview	
6.2 Project configuration	

6.3 MC_Home introduction	
6.3.1 Homing mode 0 (Absolute direct homing)	
6.3.2 Homing mode 1 (Relative direct homing)	
6.3.3 Homing mode 2 (Passive homing)	
6.3.4 Homing mode 3 (Active homing)	
6.3.5 Homing mode 6 (Absolute encoder adjustment (relative))	49
6.3.6 Homing mode 7 (Absolute encoder adjustment (absolute))	
6.4 MC_TorqueLimiting introduction	50
6.5 DSC (Dynamic Servo Control) introduction	50
Chapter 7 S7-200 SMART Application	
7.1 Application description	
7.2 Acyclic communication	
7.2.1 Project configuration	
7.2.2 SINA_PARA_S introduction	
7.2.3 Read-write parameters using SINA_PARA_S	
7.3 Telegram 1 application	
7.3.1 Project configuration	
7.3.2 SINA_SPEED introduction	61
7.4 Telegram 111 application	
7.4.1 Project configuration	
7.4.2 SINA_POS introduction	
7.4.3 Operating condition and setting	
7.4.4 Operating mode 1 (Relative positioning)	
7.4.5 Operating mode 2 (Absolute positioning)	
7.4.6 Operating mode 4 (Active homing)	
7.4.7 Operating mode 5 (Direct homing)	69
7.4.8 Operating mode 7 (Jog at the specified speed)	

# **Chapter 1** Telegram introduction

PROFINET, launched by PROFIBUS International, is a new generation automation bus standard based on industrial Ethernet technology. It can meet various communication requirements in industrial automation scenarios, and is an industrial network protocol that supports high performance, high reliability and high real-time performance.

PROFINET provides three types of channels: standard channel, real-time channel (RT), isochronous real-time channel (IRT), standard channel is a non-real-time protocol based on TCP/IP protocol, and RT and IRT channel is implemented based on Ethernet.

# 1.1 Supported telegram

Kinco PN servo drives (PN firmware version 00000005 or 10000005) support telegram 1, 3, 5, 9, 102, 105, and 111, covering AC (Application Class) 1, 3, and 4, as shown in Table 1-1. Additional telegram 750 is not currently supported.

Table 1-1 Available telegram

Application Class	telegram number
AC1	1
AC3	9,111
AC4	3,5,102,105



#### Note

• PN firmware 00000004 only supports telegram 1, 111, and 3(IRT is not supported). The PN firmware version can be found in [308001], see Table 2-1 for details.

#### The structure of each packet are as follows:

Table 1-2telegram 1 (Application Class 1)

I/O data mumban	telegram 1			
1/O data number	Set value	Actual value		
1	STW1	ZSW1		
2	NSOLL_A	NIST_A		

L/O data mundam	telegrar	n 9	telegram 111	
1/O data number	Set value	Actual value	Set value	Actual value
1	STW1	ZSW1	STW1	ZSW1
2	SATZANW	AKTSATZ	POS_STW1	POS_ZSW1
3	STW2	ZSW2	POS_STW2	POS_ZSW2
4	MDL TADDOG	VICT A	STW2	ZSW2
5	MDI_IARPOS	S AISI_A	OVERRIDE	MELDW
6	MDI VELOCITY		MDL TADDOS	VICT A
7	MDI_VELOCITY		MDI_TARPOS	AISI_A
8	MDI_ACC		MDI VELOCITY	NICT D
9	MDI_DEC		MDI_VELOCITY	NISI_B
10	MDI_MOD		MDI_ACC	FAULT_CODE
11			MDI_DEC	WARN_CODE
12			User	User

#### Table 1-3 telegram 9, 111 (Application Class 3)

Table 1-4 telegram 3, 5, 102, 105 (Application Class 4)

I/O data	tele	gram 3	telegi	ram 102	telegram 5		telegram 105	
number	Set value	Actual value	Set value	Actual value	Set value	Actual value	Set value	Actual value
1	STW1	ZSW1	STW1	ZSW1	STW1	ZSW1	STW1	ZSW1
2	NSOLL B	NIST P	NSOLUB	MIST P	NSOLL B	NIST P	NSOLL B	NIST P
3	NSOLL_B		NSOLL_B		NSOLL_B	NISI_B	NSOLL_B	
4	STW2	ZSW2	STW2	ZSW2	STW2	ZSW2	STW2	ZSW2
5	G1_STW	G1_ZSW	MOMRED	MELDW	G1_STW	G1_ZSW	MOMRED	MELDW
6		C1 VICT1	G1_STW	G1_ZSW	VEDD	C1 VICT1	G1_STW	G1_ZSW
7		GI_XISTI		C1 VICT1	AEKK	GI_XISTI	VEDD	C1 VICT1
8		C1 VICT2		GI_XISTI	<b>VDC</b>	C1 VIET2	AEKK	GI_XISTI
9		01_71812		C1 VICT2	KPU	01_71812	KDC	C1 VIST2
10				01_71812			KPC	01_A1512

# 1.2 I/O data signal

I/O data signal (set value and actual value) are used to compose the telegram, and the following table provides all signals for the I/O data.

Table 1-5 Signal table

Singal	Abbreviation	Data type	Description
Control word 1	STW1	U16	See Section 1.2.1
Status word 1	ZSW1	U16	See Section 1.5.1
Control word 2	STW2	U16	See Section 1.2.2
Status word 2	ZSW2	U16	See Section 1.5.2
Speed setpoint A	NSOLL_A	I16	1000h corresponds to the reference speed a
Speed actual value A	NIST_A	I16	4000h corresponds to the reference speed
Speed setpoint B	NSOLL_B	132	4000000h corresponds to the reference speed
Speed actual value B	NIST_B <sup>b</sup>	132	400000000 corresponds to the reference speed
Sensor 1 control word	G1_STW	U16	
Sensor 1 status word	G1_ZSW	U16	See Section 1.3.5
telegram status word	MELDW	U16	

Kinco	PN	servo	driver	PROFINET	communication	manual
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Singal	Abbreviation	Data type	Description
Sensor 1 position acutal value 1	G1_XIST1	I32	Equal to actual position [606300] plus position shift [60FB07]. Unit DEC
Sensor 1 position acutal value 2	G1_XIST2	I32	
Position deviation value	XERR	I32	—
Position control factor	KPC	I32	—
Position acutal value A	XIST_A	132	Equal to actual position [606300]. Unit DEC
Position table control word	SATZANW	U16	
Position table status word	AKTSATZ	U16	See Section 1.3.3
MDI mode control word	MDI_MOD	U16	
Position control word 1	POS_STW1	U16	
Position status word 1	POS_ZSW1	U16	
Position control word 2	POS_STW2	U16	See Section 1.3.4
Position status word 2	POS_ZSW2	U16	
MDI target position	MDI_TARPOS	132	Equal to target position [607A00]. Unit DEC
MDI velocity	MDI_VELOCITY	U32	Unit DEC, DEC = (RPM * feedback_resolution [641003] * 512 ) / 1875
MDI acceleration percentage	MDI_ACC	U16	0~4000h corresponds to 0~100%, 2000h means the
MDI deceleration percentage	MDI_DEC	U16	acceleration/deceleration is reduced to 1/2 of the drive setpoint
MDI velocity percentage	OVERRIDE	U16	$0{\sim}4000h$ corresponds to $0{\sim}100\%$ , maximum 199%, 2000h means to reduce the speed to $1/2$ of the drive setpoint
Torque limit value	MOMRED	I16	0~4000h corresponds to 100%~0, 4000h means the target current (torque) is limited to 0
Fault code	FAULT_CODE	U16	—
Warn code	WARN_CODE	U16	
Telegram 111 custom receive word	User	I16	See Section 5.4.1 Article 7
Telegram 111 custom send word	User	I16	See Section 3.4.1, Article /
a Reference speed = $1/2$ of the maximum	um speed [607F00].		

b When using telegram 111, the speed actual value NIST\_B is equal to the actual speed [606C00] in DEC.

# 1.3 Control word and status word

# 1.3.1 STW1 and ZSW1

## • Control word 1 (STW1)

Table 1-6 STW1 each bit value meaning

D:+	Mea	ning		
Ы	telegram 1,3,5,102,105 (Application Class 1, 4)	telegram 9,111 (Application Class 3)		
0	On / Off (ramp stop <sup>a</sup> )			
1	No coast stop	o / Coast stop		
2	No quick stop / Quick stop			
3	Operation enable / Operation disable			
4	Enable RFG <sup>b</sup> / Disable RFG (RFG output is 0)	Do not reject traversing task / Reject traversing task		
5	Unfreeze RFG / Freeze RFG (RFG input is not updated)	No intermediate stop / Intermediate stop		
6	Enable setpoint / Disable setpoint (RFG input is 0)	Activate traversing task $(0 \rightarrow 1)$		
7	Fault acknowledge $(0 \rightarrow 1)$			
8	Reserved (Application Class 1, 4 do not support jog)	Start reverse jog / Stop reverse jog		

9	Reserved	Start forward jog / Stop forward jog		
10	Control by PLC / N	No control by PLC		
11	1 Setpoint is reversed / Setpoint is not reversed Start homing procedure / Stop homing procedure			
12~15	5 Reserved			
a When bit 4 of STW1 is 1, ramp stop corresponds to halt mode [605D00], and disable operation after stop. When bit 4 of STW1 is 0,				
ramp stop corresponds to shutdown stop mode [605B00].				
b RFG = Ramp Function Generator (Trapezoidal curve velocity generator). When using Application Class 4, bit 5 does not work, and				
either bit 4 or bit 6 is 0, resulting in an RFG output of 0.				

Note: the significance for bit value = 1 is left of the slash ; bit value = 0 is right of the slash .

#### • Status word 1 (ZSW1)

Table 1-7 ZSW1 each bit value meaning

Dit	Mea	ning	
ЫΙ	telegram 1,3,5,102,105 (Application Class 1, 4)	telegram 9,111 (Application Class 3)	
0	Ready to switch on / N	Not ready to switch on	
1	Ready to operate / N	Not ready to Operate	
2	Operation enabled /	Operation disabled	
3	Fault preser	nt / No fault	
4	Coast stop not activate	d / Coast stop activated	
5	Quick stop not activate	d / Quick stop activated	
6	Switching on inhibited / S	Switching on not inhibited	
7	Warn present / No warning		
0	Speed error within tolerance range /	Following error within tolerance range /	
0	Speed error out of tolerance range	Following error out of tolerance range	
9	Control requested / No control requested		
10	f or n reached or exceeded / f or n not reached	Target position reached / Not at target position	
11	Reserved	Reference point set / Reference point not yet set	
12	Reserved	Traversing task acknowledgement $(0 \rightarrow 1)$	
13	Reserved	Drive stopped / Drive moving	
14	Moving forward / Moving reversely	Accelerating / Not accelerating	
15	Reserved	Decelerating / Not decelerating	
Note: the significance for bit value = 1 is left of the slash ; bit value = 0 is right of the slash .			

# 1.3.2 STW2 and ZSW2

• Control word 2 (STW2)

For telegram 3, 5, 102, and 105, valid only in IRT mode.

Table 1-8 STW2 each bit value meaning

Bit	Meaning
0~11	Reserved
12~15	PLC heartbeat signal

# $\rightarrow$

# Note

 If there is a PLC heartbeat signal error or other abnormal communication, the drive will generate a "CAN bus fault (alarm code 100.0)" alarm. The user can set Abort\_Connection\_Mode [600700] to 1: error processing; set to 0: do not process.

(š Obj	ect Di	ctionary						×
Index	Sub.	Name	Search		600	07		Search
6007	00	Abort_Connection_Mode	Index	Sub.	Name		Data Type	Attribute
60.3F	00	Error_Code						-
6040	00	Controlword	6007	00	Abort_Connection	n_Mode	Integer 16	RWSL
6041	00	Statusword		Value			Unit	
605A	00	Quick_Stop_Mode					DEC	
605B	00	Shutdown_Stop_Mode						
605C	00	Disable_Stop_Mode	Help Informa	tion of: Abo	rt_Connection_Mo	de		
605D	00	Halt_Mode	CAN communication abort mode					
605E	00	Fault_Stop_Mode	U: no process					
6060	00	Operation_Mode	1. choit					

• The alarm time threshold is determined by Guard\_Time [100C00](in ms) and Life\_Time\_Factor

[100D00], and the default value is 1000ms \* 3 = 3000 ms.

🔥 ECAN Settings					
N	Index	Туре	Name	Value	Unit
0*	101801	uint32	Vendor_ID	000005EF	HEX
1	301107	uint16	ECAN_Sync	0000	HEX
2	100500	uint32	Sync ID	?????	HEX
3	100C00	uint16	Guard_Time	1000	DEC
4	100D00	uint8	Life_Time_Factor	3	DEC

• Status word 2 (ZSW2)

For telegram 3, 5, 102, and 105, valid only in IRT mode.

Table 1-9 ZSW2 each bit value meaning

Bit	Meaning
0~11	Reserved
12~15	Drive heartbeat signal

## 1.3.3 SATZANW、AKTSATZ、MDI\_MOD

• Position table control word (SATZANW)

Used for telegram 9.

Table 1-10 SATZANW each bit value meaning

Bit	Meaning	
0.2	Index of the position task to be started in the position table (value range: $0\sim7$ )	
0~2	Bit 0~2 are valid only in the position table mode	
3~14	Reserved	
	Operating mode selection	
15	= 1 MDI mode	
	= 0 Position table mode	

• Position table status word (AKTSATZ)

Used for telegram 9.

Bit	Meaning	
0.4	The index of the actual effective positioning task (value range: 0~31)	
0~4	Bit 0~4 are valid only in the position table mode	
5~14	Reserved	
	Operating mode	
15	= 1 MDI mode activated	
	= 0 Position table mode activated	

#### Table 1-11 AKTSATZ each bit value meaning

## • MDI mode control word (MDI\_MOD)

Used for telegram 9.

Table 1-12 MDI\_MOD each bit value meaning

Bit	Meaning
0	Select absolute/relative positioning mode = 1 Absolute positioning mode
	= 0 Relative positioning mode
1~15	Reserved

# 1.3.4 POS\_STW1、POS\_STW2、POS\_ZSW1、POS\_ZSW2

• Position control word 1 (POS\_STW1)

Used for telegram 111.

Table 1-13 POS\_STW1 each bit value meaning

Bit	Meaning	
0.2	Index of the position task to be started in the position table (value range: 0~7)	
0~2	Bit 0~2 are valid only in the position table mode	
3~7	Reserved	
	Select absolute/relative positioning mode	
8	= 1 Absolute positioning mode	
	= 0 Relative positioning mode	
9~11	Reserved	
	Absolute positioning mode	
12	= 1 Execute the absolute positioning command immediately according to the target position chang	
	= 0 The absolute positioning command will not be executed immediately according to the target position change.	
13~14	Reserved	
	Operating mode selection	
15	= 1 MDI mode	
	= 0 Position table mode	

• Position control word 2 (POS\_STW2)

Used for telegram 111.

Bit	Meaning
0	Reserved
1	= 1 Set the current position as the homing
2	= 1 Activate homing switch signal
3~13	Reserved
14	= 1 Activate software limit switch signal
15	= 1 Activate hardware limit switch signal

#### Table 1-14 POS\_STW2 each bit value meaning

• Position status word 1 (POS\_ZSW1)

Used for telegram 111.

Table 1-15 POS\_ZSW1 each bit value meaning

Bit	Meaning
0- 4	The index of the actual effective positioning task (value range: 0~31)
0~4	Bit 0~4 are valid only in the position table mode
5~7	Reserved
8	= 1 Negative hardware limit switch signal active
9	= 1 Positive hardware limit switch signal active
10	= 1 Jog mode activated
11~12	Reserved
13	= 1 Position table mode activated
14	Reserved
15	= 1 MDI mode activated
13	= 0 MDI mode not activated

### • Position status word 2 (POS\_ZSW2)

Used for telegram 111.

Table 1-16 POS\_ZSW2 each bit value meaning

Bit	Meaning	
0~3	Reserved	
4	= 1 Moving forward	
4	= 0 Not moving forward	
5	= 1 Moving reversely	
5	= 0 Not moving reversely	
6	= 1 Negative software limit switch reached	
7	= 1 Positive software limit switch reached	
8~15	Reserved	

# 1.3.5 G1\_STW、G1\_ZSW、MELDW

• Sensor 1 control word (G1\_STW)

Used for telegram 3, 5, 102, 105.

Bit	Value	Meaning
0	1	Function 1 (Bit7=0):
1~3		Reserved
4~6	1~3	Command: 0: 1: Activate function 1 <sup>a</sup> 2: Read sensor index signal position and put it into G1_XIST2 3: Cancel function 1 4~7:
7	0/1	Mode: Bit7=0: Sensor index signal position search Bit7=1: Reserved
8~12		Reserved
13	1	Request to transmit absolute actual position in G1_XIST2
14	1	Request to switch off the actual value measurements in the drive
15	1	Request to reset a sensor error

#### Table 1-17 G1\_STW each bit value meaning

a Selection of function 1 (bit 0) and command (bit4~bit7) shall be set simultaneously.

#### • Sensor 1 status word (G1\_ZSW)

Used for telegram 3, 5, 102, 105.

Table 1-18 G1\_ZSW each bit value meaning

Bit	Value	Meaning
0	1	Status:
0	1	Function 1 activated
1~3		Reserved
4	1	Status:
4	1	Sensor index signal position available
5~10		Reserved
11	1	Error acknowledgement in process
12		Reserved
13	1	Indication of the transmission of absolute actual position in G1_XIST2
14	1	Acknowledgement for indication of invalid G1_XIST1
15	1	Sensor fault present

#### • telegram status word (MELDW)

Used for telegram 102, 105.

Table 1-19MELDW each bit value meaning

Bit	Meaning
0	Reserved
1	<ul><li>= 1 Torque does not reach the limit value</li><li>= 0 Torque has reached the limit value</li></ul>
2~15	Reserved

# **Chapter 2 Application description**

The PROFINET communication application in Chapters 3 to 6 is based on the following conditions:

### 1. TIA V17 PLC S7-1500(CPU 1511T-1 PN 6ES7 511-1TK01-0AB0 Firmware V2.8)

2. Kinco PN servo drive

Drive type	Drive firmware	PN firmware
FDxx5-PA-004		
FDxx5P-PA-000	Software version year is 2024 or later	00000005、10000005
MDx0-0xx-DMxK-PA-000		

3. GSD file

PN firmware version	Applicable GSD file					
00000005、10000005	GSDML-V2.43-Kinco-PA5-20240328、GSDML-V2.33-Kinco-PA5-20240328					
00000004	GSDML-V2.33-Kinco-MD60-20210507					
Note:						
a. The default is GSDML-V2.43-Kinco-PA5-20240328						
b. If PLC does not support V	2.43 GSD. use GSDML-V2.33-Kinco-PA5-20240328					

Chapter 7 introduces the method of using S7-200 SMART to control Kinco PN servo drive.

Table 2-1 PROFINET communication parameters

Parameter index	Parameter name	Description
308001	PN firmware version	Applicable PN firmware version for this manual is 00000005, 10000005
308003	PN device name	PROFINET device name (read-only)
308004~308007	PN device name 1~4	Used to modify PROFINET device name
308008	IP address	Drive IP address (hex, read-only)
308009	Subnet mask	Drive subnet mask (hex, read-only)
30800A	Default router	Drive default router (hex, read-only)
30800B	PN enable	<ul> <li>= 1 PN telegram enabled, using telegram (e. g. telegram 105) control</li> <li>= 0 PN telegram disabled, using RS232 or acyclic communication control</li> </ul>
30800C	Enable software limit	See Section 5.4.1, Article 5
30800D	PN user receive word	See Section 5.4.1 Article 9
30800E	PN user send word	See Section 5.4.1, Article 8
30800F~308010	MAC address 1~2	Drive MAC address (hex, read-only)
301101	ECAN synchronization cycle	Optional: 1ms, 2ms, 4ms, 8ms Need to be consistent with the update time of TIA portal configuration
301102	ECAN synchronization mode	<ul><li>= 1 Use isochronous synchronization (IRT) mode</li><li>= 0 Do not use isochronous synchronization (IRT) mode</li></ul>
301103	ECAN synchronization shift	_
600700	Communication abort mode	
100C00	Node guard time	See Section 1.3.2
100D00	Node guard time factor	

# **Chapter 3 Acyclic communication**

# 3.1 Drive IP and device name setting

The PROFINET device name of the drive can be set using the KincoServo+ software, TIA portal and PRONETA software; the IP address of the drive can only be set using TIA portal and PRONETA software. Please note that if the IP address is to be set using the method described below, the "IP address is set directly at the device" option should be selected in TIA portal configuration:

IP address:	192 . 168 .	0	. 2
Subnet mask:	255 . 255 .	255	. 0
Cunchronizo routor	ottinger with If	1.000	100
Synchronize router	ettings with IC	) con	itrol

To set the device name in the KincoServo+ software, proceed as follows:

- 1. Disconnect the drive from the PLC and connect the drive to the KincoServo+ software via RS232.
- 2. Enter the device name in PN Device Name1~4 [308004~308007], the length of each PN Device Name

is limited to 4 characters:

3080	03	PN_Device_Name	Value
3080	04	PN_Device_Name1	fd42
3080	05	PN_Device_Name2	
3080	06	PN_Device_Name3	Help Information of:PN_Device_Name1
3080	07	PN Device Name4	part 1 of PN_Device_Name
3080	04	PN_Device_Name1	Value
3080	05	PN_Device_Name2	5-1
3080	06	PN_Device_Name3	
3080	07	PN_Device_Name4	Help Information of:PN_Device_Name2
3080	08	In Addr	part 2 of PN_Device_Name

3. When the setting is completed, you can see that the PN\_Device\_Name [308003] has been modified:

3080	02	Net_State	Value
3080	03	PN_Device_Name	fd425-1
3080	04	PN_Device_Name1	
3080	05	PN_Device_Name2	Help Information of:PN_Device_Name
3080	06	PN Device Name3	PN_Device_Name

#### To set the drive IP and device name in TIA portal, proceed as follows:

- 1. Connect the drive to the computer with a network cable.
- Open TIA portal, expand the "Online access" drop-down list, select the corresponding network card, and click "Update accessible devices". Once the software has scanned the drive, double click "Online & Diagnostics".

3. Double-click "Assign IP address" in the "Functions" drop-down list. Fill in the IP address and subnet mask, and then click the "Assign IP address" button. If you select "Set IP address in the project" in the configuration, this step can be omitted and you can go directly to step 4 to set the PROFINET device



4. Follow step 3, double click "Assign PROFINET device name" in the "Functions" drop-down list. Fill in the PROFINET device name and click "Assign name" button, the PROFINET device name must be the same as the name in the configuration, otherwise the drive can not communicate with the PLC.

Channel diagnostics <ul> <li>PROFINET interface [X1]</li> </ul>		Configured P	ROFINET de	vice		
Functions     Assign IP address	-	PROFINET de	vice name:	pa5		
Assign PROFINET device na Reset to factory settings			Device type:	Drives		
		Device filter	ow devices of	the same type		
	Accessible de	Onlysh Onlysh vices in the network:	ow devices wi ow devices wi	ith bad parameter settings ithout names		V
•	IP address	MAC address	Device	PROFINET device name	Status	
•						
				) flashes Up	date list	Assign name

5. When the setting is complete, click "Update accessible devices" again to check whether the IP address and device name have been modified successfully.

Alternatively, the drive IP address and device name can be set using the PRONETA software, which can be downloaded from the Siemens website: <u>PRONETA - Siemens China</u>.

# 3.2 Project configuration

 Click menu "Options → Manage general station description files" to install GSD, please take the GSDML-V2.43-Kinco-PA5-20240328 as the standard. In addition, the GSD to which the PN firmware 00000004 applies is GSDML-V2.33-Kinco-MD60-20210507.

Manage general sta	tion descriptio	n files			
Installed GSDs	GSDs in the	project			
Source path: C:\	Users\21775\Docu	imentslAutoi	mation\GSD		
Content of importe	ed path				
File	146	Version	Language	Status	Info
GSDML-V2.43-Kind	co-PA5-202403	V2.43	English, Chinese	Already installed	PA5

2. In the network view, click "Hardware catalog  $\rightarrow$  Other field devices  $\rightarrow$  PROFINET IO  $\rightarrow$  Drives  $\rightarrow$  Kinco  $\rightarrow$  PA5" to add a drive and assign it to the PLC:



3. If PLC is required to automatically configure the device name of drive (the premise of automatic allocation is that the name of the drive is empty), the topology diagram must be connected. In the topology view, connect the ports according to the actual situation.

# Note

• The ports on the topology diagram corresponding to the IN ports on different drives are different. The IN port of FD5P series drive and MD series drive corresponds to port 1 in the topology diagram; the IN port of FD5 series drive corresponds to port 2 in the topology diagram.



4. Double-click the PA5 module, click "Ethernet addresses" in "General", and set the configured IP address and PROFINET device name. The device names need to be consistent with the actual device names of the drives. When there are multiple drives, the device names cannot be the same:

General	IO tags	System constants	Texts	
General Catalog int	ormation	Ethernet addr	resses	/
PROFINET inte General Ethernet a	rface [X1]	Interface n	etworked wi Su	bnet: PN//E 1
Identificati - Advanced	on & Maintena options	ance		Add new subnet
Interfac Media r	e options edundancy	Internet pr	otocol versio	n 4 (IPv4)
Isochro Real tim	nous mode le settings			Set IP address in the project
IO cy Svnc	cle hronization			IP address: 192 . 168 . 0 . 2 Subnet mask: 255 . 255 . 255 . 0
<ul> <li>Port 1 ()</li> <li>Port 2 ()</li> </ul>	(1 P1 R]			Synchronize router settings with IO controller
Identification Shared Devic	& Maintenanc e	e -		Use router Router address: 0.0.0.0 IP address is set directly at the device
		PROFINET		
				Generate PROFINET device name automatical

5. Click on the "System constants" column and note down the HW\_Interface, which will be used later in the read-write parameters module:

PA5		PA5]							
G	en	eral	IO tags	System constants	Texts	1			
Sh	ow	hardwa	re system con	stant 💌					
		Name			Туре		Hardware identi.		Used by
1	Ę	PA5~Int	terface~端口_1		Hw_Ir	terface	260		PLC_1
1	Ę	PA5~Int	terface~端口_2		Hw_Ir	terface	261		PLC_1
	Ę	PA5~Int	terface		Hw_Ir	terface	259		PLC_1
1	Ę	PA5~Pr	оху		Hw_S	ubModule	258		PLC_1
Į	E	PA5~He	ead		Hw_S	ubModule	262		PLC_1

# 3.3 SINA\_PARA\_S (FB287) introduction

FB287 can realize acyclic communication between PLC and drive, and realize servo parameters read-write function. If you cannot find the corresponding function block (FB), you can download the library file Drive\_Lib\_S7\_1200\_1500\_V17 from Siemens official website:

https://support.industry.siemens.com/cs/document/109475044/sinamics-communication-blocks-drivelib-for-reading

-and-writing-drive-data-within-tia-portal-context?dti=0&lc=en-WW

After the download is completed, click menu "Options  $\rightarrow$  Global libraries  $\rightarrow$  Open library", and install the corresponding library file according to the prompt.





#### FB287 pin definition are as follow:

Pin name	Data type	Description
Start	Bool	The rising edge triggers data transmission
DeadWrite	Deal	= 0  Read
Readwrite	D001	= 1 Write
Parameter	Test	Bit8~15: Parameter subindex
	Int	Bit0~7: Command word
Index	Int	Parameter index
ValueWrite1	Real	Reserved
ValueWrite2	DInt	Data writing area, can write 1 to 4 bytes
AxisNo	Byte	Fixed to 1
1 <b>.</b>		See Section 2.3, Article 4, by which the parameter is used to distinguish
nardwareid	HW_IO	between different axes
ValueRead1	Real	Reserved
ValueRead2	DInt	Data reading area
Emon	Deal	Indicates read-write parameters error, when the responsing command word in
Error	B001	Kinco communication protocol is 0x80, this bit is set to 1
Note: Command word: rea	ad all 40H; Write 1 byte 2F	H, write 2 bytes 2BH, and write 4 bytes 23H.

#### Table 3-1 FB287 pin definitions

# 3.4 Read-write parameters using FB287

Take the read-write CMD\_q\_Max [607300] as an example: the parameter index is 0x6073, the subindex is 0x00, and the data type is uint16, so the command word of writing parameter is 0x2B, and that of reading parameter is uniformly 0x40.

1. Read CMD\_q\_Max: When the "Start" pin changes from 0 to 1, the pin "Data Reading Area" automatically becomes 1968 and "ERROR"pin is 0, the data reading is successful:



 Write CMD\_q\_Max: Verify that PN\_Enable [30800B] is 0. "ReadWrite" pin is switched to 1, "Parameter" pin is 0x002B. "Data Writing Area" is written to 1000. Then trigger the "Start" pin to write



the data. Observing the KincoServo+ software, CMD\_q\_Max is changed to 1000 DEC.

# 3.5 Read-write parameters using WRREC and RDREC

The following describes how to read/write parameters using the WRREC / RDREC blocks, which can be found in "Instructions  $\rightarrow$  Extended instructions  $\rightarrow$  Distributed I/O".

1. First, create a new data block (DB) called Acyclic\_Communication. The data in this block is defined as follows:

			Ac	ycli	ic_	Communication			
Software units	~		N				Data type	Start value	Monitor value
🔻 🔂 Program blocks 🛛 🌑		1	-	•	St	atic			
📑 Add new block		2	-		•	Request	Struct		
📲 Main [OB1] 🛛 🔵		3				ReqRef	Byte	16#01	16#01
🚰 MC-Interpolator [OB 🛛 🔵		4	-			RegID	Byte	16#01	16#01
🚰 MC-Servo [OB91]		5	-			AxisID	Byte	16#01	16#01
SINA_PARA_S [FB287]		6				ParaNo	Byte	16#01	16#01
🧧 Acyclic_Communica 🥥		7				Attribute	Byte	16#10	16#10
🥃 SINA_PARA_S_DB [D 🥥	_	8				Number of Element	Byte	16#01	16#01
🕨 🔙 System blocks 🛛 🔵		9				Subindex / CMD	Word	16#002B	16#002B
🕨 🙀 Technology objects 🛛 🔵		10				Index	Word	16#6073	16#6073
External source files		11				Write Format	Byte	16#43	16#43
🕨 🔁 PLC tags 🛛 🔵		12	-			Write Values numb	Byte	16#01	16#01
🕨 📴 PLC data types 🛛 🔵		13	-			Write Value	Dint	0	0
Watch and force tables		14	-		•	Response	Struct		
Online backups		15	-			RespRef	Byte	16#0	16#00
🕨 🔄 Traces		16				RespID	Byte	16#0	16#00
OPC UA communication		17				AxisID	Byte	16#0	16#00
Device proxy data		18				ParaNo	Byte	16#0	16#00
📴 Program info		19				Format	Byte	16#0	16#00
🖙 PLC supervisions & alarms		20	-			CMD	Byte	16#0	16#00
E PLC alarm text lists		21	-			Value	Dint	0	0

The data block Acyclic\_Communication is described as follows:

Request	Response
ReqID:	
0x01: read-only	
0x02: readable and writable	CMD:
Other: Reserved	Responsing command word
Subindex / CMD:	

Bit 8~15: parameter subindex	
Bit 0~7: sending command word	¥7.1 .
Index: Parameter index	value:
Write Value: Data writing area	Data reading area
Other data are in principle consistent with the above figure.	

 Establish the connection of WRREC / RDREC block according to the following figure. The transmission starts when the "REQ" pin is set to 1. "ID" is the HW\_Interface and can be used to distinguish between different axes. "INDEX" is fixed to 47 and "MLEN" is 0.



- 3. The following utilizes the WRREC / RDREC block to read/write CMD\_q\_Max [607300]. The parameter index is 0x6073, subindex is 0x00, and data type is uint16, so the sending command word for writing parameter is 0x2B, and for reading parameter is uniformly 0x40.
- a. Read CMD\_q\_Max:

Use KincoServo+ software to check CMD\_q\_Max is 1000 DEC. The "ReqID" of the Acyclic\_Communication data block is assigned 0x02, "Subindex / CMD" is assigned 0x0040, and "Index" is assigned 0x6073. Trigger "REQ" pin to complete the data reading, and the reading data is displayed in the "Value" of "Response":

Ac	ycli	c_	Communication			
	Nar	ne		Data type	Start value	Monitor value
-00	•	Sta	atic			
-		•	Request	Struct		
-00			ReqRef	Byte	16#01	16#01
-			ReqID	Byte	16#01	16#02
-00			AxisID	Byte	16#01	16#01
-00			ParaNo	Byte	16#01	16#01
-0			Attribute	Byte	16#10	16#10
-00			Number of Element	Byte	16#01	16#01
-00			Subindex / CMD	Word 🔳	16#002B	16#0040
-			Index	Word	16#6073	16#6073
-			Write Format	Byte	16#43	16#43
-			Write Values numb	Byte	16#01	16#01
-00			Write Value	Dint	0	0
-0		•	Response	Struct		
-			RespRef	Byte	16#0	16#01
-00			RespID	Byte	16#0	16#02
-00			AxisID	Byte	16#0	16#01
-			ParaNo	Byte	16#0	16#01
			Format	Byte	16#0	16#43
-			CMD	Byte	16#0	16#4B
-00			Value	Dint	0	1000

Kŝ	🥵 Basic Operation					
Ν	Index	Type	Name	Value	Unit	
0	606100	int8	Operation_Mode_Buff	0	DEC	
1	604100	uint16	Statusword	4270	HEX	
2	606300	int32	Pos_Actual	16	inc	
3	606C00	int32	Speed_Real	1.77	rpm	
4	607800	int16	I_q	0.00	Ap	
5	268000	uint16	Warning_Word	0000	HEX	
6	606000	int8	Operation_Mode	-3	DEC	
7	604000	uint16	Controlword	0000	HEX	
8	607A00	int32	Target_Position	0	inc	
9	608100	uint32	Profile_Speed	0.00	rpm	
10	608300	uint32	Profile_Acc	100.00	rps/s	
11	608400	uint32	Profile_Dec	100.00	rps/s	
12	60FF00	int32	Target_Speed	0.00	rpm	
13	607100	int16	Target Torque%	0.00	%	
14	607300	uint16	CMD_q_Max	1000	DEC	
15	20200D	INT8	Din_Modeu	-4	DEC	
16	20200E	int8	Din_Mode1	-3	DEC	
17	269000	uint8	Encoder_Data_Reset	0	DEC	

### b. Write CMD\_q\_Max:

Verify that PN\_Enable [30800B] is 0. "ReqID" is assigned 0x02, "Subindex / CMD" is assigned 0x002B, "Index" is assigned 0x6073, "Write Value" is assigned 1968. Triggers "REQ" pin to complete the data writing. See the figure below, "CMD" of "Response" is 0x60, indicating that the writing is successful. Use KincoServo+ software to view CMD q Max becomes 1968 DEC.

A1-			Determine	Canada and have	A description of the
INA	me	22 C	Data type	Start value	Monitor value
•	Stat	IC			
•	• •	Request	Struct		
<b>1</b>		ReqRef	Byte	16#01	16#01
<b>1</b>		ReqID	Byte	16#01	16#02
1		AxisID	Byte	16#01	16#01
1	=	ParaNo	Byte	16#01	16#01
		Attribute	Byte	16#10	16#10
		Number of Element	Byte	16#01	16#01
<b>1</b>		Subindex/CMD	Word	16#002B	16#002B
<b>1</b>		Index	Word	16#6073	16#6073
•		Write Format	Byte	16#43	16#43
<b>1</b>		Write Values numb	Byte	16#01	16#01
•		Write Value	Dint	0	1968
• 🗈	• F	lesponse	Struct		
•		RespRef	Byte	16#0	16#01
•		RespID	Byte	16#0	16#02
•		AxisID	Byte	16#0	16#01
		ParaNo	Byte	16#0	16#01
•		Format	Byte	16#0	16#43
1		CMD	Byte 🔳	16#0	16#60
<b>a</b>		Value	Dint	0	1968

Kŝ	Basic Op	eration			
N	Index	Туре	Name	Value	Unit
0	606100	int8	Operation_Mode_Buff	0	DEC
1	604100	uint16	Statusword	4270	HEX
2	606300	int32	Pos_Actual	16	inc
3	606C00	int32	Speed_Real	1.91	rpm
4	607800	int16	I_q	0.00	Ap
5	268000	uint16	Warning_Word	0000	HEX
6	606000	int8	Operation_Mode	-3	DEC
7	604000	uint16	Controlword	0000	HEX
8	607A00	int32	Target_Position	0	inc
9	608100	uint32	Profile_Speed	0.00	rpm
10	608300	uint32	Profile_Acc	100.00	rps/s
11	608400	uint32	Profile_Dec	100.00	rps/s
12	60FF00	int32	Target_Speed	0.00	rpm
13	607100	int16	Target Torque%	0.00	%
14	607300	uint16	CMD_q_Max	1968	DEC
15	20200D	int8	Din_Mode0	-4	DEC
16	20200E	int8	Din_Mode1	-3	DEC
17	269000	uint8	Encoder_Data_Reset	0	DEC

# 3.6 Fault diagnosis function

Through the online diagnosis interface of TIA portal, the fault information of the drive can be viewed. Double-click "Online & diagnosis" under PLC\_1, click "Diagnosis buffer" in the "Diagnosis" drop-down list, and the drive fault event can be seen, which is consistent with the error display of KincoServo+ software. The "Details on event" section below provides the cause of the alarm and what to do about it:

Project tree [	■ < Abs_DSC ▶ PLC_1 [CPU 1511]	T-1 PN)
Devices		
Image: Control of the second secon	Image: Second	Diagnostics buffer Events  Display CPU Time Stamps in PGIPC local time  Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display CPU Time Stamps in PGIPC local time Pump Fault event  Display
V. Online & diagnostics     Single & Single	Display • OPCLVA • PROFINETInterface[X1] • Virtual communication in • Functions	1 9/16/2012 3:53/2.63/2014A Model #Activation of information endol     2 9/16/2012 3:53/2.63/2014A Model #Activation of information endol     3 9/16/2012 3:53/2.63/51 AM MC 421: Tonke under fogical address 0 faulty. Alarm message from drive     4 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return completed     9 9/16/2012 3:151:94.94 AM User data follo device nativatilable - device return ot completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 9/16/2012 3:151:94.93 AM User data follo device nativatilable - device return not completed     9 1/16/2012 3:151:94.93 AM User data follo device nativatilable - device nativatilable - device nativatilable - device nativatilable -
System blocks     Technology objects     Stemal source files     Technology objects     Set Technology objects     Technology objects     Technology objects     Technology objects     Technology     Technology		Details on event: Details on event: Details on event: Module: pa5/级初读_1标准报文 105, F2D-10/10 RackNot: Rack 0 / Slot 1.2 Description: Fror: Metor excitation or information error Pa5/最初读_1标准报文 105, F2D-10/10 Help on fault event
Claim text list     C	× >	Help on event       Incremental encoder: Motor UWIP/have sequence is wrong or encoder is not initialized. The Help on event         Incremental encoder: is deventioned in the initialized. The encoder is initialized. The encoder is served in the encoder is unrown in sincer is encoder is devented. The data stored in the encoder is wrong. The controller can 't support the current encoder type.         Plant designation:



When the drive fault has been eliminated and confirmed, the diagnostics buffer will show that the drive fault

event has been cleared:



# **Chapter 4 Application class 1**

# 4.1 Overview

Kinco PN servo drive can use telegram 1 in Application Class 1. PLC can control the drive through FB285 to achieve speed control. Isochronous synchronization (IRT) operation is not supported.

# 4.2 Project configuration

- 1. See Section 3.1 for the modification of the drive IP address and device name.
- Click menu "Options → Manage general station description files" to install GSD, please take the GSDML-V2.43-Kinco-PA5-20240328 as the standard. In addition, the GSD to which the PN firmware 00000004 applies is GSDML-V2.33-Kinco-MD60-20210507.

general second						
Installed GSDs	GSDs in the	project				
Source path: C:\	Source path: C:\Users\21775\Documents\Automation\GSD					
Combourt of Immont	ted nath					
Content or import	cu putit					
File	eu puur	Version	Language	Status	Info	

 $\rightarrow$  Drives  $\rightarrow$ 

Kinco  $\rightarrow$  PA5" to add a drive and assign it to the PLC:



4. If PLC is required to automatically configure the device name of drive (the premise of automatic allocation is that the name of the drive is empty), the topology diagram must be connected. In the topology view, connect the ports according to the actual situation.



### Note

• The ports on the topology diagram corresponding to the IN ports on different drives are different. The IN port of FD5P series drive and MD series drive corresponds to port 1 in the topology diagram; the IN port of FD5 series drive corresponds to port 2 in the topology diagram.



5. Double-click the PA5 module, click "Ethernet addresses" in "General", and set the configured IP address and PROFINET device name. The device names need to be consistent with the actual device names of the drives. When there are multiple drives, the device names cannot be the same:

General IO tags	System constants	Texts				
General Catalog information	Ethernet addre	sses				
PROFINET interface [X1] General Ethernet addresses	Interface ne	Interface networked with Subnet: PN/IE_1				
<ul> <li>Advanced options</li> </ul>	since		Add new subnet			
Interface options Media redundancy Isochronous mode Real time settings IO cycle Synchronization Port 1 [X1 P1 R] Port 2 [X1 P2 R] Identification & Maintenanc Shared Device	e 4	tocol version 4	<ul> <li>(IPv4)</li> <li>Set IP address in the project         <ul> <li>IP address:</li> <li>192.168.0.2</li> <li>Subnet mask:</li> <li>255.255.255.0</li> </ul> </li> <li>Synchronize router settings with IO controller         <ul> <li>Use router</li> <li>Router address:</li> <li>0.0.0.0</li> <li>IP address is set directly at the device</li> </ul> </li> </ul>			
	PROFINET		Generate PROFINET device name automatically			
	PROF	INET device nam	e: pa5			

6. In the device view, select PLC\_1, click "general  $\rightarrow$  PROFINET interface  $\rightarrow$  Advanced options  $\rightarrow$  Real

time settings  $\rightarrow$  IO communication" to set the PLC's Send clock:

PLC_1 [CPU	1511T-1 PN]					S Properties	s 🗓 Info	ę,
General	IO tags	Sys	tem co	onstants	Texts			
Checksur PROFINET int General	ns terface [X1]	^	> >	IO comm	unication			
Ethernet	addresses				Send cl	ock: 1.000	ms	Ŧ
Time-of-d	ay synchroniz					1.000		~
Operating	g mode				-	1.125		
▼ Advanced	d options					1.250		
Interfa	ce options					1.500		_
Media	Media redundancy					1.625	1	-
🔻 Real ti	me settings					1.750		
10 0	communication					2.000		
Syn	chronization	1				2.125		
Rea	I time options	=				2.250		~

7. In the device view, select PA5, click "Hardware catalog → Module → PROFIdrive Module → Submodules", delete telegram 3 under "Device overview" first, and then add telegram 1 to the corresponding position:

•	3	Device overview								
	^	Module	 Rack	Slot	I	Туре	Article number	Firmware		✓ Catalog
	=	▼ PA5	0	0		PA5	PA5-PN-AAA	V5.1.0	^	
		▼ Interface	0	0 X1		PA5				Filter Profile:
5		Port 1	0	0 X1 P1		Port 1				A thead module
8r.		Port 2	0	0 X1 P2		Port 2				- Interview
		<ul> <li>PROFIdrive Module_1</li> </ul>	0	1		PROFIdrive Module				
	Parameter Access Point	0	11		Parameter Access Po.			-		
		Standard Telegram 1, PZ	0	12		Standard Telegram 1.				Standard Telegram 1 PZD-2/2
-			0	13					-	Standard Telegram 102 PZD-6/10
			0	2						Standard Telegram 105, FZD-10/10
	-		0	3						Standard Telegram 111, PZD-12/12
	7		0	4					-	Standard Telegram 3, P7D-5/9
			0	5						Standard Telegram 5, PZD-9/9
			0	6						Standard Telegram 9, PZD-10/5
	1		0	7						Supplementary Telegram 750 P7D-2
			0	8						Supplementary lelegiant / 50,120-5/

 Remember the hardware identifier: select telegram 1 → right-click Properties→ System constants → Hardware identifier:



In the device view, select PA5, click "General→ PROFINET interface → Advanced options → Real time settings → IO cycle" to set the configured drive update time:

PA5 [PA5]		💁 Properties 🚺 Inf
General IO tags Sys	tem constants Texts	
General     Catalog information     PROFINET interface [X1]     General     Ethernet addresses     Identification & Maintenance     Advanced options     Interface options	<ul> <li>IO cycle</li> <li>Shared Device</li> <li>IO controller outside project with access to this IO device</li> <li>IO device send clock</li> </ul>	0
Media redundancy Isochronous mode Real time settings IO cycle Synchronization Port 1 [X1 P1 R] Port 2 [X1 P2 R] Identification & Maintenance Shared Device	Update time Update time:	Calculate update time automatically Set update time manually 4.000 Adapt update time when send clock changes

10. Add FB285 to Main[OB1] and assign variables to its pins.

If you cannot find the corresponding function block (FB), you can download the library file Drive\_Lib\_S7\_1200\_1500\_V17 from Siemens official website:

https://support.industry.siemens.com/cs/document/109475044/sinamics-communication-blocks-drivelib-for-re ading-and-writing-drive-data-within-tia-portal-context?dti=0&lc=en-WW

After the download is completed, click menu "Options  $\rightarrow$  Global libraries  $\rightarrow$  Open library", and install the corresponding library file according to the prompt.



# 4.3 SINA\_SPEED (FB285) introduction

Table 4-1 describes the FB285 pin definition

Table	4-1	FB285	pin	definition
-------	-----	-------	-----	------------

Pin name	Data type	Description					
		Enable axis:					
EnableAxis	Bool	=0 Disable, control word is 0xE					
		=1 Enable, control word is 0xF					
AckError	Bool	Reset fault, rising edge valid					
SpeedSp	Real	Speed setpoint in RPM					
RefSpeed	Real	Reference speed, must be 1/2 of the n	naximum speed [607F00] in RPM				
		The default is 16#3F, and the correspo	onding relationship with STW1 is as				
		follows:					
		Bit in ConfigAxis	Bit in STW1				
		Bit 0	Bit 1				
		Bit 1	Bit 2				
Confortair	Wl	Bit 2	Bit 3				
ConfigAxis	Word	Bit 3	Bit 4				
		Bit 4	Bit 5				
		Bit 5	Bit 6				
		Bit 6	Bit 11				
		Bit 7~15: Reserved					
		See Table 1-6 for the meaning of each	bit in STW1				
HWIDSTW	HW_IO	See Section 4.2, Article 7, by which the parameter is used to distinguish					
HWIDZSW	HW_IO	between different axes					
AxisEnabled	Bool	=1 Axis is enabled					
Lockout	Bool	=1 Switching on inhibited					
ActVelocity	Real	Speed actual value in RPM					
Error	Bool	=1 Fault present					
		Status indication:					
		16#7002: No error					
Status	Int	16#8401: Drive fault					
Status	Int	16#8402: Switching on inhibited					
		16#8600: DPRD_DAT error					
		16#8601: DPWR_DAT error					
DiagId	Word	Extended communication error					

# **Chapter 5 Application class 3**

# 5.1 Overview

Kinco PN servo drive can select telegram 9 and 111 in Application Class 3. When using telegram 111, PLC can control the drive through FB284 to realize the basic positioning (EPOS) function. The operation modes are Jog, Homing, MDI, position table, etc. Isochronous synchronization (IRT) operation is not supported.

# 5.2 **Project configuration**

- 1. See Section 3.1 for the modification of the drive IP address and device name.
- Click menu "Options → Manage general station description files" to install GSD, please take the GSDML-V2.43-Kinco-PA5-20240328 as the standard. In addition, the GSD to which the PN firmware 00000004 applies is GSDML-V2.33-Kinco-MD60-20210507.

Manage general st	ation descriptio	n files	,		×
Installed GSDs	GSDs in the	project			
Source path: C	:\Users\21775\Docu	ments\Auto	mation\GSD		
Content of impor	ted path				
File		Version	Language	Status	Info
GSDML-V2.43-Ki	nco-PA5-202403	V2.43	English, Chinese	Already installed	PA5

3. In the network view, click "Hardware catalog  $\rightarrow$  Other field devices  $\rightarrow$  PROFINET IO  $\rightarrow$  Drives  $\rightarrow$  Kinco  $\rightarrow$  PA5" to add a drive and assign it to the PLC:

🛅 Additional Ethernet devices			
PROFINETIO	PLC_1	PA5	
🕶 🛅 Drives	CPU 1511T-1 PN	PA5	DP-NORM
INOVANCE		PLC 1	
👻 🛅 Kinco		<u></u>	
👻 🧊 PA5			
🕶 🧊 PA5			
PA5		PN/IE_1	
SIEMENS AG			

4. If PLC is required to automatically configure the device name of drive (the premise of automatic allocation is that the name of the drive is empty), the topology diagram must be connected. In the topology view, connect the ports according to the actual situation.

# $\rightarrow$

# Note

• The ports on the topology diagram corresponding to the IN ports on different drives are different. The IN port of FD5P series drive and MD series drive corresponds to port 1 in the topology diagram; the IN port of FD5 series drive corresponds to port 2 in the topology diagram.



5. Double-click the PA5 module, click "Ethernet addresses" in "General", and set the configured IP address and PROFINET device name. The device names need to be consistent with the actual device names of the drives. When there are multiple drives, the device names cannot be the same:

General	IO tags	System constants	Texts	
General Catalog inf PROFINET inte General Ethernet a Identificati ▼ Advanced Interfac Media m	formation rface [X1] ddresses on & Maintenau options e options edundancy	Ethernet addres Interface net	ses worked with Subn	et: PN/IE_1 Add new subnet 4 (IPv4)
Media redundancy Isochronous mode Real time settings IO cycle Synchronization Port 1 [X1 P1 R] Port 2 [X1 P2 R] Identification & Maintenance Shared Device				Set IP address in the project     IP address: 192.168.0.2     Subnet mask: 255.255.255.0      Synchronize router settings with IO controller     Use router     Router address: 0.0.0.0     IP address is set directly at the device
		PROFINET	VET device nan	Generate PROFINET device name automatically

In the device view, select PLC\_1, click "general → PROFINET interface → Advanced options → Real time settings → IO communication" to set the PLC's Send clock:

PLC_1 [CPU	1511T-1 PN]				<b>Q</b> Properties	🛄 Info	ų.
General	IO tags	Sys	tem constants	Texts			
Checksur PROFINET int	ns terface [X1]	^	> > IO commu	inication			
Ethernet	addresses			Send clock:	1.000	ms	-
Time-of-d	ay synchroniz				1.000		^
<ul> <li>Advanced</li> </ul>	d options				1.250 1.375		
Interfa Media	ce options redundancy				1.500 1.625		≡
🔻 Real ti	me settings				1.750 1.875	3	
IO o Syn	communication Ichronization				2.000 2.125 2.250		
Rea	I time options	=			2.375		~

7. In the device view, select PA5, click "Hardware catalog → Module → PROFIdrive Module → Submodules", delete telegram 3 under "Device overview" first, and then add telegram 111 to the corresponding position:



8. Remember the hardware identifier: select telegram  $111 \rightarrow \text{right-click Properties} \rightarrow \text{System constants} \rightarrow \text{Hardware identifier:}$ 



In the device view, select PA5, click "General→ PROFINET interface → Advanced options → Real time settings → IO cycle" to set the configured drive update time:

PA5 [PA5]			Reperties 1. Info			
General IO tags Sy	stem constants	Texts				
<ul> <li>✓ General Catalog information</li> <li>✓ PROFINET interface [X1] General Ethernet addresses Identification &amp; Maintenance</li> <li>✓ Advanced options</li> </ul>						
Interface options Media redundancy Isochronous mode Real time settings IO cycle Synchronization Port 1 [X1 P1 R] Port 2 [X1 P2 R] Identification & Maintenance	Update time	Update time:	Calculate update time automatically C Set update time manually 4.000 Adapt update time when send clock changes			

10. Add FB284 to Main[OB1] and assign variables to its pins.

If you cannot find the corresponding function block (FB), you can download the library file Drive Lib S7 1200 1500 V17 from Siemens official website:

https://support.industry.siemens.com/cs/document/109475044/sinamics-communication-blocks-drivelib-for-re ading-and-writing-drive-data-within-tia-portal-context?dti=0&lc=en-WW

After the download is completed, click menu "Options  $\rightarrow$  Global libraries  $\rightarrow$  Open library", and install the corresponding library file according to the prompt.



# 5.3 SINA\_POS (FB284) introduction

Table 5-1 describes the FB284 pin definition

Table 5-1 FB284 pin defin	ition
---------------------------	-------

Pin name	Data type	Description	
		Operating mode:	
		=0	
		=1 Relative positioning	
ModePos	Int	=2 Absolute positioning	
		=3	
		=4 Active homing	
		=5 Direct homing	
			=6 Position table (not supported)
		=7 Jog at the specified speed	
		=8	

Pin name	Data type	Description				
EnableAxis	Bool	=0 Disable, control word is 0xE				
		=1 Enable, control word is 0xF				
CancelTraversing	Bool	=1 Do not reject traversing task =0 Reject traversing task				
IntermediateStop	Bool	=1 No intermediate stop				
	D 1	=0 Intermediate stop				
Positive	Bool	Positive direction				
Negative	Bool	Negative direction				
Jogi	Bool	Jog reversely				
Jog2	Bool	Jog forward				
FlyRef	Bool	Invalid, need to be 0				
AckError	Bool	Reset fault, rising edge valid				
ExecuteMode	Bool	Activate operating mode, rising edge valid				
Position	DInt	Position set point for operating mode 1, 2 Position table start/New task index for operating mode 6. The value ranges from 0 to 7				
Velocity	DInt	Speed set point for operating mode 1, 2, 7				
		The default is 16#00000003. The corresponding relationship with				
		relevant control word is as follows:				
		Bit in ConfigEPos Bit in control word				
		Bit 0 STW1 Bit 1				
		Bit 1 STW1 Bit 2				
		Bit 2 POS_STW2 Bit 14				
ConfigEPos	DWord	Bit 3 POS_STW2 Bit 15				
		Bit 6 POS_STW2 Bit 2				
		Bit 8 POS_STW1 Bit 12				
		Other Bits: Reserved				
		See Table 1-6 for the meaning of each bit in STW1				
		See Table 1-13 for the meaning of each bit in the POS_STW1				
		See Table 1-14 for the meaning of each bit in the POS_STW2				
OverV	Int	The percentage of the speed set point when the operating mode is 1, 2,				
		and 7, unit : %, Range 0 to 199%				
OverAcc	Int	The percentage of the acceleration when the operating mode is 1, 2, and 7 unit $\cdot$ % Range 0 to 100%				
		The percentage of the deceleration when the operating mode is 1, 2, and				
OverDec	Int	7, unit : %, Range 0 to 100%				
HWIDSTW	HW_IO	See Section 5.2, Step 7, for this parameter to distinguish between				
HWIDZSW	HW_IO	different axes				
AxisEnabled	Bool	=1 Axis is enabled				
AxisPosOk	Bool	=1 Target position reached				
AxisSpFixed	Bool	=1 Setpoint position reached				
AxisRef	Bool	=1 Reference point set				
AxisWarn	Bool	=1 Warn present				
AxisError	Bool	=1 Fault present				
Lockout	Bool	=1 Switching on inhibited				
ActVelocity	DInt	Speed actual value				
ActPosition	DInt	Position actual value				
ActMode	Int	Current operating mode				

Kinco PN servo driver PROFINET communication manual

Pin name	Data type	Description
EPosZSW1	Word	POS_ZSW1 current value, see Table 1-15
EPosZSW2	Word	POS_ZSW2 current value, see Table 1-16
ActWarn	Word	Speed actual value
ActFault	Word	Drive error code [603F00]
Error	Bool	=1 Fault present
		Status indication:
		16#7002: No error
		16#8401: Drive fault
		16#8402: Switching on inhibited
Status	Word	16#8403: Homing procedure forbidden during positioning
Status	word	16#8600: DPRD DAT error
		16#8601: DPWR DAT error
		16#8202: Operating mode is selected incorrectly
		16#8203: Setpoint is incorrect
		16#8204: Position table task index error
DiagID	Word	Extended communication error

# 5.4 FB284 function description

# 5.4.1 Operating condition and setting

- 1. The initial value of the input pin "ConfigEPos" should be 3.
- 2. The input pins "CancelTraversing" and "IntermediateStop" are valid for all modes except jog mode, and should be set to 1 during operation, as follows:
  - a. When "CancelTraversing" = 0, it means that the current task is canceled, and the deceleration corresponds to the halt mode [605D00]. The operating mode can be switched after the axis stops.
  - b. When "IntermediateStop" = 0, it means to pause the current task, and the deceleration corresponds to the halt mode [605D00]. The axis will continue to run after resetting "IntermediateStop" = 1. The operating mode can be switched after the axis stops.
- 3. The input pin "ModePos" is used to select the operating mode; the rising edge of "ExecuteMode" triggers the positioning movement.
- 4. Activate software limit switch

After setting the reference point, if you need to use a software limit switch, you need to set bit 2 of the input pin "ConfigEPos" to 1 ("ConfigEPos" = 16#00000007) or set the En\_SoftWare\_Limit [30800C] to 1.



Activate the software limit function, set the soft positive limit [607D01] and the soft negative limit [607D02] for the drive.

30800C	uint8	En_SoftWare_Limit	1	DEC
607D01	int32	Soft_Positive_Limit	1000000	DEC
607D02	int32	Soft_Negative_Limit	-1000000	DEC

After you set soft positive limit more than soft negative limit and set the reference point, the software limit function is enabled.

#### 5. Activate hardware limit switch

If you need to use a hardware limit switch, you need to set bit 3 of the input pin "ConfigEPos" to 1 ("ConfigEPos" = 16#000000B):

16#0000_000B	
%MD18	
"ConfigEPos" -	ConfigEPos
267 —	HWIDSTW
267 -	HWDZSW

Use KincoServo+ software to define the positive limit and negative limit for the DIN of the drive.

The drive can only be operated when the hardware limit switch signal is high.

Ks Digi	tal IO Functions					-
	Input					
Num	Function		×	Simulate	Real	Polarity
DIN1	Home Signal	>>	×		•	
DIN2	P Limit +	>>	×		•	
DIN3	P Limit -	>>	×		•	

Please note that only positive and negative limits are configured in the KincoServo+ software, but bit 3 of "ConfigEPos" is not set to 1, then the hardware limit function will not take effect.

#### 6. Activate homing switch

The homing switch signal can be activated by setting bit 6 of the input pin "ConfigEPos" to 1 ("ConfigEPos" = 16#0000004B):

16#0000_004B	
%MD18	
"ConfigEPos" -	ConfigEPos
267 —	HWIDSTW
267 -	HWIDZSW

The same purpose can be achieved by configuring the home signal for the drive's DIN on the KincoServo+ software:

t Digit	al IO Functions				0
-Digital I Num	nput Function	×	Simulate	Real	Polarity
DIN1	Home Signal	>> ×		•	
DIN2	P Limit +	>> ×		•	
DIN3	P Limit -	>> 🗙		•	

#### 7. Setting and reading servo parameters using telegram 111

The PLC allocates 24-byte receiving and sending areas for telegram 111, which can be viewed in the FB284 DB block. The "Reserve" variables under the structures "sxSendBuf" and "sxRecvBuf" can be used to customize the settings and read servo parameters:

			SIN	A_P	OS_DB		
▼ 🔄 AC3	^	-		Nam	e	Data type	Start value
📑 Add new device		37	-	•	sxSendBuf	Struct	
Devices & networks		38	-		STW1	Word	WORD#16#0000
PLC_1 [CPU 1511T-1 PN]		39	-		EPosSTW1	Word	WORD#16#0000
Device configuration		40	-		EPosSTW2	Word	WORD#16#0000
😵 Online & diagnostics		41	-		STW2	Word	WORD#16#0000
🔻 🙀 Software units		42	-		OverrideV	Word	WORD#16#0000
💕 Add new software unit	=	43	-		Position	DWord	DWORD#16#000(
🔻 🔂 Program blocks		44			Velocity	DWord	DWORD#16#000(
Add new block		45	-		OverrideA	Word	WORD#16#0000
📲 Main [OB1]		46	-		OverrideD	Word	WORD#16#0000
SINA_POS [FB284]		47	-		Reserve	Word	WORD#16#0000
SINA_POS_DB [DB2]		48	-	•	sxRecvBuf	Struct	
<ul> <li>System blocks</li> </ul>		49	-		ZSW1	Word	WORD#16#0000
🔻 😹 Program resources		50			EPosZSW1	Word	WORD#16#0000
🕨 🙀 Technology objects		51	-		EPosZSW2	Word	WORD#16#0000
External source files		52			ZSW2	Word	WORD#16#0000
🔻 🌄 PLC tags		53			NotUsed	Word	WORD#16#0000
Show all tags		54	-		Position	DWord	DWORD#16#0000
📑 Add new tag table		55	-		Velocity	DWord	DWORD#16#000(
🕌 默认变量表 [72]		56			ErrNr	Word	WORD#16#0000
PLC data types		57			WarnNr	Word	WORD#16#0000
Watch and force tables		58	-		Reserve	Word	WORD#16#0000

The relevant servo parameters are the PN\_User\_Receive [30800D] and the PN\_User\_Send [30800E]:

30800D	uint8	PN_User_Receive	0 DEC	2
30800E	uint8	PN_User_Send	0 DEC	3

The explanation is as follows:

PN_User_Receive	=0 non-functional =1 Enable torque limiting and transmit the torque limit value in "Reserve" under "sxSendBuf"
PN_User_Send	=0 non-functional =2 Transfer the actual current in "Reserve" under "sxRecvBuf"

#### a. Torque limiting function

When using the torque limiting function, please set the appropriate torque limit value; if the limit value is too small, it may cause the drive's following error to be too large.

The "Reserve" variable of "sxSendBuf" in the FB284 DB block corresponds to ten times the Max Torque%[607200].

First set "Reserve" to 16#1F4 = 500, then the Max Torque% should be 50%:



Index	Sub.	Name	Data Type	Attribute
3080	OD	PN_User_Receive	Unsigned8	RWL
	Value		Unit	
	1		DEC	
lelp Informa Jser defined	tion of:PN_U	Jser_Receive d		
): non				

Then set the PN\_User\_Receive [30800D] to 1: torque as follows:

#### Max Torque% has become 50%:

Index	Sub.	Name	Data Type	Attribute
6072	00	Max_Torque%	Unsigned 16	RWL
	Value		Unit	
	49.80		%	

Please note that once [30800D] is set to 1, the torque limit becomes effective, and after setting [30800D] to 0 again, the torque limit value does not revert to the initial value, but it is possible to set the torque limit [607200] directly on the KincoServo+ software.

#### b. Read actual current

First set the PN\_User\_Send [30800E] to 2: I\_q as follows:

Index	Sub.	Name	Data Type	Attribute
3080	0E	PN_User_Send	Unsigned8	RWL
	Value		Unit	
	2		DEC	
Help Informa	tion of:PN_U	ser_Send		
Help Informa User defined 0: non 1: actual 2: I_q	ition of:PN_U: receive word torque	ser_Send I		

In FB284 DB block, "sxRecvBuf"  $\rightarrow$  "Reserve" variable reads drive actual current, unit DEC, which needs to be converted, such as the reading value converted to Ap: 16 # 15 = 21, 21 / 2048 \* 18Ap (I\_Max [651003]) = 0.19Ap:



#### 5.4.2 Operating mode 1 (Relative positioning)

Requirements:

- 1. Operating mode "ModePos" = 1
- 2. "ConfigEPos" = 16#00000003
- 3. "EnableAxis" = 1
- 4. "CancelTraversing" and "IntermediateStop" must be 1, and "Jog1" and "Jog2" must be 0.

Steps:

- Specify the target position and target speed through the input pin "Position" and "Velocity". The unit of position and velocity is DEC. Refer to the drive manual for conversion, and the unit of velocity is transformed into: DEC = RPM \* 512 \* feedback resolution [641003] / 1875.
- 2. Use "OverV", "OverAcc" and "OverDec" to scale the percentage of the target speed and profile acceleration and deceleration.
- 3. The direction of movement is determined by the positive or negative value set in "Position".
- 4. The movement is triggered by the rising edge of "ExecuteMode", and "AxisPosOk" is set to 1 after reaching the target position. If there is an error locating, "Error" is set to 1.
- 5. The currently running command can be replaced with a new command via the "ExecuteMode" rising edge. At any time, it can switch between operating mode 1 and 2. If you need to switch to another operating mode, the axis must be stationary.

### 5.4.3 Operating mode 2 (Absolute positioning)

Requirements:

- 1. Operating mode "ModePos" = 2
- 2. "ConfigEPos" = 16#00000003
- 3. "EnableAxis" = 1
- 4. "CancelTraversing" and "IntermediateStop" must be 1, and "Jog1" and "Jog2" must be 0.

Steps:

- Specify the target position and target speed through the input pin "Position" and "Velocity". The unit of
  position and velocity is DEC. Refer to the drive manual for conversion, and the unit of velocity is
  transformed into: DEC = RPM \* 512 \* feedback resolution [641003] / 1875.
- 2. Use "OverV", "OverAcc" and "OverDec" to scale the percentage of the target speed and profile acceleration and deceleration.
- 3. When running, the drive will follow the shortest path to the target position, and "Positive" and "Negative" must be 0.
- 4. The movement is triggered by the rising edge of "ExecuteMode", and "AxisPosOk" is set to 1 after

reaching the target position. If there is an error locating, "Error" is set to 1.

- 5. The currently running command can be replaced with a new command via the "ExecuteMode" rising edge. At any time, it can switch between operating mode 1 and 2. If you need to switch to another operating mode, the axis must be stationary.
- 6. By setting bit 8 of "ConfigEPos" ("ConfigEPos" = 16#00000103), after updating "Position" on the PLC, there is no need to trigger "ExecuteMode", the new setting value will take effect immediately, and the servo will immediately execute the absolute positioning instruction according to the target position change.

### 5.4.4 Operating mode 4 (Active homing)

Requirements:

- 1. Operating mode "ModePos" = 4
- 2. "ConfigEPos" = 16#00000003. If hardware limits are used, "ConfigEPos" = 16#0000000B.
- 3. "EnableAxis" = 1
- 4. "CancelTraversing" and "IntermediateStop" must be 1, and "Jog1" and "Jog2" must be 0.

#### Steps:

 The way and the speed of returning to the reference point should be configured by the KincoServo+ software (PLC only sends the command, and the planning of returning to the homing is set by the servo parameters). Please refer to the drive manual for the specific way of returning to the homing:

Ks Homing Mode						
N	Index	Туре	Name	Value	Unit	
0	607C00	int32	Home_Offset	0	inc	
1	609800	int8	Homing_Method	1	DEC	
2	609901	uint32	Homing_Speed_Switch	300.00	rpm	
3	609902	uint32	Homing_Speed_Zero	100.00	rpm	
4	609903	uint8	Homing_Power_On	0	DEC	
5	609A00	uint32	Homing_Accelaration	50.00	rps/s	
6	609904	int16	Homing_Current	4.71	Ap	
7	609905	uint8	Home_Offset_Mode	0	DEC	
8	609906	uint8	Home_N_Blind	0	DEC	

2. A return to the homing motion is triggered by the rising edge of "ExecuteMode". After the motion, "AxisRef" is set to 1, if there is an error during the operation, "Error" is set to 1.

### 5.4.5 Operating mode 5 (Direct homing)

**Requirements:** 

- 1. Operating mode "ModePos" = 5
- 2. "ConfigEPos" = 16#00000003
- 3. "EnableAxis" = 1
- 4. The axis must be stationary.

Steps:

The homing of the axis is set by the rising edge of the "ExecuteMode". When the homing operation has been done, the output pin "AxisRef" turns to be 1.

### 5.4.6 Operating mode 7 (Jog at the specified speed)

Requirements:

- 1. Operating mode "ModePos" = 7
- 2. "ConfigEPos" = 16#00000003
- 3. "EnableAxis" = 1
- 4. The axis must be stationary.

#### Steps:

- 1. Specify the jog speed through the input pin "Velocity", which must be a positive value in unit DEC.
- 2. Use "OverV", "OverAcc" and "OverDec" to scale the percentage of the jog speed and profile acceleration and deceleration.
- "CancelTraversing" and "IntermediateStop" have nothing to do with the jog mode. The running direction is independent of "Positive" and "Negative".
- 4. There is no need to trigger "ExecuteMode". Reverse jogging when "Jog1" = 1, forward jogging when "Jog2" = 1. "Jog1" and "Jog2" can only be triggered separately. When "Jog1" and "Jog2" are 0 or 1 at the same time, the axis stops.
# **Chapter 6 Application class 4**

### 6.1 Overview

Kinco PN servo drive can select telegram 3, 5, 102, 105 in Application Class 4. The technology object is configured in PLC and controlled using PLC\_open function blocks such as MC\_Power and MC\_MoveAbsolute, where the position loop calculation of the servo three-loop control is completed in PLC, and the drive is in speed mode. The functional differences between the different telegrams are shown in Table 6-1.

Table 6-1 Application Class 4 telegram function difference

Telegram	IRT supported	Torque limiting supported	DSC supported
105	Yes	Yes	Yes
102	Yes	Yes	No
5	Yes	No	Yes
3	Yes	No	No

# 6.2 Project configuration

- 1. See Section 3.1 for the modification of the drive IP address and device name.
- Click menu "Options → Manage general station description files" to install GSD, please take the GSDML-V2.43-Kinco-PA5-20240328 as the standard. In addition, the GSD to which the PN firmware 00000004 applies is GSDML-V2.33-Kinco-MD60-20210507.

lanage general sta	tion description	files			
Installed GSDs	GSDs in the p	roject			14
Source path: C:\L	Jsers\21775\Docum	n <mark>ents\Auto</mark> r	mation\GSD		
Content of importe	ed path				
🛃 File		Version	Language	Status	Info
GSDML V2 43-Kinc	o-PA5-202403	V2 43	English Chinese	Already installed	PAE

 In the network view, click "Hardware catalog → Other field devices → PROFINET IO → Drives → Kinco → PA5" to add a drive and assign it to the PLC:

<ul> <li>Other field devices</li> </ul>			
Additional Ethernet devices			
✓ Im PROFINET IO	PLC_1	PAS	
🕶 🧊 Drives	CPU 1511T-1 PN	PAS	DP-NORM
INOVANCE		PLC_1	
👻 🫅 Kinco			
TIM PAS			
🕶 🧰 PA5		PN/IE 1	
PA5			
SIEMENS AG			

4. The topology diagram must be connected to use the isochronous synchronization mode. In the topology view, connect the ports according to the actual situation.



Note

• The ports on the topology diagram corresponding to the IN ports on different drives are different. The IN port of FD5P series drive and MD series drive corresponds to port 1 in the topology diagram; the IN port of FD5 series drive corresponds to port 2 in the topology diagram.



5. In the device view, select PLC\_1, click "General  $\rightarrow$  PROFINET interface  $\rightarrow$  Advanced options  $\rightarrow$  Real

PLC_1 [CPU	1511T-1 PN]				<b>Properties</b>	🗓 Info 📱
General	IO tags	Sy	stem constants	Texts		
Checksur PROFINET int General	ns terface [X1]	^	> > IO commu	nication		
Ethernet Time-ofd Operatin Advancet Interfa Media Real ti Syn	addresses ay synchroniz g mode d options ce options redundancy me settings communication ichronization			Send clock:	1.000           1.000           1.250           1.375           1.500           1.625           1.750           1.875           2.000           2.125           2.250	ms 💌
PROFINET inte General Ethernet a Time-of-da Operating	rface [X1] ddresses y synchroniz mode		Synchroniza     Synchroniza     Synchroniza	sync domain:	Sync-Domain_1 Sync master	
<ul> <li>Advanced Interfac Media re Real tim IO co Sync</li> </ul>	options e options edundancy ne settings ommunication hronization			RT class:	RT,IRT	

time settings" to set the send clock and enable the synchronization mode:

In the device view, select PA5, click "Hardware catalog → Module → PROFIdrive Module → Submodules", delete telegram 3 under "Device overview" first, and then add telegram 105 to the corresponding position:

		Device overview							
	^	Wodule	 Rack	Slot	I address	Q address	Туре	Article number	✓ Catalog
		▼ PA5	0	0			PA5	PA5-PN-AAA	<search></search>
	=	Interface	0	0 X1			PA5		Filter Profile:
-25		<ul> <li>PROFIdrive Module_1</li> </ul>	0	1			PROFIdrive Module		N Head medule
Q,	to and	Parameter Access Point	0	11			Parameter Access P.		The Module
		Standard Telegram 105,	 0	12	019	019	Standard Telegram .		RROEldrive Medule
_			0	13	-				
			0	2		_			Standard Telegram 1, PZD-2/2
-			0	З				12	Standard Telegram 102, PZD-6/10
			0	4					Standard Telegram 105, PZD-10/10
			0	5					Standard Telegram 111, PZD-12/12
			0	6					Standard Telegram 3 .PZD-5/9
			0	7					Standard Telegram 5, PZD-9/9
	4		0	8					Standard Telegram 9, PZD-10/5
			0	9					Supplementary Telegram 750.PZD-3/1
	-		0	10					

 Click "General → PROFINET interface → Advanced options → Isochronous mode", then check telegram 105 below to enable the synchronization mode, and set Ti to 0.375ms:

General	IO tags	Syste	m constants	Texts					
<ul> <li>General</li> <li>Catalog in</li> </ul>	nformation		> Isochronous	mode					
PROFINET int	erface [X1]		Isochronous	mode for local i	modules				
Ethernet	addresses				Sochronous mode				
Identifica	tion & Mainten	ance		Send clock:	1.000			ms	~
▼ Advanced	doptions			Application cycle:	1.000			ms	>
Media	ce options redundancy			Ti/To values:	Manual				-
Isochr Real ti	onous mode me settings		Time T	i (read in process values):	0.375000 ms				
10 0	cycle			Intervals:	0.125				ms
Syn Port 1	chronization [X1 P1 R]		Time Ti	o (output process values):	0.25 ms				
Port 2 Identification	[X1 P2 R] n & Maintenand	e É		Intervals:	0.125				ms
Shared Devi	ce	•	Detail overvie	ew					
			Name			Slot/s	Isochr		
			PROFIdrive	Module_1/Param	eter Access Point	1/1			
			PROFIdrive	e Module_1/Standa	ard Telegram 105, PZD-10/10	1/2			

8. In IRT mode, device update time = PLC send clock:

<ul> <li>Advanced options</li> </ul>	IO controller outside project			-
Interface options	with access to this IO device	0		
Media redundancy	IO device send clock	1.000	ms	-
Isochronous mode				
<ul> <li>Real time settings</li> </ul>	Update time			
IO cycle				
Synchronization		Calculate update time automatically		
Port 1 [X1 P1 R]		<ul> <li>Set update time manually</li> </ul>		
Port 2 [X1 P2 R]	the design of the second	1.000		
Identification & Maintenance	update time:	1.000	ms	
Shared Device				

The update time of the configuration needs to be consistent with the ECAN\_Sync\_Cycle [301101], set to

0 for 1ms:

Index	Sub.	Name	Data Type	Attribute	
3011	01	ECAN_Sync_Cycle	Unsigned8	RWSL	
	Value		Unit		
	0		DEC		
ECAN sync cy 1:1ms	de time	a_sync_cycle			

 Enable isochronous synchronization mode on the drive side by setting ECAN\_Sync\_Clock [301102] to 1 and also setting ECAN\_Sync\_Shift [301103] to 4:

301101	uint8	ECAN_Sync_Cycle	0	DEC
301102	uint8	ECAN_Sync_Clock	1	DEC
301103	uint8	ECAN_Sync_Shift	4	DEC

10. After the device is configured, click "Technology objects" in the drop-down list of PLC\_1 on the left side to add a new technology object and select the positioning axis:

-	^	Name	Version	Type:	TO_PositioningAxis
		💌 🛅 Motion Control	<u>V5.0</u>	Number	4
		TO_SpeedAxis	V5.0	Number:	1
-		TO_PositioningAxis	V5.0		🔘 Manual
Motion Control		TO_SynchronousAxis	V5.0		Automatic
		TO_ExternalEncoder	V5.0		
		=- TO_OutputCam	V5.0	Description:	
		TO_CamTrack	V5.0	The "Positioning	axis" (TO_PositioningAxis)
	_	TO_MeasuringInput	V5.0	technology obje	ect maps a physical drive in
PID	=	TO_Cam	V5.0	You can issue p	ositioning commands to the
FID		TO_Kinematics	V5.0	drive by means	of the user program with
		= TO_LeadingAxisProxy	V5.0	PLCopen motion	ontrol instructions.
				Note: The use o affects the temp CPU execution le F-program.	f technology objects poral behavior of other evels, including the

11. Click "Technology objects  $\rightarrow$  PositioningAxis\_1  $\rightarrow$  Configuration  $\rightarrow$  Basic parameters", select Axis type:

Basic parameters		
<ul> <li>Hardware interface</li> </ul>		
Drive	Axis type	
Encoder	Virtual axis	s
Data exchange with the drive		
Data exchange with encoder		
Leading value settings	) 💿 Linear	
<ul> <li>Extended parameters</li> </ul>	Rotary	
Mechanics		
Dynamic default values		
Emergency stop		
▼ Limits	1	
Position limits		
Dynamic limits		
Torque limits	•	
Fixed stop detection		
✓ Homing		
Active homing	Use positi	on values with higher resolution
Passive homing	Unit of measure for positions	-
<ul> <li>Position monitoring</li> </ul>		
Position monitoring	Unit of measure for velocity: mm/s	
Following error	Unit of measure for torque: Nm	-
Standstill signal	Unit of measure for force: N	-
Control loop		

12. Click "Hardware interface  $\rightarrow$  Drive", select telegram 105:

Drive type:	PROFIdrive	-		
ata connection:	Drive	•		
Drive:	<select drive=""></select>		Device configuration	on
	- DLC_1 [CPU 151	1T-1 PN]		
	🕨 🚺 Local modul	es	Name	Device type
	PROFINET IO-     PA5	System (100)	PROFIdrive Mode	ule_1 Standard Telegram 105,

Kinco PN servo drives support incremental and absolute encoders. Click "Hardware interface → Encoder", select "Incremental" if a Kinco single-turn encoder motor is used:

Encoder 1		
	🛃 Use encoder	
Data connection:	Encoder	-
Encoder:	PA5.PROFIdrive Module	_1_Enc
Encoder type:	Incremental	-

Select "Cyclic absolute" if a Kinco multi-turn absolute encoder motor is used:

Encoder 1		
	Use encoder	
Data connection:	Encoder	-
Encoder:	PA5.驱动对象_1_Encoder1	
Encoder type:	Cyclic absolute	-

14. Click on "Data exchange with the drive" to set the Reference speed, Maximum speed and Reference

torque:

Drive data				
	Drive telegram:	Standard telegram 10	5 💌	Device configuration
		Automatically apply	drive values d drive values a	during configuration (offline) at runtime (online)
	Reference speed:	2500.0	1/min	1 The parameters of the drive must
				match specifications in the device
	Maximum speed:	5000.0	1/min	configuration.

The Reference speed is 1/2 of the Max Speed [607F00]:

Index	Sub.	Name	Data Type	Attribute	
607F	00	Max_Speed	Unsigned32	RWSLTM	
Value			Unit		
5000.00			rpm		

CMD q Max [607300] and Max Torque% [607200] of the drive are related, and the Reference torque can be taken as the initial default value of CMD\_q\_Max [607300], with the unit of Ap, which is generally the lesser of the two values of the drive peak current and the motor peak current:

6073	00	CMD g Max	Unsigned 16	RWSLTM	
Value			Unit		
17.30			Ap		

maximal current command

15. Click on "Data exchange with encoder". If a Kinco single-turn encoder motor is used, the Increments per revolution is Feedback \_Resolution [641003]. For Fine resolution, select Gx\_XIST1 bit 0:

Settings for:

Index	Sub.	Name		Data Type	Attribute
6410 03		Feedback_Resolution		Unsigned32	RWSLEB
	Value			Unit	
65536.00			inc/r		
Informa	tion of Fee	thack Resolution			

Encoder 1			
Encoder telegram:	Standard telegram 105	-	Device configuration
	Automaticallyapplyap	coder values di	ring configuration (offline)
		coder values de	and coniguration (online)
	Automatically apply en	coder values du	aring runtime (online)
Measuring system:	Rotary	<b>•</b>	The parameters of the encoder
Increments per revolution:	65536		device configuration.
			, ,
Fine resolution			
Fine resolution			

If a Kinco multi-turn absolute encoder motor is used, the Increments per revolution is Feedback \_Resolution [641003], e.g. 65536, and the Number of revolutions is also set to 65536, with Fine resolution selections G1\_XIST1 bit 0 and G1\_XIST2 bit 0:

-

Index	Sub.	Name	Data Type	Attribute	Encoder telegram	: Standard telegram 105	•	Device configuration
6410	410 03 Feedback_Resolution		n Unsigned32	Unsigned32 RWSLEB		Automatically apply encoder values during configuration (offline)		
	Value		Unit			Automatically apply enco	der values (	during runtime (online)
	65536.0	0	inc/r			-		×
elp Informat	tion of:Fee	dback_Resolution			Measuring system	Rotary		Ine parameters of the encoder must match specifications in the
ncoder resol	ution	111020100000			Increments per revolution	65536		device configuration.
					Number of revolutions	65536		
					Fine resolution			
					Bits in Gx_XIST1	: 0 bit		
					Bits in Gx_XIST2	: 0 bit		

Encoder 1

16. Click "Extended parameters  $\rightarrow$  Mechanics" to set the position parameters:

cedaning value seconds	× 1	Cattings for		
<ul> <li>Extended parameters</li> </ul>		Setungs for		
Mechanics	0	Encoder 1		
Dynamic default values	0			
Emergencystop				
✓ Limits	0			
Position limits	0	Encoder mounting type:	On motor shaft	•
Dynamic limits	0		Invert encoder direction	
Torque limits	0			
Fixed stop detection	0			
✓ Homing	<b>o</b> t			
Active homing	0	Drive mechanism		
Passive homing	0			
<ul> <li>Position monitoring</li> </ul>				
Position monitoring	0	Load gear		
Following error	0	3		
Standstill signal	0	Number of motor revolutions:	1	
Control loop	0	Number of load revolutions:	1	
Actual value extrapolation	0			
		Position parameters		
		resident parente tens		
		Leadscrew pitch:	60.0 mm	Irot

17. Click "Extended parameters → Position monitoring → Following error" to disable the following error monitoring. When monitoring is enabled and the following error setting is small, the PLC will report error easily after enabling operation:

Basic parameters	<ul> <li>Following arms</li> </ul>
Hardware interface	
Drive	
Encoder	Enable following error monitoring
Data exchange with the drive	
Data exchange with encoder	Maximum following
Leading value settings	error:
Extended parameters	100.0 mm
Mechanics	
Dynamic default values	
Emergency stop	
	Error
Position limits	
Dynamic limits	Eallowing arrors
Torque limits	
Fixed stop detection	10.0 mm
✓ Homing	
Active homing	
Passive homing	Normal operation
<ul> <li>Position monitoring</li> </ul>	
Position monitoring	
Following error	
Standstill signal	adjustment: Velocity
Control loop	10.0 mm/c 500.0 mm/c
Actual value extrapolation	

18. Click "Extended parameters  $\rightarrow$  Limits  $\rightarrow$  Torque limits" and select "On motor side":

▼ 扩展参数	
机械	
动态默认值	✓ 扭矩限值的默认设置
急停	
▼ 位置限制	✓ 如果在运动控制指令的"Limit"
位置限制	⊘
动态限值	
扭矩限值	● 有效・ 电机侧 ▼
固定停止检测	✓ 扫矩限值: 0.0 Nm
▼ 回零	
主动回零	
被动回零	
▼ 位置监视	
位置监视	
跟随误差	
停止信号	
控制回路	
· 尔尔宁 (南北保修)	

19. DSC can be enabled by clicking "Extended parameters  $\rightarrow$  Control loop", see section 6.5 for details on

how to use it.		
<ul> <li>Position monitoring</li> </ul>	0	
Position monitoring	0	
Following error	0	
Standstill signal	0	
Control loop	0	
Actual value extrapolation		Dynamic Servo Control (DSC)
		Dynamic Servo Control is only possible with drive telegram 5, 6, 105 or 106
		Position control in the drive (DSC enabled)
		O Position control in the PLC

20. After the technology object has been configured, click "Program blocks → MC-Servo [OB91]" in the drop-down list of PLC\_1 on the left side, and then right-click to open the properties to set the PLC application cycle. Please note that when using the DSC function, the PLC application cycle, device update cycle (see Artile 8) and ECAN\_Sync\_Cycle [301101] must be the same.

PLC_1 [CPU 1511T-1 PN]	MC-Servo [OB91]			
Transformation				
😧 Online & diagnostics	General Te	exts		
Software units	General			
<ul> <li>Program blocks</li> </ul>	Information	Cycle time		
📑 Add new block	Time stamps			
Hain [OB1]	Compilation	○ cyclic		
MC-Interpolator [OB92]	Protection			1
🚰 MC-Servo [OB91]	Attributes	Cycle time (ms)		
👻 🙀 Technology objects	Cycle time	<ul> <li>Synchronous to the bus</li> </ul>		
💕 Add new object	-	Source of the send clock:	PROFINETIO-System (100)	-
PositioningAxis_1 [DB1]		- Send clock (ms)	1	
Configuration		•		
👫 Commissioning		- Factor:	1	
<b>Q</b> Diagnostics		Cycle time (ms)	1	

21. Configuration completed, program written, compiled and downloaded to PLC:

Network 1: MC_Power	🕨 🎦 Measuring input, out
Network 2: MC Reset	🕨 🎦 Synchronous motion
	🕨 🛅 Cam
Network 3: MC_Home	🕨 🛅 MotionIn
Network 4: MC_MoveAbsolute	🔻 🛅 Torque data
Notwork Ex. MC MovePolative	MC_TorqueAdditive
Metwork 5. Mic_MoveRelative	💶 MC_TorqueRange
Network 6: MC_MoveVelocity	🚍 MC_TorqueLimiting
Network 7: MC_Halt	Motion (kinematics)
	🕨 🛅 Zones
Network 8: MC_TorqueLimiting	🕨 🫅 Tools
	<ul> <li>Network 1: MC_Power</li> <li>Network 2: MC_Reset</li> <li>Network 3: MC_Home</li> <li>Network 4: MC_MoveAbsolute</li> <li>Network 5: MC_MoveRelative</li> <li>Network 6: MC_MoveVelocity</li> <li>Network 7: MC_Halt</li> <li>Network 8: MC_TorqueLimiting</li> </ul>

# 6.3 MC\_Home introduction

The drive must complete homing motion before absolute positioning. The homing trajectory is generated by the PLC, and the homing switch and limit switches are usually connected to the PLC:

Basic parameters	Position limits	
<ul> <li>Hardware interface</li> </ul>		
Drive	Hardware and software limit switches	
Encoder		
Data exchange with the drive	Enable HW limit switches	
Data exchange with encoder		
Leading value settings		
<ul> <li>Extended parameters</li> </ul>	If the hardware limit switches are overshot, the drive is immediately decelerated by	he emergency stop ramp configured in
Mechanics	the drive.	
Dynamic default values		
Emergency stop		
✓ Limits	Input negative HW limit switch: Input pos	itive HW limit switch:
Position limits	Select tag>	ig>
Dynamic limits	Construction accession (1994) Series with the series of th	
Torque limits	Level selection negative hw limit switch:	cuon positive Hwilmit switch:
Fixed stop detection	High level	<b>▼</b>
- Homing		
Homing     Active barries		
Active noming		
Passive homing		
Position monitoring		
Position monitoring		1
Following error		
Standstill signal	C Enable SW limit switches	
Control loop	Position of negative SW limit switch: Position of	f positive SW limit switch:
Actual value extrapolation	✓ 10e+12 mm 10e+12	
Basic parameters	Calandada kanalar mada	
<ul> <li>Hardware interface</li> </ul>	Select the noming mode	
Drive	Ilse zero mark via PROEldrive telegram	
Encoder		
Data exchange with the drive	Use reference cam and zero mark via PROFIdrive telegram	
Data exchange with encoder	Use homing mark via digital input	
Leading value settings		
Extended parameters		
Extended parameters	Ugital input noming markicam: <select tags<="" td=""><td></td></select>	
Distantics	Level selection: High level	
Dynamic default values	Enable direction reversal at HW limit switch	
Emergency stop		
• Limits	Homing direction	
Position limits		
Dynamic limits	✓ →	
Torque limits	O Positive	
Fixed stop detection		
✓ Homing	V O Negative	
Active homing		
Passive homing	velocity	
<ul> <li>Position monitoring</li> </ul>	✓	Approach velocity:
Position monitoring		100.0 mm/s
Following error	<b>2</b> 1	·····
Standstill signal		
Control loop		Homing velocity:
Actual value extrapolation		25.0 mm/s
	Position	
	· · · · ·	
		1
		Zero mark
		Zero mark Move to homing point
		Zero mark Move to homing point
	Home position offset: 0.0	<ul> <li>Zero mark</li> <li>Move to homing point</li> </ul>
	Home position offset: 0.0 mm	<ul> <li>Zero mark</li> <li>Move to homing point</li> </ul>
	Home position offset: 0.0 mm Home position: 0.0 mm	<ul> <li>Zero mark</li> <li>Move to homing point</li> </ul>



#### Table 6-2 describes the MC\_Home pin definition

Table 6-2 MC\_Home pin definition

Pin name	Data type	Description
Axis	TO_PositioningAxis TO_SynchronousAxis TO_ExternalEncoder	Technology objects
Execute	Bool	Start job with a rising edge
Position	LReal	The specified value is used according to the selected "Mode"
Mode	Int	<ul> <li>Homing modes:</li> <li>= 0 Direct homing (absolute), the current position of the technology object is set to the value of parameter "Position".</li> <li>= 1 Direct homing (relative), the current position of the technology object is shifted by the value of parameter "Position</li> <li>= 2 Passive homing, the current position of the technology object is set to the value of parameter "Position".</li> <li>= 3 Active homing, the current position of the technology object is set to the value of parameter "Position".</li> <li>= 6 Absolute encoder adjustment (relative), the current position is shifted by the value of parameter "Position".</li> <li>= 7 Absolute encoder adjustment (absolute), the current position is set to the value of parameter "Position".</li> </ul>

Pin name	Data type	Description
ReferenceMarkPosition	LReal	Display of the position at which the technology object was homed
		(valid when "Done" = TRUE)
Done	Bool	= 1 Job is completed
Busy	Bool	= 1 The job is being processed
CommandAborted	Bool	=1 The job was aborted by another job during execution
Error	Bool	=1 Error, see "ErrorID"
ErrorID	Word	Please consult the information system of TIA portal for help

The homing modes supported by different encoders are shown in Table 6-3.

Table 6-3 Supported homing mode

Homing mode	Incremental encoder	Absolute encoder
Active homing ("Mode"= 3)		(Kinco indu-turi absolute cheoder)
Passive homing ("Mode"= 2)	$\checkmark$	_
Set actual position ("Mode"= 0)	$\checkmark$	$\checkmark$
Relative offset to the actual position ("Mode"= 1)	$\checkmark$	$\checkmark$
Absolute encoder adjustment ("Mode"= $6$ , 7)	_	$\checkmark$

### 6.3.1 Homing mode 0 (Absolute direct homing)

The axis does not move after the MC\_Home is executed. The result of executing the instruction is that the actual position of the axis is directly changed to "Position specified in MC\_Home". In the following example, "Position" = 0 mm, then the actual position of the axis becomes 0 mm after homing. The coordinate value belongs to the "absolute" coordinate value, that is, the axis has established an absolute coordinate system and can be absolutely positioned.



The above figure shows the state before homing, the current position of the axis is 45 mm and the drive actual position [606300] is 49152 DEC. In Section 6.2, Article 16, the leadscrew pitch is 60 mm/rot, the conversion relation is as follows:

Actual position of PLC technology object axis (mm) = (Current servo actual position [606300] - Servo actual position [606300] at PLC power-up) / Feedback \_Resolution [641003] \* Leadscrew pitch

#### Or

Actual position change of PLC technology object axis (mm) = Servo actual position [606300] change / Feedback \_Resolution [641003] \* Leadscrew pitch

The following figure shows the state after homing, the actual position of the axis = "Position specified in MC Home" = 0 mm, and the drive actual position [606300] does not change and remains at 49152 DEC.



After the homing motion is completed, no matter what position the axis moves to, as long as the PLC is powered off, the actual position data of the axis will be lost and become 0, instead of being converted over with the current encoder value of the drive.

#### 6.3.2 Homing mode 1 (Relative direct homing)

The axis does not move after the MC\_Home is executed. The result of executing the instruction is that the actual position of the axis is directly changed to "current position + Position specified in MC\_Home". In the following example, "Position" = 10 mm, the current position of the axis was 20 mm before MC\_Home was executed, and the actual position of the axis after MC\_Home was executed became 30 mm.



actual position of motor

The above figure shows the state before homing, the current position of the axis is 20 mm and the drive actual position [606300] is 71104 DEC.

The following figure shows the state after homing, the actual position of the axis = "current position + Position specified in MC\_Home" = 30 mm, and the drive actual position [606300] does not change and remains at 71104 DEC.



actual position of motor

After the homing motion is completed, no matter what position the axis moves to, as long as the PLC is powered off, the actual position data of the axis will be lost and become 0, instead of being converted over with the current encoder value of the drive.

#### 6.3.3 Homing mode 2 (Passive homing)

When only MC\_Home is triggered, the axis will not move, and other motion control instructions (e.g. MC\_MoveRelative) are needed to make the axis run, and when the axis reaches the homing switch, the current position will be changed to "Position specified in MC\_Home".

Passive homing requires the MC\_Home command to be used in combination with the MC\_MoveAbsolute or MC\_MoveRelative or MC\_MoveVelocity command, and the axis is completed to the homing in the process of executing other motion commands. After PLC power off and restart, the actual position data of the axis will be lost.



1. Use zero mark via PROFIdrive telegram (i.e. detecting zero mark)

Motion sequence:

- a. Start passive homing via the "MC\_Home" instruction.
- b. Move via other motion control instruction (e.g. MC\_MoveRelative). The detection of the homing mark is enabled when the actual position value of the axis moves in the assigned homing direction.
- c. When zero mark is detected, the actual position is changed to "Position specified in MC\_Home". Or
- a. Move in the assigned homing direction via other motion control instruction (e.g. MC\_MoveRelative).
- b. Start passive homing via the "MC\_Home" instruction.
- c. When zero mark is detected, the actual position is changed to "Position specified in MC\_Home".
- Use reference cam and zero mark via PROFIdrive telegram (i.e. detecting zero mark after digital input is detected.)

Motion sequence:

- a. Start passive homing via the "MC\_Home" instruction.
- b. Move via other motion control instruction (e.g. MC\_MoveRelative) and wait for the digital input.
- c. Detection of zero mark will begin as soon as the digital input is detected and disengaged.
- When zero mark is detected, the actual position is changed to "Position specified in MC\_Home". Or
- a. Move via other motion control instruction (e.g. MC\_MoveRelative).
- b. Start passive homing via the "MC Home" instruction and wait for the digital input.
- c. Detection of zero mark will begin as soon as the digital input is detected and disengaged.
- d. When zero mark is detected, the actual position is changed to "Position specified in MC Home".

3. Use homing mark via digital input (i.e. detecting digital input)

Motion sequence:

- a. Start passive homing via the "MC\_Home" instruction.
- b. Move via other motion control instruction (e.g. MC MoveRelative) and wait for the digital input.
- c. When the digital input is detected, the actual position is changed to the "Position specified in MC Home".

Or

- a. Move via other motion control instruction (e.g. MC\_MoveRelative).
- b. Start passive homing via the "MC\_Home" instruction and wait for the digital input.
- c. When the digital input is detected, the actual position is changed to the "Position specified in MC Home".

#### 6.3.4 Homing mode 3 (Active homing)

The technology object performs a homing movement according to the configuration:

✓ Homing	Falast the haming made
Active homing	Select the homing mode
Passive homing	Use zero mark via PROFIdrive telegram
<ul> <li>Position monitoring</li> </ul>	
Position monitoring	O Use reference cam and zero mark via PROFIdrive telegram
Following error	Use homing mark via digital input

1. Use zero mark via PROFIdrive telegram (i.e. detecting zero mark)

Motion sequence:

- a. Start active homing via the "MC\_Home" instruction.
- b. Look for the zero mark during motion.
- c. When zero mark is detected, the actual position is changed to "Position specified in MC\_Home" "Home position offset":



d. The axis will then move a distance of the "Home position offset" and the actual position will be equal to "Position specified in MC Home" after completion.

 Use reference cam and zero mark via PROFIdrive telegram (i.e. detecting zero mark after digital input is detected.)

Motion sequence:

- a. Start active homing via the "MC\_Home" instruction.
- b. The axis detects digital input during motion.
- c. Decelerates when digital input is detected, and detect zero mark when the falling edge of digital input is detected.
- d. When zero mark is detected, the actual position is changed to "Position specified in MC\_Home" "Home position offset".
- e. The axis will then move a distance of the "Home position offset" and the actual position will be equal to "Position specified in MC Home" after completion.
- 3. Use homing mark via digital input (i.e. detecting digital input)

Motion sequence:

- a. Start active homing via the "MC\_Home" instruction.
- b. Detection of the rising edge at the digital input, while moving with homing velocity.
- c. Decelerates when the rising edge of digital input is detected; when the falling edge of digital input is detected, the actual position is changed to "Position specified in MC\_Home" "Home position offset".
- d. The axis will then move a distance of the "Home position offset" and the actual position will be equal to "Position specified in MC Home" after completion.

#### 6.3.5 Homing mode 6 (Absolute encoder adjustment (relative))

This mode is only for the connected encoder type is absolute value encoder, in this mode, after the MC\_Home instruction is triggered, the axis will not run, and will not search for the home switch, it will set the current position value to "current position + Position specified in MC\_Home". The absolute value is stored retentively in the CPU, and will not be lost after the CPU power off.

#### 6.3.6 Homing mode 7 (Absolute encoder adjustment (absolute))

This mode is only for the connected encoder type is absolute value encoder, in this mode, after the MC\_Home instruction is triggered, the axis will not run, and will not search for the home switch, it will set the current position value to "Position specified in MC\_Home". The absolute value is stored retentively in the CPU, and will not be lost after the CPU power off.

# 6.4 MC\_TorqueLimiting introduction

The CMD\_q\_Max [607300] and the Max\_Torque% [607200] of the drive are associated. The maximum current (torque) can be limited using the MC TorqueLimiting instruction.

1. The MC TorqueLimiting pin is defined in Table 6-4.

Pin name	Data type	Description
	TO_SpeedAxis	
Axis	TO_PositioningAxis	Technology objects
	TO_SynchronousAxis	
Enable	Bool	= 1 Activate torque limiting function
T :	I D1	Equal to CMD_q_Max [607300] value in Ap
Limit	LKeal	Range: 0 to drive / motor peak current
Mada	Diat	= 0 Torque limit mode
Mode	Dim	=1
InClamping	Bool	_
InLimitation	Bool	= 1 I_q [607800] reaches CMD_q_Max [607300]
Busy	Bool	= 1 Tasks in progress
Error	Bool	= 1 Error, see "ErrorID"
ErrorID	Word	Please consult the information system of TIA portal for help

Table 6-4 MC\_TorqueLimiting pin definition

2. Enable the torque limit function, "Enable" pin set to 1, in the "Limit" pin input target maximum current value 10 (unit Ap), then drive CMD\_q\_Max [607300] becomes 10 Ap:



3. When I\_q [607800] reaches CMD\_q\_Max [607300], the output pin "InLimitation" is set to 1, and the drive message status word MELDW's bit 1 is set to 0 (see Table 1-19).

### 6.5 DSC (Dynamic Servo Control) introduction

When using telegram 3 and 102, the drive works in speed mode, the position loop calculation is completed by the PLC, and the calculation update cycle of the position loop is the same as the communication cycle of PROFINET. Telegram 5 and 105 support Dynamic Servo Control (DSC). When DSC is enabled, the drive works in interpolation mode, and the calculation and update cycle of the position loop is the local control cycle of the drive. The DSC function puts the PLC position loop calculation into the drive to complete, and the PLC only needs to perform the central interpolation calculation of the position, and then adjust the position loop calculation of the drive periodically through the PROFINET interface.

In the technology objects configuration interface, click "Extended parameters  $\rightarrow$  Control loop" to set the parameters related to the DSC function, as shown in the following figure:



In the above figure, "Gain (Kv factor)" can not be 0, its specific value will not affect the servo's position loop proportional gain, keep it as the default value; "Pre-control" is the percentage of speed feedforward, and the role of K\_Velocity\_FF [60FB02] is the same:

Kŝ	Position	Loop		
N	Index	Type	Name	Value Unit
0	60FB01	int16	Kpp[0]	10.00 Hz
1	60FB02	int16	K_Velocity_FF	100.00 %
2	60FB03	int16	K_Acc_FF	32767 DEC

Please note that when using the DSC function, if the type of encoder connected is a single-turn encoder (incremental encoder), it is necessary to set the Store\_Position [60FB06] to 1, then write 0 to the Position\_Shift [60FB07] and store the control parameters:

Kŝ	Basic O	peratio	n		•
N	Index	Туре	Name	Value	Unit
0	606100	int8	Operation_Mode_B	0	DEC
1	604100	uint16	Statusword	4270	HEX
2	606300	int32	Pos_Actual	0	inc
3	606C0C	int32	Speed_Real	0.72	rpm
4	607800	int16	I_q	0.00	Ap
5	268000	uint16	Warning_Word	0000	HEX
6	606000	int8	Operation_Mode	-3	DEC
7	604000	uint16	Controlword	0000	HEX
8	607A00	int32	Target_Position	0	inc
9	608100	uint32	Profile_Speed	0.00	rpm
10	608300	uint32	Profile_Acc	100.00	rps/s
11	608400	uint32	Profile_Dec	100.00	rps/s
12	60FF00	int32	Target_Speed	0.00	rpm
13	607100	int16	Target_Torque%	0.00	%
14	607300	uint16	CMD_q_Max	17.30	Ap
15	20200E	int8	Din_Mode0	-4	DEC
16	20200E	int8	Din_Mode1	-3	DEC
17	269000	uint8	Encoder Data Resi	0	DEC
18	60FB06	uint8	Store_Position	0	DEC
19	60FB07	int32	Pos_Shift	-21570	DEC

Kŝ	Basic O	peratio	n		•
N	Index	Туре	Name	Value	Unit
0	606100	int8	Operation_Mode_B	0	DEC
1	604100	uint16	Statusword	C270	HEX
2	606300	int32	Pos_Actual	-21570	inc
3	606C0C	int32	Speed_Real	1.49	rpm
4	607800	int16	I_q	0.00	Ap
5	268000	uint16	Warning_Word	0000	HEX
6	606000	int8	Operation_Mode	-3	DEC
7	604000	uint16	Controlword	0000	HEX
8	607A00	int32	Target_Position	0	inc
9	608100	uint32	Profile_Speed	0.00	rpm
10	608300	uint32	Profile_Acc	100.00	rps/s
11	608400	uint32	Profile_Dec	100.00	rps/s
12	60FF00	int32	Target_Speed	0.00	rpm
13	607100	int16	Target_Torque%	0.00	%
14	607300	uint16	CMD_q_Max	17.30	Ap
15	20200E	int8	Din_Mode0	-4	DEC
16	20200E	int8	Din_Mode1	-3	DEC
17	269000	uint8	Encoder_Data_Res	0	DEC
18	60FB06	uint8	Store_Position	1	DEC
19	60FB07	int32	Pos_Shift	0	DEC

# **Chapter 7 S7-200 SMART Application**

## 7.1 Application description

The PROFINET communication application in this chapter is based on the following conditions:

1. STEP 7-Micro/Win SMART V02.08.02.00\_00.01

PLC S7-200 SMART(CPU ST20 DC/DC/DC V02.04.01\_00.00.03.00 固件 V2.6)

2. Kinco PN servo drive

Drive type	Drive firmware	PN firmware	
FDxx5-PA-004			
FDxx5P-PA-000	Software version vintage 2024 and beyond	00000005, 10000005	
MDx0-0xx-DMxK-PA-000			

3. GSD file

PN firmware version	Applicable GSD file
00000005、10000005	GSDML-V2.33-Kinco-PA5-20240328
00000004	GSDML-V2.33-Kinco-MD60-20210507

Table 2-1 describes the parameters related to the servo PROFINET communication.

## 7.2 Acyclic communication

### 7.2.1 Project configuration

 Click the menu "File → GSDML Management" to install the GSD file (GSDML-V2.33-Kinco-PA5-20240328). After successful installation, there is no need to repeat the installation for a new project:

File	Edit	View Pl	LC Debug	y Tools	Hel	p				14		
New Clo	ose Save	Import * Export *	Upload C	Download	Print	Preview Page Setup Print	Project	e (1)	Create Open Folder Memory	SSDML	ent	
Manage gen	neral statio	on descriptio	n files				1		LIBIOIC	1	2	-
ntroductio	n											
"GSDML man	nagement" a	llows you to ins	tall and delete	GSDML files 1	or PROFI	INET.						
monted G	smm fil	o.c										
aporteu o	File Name							4	Installation Da	ate	Status	
1	GSDML-V	2.33-Kinco-PA5	20240328.xml		_				2024-04-03 1	1:33:52	OK	_
2	GSDML-V.	2.33-Kinco-MDE	0-20210507.xr	nl					2024-04-04 1	1:58:23	OK	
nstall ner	• GSILL.											
							2					
C:\Users\21	1775\Docum	ents\200SMAR	r_gsd\			Browse	3 Delete	1				
C:\Users\21	1775\Docum	ents\200SMAR	r_gsd\			Browse	3 Delete				5 6	ОК

"Next" :

PF

 Click "Tools → Find PROFINET Devices" to ensure that the servo is connected. See Section 3.1 to modify the servo IP address and device name, or click "Edit" here to modify the device name:



3. Click "Tools  $\rightarrow$  PROFINET", select "Controller", set the PLC IP address and station name, and click

File Edit View PLC	Debug Tools Help			
High Speed Motion PID PWM Text Counter	Get/Put Data PROFINET Server	Motion PID Tune SMART ontrol Panel Control Panel Configure Too	Drive Find PROFINET ation - Devices M	Certificate lanagement Setting
PROFINET Configuration Wizard				
PROFINET network Controller (CPU ST20_plc200smar	Introduction			
	This wizard allows you to o the project, which can be	onfigure a PROFINET network step by downloaded to the PLC together with th	step. The PROFINET config he project.	juration is generated an
	PLC Role			
	Select a role for the PLC.			
	3 Controller			
	☐ I-Device	ent of PROFINET interface by higher-le	ovel IO controller	
	Ethernet Port	c	ommunication	
	G Fixed IP address and	name	Send Clock:	1.000 • ms
	4 IP Address:	192 . 168 . 0 . 155	Start Up time:	10000 ms
	Subnet Mask:	255 . 255 . 255 . 0		
	Default Gateway:	0.0.0.0		
	Station Name: p	lc200smart		

4. Add the servo to the device table, set the IP address and device name (need to be the same as the actual connected device), and then click "Next" :

OFINET rebinok Controller (PLU 5720_plc200smart) PASY5.10.pa5 PASY5.00 Completion	PaS(PAS/51.0) The device table 1 For can add device Device table	ists all devices s 5 from the device	hat are currently ceatalog tree on the	c200smaf 321680155 safigured for this right.	FROFIMET network.	Catalog ⇒ PLC 57-200 SMART - 070 SR30 - 070 SR40 - 070 SR40
	Device Number	Type	Device Name	IP Setting	IP Address	
	1	PA5V5.1.0 3	pa5	Set by user	192.168.0.2	1
	2					Article no. : PAS-PN-AAA
	3					Vereiens
	5					version:
	6					GSDML-V2.33-Kinco-PA5-20240328.xml
	8					Description:
	<					GSDML-V2.33-Kinco-PA5-20240328.xml
2	Add Delete					J Kinco PA5 PN Driver, with PROFINET-IO interface (RT, IRT and non-cyclic communication, dock synchronization, shared device), support MRPD, S2, DR

5. Add the PROFIdrive module for the servo, and the submodule of Standard Telegram 3 will be added by

default. If only acyclic communication is carried out, the submodule of the telegram can be deleted:

ROFLdrive Module(1)         Image         O         PROFLdrive Module           2         -         Interface         0.32760x11         -           3         -         Pot1         0.32760x11         -           4         -         Pot1         0.32760x11         -           4         -         Pot1         0.32760x11         -           4         -         Pot1         0.32760x11         -           6         -         Pot1         0.32700x1         -           6         -         1         Pot1         0.32700x1         -           6         -         1         -         -         -         -           7         -         -         -         -         -         -           8         -         -         -         -         -         -           10         -         -         -         -         -         -         -           11         -         -         -         -         -         -         -           12         -         -         -         -         -         -         -         -         - <th></th> <th></th> <th>Index</th> <th>Module Name</th> <th>Submodule Name</th> <th>Slot_Subslot</th> <th>PNI Start A</th> <th>B-Module</th>			Index	Module Name	Submodule Name	Slot_Subslot	PNI Start A	B-Module
2         -         Interface         0.32768(71)           3         -         -         Pot 1         0.32768(71)           4         -         Pot 1         0.32768(71)         -           5         -         1         Pot 2         0.32768(71)         -           6         -         -         Pot 2         0.32768(71)         -           7         -         -         12         -         -           8         -         -         12         -         -           8         -         -         12         -         -           9         -         -         -         3         -           10         -         -         -         -         -           11         -         -         -         -         -           12         -         -         -         -         -         -           10         -         -         -         -         -         -           11         -         -         -         -         -         -           12         -         -         -         -         -<	1		0	PA5		0		PROFIdrive Module
3       -       Pot 1       0.3276901         4       -       Pot 2       0.3270901         6       1       PRDFldive Module       1         6       -       1       PRDFldive Module       1         7       -       12       5tandard Telegram 102, P2D-6/10       5tandard Telegram 102, P2D-6/10         8       -       -       12       5tandard Telegram 102, P2D-6/10       5tandard Telegram 102, P2D-6/10         8       -       -       12       5tandard Telegram 102, P2D-6/10       5tandard Telegram 102, P2D-6/10         9       -       -       12       5tandard Telegram 3, P2D-10/5       5tandard Telegram 3, P2D-9/9         9       -       -       3       -       5tandard Telegram 102, P2D-9/9         10       -       -       3       -       5tandard Telegram 102, P2D-9/9         11       -       -       -       5tandard Telegram 102, P2D-9/9       -         12       -       -       6       -       -         13       -       -       10       -       -         15       -       -       10       -       -         16       -       -       11	2				Interface	0 32768(×1)		Standard Telegram 1, P7D-2/2
4         -         Pont 2         0.32770pc1           5         1         PROHotive Module         1         -           6         -         -         1         2702pc1           7         -         -         1         20270pc1         -           7         -         -         1         20270pc1         -           7         -         -         1         20270pc1         -           7         -         -         12         -         -         -           8         -         -         2         -         -         -         -           9         -         -         -         3         -	3				Port 1	0 32769(×1		Standard Telegram 102, PZD-6/10
5         1         PROFIdive Module         1           8         -         12           7         -         12           8         -         12           9         -         2           9         -         3           10         -         3           11         -         3           10         -         3           11         -         3           10         -         3           11         -         3           12         -         3           13         -         3           14         -         1           15         -         1           16         -         1           18         -         1           18         -         1           19         -         1           11         -         1           12         -         1           13         -         1           14         -         1           15         -         1           16         -         1	4	Г			Port 2	0 32770(×1		- Standard Telegram 105, PZD-10/10
6     -     12       7     -     13       8     -     2       9     -     2       10     -     3       10     -     3       11     -     3       12     -     4       13     -     5       14     -     6       15     -     9       16     -     11       17     -     11       18     -     11       19     -     12       10     -     4       11     -     6       13     -     7       14     -     10       17     -     11       18     -     12       20     -     13       20     -     14       21     -     16	5		1	PROFIdrive Module		1		Standard Telegram 111, PZD-12/12
7     -     -     13       8     -     2       9     -     2       9     -     3       10     -     3       11     -     3       12     -     6       13     -     7       14     -     6       15     -     9       16     -     10       17     -     11       18     -     12       19     -     12       20     -     14       21     -     15	6		]			12		Standard Telegram 3 ,PZD-5/9
8 <ul> <li>-</li> <li>3</li> <li>-</li> <li>6</li> <li>-</li> <li>-</li> <li>6</li> <li>-</li> <li>-</li></ul>	7	Г				13		
9       -       3         10       -       4         11       -       4         11       -       5         12       -       -         13       -       5         14       -       6         15       -       7         16       -       10         17       -       10         18       -       11         18       -       13         20       -       14         21       -       15         22       -       16	8					2		Standard Telegram 9, PZD-10/5
10       -       -       4         11       -       5       -         12       -       6       -         13       -       -       6       -         14       -       8       -       -         15       -       0       9       -         16       -       10       -       -         17       -       11       -       -         18       -       12       -       -         20       -       13       -       -         20       -       14       -       -         21       -       15       Description:       -         22       -       -       16       -       -	9					3		
11        5         12        6          13        6          14        7          14        8          15        9          16        10          17        11          18        11          19        13          20        14          20        15          20        16       Description:	10	Г				4		
12        6          13        7          14        8          15        9          16       -       10          17        11          18        11          20        13          21        15          22        16	11					5		
13     -     7       14     -     8       15     -     9       16     -     10       17     -     11       18     -     12       19     -     13       20     -     14       21     -     16	12					6		
14         -         8           15         -         9           16         -         10           17         -         11           18         -         11           19         -         13           20         -         14           21         -         16	13					7		
15      9        16      10        17      10        18      11        19      12        10      13        20      14        21      15     Description:	14					8		
16         -         10           17         -         11         Artide no.:           18         -         12         Artide no.:           19         -         13         -           20         -         14         -           21         -         16         Description:	15					9		
17         -         11         Artide no.:           18         -         12         -           19         -         13         -           20         -         -         14           21         -         -         15           22         -         -         16         Description:	16					10		L
18         -         12           19         -         13         20         -         13           20         -         14         21         -         15         Description:           21         -         16         To executed forms upped on 100 0         To executed forms upped on 100 0	17					11		Article no.:
19         -         13           20         -         14           21         -         15           22         -         16         To provide formula works on 100 formula works on 1	18					12		
20         -         14           21         -         15         Description:           22         -         16         The specified from upper participation and the specified f	19					13		
21 15 Description:	20					14		
22 The supported formulation are V02 0	21					15		Description:
View of the support de view of the view of the support de view of the support de view of th	22		-			16		The supported firmware version are V02.05, V02.06 and later.

6. Then keep clicking "Next" until it is successfully generated:

PF

OFINET network Controller (CPU ST20_plc200smart) Image: PASV5.1.0-pa5 Image: PASV5.10-pa5 Image: PASV5.10-pa5	Da50	245/5101		2	plc200smart 192.168.0.155	
	STEP 7-M	icro/WIN SM. If a PROFINET i Time in Commi automatically.	ART network is configured, t unication node of the S	he system will a ystem Block dial	X djust Background og to 20%	Slot Subelot
-	1	1	0	pa5	PA5	0 1
	2	1	0	pa5	Interface	0_32768
	3	1	0	pa5	Port 1	0_32769
	4	1	0	pa5	Port 2	0_32770
	5	1	14848	pa5	PROFIdrive Module	1_1

7. In the main program, call SINA PARA S and write the following program:



8. The symbol table address used in the program is defined as shown in the following figure:

		1200202		1 Martin Contractor
9		Symbol	Address	Comment
1		Start	V6000.0	Rising edge triggers read and write
2	9	Read_Write	V6000.1	0: read 1: write
3		Device_Parameter	VB6040	·
4		Format	VB6070	
5		Status	VB6100	
6		Status_bit	VB6102	
7		Write_REAL_Value	VD6020	
8		Write_DINT_Value	VD6024	Dara written to the servo
9	9	APINumber	VD6042	
10		Read_REAL_Value	VD6060	
11		Read_DINT_Value	VD6064	Data read from the servo
12		Errorld	VD6090	
13		PN_Error_Code	VD6094	
14		Subindex_CMD	VW6010	Parameter subindex + Command word
15		Index	VW6012	Parameter index
16		Device_No	VW6030	
17	9	SlotNumber	VW6046	
18	9	SubSlotNumber	VW6048	
19		ErrorNo	VW6080	

9. Before downloading the program, assign the V-address area used by the library:



### 7.2.2 SINA\_PARA\_S introduction

Table 7-1 describes the SINA\_PARA\_S pin definition.

Table 7-1 SINA\_PARA\_S pin definitions

Pin name	Data type	Description
Start	Bool	The rising edge triggers data transmission
ReadWrite	Bool	0=Read; 1=Write
Parameter	Int	Bit8~15: Parameter subindex; Bit0~7: Command word
Index	Int	Parameter index
ValueWrite1	Real	Reserved
ValueWrite2	DInt	Data writing area, can write 1 to 4 bytes
DeviceNo	Word	Device number
		PROFINET device parameters, byte offset as follows:
		0: Axis number
		1: Reserved
Device_Parameter	Dword	2~5: API number(Fixed to 14848)
		6~7: Slot number
		8~9: Subslot number
ValueRead1	Real	Reserved
ValueRead2	DInt	Data reading area
		Parameter format:
		02H: Int8
		03H: Int16
		04H: Int32
		05H: Unsigned8
		06H: Unsigned16
Format	Duta	07H: Unsigned 32
Format	Бую	08H: Float
		10H: Octal string (16bit)
		13H: Time diff (32bit)
		41H: Byte
		42H: Word
		43H: Double word
		44H: Error
ErrorNo	Word	Error number according to the PROFIdrive specification
EmenID	DWard	First word: Binary encoding indicating a faulty parameter access
ErroriD	Dword	Second word: Type of fault
PN_Error_Code	DInt	Error code according to the PROFINET protocol
Status	Bute	Bit0~4: System definition error codes for instructions RDREC and WRREC;
Status	Бую	Bit5: Error; Bit6: Request in progress
Status bit	Rute	Indicates the status of the reading/writing parameter, which is 4 when the
	Byic	reading/writing is successful
Note: Command word Read	· 40H· Write 1 byte· 2Fl	H. Write 2 hytes: 2BH: Write 4 hytes: 23H

The Device\_Parameter in Table 7-1 can be confirmed in the following figure:

File Edit View	w PLO	C Debug	Tools	Help						
High Speed Motion PID P Counter	WM Te Disp	xt Get/Put	Data Log	NET Web Server	Motion PID Tune Control Panel Control Pa	SMART Drive nel Configuration -	Find PROFINET Devices	Certificate Management	Options	
PROFINET Configuration Wi	izard	ras	_			10015			seamgs	
PROFINET removes PROFINET network  PROFILT20_plc2l  PROFILT20_plc2l  PASVS.1.0-pa5  PASVS.10-pa5  PROFILTVe Modul  Completion	00smar e(1)	pa5(PA5V)	5.1.0)		2	plc200smart				
		Addre	ss overvie viceNumber	API	Device Name	Module	Slot Subslot	10 Tupe	Address From	Address To
De	viceti			0	pa5	PA5	0 1			
		2 1		0	pa5	Interface	0_32768		-	
		3 1	APIN	umber	pa5	Port 1	0_32769			
		4 1		0	pa5	Port 2	0_32770	-		11
Device_Parar	meter _	-> 1		14848	pa5	PROFIdrive Module		SlotNum	ber- SubSlot	Number

7.2.3 Read-write parameters using SINA\_PARA\_S

Read feedback\_resolution: the parameter index is 0x6410, the parameter subindex is 0x03, and the read
parameter command word is unified as 0x40. When the "Start" pin changes from 0 to 1, the
"ValueRead2" pin in the data reading area automatically becomes 10000, and the "Status\_bit" pin is 4,
the data reading is successful.

Kŝ	Motor Se	ettings			
N	Index	Туре	Name	Value	Unit
0	60F612	uint16	Motor_IIt_Real	0.00	%
1	641016	uint16	Motor_Using	64	ASCII
2	304106	uint8	Use_Inner_MTLib	1	DEC
3	641001	uint16	Motor_Num	64	ASCII
4	641002	uint8	Feedback_Type	04	HEX
5	641003	uint32	Feedback_Resolution	10000.00	inc/r
6	641004	uint32	Feedback_Period	327702	DEC



2. Write target\_position: the parameter index is 0x607A, the parameter subindex is 0x00, and the data type is Int32, so the write parameter command word is 0x23, the "ReadWrite" pin is switched to 1. The data

writing area is written to -10000. When the "Start" pin is changed from 0 to 1, the data is written. The "Status\_bit" pin is 4, and the data is written successfully. Observing the KincoServo+ software, the target position is changed to -10000.



## 7.3 Telegram 1 application

### 7.3.1 Project configuration

 Click the menu "File → GSDML Management" to install the GSD file (GSDML-V2.33-Kinco-PA5-20240328). After successful installation, there is no need to repeat the installation for a new project:

2 1 13			Help				
New	Open Close Save Operations	Upload Download	Print Print Print Print Print	Project POU Data Page Protection	Create Open Folder Memory Libraries	GSDML Management GSDML	t
Manage g	eneral station description	files			······································		2
ntroduct	ion						
"GSDML m	anagement" allows you to insta	ll and delete GSDML files f	or PROFINET.				
Tanortad	GSDWT files						
apor teu	File Name			4	Installation Da	te	Status
1	GSDML-V2.33-Kinco-PA5-2	0240328.xml			2024-04-03 11	:33:52	OK
2	GSDML-V2.33-Kinco-MD60	20210507.xml			2024-04-04 11	:58:23	0K

2. Click "Tools  $\rightarrow$  Find PROFINET Devices" to ensure that the servo is connected. See Section 3.1 to modify the servo IP address and device name, or click "Edit" here to modify the device name:

ile Edit View PLC Debug Tools Help	
Motion PID PWM Text GetPut Data PROFINET Wet Upg Without Serve	Motion PID Tune SMART Drive Control Panel Configuration Tools
Find PROFINET Devices	×
Communication Interface Intel(R) 82574L Gigabit Network Connection.TCPIP.1	Press the 'Edit' button to change the device name of the selected device. Press the 'Hash Lights' button to continuously flash device LEDs to visually locate a connected device. MAC Address 102.3:55:78:52:E9 Flash Lights 192.168.0.2 Subnet Mask 255.255.255.0 Default Gateway 0.0.0.0 Device Name (Chinese, ASCII characters 'a' '2', '0' -'9', '.' and '2', should not start with number, '.', '2', or 'port-n(n=09)', should not end with '.' or '2') pa5 4 Edit Convert name: pa5
Find Devices 3	

- 3. Click "Tools → PROFINET", select "Controller", set the PLC IP address and station name, and click
  - "Next" :

Ψ File Edit View PLC Debu	g Tools Help	
High Speed Motion PID PWM Text Get/Put Counter	1 Data PROFINET Web Log Server Control Panel	ART Drive Find PROFINET Certificate Iguration Devices Management Tools
PROFINET Configuration Wizard	1	Torrida
PROFINET network     PROFINET Network     Controller(CPU ST20_plc200smar     Intro	eduction This wizard allows you to configure a PROFINET network sites the project, which can be downloaded to the PLC together w	by step. The PROFINET configuration is generated and ith the project.
PLC N	Select a role for the PLC.     Select a role for the PLC.     Vector     Toevice     Parameter assignment of PROFINET interface by high	re-level ID controller
Ether	rnet Port	Communication Send Clock: 1.000 - ms
	IP Address:         192         .168         0         .155           Subnet Mask:         255         .255         .0           Default Gateway:         0         .0         .0         .0           Station Name:         pic200smart	Start Up time: 10000 ms

4. Add the servo to the device table, set the IP address and device name (need to be the same as the actual connected device), and then click "Next" :

PROFINET network © controller(CPU ST20 pk:200smart) □ □ PAVS.1.0.pa5 □ □ □ PAVS.1.0.pa5 □ □ □ PAVS.1.0.pa5 □ □ □ Completion	pa@PASV5.1.0	lists all devices a cess from the device	hat are currently establisher on the	6200:mat 92.168.0.155 90nfigured for this right.	PROFIDET network.	Catalog ⇒ PLC 57-200 SMART - CPU 97-30 -
	Device Number	Type	Device Name	IP Setting	IP Address	
	1	PA5V5.1.0 3	pa5	Set by user	192.168.0.2	T
	2					Article no.: PAS-PN-AAA
	4					Version
	5					TC SIGN
	7					GSDML-V2.33-Kinco-PA5-20240328.xml
	8					Description:
	<					GSDML-V2.33-Kinco-PA5-20240328.xml
2	Add Delete					Kinco PA5 PN Driver, with PROFINET-IO interface (RT, IRT and non-cyclic communication, dock synchronization, shared device), support MRPD, S2, DR

5. Add the PROFIdrive module to the servo, then select and delete the submodule of standard telegram 3 added by default, add the submodule of standard telegram 1, and note down the start address of the I/O data which is needed when calling SINA\_SPEED:

1		Index	Module Name	Submodule Name	Slot_Subslot	PNI Start	Inpu	PNQ St	Output Size (.	⊕ Module
1	Г	0	PA5		0		1		1	
2	Г			Interface	0 32768(×1)					Standard Telegram 1, P2D-2/2
3	Г			Port 1	0 32769(×1					Standard Telegram 105, PZD-10/10
4	Г			Port 2	0 32770(×1					
5		1	PROFIdrive Module		1					
6	Г			Standard Telegram 1,	12	146	4	138	4	
7	Г				13					Supplementary Telegram 750,PZD-3/1
8	Г	2			2	1				Standard Telegram 9, P2D-10/5
9	Г				3	1			19	
10	Г				4					
11	Г	-			5					
12	Г				6					
13	Г				7	1	1	Ť.	1	
14	Г				8		1			
15	Г				9	1		T	1	
16	F	22			10	1		-		
17	Ē		1		11		10		20. D	Article po :
18	F				12		1		1	Ardenon
19	F				13	-		1		
20	Ē	-			14		-	-	10 R	
21	F				15		1	1	1	Description:
22	F				16		1			The supported firmware version are V02.05
							-			V02.06 and later.
<	Add		Delete						>	Standard Telegram 1: Closed-loop speed control, PZD length 2/2 words

6. Then keep clicking "Next" until it is successfully generated:

PROFINET network Chroller(CPU ST20_pic200smart) FROFDAPS.10-pa5 PROFIdrive Module(1) Completion ST	pa5(F EP 7-Mi	245751.01 cro/WIN SMA if a PROFINET nr Time in Commun automatically.	RT etwork is configured, t nication node of the Sy	he system will a	pic200smart 132.168.0.155 djust Background og to 20%	
					确定	Slot Subslot
	1	1	0	pa5	PA5	0_1
	2	1	0	pa5	Interface	0_32768
	3	1	0	pa5	Port 1	0_32769
	4	1	0	pa5	Port 2	0_32770
	5	1	14848	pa5	PROFIdrive Module	1_1

7. In the main program, call SINA\_SPEED and write the following program, where the inputs "Starting\_I\_add" and "Starting\_Q\_add" must correspond to the start address of the I/O data of telegram 1 (see step 5):



8. Before downloading the program, assign the V-address area used by the library:



### 7.3.2 SINA\_SPEED introduction

Table 7-2 describes the SINA\_SPEED pin definition.

Table 7-2 SINA\_SPEED pin definition

Pin name	Data type	Description					
EnableAxis	Bool	=1 Enable					
AckError	Bool	Reset fault, rising edge valid					
SpeedSp	Real	Speed setpoint in RPM					
RefSpeed	Real	Reference speed, must be 1/2 of the maximum speed [607F00] in RPM					
		The default is 16#3F, and the corresponding relationship with STW1 is as					
		follows:					
		Bit in ConfigAxis Bit in STW1					
		Bit 0 Bit 1					
	Word	Bit 1 Bit 2					
ConfigAxis		Bit 2 Bit 3					
		Bit 3 Bit 4					
		Bit 4 Bit 5					
		Bit 5 Bit 6					
		Bit 6 Bit 11					
		See Table 1-6 for the meaning of each bit in STW1					
Starting_I_add	DWord	Start address of the PN I area of telegram 1					
Starting_Q_add	DWord	Start address of the PN Q area of telegram 1					
AxisEnabled	Bool	=1 Axis is enabled					
Lockout	Bool	=1 Switching on inhibited					
ActVelocity	Real	Speed actual value in RPM					
Error	Bool	=1 Fault present					

### 7.4 Telegram 111 application

### 7.4.1 Project configuration

 Click the menu "File → GSDML Management" to install the GSD file (GSDML-V2.33-Kinco-PA5-20240328). After successful installation, there is no need to repeat the

installation	for a new project:		
	Manage general station description files		×
	Introduction		
	"GSDML management" allows you to install and delete GSDML files for PROFINET.		
	Imported GSDML files		
	File Name	Installation Date	Status
	1 GSDML-V2.33-Kinco-PA5-20240328.xml	2024-04-03 11:33:52	OK
	2 GSDML-V2.33-Kinco-MD60-20210507.xml	2024-04-04 11:58:23	OK
	Install new GSDNL		
	C:/users/c1//5/Documents/c005MAK1_c5D/ Browse Delete		ОК

2. Click "Tools  $\rightarrow$  Find PROFINET Devices" to ensure that the servo is connected. See Section 3.1 to modify the serve IP address and device name, or click "Edit" here to modify the device name:

modify the servo IP address and device name, or click "Edit" here to modify the device name:  $\times$ 

Intel(R) 82574L Gigabit Network Connection.TCPIP.1	<ul> <li>Press the Edit button to change the de device. Press the "Flash Lights" button t LEDs to visually locate a connected devi</li> </ul>	o continuously flash device
PROFINET Device	MAC Address	
Drives	00:23:55:78:52:E9 Flash Light	s
	IP Address	
	192.158.0.2	
	Subnet Mask	
	255 .255 .255 . 0	
	Default Gateway	
	192.168.0.2	
	Device Name (Chinese, ASCII character , should not start with number, '.', '-', o not end with '.' or '-')	s 'a' - 'z', '0' - '9', '.' and '-' r 'port-n(n=09)', should
	pa5	Edit
	Convert name: pa5	

3. Click "Tools → PROFINET", select "Controller", set the PLC IP address and station name, and click "Next" :

Controller (CPU ST20_pic200smer	Introduction	
	This wizard allows you to configure a PROFINET network the project, which can be downloaded to the PLC togethe	step by step. The PROFINET configuration is generate r with the project.
	PLC Role	
	Select a role for the PLC.	
	Controller	
	I-Device	
	Parameter assignment of PROFINET interface by	higher-level IO controller
	Ethernet Port	Communication
	Fixed IP address and name	Send Clock: 1.000 💌
	IP Address: 192 . 168 . 0 . 155	Start Up time: 10000 r
	Subnet Mask: 255 . 255 . 255 . 0	
	Default Gateway:	
	Station Name: plc200smart	

le contra de

4. Add the servo to the device table, set the IP address and device name (need to be the same as the actual connected device), and then click "Next" :

PRCFILET network Controller (CPU ST20_plc200smart) □ PAS(0) □ PAS(0) □ Completion	pe5[PA5V5.1.0] The device table Device table	lists all device es from the devi	as that are currently ce catalog tree on the	olo200smart 192168.0.155 configured for this c right.	PROFIMET network.	Cotalog
	Device Number	Type	Device Name	IP Setting	IP Address	
	1 2 4 5 6 7 8	PA5V5.1.0 3	pa5	Set by user	192.168.0.2	Artide no.: PAS-PN-AAA Version: GSDML-V2.33-Kinco-PAS-20240328.xml Description: GSDML-V2.33-Kinco-PAS-20240328.xml
2	<     Add Delete	]				Kinco PA5 PN Driver, with PROFINET-IO Interface (RT, IRT and non-cyclic communication, dock synchronization, shared device), support MRPD, S2, DR

5. Add the PROFIdrive module to the servo, then select and delete the submodule of standard telegram 3 added by default, add the submodule of standard telegram 111, and note down the start address of the I/O data which is needed when calling SINA\_POS:

		Index	Module Name	Submodule Name	Slot_Subslot	PNI St	Input	PNQ S	Output Si:	. E. Module
		0	PA5		0			1		⊡ Submodule
	Г			Interface	0 32768(×1)					Standard Telegram 1, P2D-2/2 Standard Telegram 102, P7D-6/10
)				Port 1	0 32769(×1					Standard Telegram 105, PZD-10/10
	Г			Port 2	0 32770(×1					Standard Telegram 111, PZD-12/12
i i		1	PROFIdrive Module		1			1		Standard Telegram 3 ,PZD-5/9
5	~			Standard Telegram 111,	12	146	24	138	24	Standard Telegram 5, PZD-9/9
7	Г				13					Supplementary Telegram 750,P2D-3, Standard Telegram 9, P2D-10/5
3					2		Ľ.			Standard Helegram 5,1 25 1075
9	Г				3		C.			
0	Г				4					
1					5					
2	Г	-			6					
3		-			7	1				
4					8					
15	Г	-			9					
6					10					
17	Г				11					
8	Г				12					
9	Г				13					
20	Г				14					
21	Г	-			15	Ľ.				
					16	1	1			

6. Then keep clicking "Next" until it is successfully generated:

PROFINET network Controller(CPU ST20_plc200smar PASVS.1.0-pa5 PASVS.1.0-pa5 PASV6(0) PROFIdrive Module(1) Completion	t)	PA5V5.1.01		3	plc200smart 192.168.0.155	
	STEP 7-M	licro/WIN SM. If a PROFINET Time in Comm automatically.	ART network is configured, i unication node of the S	the system will a system Block dial	× djust Background og to 20%	Slot Subslot
	1	1	0	pa5	PA5	0_1
	2	1	0	pa5	Interface	0_32768
	3	1	0	pa5	Port 1	0_32769
	1000		0		0.10	
	4	10	0	pap	Port 2	0_32770

In the main program, call SINA\_POS and write the following program, where the inputs "St\_I\_add " and "St\_Q\_add" must correspond to the start address of the I/O data of telegram 111 (see step 5) :



8. The symbol table address used in the program is defined as shown in the following table:

VW7000
VD7002
VD7006
V7010.0
V7010.1
V7010.2
V7010.3
VD8000
VD7500
VD7020
VD7024
VW7028
VW7030
V7032.0
VW8002
VW8004
VW8006
VD8008

9. Before downloading the program, assign the V-address area used by the library:



Network Comment			Statu	is Chart			
Always_On=ON		SINA_POS	1	- 🎽 - 📘 🔳 🗍	A 21	a 🚡 🔂 🕅 🖂 🖘 🗸	
		EN	1	Address	Format	Value	New Value
	2		1	Mode_setting	Signed	+2	
	+2	- Mode_ Activer - U	2	Position_setting	Signed	+0	
	+0-	- Positio ActPosi - U	3	Velocity_setting	Signed	+546133	
	+346133	Eastle Eault C~ 0	4	Enable	Bit	2#1	
	2#1	Non st~ Done 2#1	5	Non_stop	Bit	2#1	· · · · ·
	2#1	Non p~	6	Non_pause	Bit	2#1	
	2#1	- Start	7	Start	Bit	2#1	
	16#0000092	- &B146	8	OverV	Signed	+100	
	16#0100008A	- &QB138	9	OverAcc	Signed	+100	
	16#08001F40	- &Contr~	10	OverDec	Signed	+100	
	16#08001D4C	- &Status~	11	ConfigEpos	Signed	+3	÷
		1 m m	12	0W138	Binary	2#0000 0100 0111 1111	
			13	V8000.0 Positive	Bit	2#0	0 0
Symbol	Address		14	V8000.1 Negativ	Bit	2#0	t i
ActPosition	VD7020	)	15	V8000.2 log1	Bit	2#0	25
ActVelocity	VD7024	1	16	V8000 3 Jog2	Bit	2#0	
Always_On	SM0.0		- 17	V8000 5 AckErro	Bit	2#0	
Control_table	VD8000	1		ACKEIIO	1 Dit		

### 10. After downloading the program, you can test it with a status chart:

# 7.4.2 SINA\_POS introduction

### Table 7-3 describes the SINA\_POS pin definition

Table 7-3 SINA\_POS pin definition

Pin name	Data type	Description
ModePos	Int	Operating mode:         =0         =1       Relative positioning         =2       Absolute positioning         =3          =4       Active homing         =5       Direct homing         =6       Position table (not supported)         =7       Jog at the specified speed         =8
Position	DInt	Position setpoint for operating mode 1, 2
Velocity	DInt	Speed setpoint for operating mode 1, 2, 7
EnableAxis	Bool	<ul> <li>=0 Disable, servo control word is 0xE</li> <li>=1 Enable, servo control word is 0xF</li> </ul>
CancelTraversing	Bool	<ul><li>=1 Do not reject traversing task</li><li>=0 Reject traversing task</li></ul>
IntermediateStop	Bool	<ul><li>=1 No intermediate stop</li><li>=0 Intermediate stop</li></ul>
Execute	Bool	Activate operating mode, rising edge valid
St_I_add	DWord	Start address of the PN I area of telegram 111
St_Q_add	DWord	Start address of the PN Q area of telegram 111

Pin name	Data type	Description								
		A point	er to the sta	art address	of Cont	rol_table,	for exa	imple &	VD8000	
		Byte	Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit0
		0	Reserved	Reserved	Ack- Error	Reserve	d Jog 2	Jog 1	Negative	Positive
		1	Reserved							
		2	OverV: Per	centage of S	speed Setp	oint at Op	erating M	lodes 1, 2	2, 7, unit %,	, range 0 to
		3	199%							
Control table	DWord	DWord 4 OverAcc: Acceleration percentage when operating mo	ode is 1,	e is 1, 2 and 7, unit %, range						
control_uote	Dword	5	0~100%							
		6	OverDec: D	Deceleration	percentag	e when op	erating m	ode is 1,	2 and 7, un	it %, range
		7	0~100%							
		8	ConfigEpos	s ——						Bit 0
		9 Bit0: Coast stop Bit1: Quick stop								
		10	Bit2: Activa	ate software	limit E	Bit3: Activa	te hardwa	are limit		
			Bit6: Refere	ence point sv	witch			1 1		
		11	Bit8: The al	bsolute posit	tioning set	point is ch	anged im	imediatel	У	
		A point	er to the sta	rt address	of Statu	onngepos us table f	is 5.	nla & V	ZD7500	
		Byte	Bit7	Bit6	Bit 5	Bit A	Bit 3	Bit 2	Bit 1	Bit 0 Axis- Enabled
		Byte	Dit/	Over-	Axis-	Axis-	ock-	Axis-	Axis-	Axis-
		0	Reserved	range	Error	Warn	out	Ref	PosOk	it 1 Bit0 gative Positive unit %, range 0 to 1 7, unit %, range 00 1 Bit 0 s- Axis- Dk Enabled 00 00 00 00 00 00 00 00 00 00 00 00 00
			Error ID-			I		I	I	
		0: No error								
			1: Drive fault							
	/	1	2: Drive d	isabled						
Status_table	DWord		3: Unsupp	orted mode						
			3: Unsupported mode     4: OverV, OverAcc and OverDec is overranged      ActMode: Current operating mode							
		2								
		3								
		4	POS_ZSW	/1 current va	alue, see T	able 1-15				
		5								
		7	POS_ZSW	/2 current va	alue, see T	able 1-16				
ActVelocity	DWord	Speed a	ctual value							
ActPosition	DWord	Position	n actual val	ue						
Warn_code	Word	Servo w	varn code							
Fault_code	Word	Servo e	rror code [6	603F00] al	osolute p	ositionin	g.			
Done	Bool	The target position is reached when operation mode is relative or absolute positioning.								

### 7.4.3 Operating condition and setting

- Enabled by entering pin "EnableAxis" = 1, "AxisEnabled" in "Status\_table" is 1 if the servo is ready and fault-free ("AxisError " = 0).
- 2. The input pin "CancelTraversing" and "IntermediateStop" are valid for all modes except jog mode, and should be set to 1 during operation, as follows:
- a. When "CancelTraversing" = 0, it means that the current task is canceled, and the deceleration corresponds to the halt\_mode [605D00]. The operating mode can be switched after the axis stops.

- b. When "IntermediateStop" = 0, it means to pause the current task, and the deceleration corresponds to the halt\_mode [605D00]. The axis will continue to run after resetting "IntermediateStop" = 1. The operating mode can be switched after the axis stops.
- 3. The input pin "ModePos" is used to select the operating mode; the rising edge of "Execute" triggers the positioning movement.
- 4. Activate software limit switch

After setting the reference point, if you need to use a software limit switch, you need to set bit 2 of the input pin "ConfigEPos" to 1 ("ConfigEPos" = 16#00000007) or set the En\_SoftWare\_Limit [30800C] to 1.

Activate the software limit function, set the soft positive limit [607D01] and the soft negative limit [607D02] for the servo.

30800C	uint8	En_SoftWare_Limit	1	DEC
607D01	int32	Soft_Positive_Limit	1000000	DEC
607D02	int32	Soft_Negative_Limit	-10000000	DEC

After you set soft positive limit more than soft negative limit and set the reference point, the software limit function is enabled.

5. Activate hardware limit switch

If you need to use a hardware limit switch, you need to set bit 3 of the input pin "ConfigEPos" to 1 ("ConfigEPos" = 16#0000000B):

Use KincoServo+ software to define the positive limit and negative limit for the DIN of the servo. The servo can only be operated when the hardware limit switch signal is high.

Ks Digital IO Functions					-
Digital Input		10000000			
Num Function		×	Simulate	Real	Polarity
DIN1 Home Signal	>>	×		•	
DIN2 P Limit +	>>	×		•	
DIN3 P Limit -	>>	×			

Please note that only positive and negative limits are configured in the KincoServo+ software, but bit 3 of "ConfigEPos" is not set to 1, then the hardware limit function will not take effect.

### 7.4.4 Operating mode 1 (Relative positioning)

Requirements:

- 1. Operating mode "ModePos" = 1
- 2. "ConfigEPos" = 16#00000003
- 3. "EnableAxis" = 1
- 4. "CancelTraversing" and "IntermediateStop" must be 1, and "Jog1" and "Jog2" must be 0.

Steps:

- Specify the target position and target speed through the input pin "Position" and "Velocity". The unit of position and velocity is DEC. Refer to the servo drive manual for conversion, and the unit of velocity is transformed into: DEC = RPM \* 512 \* feedback resolution [641003] / 1875.
- 2. Use "OverV", "OverAcc" and "OverDec" to scale the percentage of the target speed and profile acceleration and deceleration.
- 3. The direction of movement is determined by the positive or negative value set in "Position".
- 4. The movement is triggered by the rising edge of "Execute", and "AxisPosOk" is set to 1 after reaching the target position. If there is an error locating, "AxisError" is set to 1.
- 5. The currently running command can be replaced with a new command via the "Execute" rising edge. At any time, it can switch between operating mode 1 and 2. If you need to switch to another operating mode, the axis must be stationary.
- 6. Please note that "Execute" needs to be reset to 0 after the relative positioning motion is triggered by the rising edge of "Execute".

### 7.4.5 Operating mode 2 (Absolute positioning)

Requirements:

- 1. Operating mode "ModePos" = 2
- 2. "ConfigEPos" = 16#00000003
- 3. "EnableAxis" = 1
- 4. "CancelTraversing" and "IntermediateStop" must be 1, and "Jog1" and "Jog2" must be 0.

Steps:

- Specify the target position and target speed through the input pin "Position" and "Velocity". The unit of position and velocity is DEC. Refer to the servo drive manual for conversion, and the unit of velocity is transformed into: DEC = RPM \* 512 \* feedback resolution [641003] / 1875.
- 2. Use "OverV", "OverAcc" and "OverDec" to scale the percentage of the target speed and profile acceleration and deceleration.
- 3. The servo will follow the shortest path to the target position when running. "Positive" and "Negative" must be 0.
- 4. The movement is triggered by the rising edge of "Execute", and "AxisPosOk" is set to 1 after reaching the target position. If there is an error locating, "AxisError" is set to 1.
- 5. The currently running command can be replaced with a new command via the "Execute" rising edge. At any time, it can switch between operating mode 1 and 2. If you need to switch to another operating mode, the servo must be stationary.

- 6. By setting bit 8 of "ConfigEPos" ("ConfigEPos" = 16#00000103), after updating "Position" on the PLC, there is no need to trigger "Execute", the new setting value will take effect immediately, and the servo will immediately execute the absolute positioning instruction according to the target position change.
- 7. Please note that "Execute" needs to be reset to 0 after the absolute positioning motion is triggered by the rising edge of "Execute".

### 7.4.6 Operating mode 4 (Active homing)

#### **Requirements:**

- 1. Operating mode "ModePos" = 4
- 2. "ConfigEPos" = 16#00000003. If hardware limits are used, "ConfigEPos" = 16#0000000B.
- 3. "EnableAxis" = 1
- 4. "CancelTraversing" and "IntermediateStop" must be 1, and "Jog1" and "Jog2" must be 0.
- 5. One of "Negative" and "Positive" must be set to 1.

#### Steps:

 The way and the speed of returning to the reference point should be configured by KincoServo+ software (PLC only sends the command, and the planning of returning to the reference point is set by the servo parameters). Please refer to the servo drive manual for the specific way of returning to the reference point:

Ν	Index	Type	Name	Value	Unit
0	607C00	int32	Home_Offset	0	inc
1	609800	int8	Homing_Method	1	DEC
2	609901	uint32	Homing_Speed_Switch	300.00	rpm
3	609902	uint32	Homing_Speed_Zero	100.00	rpm
4	609903	uint8	Homing_Power_On	0	DEC
5	609A00	uint32	Homing_Accelaration	50.00	rps/s
6	609904	int16	Homing_Current	4.71	Ap
7	609905	uint8	Home_Offset_Mode	0	DEC
8	609906	uint8	Home N Blind	0	DEC

A return to the reference point motion is triggered by the rising edge of "Execute", which should remain 1 during the motion. After the motion, "AxisRef" is set to 1, and if there is an error during the operation, "AxisError" is set to 1.

### 7.4.7 Operating mode 5 (Direct homing)

Requirements:

- 1. Operating mode "ModePos" = 5
- 2. "ConfigEPos" = 16#00000003
- 3. "EnableAxis" = 1
- 4. The axis must be stationary.

Steps:

The reference point of the axis is set by the rising edge of the "Execute". When the homing operation has been done, the output pin "AxisRef" turns to be 1.

### 7.4.8 Operating mode 7 (Jog at the specified speed)

Requirements:

- 1. Operating mode "ModePos" = 7
- 2. "ConfigEPos" = 16#00000003
- 3. "EnableAxis" = 1
- 4. The axis must be stationary.

#### Steps:

- 1. Specify the jog speed through the input pin "Velocity", which must be a positive value in unit DEC.
- 2. Use "OverV", "OverAcc" and "OverDec" to scale the percentage of the jog speed and profile acceleration and deceleration.
- "CancelTraversing" and "IntermediateStop" are not related to the jog mode. The running direction is independent of "Positive" and "Negative".
- 4. There is no need to trigger "Execute". Reverse jogging when "Jog1" = 1, forward jogging when "Jog2" = 1.
  "Jog1" and "Jog2" can only be triggered separately. When "Jog1" and "Jog2" are 0 or 1 at the same time, the axis stops.