# How to communicate with S7-1200 and LXM28A via MGate 5123

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#### About Moxa

Moxa is a leading provider of edge connectivity, industrial computing, and network infrastructure solutions for enabling connectivity for the Industrial Internet of Things. With 35 years of industry experience, Moxa has connected more than 82 million devices worldwide and has a distribution and service network that reaches customers in more than 80 countries. Moxa delivers lasting business value by empowering industry with reliable networks and sincere service for industrial communications infrastructures. Information about Moxa's solutions is available at <a href="https://www.moxa.com">www.moxa.com</a>.



# **1** Introduction

The MGate 5123 is an industrial Ethernet gateway for converting CANopen, J1939, or CAN proprietary (CAN 2.0A/B) to PROFINET network communications. To integrate existing CAN-based devices into a PROFINET network, use the MGate 5123 as a CAN master to collect data and exchange data with the PROFINET controller.

This document shows how to use the MGate 5123 to do data exchange between the Siemens S7-1200 PLC and Schneider Electric Lexium 28 servo drive (LXM28A). Northbound, the MGate communicates with S7-1200 via PROFINET and acts as a PROFINET IO Device. Southbound, the MGate communicates with LXM28A via CANopen and acts as a CANopen master.

See Figure 1 for the system topology of this demonstration. For the MGate and LXM28A CAN port pin assignment, see Figure 2. Connect MGate pin 1 to LXM28A pin 2 and MGate pin 2 to LXM28A pin 1. The PC runs Siemens TIA Portal for S7-1200 PLC configuration, monitoring and controlling the PLC.



< Figure 1. System Topology >

### CAN Port (6-pin Terminal Block)



MGate 5123 CAN Port

### LXM28A CAN interface (CN4)

< Figure 2. CAN Port Pin Assignment>

#### How to communicate with S7-1200 and LXM28A via MGate 5123

# 2 System Requirements

#### **Hardware Equipment**

#### 1. Siemens S7-1200 PLC:

- a. Processor: CPU 1212C AC/DC/RLY
- b. Article number: 6ES7 212-1BE31-0XB0
- c. Version: 3.0

#### 2. MGate 5123:

- a. Firmware version: 2.0 or later
- b. GSDML file: GSDML-V2.42-MOXA-Device0204-20230505.xml

#### 3. Schneider LXM28A Servo Drive:

- a. Model: LXM28AUA5M3X
- b. EDS file: SELXM28\_017500.eds

#### 4. Schneider BCH2 Servo Motor:

a. Model: BCH2MBA533CA5C

#### **Software Equipment**

#### 1. Siemens TIA Portal:

Siemens PLC Engineering Software published by Siemens AG.

a. Version: 17

# 3 LXM28A Servo Drive Settings

# 3.1 Set Device Configuration via HMI

The integrated HMI allows you to edit parameters via the integrated Human-machine Interface (HMI).



Item	Description
1	5-digit 7-segment display
2	OK key
3	Arrow keys
4	M key
5	S key

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# 3.1.1 Setting the Operating Mode

Use the parameter **P1-01** to set **Operating Mode** and **Direction of Movement**:



Set **A** as b: The drive operates in the operating mode CANopen.

Set **C** as 0: Movement is in a counterclockwise direction.

The product activates the changed settings the next time it is powered on.

### 3.1.2 Baudrate Setting

Use the parameter **P3-01** to set the baudrate:



Set as **L0002**: CANopen baudrate is **125 kBit/s**, Modbus baudrate is **19,200 Baud**. When the product is powered on next, the modified settings will become active.

### 3.1.3 CANopen Device Address Setting

Use the parameter **P3-05** to set the CANopen device address:

Set as 2.

The changed settings will become active the next time the product is powered on.

# 4 MGate 5123 Settings

Log in to the MGate 5123's web console and perform the following settings.

# 4.1 Protocol Conversion

In the **Protocol Conversion** settings, the "North Device" site is fixed as "PROFINET Controller". On the "Edge Device" site, you have the choice of selecting either CANopen slave, J1939, or CAN Proprietary protocols. For this demonstration, we chose CANopen slave.

Set as below:

Drotocol Conversion	
Protocol Conversion	
North Device	
PROFINET Controller	SNMP Client
	PROFINET IO Device SNMP Agent MGate 5123_5121123 CANopen Master
Edge Device	V
⑦ CANopen Slave	EDIT

# 4.2 CANopen Master Settings

Manage CANopen devices on this page.



# 4.2.1 Import CANopen Slave Device EDS File

Before adding the CANopen slave device, import the EDS of the CANopen slave device. Click **EDS Repository** to import LXM28A's EDS file.

← EDS Reposito	s Repository Dry					
					DELETE	L IMPORT
🗌 Vendor 🌲	Product Name 👙	Vendor ID 🌲	Revision 👙	EDS File 👙	Rx PDOs	Tx PDOs
No data to display.	Choose File SELXM28_017500.eds			1		
		CAN	CEL DONE			

Click **DONE** for the LXM28A's EDS file to import successfully.

-	Schneider Electric	Lexium28	0x0800005a	1.29952	SELXM28_017500.eds	4	4
	Vendor 🌲	Product Name 🔶	Vendor ID 🌲	Revision 🌲	EDS File 🔶	Rx PDOs	Tx PDOs

#### 4.2.2 CANopen Master Settings

Click **CANopen Master** to configure the MGate's CANopen master settings:

- Set Node ID as 127 and baudrate as 125 kbits/s.
- Enable CAN Bus-OFF Reset will auto reset the error count and restart the bus.
- Enable or disable CANbus Termination Resistor 120 ohms, depending on whether the bus needs the termination resistor.
- In this demo, we don't need to use Sync Producer or Time Producer. So, disable them.

Home → CANopen Master → Master and Slave Setting ← Master And Slave Setting		
Master Setting Slave Setting		
Node ID	SYNC	TIME
127	Enable sync producer	Enable time producer
Baudrate	Enable counter	COB ID
125 kbit/s 👻	COB ID 0x 0080	0x 0100
Initial Delay (ms)		Interval (ms)
0	Interval (ms)	1000
<ul> <li>Enable CAN Bus-off Reset</li> <li>Enable CAN bus termination resister (120 Ω)</li> </ul>	1000	

# 4.2.3 CANopen Slave Settings

Select the Slave **Setting** tab and click the **ADD** button to add a CANopen slave.

Home > CANopen Master > Master and Slave Setting ← Master And Slave Setting								
Master Setting Slav	e Setting							
				DELETE     Q SCAN     + ADD     The maximum number of slaves is 126				
Node ID	Device Name	Revision	EDS File					
No data to display.								

The Add Slave Setting window pops up. Choose Lexium28 and click the ADD button.

Add Slave Setting						
Vendor All						
✓ Vendor	Product Name	Vendor ID	Revision	EDS File	Rx PDOs	Tx PDOs
Schneider Electric	Lexium28	0x800005a	1.29952	SELXM28_017500.eds	4	4
				ltems per page: 10 💌 1 - 1	of 1 K K	<u>1</u> /1→ →
					CA	ANCEL ADD

It creates the "Node ID 1" slave. Click the **Edit** button and choose **Edit slave settings** to change further settings.

Node ID	Device Name	Revision	EDS File	
□ 1	1	1.29952	SELXM28_017500.eds	
				Edit slave settings Edit device parameters Delete

Change Node ID as 2 and change Device Name to **LXM28A**. Choose **Heartbeat** to retrieve the slave's status and set **Heartbeat Consuming Timeout** to 550 ms. If you want the MGate to dynamically configure the slave's device parameters and PDO mapping, enable the **Enable device parameters initialization** setting. This feature will let the MGate send SDO requests to set the slave's communication parameters and PDO mapping when the CANopen bus is ready to submit the MGate's CANopen settings.

Edi	t Slave Settings		
Noo 2	de ID		
Dev	vice Name		
LX	M28A		
Stat He	te Retrieval artbeat		-
	and car		
	Master Heartbeat Consuming Timeout (ms) 550		
		CANCEL	SAVE

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If you enable the **Enable device parameters initialization** setting, click **Edit device parameters** to set the slave's communication parameters.

↔ CANopen Master > Master and Slave Setting ← Master And Slave Setting							
Master Setting Sl	ave Setting						
				DELETE Q. SCAN + ADD The maximum number of slaves is 126			
Node ID	Device Name	Revision	EDS File				
2	LXM28A	1.29952	SELXM28_017500.eds	:			
				Edit slave settings Edit device parameters Delete			

# In **Communication Profile Area**, we set **0x1017 Producer Heartbeat Time** to 500 ms.

Edit Device Parameters									
	Comn	nunication Profile Are	a			^			
-		Index	Name	Value	Default Value	•			
		0x1014	COB-ID EMCY		\$NODEID+0x80				
		0x1015	Inhibit Time Emergency		0				
	>	0x1016	Heartbeat Consumer Entries		-				
		0x1017	Producer Heartbeat Time	500	0				

In Device Profile Area, we set the settings:

- 0x6083 (Profile Acceleration), value 2000000
- 0x6084 (Profile Deceleration), value 2000000
- 0x6085 (Quick Stop Deceleration), value 4000000

Device	e Profile Area			
	Index	Name	Value	Default Value
	0x6081	Profile Velocity in profile position mode		0
	0x6083	Profile Acceleration	2000000	4266666667
	0x6084	Profile Deceleration	2000000	4266666667
	0x6085	Quick Stop Deceleration	4000000	4266666667

### 4.2.4 PDO Settings

The MGate's PDO settings allow 256 TPDO entries for mapping the slave's RPDO and 256 RPDO entries for mapping the slave's TPDO.

In this demo, we enable the slave's RPDO1, RPDO2, TPDO1, and TPDO2, and mapping to MGate's TPDO1, TPDO2, RPDO1, and RPDO2. Each PDO adds steps as below:

#### 1. Slave's RPDO1:

Choose TPDO1 from the **Master PDO** drop-down list. Change Slave Node ID to 2 and choose RPDO1 from the Slave **PDO** drop-down list. The **COB ID** will be updated to 0x202.

Choose **Event** from the **Transmission Type** drop-down list and set **Event Timer** to 1,000 ms.

dd PDO		
laster PDO		
PDO1		Ŧ
TPDO1		
✓ Enable		
Slave Node ID Sl	ave PDO	
2R	PDO1	*
COB ID		
0x 0202		
Transmission Type		
Event		*
labilit Time (me)		
nnibit Time (ms)		
0		
Event Timer (ms)		
1000		
Fault Protection		
Pause		-
	CANCEL	SAVE

In the **Data Mapping** section, click the **ADD** button and choose **Add mapping object by EDS**.

Fault Protection Pause	on				¥
Data Map	ping				ADD 👻
Bit Position	Object Index	Data Type	Tag Name	Enc	Add custom object
No data to di	splay.				

Choose Controlword [0x6040, 0x00] and Modes\_of\_Operation [0x6060, 0x00]. Click the DONE button.

Fault Protection	
Pause	Drive_Profile_Lexium-RefB_32_Bit_Parameter [0x430E, 0x00]
	Electronic_Gear_Ratio_(Numerator) [0x4FA5, 0x01] INTEGER32
Data Mapping	□ Electronic_Gear_Ratio_(Denominator) [0x4FA5, 0x02] ADD ▼ INTEGER32
	Controlword [0x6040, 0x00] UNSIGNED16
Bit Position Objec	Modes_of_Operation [0x6060, 0x00] INTEGER8
	Following_Error_Window [0x6065, 0x00] UNSIGNED32
No data to display.	Following_Error_Time_Out [0x6066, 0x00] UNSIGNED16
	Position_Window [0x6067, 0x00] UNSIGNED32
	Total: 26 Selected: 2 CANCEL DONE
	CANCEL SAVE

The slave's RPDO1 Data Mapping result is given below. Use the **Arrow** button to change object's **Bit Position**.

Data M	lapping					A	DD	•
Bit Position	Object Index	Data Type	Tag Name	Endian Swap				
0	0x6040 / 0x00	2 Byte 💌	Controlword	None	•	^		•
16	0x6060 / 0x00	1 Byte 👻	Modes_of_Ope	None	*		~	

Tag Names should be prefixed with the Object Index for easy identification.

Data M	lapping					A	DD	•
Bit Position	Object Index	Data Type	Tag Name	Endian Swap				
0	0x6040 / 0x00	2 Byte 💌	6040_Controlw	None	•	~	v	•
16	0x6060 / 0x00	1 Byte 💌	6060_Modes_o	None	•	^	: Q.1	

The **Fault Protection** function sends a predefined setting to field devices to prevent incorrect actions when upstream communication times out (**Fault Timeout**). Choose **Proceed – Set to User-Define Value** and set the **User-Define Value** to **00 00 FF**. The first two bytes mean the value of the **Control Word** object is 0x0000 (stop and servo off) and the value of the **Modes of Operation** object is 0xFF (JOG mode).

ault Protecti	00									
rocood	Cot to Llev	or Dofino	d Value							
Toceeu -	Set to Use	er-Denne	u value							
Fault Tir	neout(ms)									
3000										
1.6										
Info		an ath a fat	a lla su da	fine of Male	. den en de	an the la	and have a st	field in the	Data Man	
Info The n	naximum le	ength of th	ne User-de	fined Valu	ie depends	on the le	ngth speci	fied in the	Data Map	ping
Info The n confi	naximum lo guration.	ength of th	ne User-de	fined Valu	ie depends	on the le	ngth speci	fied in the	Data Map	ping
Info The n confi	naximum lo guration. fined Value	ength of th	ne User-de	fined Valu	ie depends	on the le	ngth speci	fied in the	Data Map	ping
Info The n confi	naximum lo guration. fined Value	ength of th	ne User-de	fined Valu	ie depends	on the le	ngth speci	fied in the	Data Map	ping

#### 2. Slave's RPDO2:

Choose TPDO2 from the **Master PDO** drop-down list. Change Slave Node ID to 2 and choose RPDO2 from the **Slave PDO** drop-down list. The system will update the COB ID to 0x302. Choose **Event** from the **Transmission Type** drop-down list and set **Event Timer** as 1,000 ms. In the **Data Mapping** section, click the **ADD** button and choose **Add mapping object by EDS**. Choose **Target\_Position [0x607A, 0x00]** and **Profile\_Velocity\_in\_profile\_position\_mode [0x6081, 0x00]**. Click the **DONE** button.

Max_Current [0x6073, 0x00] UNSIGNED16	*
Target_Position [0x607A, 0x00] INTEGER32	
Profile_Velocity_in_profile_position_mode [0x6081, 0x00] UNSIGNED32	
Profile_Acceleration [0x6083, 0x00] UNSIGNED32	
Profile_Deceleration [0x6084, 0x00] UNSIGNED32	
Torque_Slope [0x6087, 0x00] UNSIGNED32	
Velocity_Offset [0x60B1, 0x00] INTEGER32	
Torque_Offset [0x60B2, 0x00] INTEGER16	
Touch_Probe_Function [0x60B8, 0x00] UNSIGNED16	-
Total: 26 Selected: 2 CANCEL DON	IE

The slave's RPDO2 Data Mapping results are given below:

Data M	apping					A	DD	•
Bit Position	Object Index	Data Type	Tag Name	Endian Swap				
0	0x607A / 0x00	4 Byte 💌	Target_Positior	None	*	^	×	
32	0x6081 / 0x00	4 Byte 🔻	Profile_Velocity	None	Ŧ	^	~	

Change Tag Name with the Object Index prefix:

Bit Position	Object Index	Data Type	Tag Name	Endian Swap				
0	0x607A / 0x00	4 Byte 💌	607A_Target_P	None	•	^	v	•
32	0x6081 / 0x00	4 Byte 💌	6081_Profile_Ve	None	*	^	÷	

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#### 3. Slave's TPDO1:

Choose RPDO1 from the **Master PDO** drop-down list. Change Slave Node ID to 2 and choose TPDO1 from the **Slave PDO** drop-down list. The system will update the COB ID to 0x182. Choose **Event** from the **Transmission Type** drop-down list and set **Inhibit Time** to 500 ms and **Event Timer** to 1,000 ms.

RPDO1		
Enable		
slave Node ID	Slave PDO	
2	TPDO1	•
008.05		
COBID		
0x 0182		
0x 0182		
COS ID Ox 0182		
Ox 0182		÷
Transmission Type		
Inhibit Time (ms)		
COS ID Ox 0182 Transmission Type Event Inhibit Time (ms) 500		÷
Cos ID Ox 0182 Event Inhibit Time (ms) 500 Sweet Times (ms)		•

In the **Data Mapping** section, click the **ADD** button and choose **Add mapping object by EDS**. Choose **Error\_Code** [0x603F, 0x00], **Statusword** [0x6041, 0x00], and **Modes\_of\_Operation\_Display** [0x6061, 0x00]. Click the **DONE** button.



The slave's TPDO1 Data Mapping results are below:

Data M	apping					ADD 👻	
Bit Position	Object Index	Data Type	Tag Name	Endian Swap			
0	0x603F / 0x00	2 Byte 💌	Error_Code	None	Ŧ	~ ~	
16	0x6041 / 0x00	2 Byte 💌	Statusword	None	Ŧ	• v	
32	0x6061 / 0x00	1 Byte 💌	Modes_of_Ope	None	*	~ ~	

Change Tag Name with the Object Index prefix:

Data M	Jata Mapping								
Bit Position	Object Index	Data Type	Tag Name	Endian Swap					
0	0x603F / 0x00	2 Byte 🔻	603F_Error_Coc	None	•	^	v	•	
16	0x6041 / 0x00	2 Byte 👻	6041_Statuswo	None	•	^	Ŷ	1	
32	0x6061 / 0x00	1 Byte 🔻	6061_Modes_o	None	-	^	×		

#### 4. Slave's TPDO1:

Choose RPDO2 from the **Master PDO** drop-down list. Change Slave Node ID to 2 and choose TPDO2 from the **Slave PDO** drop-down list. The system will update the COB ID to 0x282. Choose **Event** from the **Transmission Type** drop-down list and set **Inhibit Time** to 500 ms and **Event Timer**" to 1,000 ms.



In the **Data Mapping** section, click the **ADD** button and choose **Add mapping object by EDS**. Choose **Error\_Code** [0x603F, 0x00], **Statusword** [0x6041, 0x00], and **Modes\_of\_Operation\_Display** [0x6061, 0x00]. Click the **DONE** button.

Enable		
ve Node ID	Slave PDO TPDO2	×
		2
COB ID		
Ox 0282		
assistes Tras		
ent		•
Inhibit Time (ms)		
0		
0		
0 Event Timer (ms) 1000		

In the **Data Mapping** section, click the **ADD** button and choose **Add mapping object by EDS**. Choose **Position\_Actual\_Value [0x6064, 0x00]** and **Velocity\_Actual\_Value [0x606C, 0x00]**. Click the **DONE** button.



The slave's TPDO2 Data Mapping results are below:

Data M	A	DD -	•					
Bit Position	Object Index	Data Type	Type Tag Name		Endian Swap			
0	0x6064 / 0x00	4 Byte 💌	Position_Actua	None	Ŧ	~	~	
32	0x606C / 0x00	4 Byte 💌	Velocity_Actua	None	Ŧ	^	v	

Change Tag Name with the Object Index prefix:

Data Mapping								
Bit Position	Object Index	Data Type	Tag Name	Endian Swap				
0	0x6064 / 0x00	4 Byte 💌	6064_Position_	None	•	^	Ŷ	1
32	0x606C / 0x00	4 Byte 💌	606C_Velocity_	None	-	^	×	î

### 4.2.5 Verify Slave's CANopen Settings

After applying **CANopen Settings**, the MGate will send an SDO requests to set the slave's communication parameters and PDO mapping because the "Enable device parameters initialization" setting was enabled. Start capturing **CANopen Traffic** to log communications. Then, verify the slave's CANopen settings.

1. **Heatbeat producer time** is 500 ms: Select **NMT** from the **Type** filter. Verify that the interval is about 500 ms.

me > C	ANopen Traffic								
ANC	pen Traffic								
START	Ready to capture								
•	Auto Scroll	Type NMT			• Node ID			L EXPORT	EST
No.	Time	Tx/Rx	Node ID	Туре	COB ID	Description	Data		
6	0.374	Rx	2	NMT Err Ctrl	0x0702	Operational	05		
19	0.875	Rx	2	NMT Err Ctrl	0x0702	Operational	05		
21	1.872	Rx	2	NMT Err Ctrl	0x0702	Operational	05		
27	1.870	Rx	2	NMT Err Ctrl	0x0702	Operational	05		
34	2.373	Rx	2	NMT Err Ctrl	0x0702	Operational	05		
45	2.875	Rx	2	NMT Err Ctrl	0x0702	Operational	05		
53	3.378	Rx	2	NMT Err Ctrl	0x0702	Operational	05		
62	3.878	Rx	2	NMT Err Ctrl	0x0702	Operational	05		
				12		St 97			

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2. **Slave's TPDO1:** The data length of TPDO1 is 5 bytes. The Tx interval time is 1,000 ms to meet the **Event Timer** setting.

Hama N C	A Nonon Troffic						
CANC	pen Traffic						
START	Ready to capture						
		Туре			Node ID		A SYROPT TECT
	Auto Scroll	PDO					EXPORT TEST
No	Time	Ty/Ry	Node ID	Type	COBID	Description	Data
140.		14/154	1100010	type	00010	beachprion	Data
3	0.410	Rx	2	TPDO2	0x0282	Transmit PDO 2	BC 39 13 00 AE ED FF FF
5	0.533	Rx	2	TPDO1	0x0182	Transmit PDO 1	00 00 31 42 00
6	0.908	Rx	2	TPDO2	0x0282	Transmit PDO 2	BA 39 13 00 00 00 00 00
8	1.035	Тх	2	RPDO1	0x0202	Receive PDO 1	00.00.00
			-				
9	1.035	Тх	2	RPDO2	0x0302	Receive PDO 2	00 00 00 00 00 00 00 00
			-		0.00002		
11	1.533	Rx	2	TPDO1	0x0182	Transmit PDO 1	00 00 31 42 00
					0.00102		
12	1 575	Bx	2	TPDO2	0x0282	Transmit PDO 2	BB 39 13 00 00 00 00 00
		100	-		0.0202	numinit PDO 2	

3. Slave's TPDO2: The data length of TPDO1 is 8 bytes. The Tx interval time is 500 ms, and the data changes to meet the **Inhibit Time** setting.

Home > CA	Nopen Traffic						
CANo	pen Traffic						
START	Ready to capture						
	Auto Scroll	Туре			Node ID		± EXPORT TEST
		PDO			* 4		
No.	Time	Tx/Rx	Node ID	Туре	COB ID	Description	Data
2	0.410	Pv	2	TRDO2	0×0292	Transmit PDO 2	PC 20 12 00 AE ED EE EE
2	0.410	NX.	2	TPDOZ	0x0262	Iransmit PDO 2	BC 39 13 00 AE ED FF FF
5	0.533	Rx	2	TPDO1	0x0182	Transmit PDO 1	00 00 31 42 00
6	0.908	Rx	2	TPDO2	0x0282	Transmit PDO 2	BA 39 13 00 00 00 00 00
8	1.035	Tx	2	RPDO1	0x0202	Receive PDO 1	00 00 00
9	1.035	Tx	2	RPDO2	0x0302	Receive PDO 2	00 00 00 00 00 00 00 00
11	1.533	Rx	2	TPDO1	0x0182	Transmit PDO 1	00 00 31 42 00
12	1.575	Rx	2	TPDO2	0x0282	Transmit PDO 2	BB 39 13 00 00 00 00 00

4. Verify the **device parameters initialization** process. Reboot the slave. After booting up the slave, the MGate will send an SDO request to write the config to the slave.

Home > CAN	lopen Traffic						
CANop	en Traffic						
START	Ready to capture						
🛑 Au	ito Scroll	Type SDO		•	Node ID 2		1 EXPORT TEST
No.	Time	Tx/Rx	Node ID	Туре	COBID	Description	Data
35	6.662	Tx	2	RSDO	0x0602	Receive SDO	2B 17 10 00 F4 01 00 00
36	6.743	Rx	2	TSDO	0x0582	Transmit SDO	60 <b>1</b> 7 10 00 00 00 00 00
37	6.743	Тх	2	RSDO	0x0602	Receive SDO	23 83 60 00 80 84 1E 00
38	6.753	Rx	2	TSDO	0x0582	Transmit SDO	60 83 60 00 00 00 00 00 00
39	6.754	Тх	2	RSDO	0x0602	Receive SDO	23 84 60 00 80 84 1E 00
40	6.763	Rx	2	TSDO	0x0582	Transmit SDO	60 84 60 00 00 00 00 00 00
41	6.764	Tx	2	RSDO	0x0602	Receive SDO	23 85 60 00 00 09 3D 00
42	6.774	Rx	2	TSDO	0x0582	Transmit SDO	60 85 60 00 00 00 00 00 00
43	6.774	Tx	2	RSDO	0x0602	Receive SDO	23 00 14 01 02 02 00 80

# 4.3 **PROFINET IO Settings**

### 4.3.1 Device Name Settings

In the **PROFINET IO Device** setting, click the **MANAGE** button to set **Device Name** as mgate-dev. Click the **SAVE** button.



# 4.3.2 **PROFINET IO Settings**

Choose **Application Relation 1** to map CANopen IO data. In the **I/O Mapping** tab, click **ADD SLOT** to add IO modules.

Home > PROFINET IO Device > Application Relation 1	
← Application Relation 1 ・	
Application Relation 1 Input data size 0 Output data size 0	
I/O Mapping	+ ADD SLOT
Slot Number Slot Name Type Slot Data Size (bytes)	
There are no setting in this data mapping. Click + ADD SLOT to create the first setting	

• Add Slot Number 1 module as an **Input** type module. Choose all RPDO1 tags and RPDO2 tags. Enable **Auto Adjust Slot Size** to auto calculate the data size.

Add Slot	
Slot Number	
1	
Туре	
Input	-
Slot Name	
M_RPDO	
Auto Adjust Slot Size	
Select Tags	
Info:	
Select one or more tag providers to get their tags, and select tags t	0
map data.	
Denvident	
canopen master	~
	7 Taos
[canopen_master] RPDO1	
603F_Error_Code	
6041_Statusword	
6061_Modes_of_Operation_Display	
Iranonen masteri 20002	- 10
SOSC Valacity Actual Value	- 11
606C_velocity_Actual_value	
bub4_Mosition_Actual_Value	Y
Tatal: 7 Salastad: 5	
Total, 7 Selected, 3	

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1/0 N	lapping					+
	Slot Number	Slot Name	Туре	Slot Data Size (bytes)		
~	1	M_RPDO	Input	13		
	Tag name canopen_master/R	PDO1/603F_Error_Code	Data type uint16	Byte index 0 - 1	Quantity (bytes) 2	~ ~
	Tag name canopen_master/R	PDO1/6041_Statusword	Data type uint16	Byte index 2 - 3	Quantity (bytes) 2	× •
	Tag name canopen_master/R	PDO1/6061_Modes_of_Operation_Disp	Data type uint8	Byte index 4 - 4	Quantity (bytes) 1	~ v
	Tag name canopen_master/R	PDO2/606C_Velocity_Actual_Value	Data type uint32	Byte index 5 - 8	Quantity (bytes) 4	~ ~
	Tag name canopen_master/R	PDO2/6064_Position_Actual_Value	Data type uint32	Byte index 9 - 12	Quantity (bytes) 4	<b>^</b> ~

### • After adding, use the **Arrow** button to change the tag's **Byte Index position**.

The final mapping of Slot 1 is below:

Slot Number	Slot Name	Туре	Slot Data Size (bytes)		
1	M_RPDO	Input	13		
Tag name canopen_m	aster/RPDO1/603F_Error_Code	Data type uint16	Byte index 0 - 1	Quantity (bytes) 2	~ <b>~</b>
Tag name canopen_m	aster/RPDO1/6041_Statusword	Data type uint16	Byte index 2 - 3	Quantity (bytes) 2	. · ·
Tag name canopen_m	aster/RPDO1/6061_Modes_of_Operation	Data type Disp uint8	Byte index 4 - 4	Quantity (bytes) 1	• •
Tag name canopen_m	aster/RPDO2/6064_Position_Actual_Value	Data type uint32	Byte index 5 - 8	Quantity (bytes) 4	× •
Tag name canopen_m	aster/RPDO2/606C_Velocity_Actual_Value	Data type uint32	Byte index 9 - 12	Quantity (bytes) 4	<b>^</b> ~

### Moxa Tech Note How to communicate with S7-1200 and LXM28A via MGate 5123

• Add Slot Number 2 module as an **Output** type module. Choose all TPDO1 and TPDO2 tags. Enable **Auto Adjust Slot Size** to auto calculate the data size.

Add Slot
Slot Number 2
Туре
Output -
Slot Name
M_TPDO1
Auto Adjust Slot Size
Select Tags
Info: Select one or more tag providers to get their tags, and select tags to map data.
Providers canopen_master v
5 Tags
state
[canopen_master] TPDO1
6040_Controlword
6060_Modes_of_Operation
[canopen_master] TPDO2
607A_Target_Position
6081_Profile_Velocity_in_profile_position_mode
Total: 5 Selected: 4 DONE

#### • The final mapping of Slot 2 is below:

~	2	M_TPDO1	Output	11			
	Tag name	-722201/2010 Controluced	Data type	Byte index	Quantity (bytes)		
	canopen_maste	171PDG1/6040_Controlword	untio	0-1	2		
	Tag name canopen_maste	r/TPDO1/6060_Modes_of_Operation	Data type uint8	Byte index 2 - 2	Quantity (bytes)	^	v
	Tag name canopen_maste	r/TPDO2/607A_Target_Position	Data type uint32	Byte index 3 - 6	Quantity (bytes) 4	^	~
	Tag name canopen_maste	r/TPDO2/6081_Profile_Velocity_in_profile_	Data type uint32	Byte index 7 - 10	Quantity (bytes) 4	^	×

#### Moxa Tech Note How to communicate with S7-1200 and LXM28A via MGate 5123

Add Slot Number 3 module as an Output type module. Choose [canopen\_master]
 NMT > State tags. Enable Auto Adjust Slot Size to auto calculate the data size.

Slot Number	
3	
Туре	
Output	•
Slot Name	
ControlState	
🗹 Auto Adjust Slot Size	
Select Tags	
Info: Select one or more tag providers to get the map data. Providers canopen master	eir tags, and select tags to
Q. Search	
Q Search SELECT ALL	CLEAR
Q Search SELECT ALL [canopen_master] NMT	CLEAR
Q Search SELECT ALL [canopen_master] NMT I state	CLEAR
Q Search  SELECT ALL [canopen_master] NMT  v state [canopen_master] TPDO1	CLEAR
Q Search  SELECT ALL [canopen_master] NMT  S state [canopen_master] TPDO1  Controlword  Controlword	CLEAR
Q. Search         SELECT ALL         [canopen_master] NMT         ☑ state         [canopen_master] TPDO1         □ Controlword         □ Modes_of_Operation	CLEAR

After adding, each slot data size shows as below:

1/0	Mapping				+ ADD SLOT
	Slot Number	Slot Name	Туре	Slot Data Size (bytes)	
>	1	M_RPDO	Input	13	/
>	2	M_TPDO1	Output	11	/
>	3	ControlState	Output	2	/

# 5 Siemens S7-1200 Setting

We use TIA Portal to configure the Siemens S7-1200.

# 5.1 Hardware Configuration

1. Create a new project.

	Create new project	
Open existing project	Project name:	LXM28
	Path:	D:\TIAproj
🥚 Create new project	Version:	V17
	Author:	admin
Migrate project	Comment:	^
Close project		
		×
		Create

On successful creation of the project, click **Configure a device** to add the PLC.
 Project: "LXM28" was opened successfully. Please select the next step:

Start			
	Devices & networks	\$ <sup>9</sup>	Configure a device
→	PLC programming	٢	Write PLC program
→		-005	Configure technology objects
→		Ø	Configure an HMI screen

#### Moxa Tech Note

3. Under the actual PLC's CPU model, select it from **Controllers > Simatic S7-1200 > CPU** as below:

	Add new device			
<ul> <li>Show all devices</li> <li>Add new device</li> </ul>	Device name: PLC_1			
E	Controllers	✓      ✓	Device:	
	НМ	GES7 212-2 KODCINY     GES7 212-1 BD30-0XB0     GES7 212-1 BE31-0XB0     GES7 212-1 BE31-0XB0     GES7 212-1 BE40-0XB0     GES7 212-1 BE40-0XB0	Article no.:	CPU 1212C AC/DC/RJy 66ES7 212-1BE31-0XB0
100100000000000000000000000000000000000		CPU 1212C DC/DC/Rly	≡ Description	V3.0

4. Click **PLC's PROFINET interface** to set its IP Address. Click **Add new subnet** to create a subnet to **PN/IE\_1**.

PROFINET interface_1 [M	odule]	
General IO tags	System constants	Texts
General Ethernet addresses	Ethernet addres	'esses
Advanced options     Time supplication	Interface netw	etworked with
inte synchronization		Subnet: PN/IE_1 Add new subnet
	Internet proto	tocol version 4 (IPv4)
	-	Set IP address in the project
	-	IP address: 192 . 168 . 20 . 12
		Subnet mask: 255 . 255 . 255 . 0
		Use router
		Router address: 0 . 0 . 0 . 0
		IP address is set directly at the device

 Click Options > Manage general station description to install the MGate 5123's GSD file.

View	Insert	Online	Op	tions	Tools	Window	Help		
e projec	t 昌	Х 🗉 🕻	Ť	Setting	s				ne
е				Suppor	t packa	ges			1
				Manag Start A	e gener utomati	al station d on License	escripti Manag	on files (GSD) er	
			#-	Show r	eference	e text			2
3				Global	libraries		_	•	_
								8 <sup>1</sup>	

Select the latest version of the MGate 5123, V2.42 and click Install.

Manage general station description	ı files			×				
Installed GSDs GSDs in the	project							
Source path: D-ICSDM								
Didsbill	Source part. D:IGSDML							
Content of imported path								
File	Version	Language	Status	Info				
GSDML-V2.25-MOXA-Device0204	V2.25	English	Not yet installed	PROFINET I				
GSDML-V2.3-MOXA-Device0204-2	V2.3	English	Not yet installed	PROFINET I				
GSDML-V2.42-MOXA-Device0204	V2.42	English	Not yet installed	PROFINET I				
				_				
				_				
				_				
<	K							
			Delete Install	Cancel				

 In the Hardware catalog window, filter "moxa" to search the MGate 5123. Choose the Moxa PROFINET Device 0202 device icon and drag and drop to the "PN/IE\_1" subnet.

🛃 Торо	logy view 🔥 Network view	Device view	Options	
Network	<b>a</b>	Network overvie 4		
	^	Y Device	✓ Catalog	
		<ul> <li>S7-1200 statio</li> </ul>	тоха	á téá l
PLC 1		▶ PLC_1	Filter Profile: <all></all>	
CPU 1212C	-		Controllers	
	•			
	2		PC systems	
			Drives & starters	
PN/IE_1			Im Network components	
			Detecting & Monitoring	
			Distributed I/O	
	×		Power supply and distribution	
< III > 100%		< II >	Field devices	
PLC_1 [CPU 1212C D 📴 Pro	operties 🚺 Info 🗊 😨 Dia	anostics 🔤 🗖 🗖 🚽	▼ Im Other field devices	
Canami 10 tana	to a second sector Touts		Additional Ethernet devices	4
General 10 tags Sys	stem constants Texts		▼ PROFINET IO	
<ul> <li>General</li> </ul>	General	^	Drives	
PROFINET interface			Encoders	
DI 8/DQ 6	Project information		👻 间 Gateway	
► AI 2			✓ Im Moxa Inc.	
<ul> <li>High speed counters (HSC)</li> </ul>			🗸 🧾 MGate Generic	
<ul> <li>Pulse generators (PTO/PWM)</li> </ul>	Nam	e: PLC_1	Moxa PROFINET	Device 0204

#### **Moxa Tech Note**

7. In **Network view**, you will see the MGate 5123 is in the **PN/IE\_1** subnet. Click **Not** assigned to assign the MGate 5123 to **PN/IE\_1**.

		2	Copology view	6	Network view
Network Connections	HMI connection	- 2 <b>5</b> 1	P 🖬 🛛	Net	work overview
			^	~	Device
					<ul> <li>\$7-1200 station_1</li> </ul>
PLC 1	mgate-dev				PLC_1
CPU 1212C	Moxa PROFINET				<ul> <li>GSD device_1</li> </ul>
	Not assigned				mgate-dev
PN/IE_1					

The MGate 5123 is then set into the **PLC\_1**'s PROFINET IO System.



If your MGate 5123 device name is not "mgate-dev", change it via **Properties > General > Name**.

mgate-dev [Moxa PROFIN	IET Devic	e 0204]	🧟 Proper	ties	L Info	1	Diagnos
General IO tags	System	constants	Texts				
✓ General Catalog information	G	eneral					
▼ PROFINET interface [X1]							
General			Na	me:	mgate-dev		
Ethernet addresses			Aut	hor:	admin		
Identification & Maintena	nce						

 In the MGate 5123's Device overview, drag and drop Input 013 Byte to Slot 1, Output 011 Byte to Slot 2, and Output 002 Byte to Slot 3.

		a T	opolog	gy view	📩 Net	work view	Device vie	w
Dev	vice overview							
	Module		Rack	Slot	I address	Q address	Туре	
	<ul> <li>mgate-dev</li> </ul>		0	0			Moxa PROFINET De	
	PN-IO		0	0 X1			mgate-dev	1
	Input 013 Byte_1		0	1	6880		Input 013 Byte	
	Output 011 Byte_1		0	2		6474	Output 011 Byte	
	Output 002 Byte_1		0	3		7576	Output 002 Byte	
			0	4				_

# 5.2 Software Configuration

# 5.2.1 Modify Tag table

1. In **Default tag table**, create the **Input** and **Output** tags as below:

D	Default tag table								
_		Name	Data type	Address					
1	-	I_6041_Statusword	Word	%IW70					
2	-	I_603F_Error_Code	Word	%IW68					
3	-	I_6064_Position_Actual_Value	DWord	%ID73					
4	-	I_606C_Velocity_Actual_Value	DWord	%ID77					
5	-	I_6061_Modes_of_Operation	Byte	%IB72					
6	-	Q_ControlNMTS tate	Word	%QW75					
7	-	Q_6040_Controlword	Word	%QW64					
8	-	Q_6060_Modes_of_Operation	Byte	%QB66					
9	-	Q_607A_Target_Position	DWord	%QD67					
10	-	Q_6081_Profile_Velocity_in_pr	DWord	%QD70					

2. Create **Memory** tags for program configuration or tag monitoring:

11	-	MR_Operation_Display	Byte	%MB100
12	-	MR_Error_Code	Word	%MW102
13	-	MR_Statusword	Word	%MW104
14	-	MR_Actual_Position	DWord	%MD106
15	-	MR_Actual_Velocity	DWord	%MD110
16	-	MW_Operation_Mode	Byte	%MB200
17	-	MW_Controlword	Word	%MW202
18	-	MW_Target_Position	DWord	%MD204
19	-	MW_Target_Velocity	DWord	%MD208
20		MW_ControlNMTState	Word	%MW212

#### 5.2.2 Modify OB1

1. The PROFINET data format is different from CANopen. If the tag is multi-byte, reverse the byte order. In this demonstration, we keep the CANopen data without swapping. So, in Network 1, the program uses SWAP instructions to copy the value of the **Input** tag to the **Memory** tag. If you swapped the tag value in the **4.2.4 PDO** Settings, use MOVE instructions.



Actual\_Value

IN

Velocity\*

OUT

#### 2. Add Network 2: Update Memory tags to Output tags

OUT

- IN





#### 3. Add Network 3: Control NMT State



#### 5.3 **Download to PLC**

1. Execute **Download**.



2. Click Start Search to search for an accessible PLC.

Configured acc	ess nodes of "PLC_1"			
Device	Device type	Slot	Interface type	Address
PLC_1	CPU 1212C AC/D	1 X1	PN/IE	192.168.2

	Ţ	ype of the PG/PC interf	ace: 🖳 PN/IE		•
		PG/PC interf	ace: 🔊 DM962	1A USB To Fast Ethernet /	Adapter(KM 💌 💎
	Conne	ection to interface/sub	net: PN/IE_1		• 💎
		1st gate	way:		- 🖲
	Select target device: Device	Device type	Interface type	Show all compatib Address	le devices Target device
	-	-	PN/IE	Access address	-
μ <u></u>					

X

Subnet

PN/IE\_1

192.168.20.12



#### How to communicate with S7-1200 and LXM28A via MGate 5123

3. When found, execute **Load**.

	Select target device:			Snow all compatible of	ievices 🔻
	Device	Device type	Interface type	Address	Target device
100 T	PLC_1	CPU 1212C DC/D	PN/IE	192.168.20.12	PLC_1
	-	-	PN/IE	Access address	
Flash LED					
					<u>S</u> tart search
Online status information:	:			Display only error m	essages
👍 Found accessible dev	vice desktop-06g5gqr				^
1 Scan completed. 1 co	ompatible devices of 5 acc	essible devices four	nd.		
Scan and information	retrieval completed.				
"? Retrieving device info	rmation				~
				Lord	Cancol
				<u>r</u> oad	Cancel

- 4. After loading, enable **Start all** to start modules and click **Finish**.
- Check the MGate's PROFINET Diagnostics on the web console. Make sure IO Controller Status-> Operator Mode is RUN and all IO Module Status are GOOD.

Home >	PROFINET Diag	<sup>gnostics</sup> iagnostics				
<b>—</b> A	utorefresh					
Appl	ication Relati	on 1 Appli	cation Relation 2			
10 0	Controller	Status				
MAC Opera	Address ator Mode		00:1c:06:13:14:89 RUN			
Para	ameters					
Upda Devic	te Time (ms) e Name		8 mgate-dev			
I/O	Slots					
Slo	t Number	Slot Name	Туре	Data Size (bytes)	Data (hex byte)	Status
1		M_RPDO	Input	13	10 82 18 62 00 C0 47 08 00 00 00 00 00	GOOD
2		M_TPDO1	Output	11	00 00 00 00 00 00 00 00 00 00 00 00	GOOD
3		ControlState	Output	2	00 00	GOOD

# 6 Communication Test

Click Add new watch table to create the Watch table\_1.

Add the tags below to be observed and click **Go online**. Then, click **Monitor all**.

Ci + 🗍	🔃 🗓 🖳 📮 🖉 Go online 💆 🕻	io offline   🚹	📕 🗶 🗄 🛄	⊲earch in project>					
LXM28 →	LXM28 → PLC_1 [CPU 1212C AC/DC/Rly] → Watch and force tables → Watch table_1								
	<u>+</u>								
学 学 🔐	ž 😼 Ь 🖋 🗞 🕫 🚏								
i	Name	Address	Display format	Monitor value					
1	"MR_Operation_Display"	%MB100	Hex	16#FF					
2	"MR_Error_Code"	%MW102	Hex	16#0000					
3	"MR_Statusword"	%MW104	Hex	16#4231					
4	"MR_Actual_Position"	%MD106	DEC+/-	3100807					
5	*MR_Actual_Velocity*	%MD110	DEC+/-	4687					
6	"MW_Operation_Mode"	%MB200	Hex	16#00					
7	"MW_Controlword"	%MW202	Hex	16#0000					
8	"MW_Target_Position"	%MD204	DEC+/-	0					
9	"MW_Target_Velocity"	%MD208	DEC+/-	0					
10	"MW_ControlNMTState"	%MW212	Hex	16#0000					

# 6.1 NMT State Test

Write canopen\_master/NMT/state to update the NMT state. The valid values are:

- 0 => Enter to **Operational Mode**
- 1 => Enter to **Pre-Operational Mode**
- 2 => Enter to **Stop Mode**

Change the **MW\_ControlNMTState** value to 0x0001:

2	# # 1 Iv Iu 🖊 & 🕫 🖤						
i	Name	Address	Display format	Monitor value	Modify value		
1	"MR_Operation_Display"	%MB100	Hex	16#FF			
2	"MR_Error_Code"	%MW102	Hex	16#0000			
з	"MR_Statusword"	%MW104	Hex	16#4231			
4	"MR_Actual_Position"	%MD106	DEC+/-	3100801			
5	"MR_Actual_Velocity"	%MD110	DEC+/-	-4690			
6	"MW_Operation_Mode"	%MB200	Hex	16#00			
7	"MW_Controlword"	%MW202	Hex	16#0000			
8	"MW_Target_Position"	%MD204	DEC+/-	0			
9	"MW_Target_Velocity"	%MD208	DEC+/-	0			
10	"MW_ControlNMTState"	%MW212	Hex	▼ 16#0000	16#0001		

### Moxa Tech Note How to communicate with S7-1200 and LXM28A via MGate 5123

Check **CANopen Diagnostics** on the MGate's web console. The status of LXM28A shows **Pre-Operational**.

Home > CANopen Diagnostics	c	
	5	
Overview Slave Status	_	
LXM28A	Slave Status	Object Parameter
Node ID ; 2 State : Pre-operationa I Inactive Time : 306 (ms) EDS File : SELXM28_0175 00.eds	Device Name Node ID State Inactive Time (ms) EDS File	: LXM28A : 2 : Pre-operational : 306 : SELXM28_017500.eds

Change the **MW\_ControlNMTState** value to 0x0000. Check **CANopen Diagnostics** on the MGate's web console. The status of LXM28A shows "Operational".

Overview	Slave Status			
LXM28A		* Slave Status	Object Parameter	
Node ID State	: 2 : Operational	Device Name		: LXM28A
EDS File	: 239 : SELXM28_017500.ed	Node ID		: 2
	5	State		: Operational
		Inactive Time (ms	)	: 239
		EDS File		: SELXM28_017500.eds

# 6.2 JOG Mode Test

In this test, we set the **Operation Mode** to **JOG** mode by setting **MW\_Operation\_Mode** to **0xFF**. Set **Controlword** to **Enable Operation** by setting **MW\_Controlword** to **0x000F**. Click **Modify**.

≝ ≝ ⊯ № № <mark>ダ</mark> 兆 ፇ ඐ ಞ							
	i	Name	Address	Display format	Monitor value	Modify value	
1		"MR_Operation_Display"	%MB100	Hex	16#FF		
2		"MR_Error_Code"	%MW102	Hex	16#0000		
3		"MR_Statusword"	%MW104	Hex	16#4231		
4		"MR_Actual_Position"	%MD106	DEC+/-	3100806		
5		"MR_Actual_Velocity"	%MD110	DEC+/-	0		
6		"MW_Operation_Mode"	%MB200	Hex	16#00	16#FF	
7		"MW_Controlword"	%MW202	Hex	16#0000	16#000F	
8		"MW_Target_Position"	%MD204	DEC+/-	0		
9		"MW_Target_Velocity"	%MD208	DEC+/-	0		
10		"MW_ControlNMTState"	%MW212	Hex	16#0000	16#0000	

Next, modify **MW\_Controlword** to **0x001F**. It triggers LXM28A to start JOG in a **positive** direction. We see the value of MR\_Actual\_Position steadily increasing, and the value of **MR\_Actual\_Velocity** is positive.

	i	Name	Address	Display format	Monitor value	Modify value
1		"MR_Operation_Display"	%MB100	Hex	16#FF	
2		"MR_Error_Code"	%MW102	Hex	16#0000	
3		"MR_Statusword"	%MW104	Hex	16#1637	
4		"MR_Actual_Position"	%MD106	DEC+/-	7657809	
5		"MR_Actual_Velocity"	%MD110	DEC+/-	440731	
6		"MW_Operation_Mode"	%MB200	Hex	16#FF	16#FF
7		"MW_Controlword"	%MW202	Hex 💌	16#001F	16#001F
8		"MW_Target_Position"	%MD204	DEC+/-	0	
9		"MW_Target_Velocity"	%MD208	DEC+/-	0	
10		"MW_ControlNMTState"	%MW212	Hex	16#0000	16#0000
			and distances of the second			

Next, change **MW\_Controlword** to **0x002F**. It triggers LXM28A to start JOG in a **negative** direction. We see the value of **MR\_Actual\_Position** steadily decreasing, and the value of **MR\_Actual\_Velocity** is negative.

i	Name	Address	Display format	Monitor value	Modify value
1	"MR_Operation_Display"	%MB100	Hex	16#FF	
2	"MR_Error_Code"	%MW102	Hex	16#0000	
3	"MR_Statusword"	%MW104	Hex	16#1637	
4	"MR_Actual_Position"	%MD106	DEC+/-	106_220_847	
5	"MR_Actual_Velocity"	%MD110	DEC+/-	-398536	
6	"MW_Operation_Mode"	%MB200	Hex	16#FF	16#FF
7	*MW_Controlword*	%MW202	Hex 💌	16#002F	16#002F
8	"MW_Target_Position"	%MD204	DEC+/-	0	
9	"MW_Target_Velocity"	%MD208	DEC+/-	0	
10	"MW_ControlNMTState"	%MW212	Hex	16#0000	16#0000

# 6.3 Fault Protection Test

Now, we see the BCH2 servo motor is in reverse movement. If we unplug the Ethernet cable of S7-1200 to disconnect PROFINET connection, it triggers the fault protection function, which we set in "4.2.4 PDO settings". The operation mode will be 0x00, and the BCH2 servo motor stops the movement and stays in servo off mode.

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