

Application Note

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

> www.hiwinmikro.tw MD39UE01-2307_V1.0

Revision History

The version of the manual is also indicated on the bottom of the front cover.

MD39UE01-2307_V1.0



Release Date	Version	Applicable Product	Revision Contents
Jul. 17 th , 2023	1.0	E series EtherCAT drive	First edition.

Related Documents

Through related documents, users can quickly understand the positioning of this manual and the correlation between manuals and products. Go to HIWIN MIKROSYSTEM's official website \rightarrow Download \rightarrow Manual Overview for details (<u>https://www.hiwinmikro.tw/Downloads/ManualOverview_EN.htm</u>).

Preface

This manual provides detailed information on the operation of PLC software Sysmac Studio when E series EtherCAT drive is used with OMRON NJ and NX series PLC.

Specifications of Software/Hardware

Name	Version of Software/Firmware
	Software (Thunder): 1.8.10.0 or above
E1 Series EtherCAT Drive	Firmware: 2.8.10 or above
	ESI file: HIWIN_MIKROSYSTEM_ED1F_20221101 or above
	Software (Thunder): 1.9.16.0 or above
E2 Series EtherCAT Drive	Firmware: 3.9.10 or above
	ESI file: HIWIN_MIKROSYSTEM_ED2F_20230417 or above
OMRON Motion Controller	Software (Sysmac Studio): 1.45 or above
(NJ, NX Series)	Firmware: 1.15 or above

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1. Communication and module setup

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1.1 Create new project

1. Open Sysmac Studio and select New Project.

Offline
New Project
🗁 Open Project
≝ [₽] Import
[□] ∰ Export
Online
4 Connect to Device
Version Control
🙌 Version Control Explorer
License
📟 License

Figure 1.1.1

2. Enter Project name, Author, Device, and Version, and click Create.

Project P	roperties
Project name	New Project
Author	user
Comment	
Туре	Standard Project
Select	Device
Category	Controller
Device	NJ501 🔽 - 1300 💌
Version	1.15
	Create

Figure 1.1.2

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E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

Communication and module setup

3. Successfully create a new project.



Figure 1.1.3

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Communication and module setup

1.2 Select connection type

1. Select Controller on the upper screen and click Communications Setup.



Figure 1.2.1

2. Select **Connection type** and click **OK**.

📓 Communications Setup		- 🗆 ×
 Connection type 		
Select a method to connect with the Direct connection via USB Enter connection via a USB Ethernet connection via a hu Select one method from the Direct connection via U Direct connection via U Ethernet connection via U Ethernet connection via U Ethernet connection via	Controller to use every time you go online. et be options at every online connection. B8 hemet USB a hub	
▼ Remote IP Address		
Specify the remote IP address.	USB Communications Test Ethernet Communications Test	
▼ Options		
Confirm the serial ID when goin Check forced refreshing when g	g online. sing offline.	
Response Monitor Time		
Set the Response Monitor Time in th Please set a sufficiently large value w 2 (s)	communications with the Controller.(1-3600sec) nen connecting to the Control er via multiple networks, such as VPN co	nnection.
	OK Cancel	

Figure 1.2.2

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1.3 Install ESI files

1. On the left side of the screen, go to **Configurations and Setup** and double-click **EtherCAT** to open

EtherCAT tab. Then, right-click the controller icon III and select Display ESI Library.

File Edit View Insert Project Contr	roller Simulation Tools Window	Help				
Х 🖞 🛍 前 ち さ 🖬 💷	山へ影ら同談な	🗓 🕅 🛕 🔌 68 4		ଅ ବ ବ ୟ		
Multiview Explorer 🚽 🖗 Ethe	rCAT X					
new_Controller_0 V	ddress Network configuration					
Configurations and Setup	Master	Cut			Item name	Value
EtherCAT		Сору		N	lodel name	Master
CPU/Expansion Racks		Paste			roduct name	Master
🚅 I/O Map		Delete			DO Communications Cycle	0 1000 us
Controller Setup		Undo				Setting
► ☆ Motion Control Setup		Redo			ransmission Delay Time	Edit Settings
e' Cam Data Settings		Expand All		F	eference Clock	Not exist
Event Settings		Collapse All			otal Cable Length ail-soft Oneration Setting	Fail-soft operation
Task Settings		Calculate Transmission Delay	of the Master		Vait Time for Slave Startup	30 s
🖂 Data Trace Settings		Calculate Holdinission octay The	Ser line manager	F	DO communications timeout	2 times
OPC UA Settings		Import Slave Settings and Insert N	ew Slave		evision Check Method	Setting <= Actual device
Programming		Export Slave Settings			enal Number Check Method	NO CHECK
▼ @ POUs		Write Slave Node Address				
📰 🔻 🕷 Programs		Compare and Merge with Act al N	letwork Configuration			
🖉 🔤 Program0		Get Slave Serial Numbers				
L @ Section0		Clear All Settings				
L 🕷 Functions		Display Diagnosis/Statistics in prm	ation		Device name	
上波 Function Blocks		Display Production Information			Set a name for the master.	
🔲 🕨 🥅 Data		Dientay Parket Monitor				
📰 🕨 🖿 Tasks		Display ESI Library				
		Export Configuration Information				
Build and		Output to ENS File	and the second se			- ª ×
	rrors 🚹 0 Warnings	Export All Couplers' I/O Allocation:	s			
	I Description	Assign Drives to Axes				1
		Safety Related PDOs Batch Setting				

Figure 1.3.1

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Communication and module setup

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

2. All the supported ESI files will be displayed in **ESI Library** window, please confirm if there is an ESI file for the drive. If there is none, users can select the ESI file and click **Install (File)**.



 ESI file name of E1 series servo drive is: ED1F_date; ESI file name of E2 series servo drive is: ED2F_date.



The ESI files of E series servo drive can be found in the installation path of Thunder (the drive's human machine interface): **Thunder/doc/ESI Files**.

(2) If users would like to update to the latest version of ESI file, please select the old version first and click **Uninstall** to remove it before reinstalling a new one. (If the old version of ESI file has been used to create the drive network configuration in section 1.4, users need to remove the drive configuration first before removing the old version of ESI file.)



Figure 1.3.2

Communication and module setup

1.4 Configure drive network

Before configuring drive network, users must first set **Node Address** of the drive. Choose one of the following methods to set node address:

- 1. Set node address through the actual knob of the drive.
- 2. Set node address of the drive through the controller.



The setting range of node address is $1\sim192$ and cannot be 0.

1.4.1 Set node address through the actual knob of the drive

- 1. Open the top front cover of the drive and use a small Phillips screwdriver to screw and set the node address of the drive. The node address of same network topology cannot be repeated. After setting, the drive needs to be powered off and restarted.
- 2. After the drive restarts, go to **Toolbox** on the right side of the screen. Select the icon of the adopted E series servo drive and drag it under the controller icon in **EtherCAT** tab.



Figure 1.4.1.1

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Communication and module setup

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

3. Click the **Online** icon in the toolbar on the upper screen to connect to the controller. After the connection is established, a yellow line will appear below the icon. Then, right-click the controller icon and select **Compare and Merge with Actual Network Configuration**.

File Edit View Insert Proje	ct Controller	Simulation Too	ls Window	Help									
X 🖲 🖬 🖶 ちぐ 🕯	2 10 5	~ ※ 55 *			▲ 🔉	63 🍻 🎋	6 0	D: 10	ଅଇ୍ପ୍	ing d			
Multiview Explorer 🛛 👻 🖡	EtherCAT X												-
new_Controller_0 🔻	Node Address	etwork configura	on acter			1	_						
Configurations and Setup			Aaster		_	Cur		_	_		Item name	Value	
EtherCAT	1		E001	ive Rev:0x0001000	00					Dev	vice name	Master	
L - Node1 : E1 CoE Drive (-	LICOLDI	110 110 110 1000 1000						Pro	duct name	Master	
► ISt CPU/Expansion Racks										Nu	mber of Slaves		
a+ I/O Map										- PD	O Communications Cycle	1000	us
Controller Setup										Tot	erence Clock al Cable Length	Not exist 1000	m
►										Fail	-soft Operation Setting	Fail-soft operation	
e/ Cam Data Settings						Expand All				Wa	it Time for Slave Startup	30	s
Event Settings						Collapse All				- PD	O communications timeout	2 Satting <- Actual device	times
Task Settings							tission D 94			Ser	ial Number Check Method	No check	
Data Trace Settings							tings an l I						
Programming							lings						
						Write Slave Nod	e Addres						
 ▼ ∭ Programs					1	Compare and M	erge with A	Actual Networ	rk Configuration	_			
v ⊡ Program0					- 4	Get slave serial	Numbers						
∟ . Section0													
LI Functions						Display Diagnos	is/Statistics	Information			niáco porpo		-
L 號 Function Blocks						Display Producti	on Informa			∫ Se	evice name for the master.		
🔳 🕨 🥅 Data						Display Packet N	Ionitor						
► 🖿 Tasks						Display ESI Libra							
					_								
	Build												• # ×
		0 Warnings											
	1 1	Description		Program	í.								
Filter 💽	Outout Build		_		_			_					
	Dond												

Figure 1.4.1.2

4. In **Compare and Merge with Actual Network Configuration** window, click **Apply actual network configuration** to apply the actual drive node address to the project, and the drive network configuration would be completed.

Sompare and Merge with Actual Network Configuration	n						-		×
Node AddressINetwork configuration on Sysmac Studio	Node address Actua	I network configuration Master	N.	et Cor 1a	nparison result Matched	Act Ma	Lower C	onfigur	ation
1 E001 E1 CoE Drive Rev:0	2	E1 CoE Drive I	Rev:0x00		Added	2 :			
			1		Removed				
			- 8						
			- 8						
			- 8						
			- 8						
			- 8						
			- 8						
			- 8						
			- 8						
	K		>						
Apply actual network configuration									
some slaves such as Power supply onits are not included		Close							

Figure 1.4.1.3

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

1.4.2 Set node address of the drive through the controller

1. In **Toolbox** on the right side of the screen, select the icon of the adopted E series servo drive and drag it under the controller icon in **EtherCAT** tab.



Important



Figure 1.4.2.1

2. Click the **Online** icon in the toolbar on the upper screen to connect to the controller. After the connection is established, a yellow line will appear below the icon. Then, right-click the controller icon and select **Write Slave Node Address**.

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Communication and module setup

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Communication and module setup

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

File Edit View Insert Projec	ct Controller Simu	ulation Tools \	Window Help					
X D D D D C C	こうでもく	x 55 5		A 🔉 63 🖗	5 G O O O			
	Constant of the second second							
Multiview Explorer 🚽 🕂	EtherCAT ×							-
new Controller 0 🔻	Node Address Netwo	rk configuration	_	2				
		Master Macter		Cut		Item name	Value	
Configurations and Setup		L BI EC	001			Device name	Master	
EtherCAT	1	E E	1 CoE Drive Rev:			Model name	Master	
L I Node1 : E1 CoE Drive (Product name	Master	
CPU/Expansion Racks						Number of Slaves	1	
+ I/O Map						Reference Clock	Not exist	us
🔲 🕨 🔃 Controller Setup						Total Cable Length	1000	m
► ⊕ Motion Control Setup				Expand All		Fail-soft Operation Setting	Fail-soft operation	
& Cam Data Settings				Collapse All		Wait Time for Slave Startup	30	S
Event Settings					Time of the Martin	PDO communications timeout	Z Setting <= Actual device	times
In Task Settings					time or the waater	Serial Number Check Method	No check	
Data Trace Settings					ert New Slave			
Programming				Export Slave Settings				
Programming				Write Slave Node Address				
V 🖞 POUs				Compare and Merge with A	ctual Network Configuration			
▼ III: Programs				Get Slave Serial Numbers				
V 🖂 Program0								
L delse Section0								
L 銀 Functions				Display Diagnosis/Statistics	Information	- Device name		
∟淝 Function Blocks				Display Production Informat		Set a name for the master.		
🖿 🕨 m Data				Display Packet Monitor				
► 🖿 Tasks				Display ESI Library				
	Build							- 1 ×
		Wetenting						To the A
		Description	Proj					
		Description	1 110					
					anna -			
Eilter	Outout Build							
	Duild							

Figure 1.4.2.2

3. In **Slave Node Address Writing** window, first set the drive's node address in **Set value**, a reminder window will pop up after clicking **Write**. Users need to click **Write** again to write the node address into the controller and the drive. After finishing node address writing, please power off the controller and drive for 5 seconds and then power on again to complete the drive network configuration.

Slave Node Address Writing -		\times
Present valuelSet valuelActual network configuration I Master		
 Slave Node Address Writing Node addresses are written to the slaves. In order to reflect the result of this operation, you have to cycle the power supply to the slaves again manual Be sure it is care to ob this operation. Write Cancel 	X	
Update With Latest Actual Networ When any value other than 0 is set to a slave whose node addresses and be set from hardware, the setting has priority. In ot addresses set here are applicable.	cConfigura ner cases, t rite Ca	ation the ancel

Figure 1.4.2.3

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

1.5 Edit PDO object

1. Click the drive icon in EtherCAT tab and then click Edit PDO Map Settings in the right window.

When editing PDO object, it cannot be connected to the controller. If it is connected, please click the **Offline** icon in the toolbar on the upper screen to cut off the connection.

Important

File Edit View Insert Project Controller Simulation Tools Window Help		
	₽ ゴ @ Q W	
Multiview Explorer 🚽 🔮 EtherCAL 🗙		Toolbox 🚽 🕸
Node Address/Network configuration		All vendors 🗸 🔻
Master		Groups
Configurations and Setup	Item name Value	All groups
EtherCAT EtherCAT Et CoE Drive Rev:0x00010000	Serial Number 0x00000000	Terminal Coupler Servo Drives
L ← Node2 : E1 CoE Drive ()	0x6060:00 RxPDO 1/Modes	Frequency Inverter
▶ 📾 CPU/Expansion Racks	0x607A:00 RxPDO 1/Target 0x60R8:00 RxPDO 1/Target	😑 Digital IO
≠ I/O Map	Dx60FE:01 RxPDO 1/Physica	E Encoder Input
► R. Controller Setup	0x605A:00 RxPDO 1/Quick 0x603E:00 TxPDO 1/Error c	Measurement Sensor
► Motion Control Setup	PDO Map Settings 0x6041:00 TxPDO 1/Status	Input Keyword
er Cam Data Settings	0x6061:00 TxPDO 1/Modes 0x6064:00 TxPDO 1/Modes	Show all versions
► Event Settings	0x60B9:00 TxPDO 1/Touch	TEL Rev:0x00010004
e, rack settings	0x60BA:00 TxPDO 1/Touch 0x60E4:00 TxPDO 1/Eollowi	ASDA-A3-E CoE Drive Revol
Deta frace settings		Delta ASDA-A3-E EtherCAT(
• evogramming	Edit PDO Map Settings	ASDA-B3-E CoE Drive Revol Detta ASDA-B3-E EtherCATIC
v ∎ rous v ® Doutrams	Enable Distributed Clock Enabled (UC synchronous)	E1 CoE Drive Rev:0x000100
v w Pooram0	Reference Clock Exist	
L & Section0	Setting Parameters	E2 COE Drive
USE Functions	Backup Parameter Settings	InoSV660N Rev:0x0001000
L版 Function Blocks	The data is input/output periodically by the process data (PDO)	IX7NH - Standard EtherCA
▶ m Data	communications.	K7NH - Standard EtherCAT c
▶ m Tasks		L7MMT - LMS EtherCAT dri
		L7N - Standard EtherCAT d
Build	- " ×	17N - Standard EtherCAT dre
🔀 to lenors 🛕 to Warnings		L/NH - Standard EtherCAT d
I Description I Program I Location I		L7NHF - EtherCAT Full Close
		Model name : E1 CoE Di
		Product name : E1 CoE I
		Vendor : HIWIN MIKRO
		Comment :
		URL :
E Filter Dutput Build		

Figure 1.5.1

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Communication and module setup E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

2. Select **TxPDO** and **RxPDO** groups that users would like to use and click **OK**.

	📓 Edit PE	OO Map Settin	gs							_		\times
P	DO Map					PDO entries i	ncluded i	in RxPDO 1				
		Proce	ss Data Size :	Input 184	[bit] / 11472 [bit]	Index	l Size	lData type	PDO	entry na	ame	lCon
	Coloction	Input/Output	Namo	Output 1	20 [bit] / 114/2 [bit]	0x6040:00	16 [bit]	UINT	Controlwor	d		
H	Selection	πραιγΟατρατ		i riag i	·	0x6060:00	8 [bit]	SINT	Modes of o	peratio	n	
		Output		 Editable		0x607A:00	32 [DIT]		Target posi	tion	on	
H		Output		Editable		0x60EE-01	22 [bit]		Develoal ou	touto	ION	
	X	Output	RxPDO 3	Editable		0x6054.00	16 [bit]		Ouick stop	ontion	rode	
	ŏ	Output	RxPDO 4	Editable		0.0000-0.00			Quick stop	option	couc	
E			No option									
		Input		 Editable								
	X	Input		Editable								
	X	Input	TyPDO 2	Editable								
	ŏ	Input	TxPDO 4	Editable								
H	<u> </u>											
I												
I												
I												
I												
I												
I						<	_	_	_	_	_	
L												
							N	love Up	Move Do	wn	Alig	n
						Edit PDC) Entry	Add P	DO Entry	Dele	te PDO I	Entry
									OK	Cance	el A	pply

Figure 1.5.2

- (1) After clicking any of the PDO groups, the default PDO objects of the group would be displayed on the right side in Edit PDO Map Settings window.
- Important
- (2) Users can click Add PDO Entry to add other objects to the group or click Delete PDO Entry to delete existing objects in the group.
- (3) The maximum object number for RxPDO and TxPDO is eight each.

2. Parameters setup

2.	Param	Parameters setup						
	2.1	Add	motion control axis	2-2				
	2.2	Conf	figure PDO object	2-4				
	2.3	Set unit conversion						
	2.4	4 Operation settings						
	2.5	.5 Select homing methods2						
	2	2.5.1	Incremental homing method	2-11				
	2.5.2 Absolute homing method							
	2.6	Transfer parameter settings to the controller						

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Parameters setup

After completing the connection with controller and drive network configuration, users can start to set relevant parameters for motion control axis (such as PDO objects configuration, unit conversion, operation settings, and homing method).

- (1) When setting the parameters of the motion axis, it cannot be connected to the controller. If it is connected, please click the **Offline** icon in the toolbar on the upper screen to cut off the connection with the controller.
- (2) This manual only introduces the basic settings. For other settings, please refer to the official operation manual of OMRON.

2.1 Add motion control axis

 In Configuration and Setup on the left side of the screen, double-click to open Motion Control Setup. Then, right-click Axis Settings and click Add to add a Motion Control Axis.

Figure 2.1.1

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

2. Motion control axis MC_Axis000 will appear under Axis Settings.

Figure 2.1.2

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2.2 Configure PDO object

1. Click the added motion control axis MC_Axis000 and select Axis Basic Settings 🖄. Set Axis type

to **Servo axis** and set **Output device 1** to the node number of the drive used by the motion axis.

Figure 2.2.1

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E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

- Studio Parameters setup
- 2. Click **Detailed Settings** and configure the PDO objects corresponding to **Output (Controller to Device)**, **Input (Device to Controller)**, and **Digital inputs** according to user needs.

Important

(2) For the bit definition of **Digital inputs** object **0x60FD**, please refer to "E Series Servo Drive EtherCAT(CoE) Communications Command Manual".

Axis Basic Settings Output device 1 Node : 2 E1 CoE Drive(E002) Output device 2 <not assigned=""> Channel Output device 3 <not assigned=""> Channel</not></not>						
▼ Detailed Settings						
Reset to Default						
Function Name	Device	Process Data				
 Output (Controller to Device) 						
1. Controlword	Node : 2 E1 CoE Drive(E002)	6040h-00.0(RxPDO 1_C 🔻				
3. Target position	Node : 2 E1 CoE Drive(E002)	607Ah-00.0(RxPDO 1_1 🔻				
5. Target velocity	<not assigned=""></not>	<not assigned=""></not>				
7. Target torque	<not assigned=""></not>	<not assigned=""></not>				
9. Max profile Velocity	<not assigned=""></not>	<not assigned=""></not>				
11. Modes of operation	Node : 2 E1 CoE Drive(E002)	6060h-00.0(RxPDO 1_N 🔻				
15. Positive torque limit value	<not assigned=""></not>	<not assigned=""></not>				
16. Negative torque limit value	<not assigned=""></not>	<not assigned=""></not>				
21. Touch probe function	Node : 2 E1 CoE Drive(E002)	60B8h-00.0(RxPDO 1_T 🔻				
44. Software Switch of Encoder's Input	<not assigned=""></not>	<not assigned=""></not>				

Figure 2.2.2

	Detailed Settings					
▼ Dei	Detailed Settings					
Res	et to Default					
1	Function Name	Device	Process Data			
	+ Output (Controller to Device)					
	 Input (Device to Controller) 					
	22. Statusword	Node : 2 E1 CoE Drive(E002)	6041h-00.0(TxPDO 1_S 🔻			
	23. Position actual value	Node : 2 E1 CoE Drive(E002)	6064h-00.0(TxPDO 1_P			
	24. Velocity actual value	<not assigned=""></not>	<not assigned=""></not>			
	25. Torque actual value	<not assigned=""></not>	<not assigned=""></not>			
	27. Modes of operation display	Node : 2 E1 CoE Drive(E002)	6061h-00.0(TxPDO 1_N 🔻			
	40. Touch probe status	Node : 2 E1 CoE Drive(E002)	60B9h-00.0(TxPDO 1_T			
	41. Touch probe pos1 pos value	Node : 2 E1 CoE Drive(E002)	60BAh-00.0(TxPDO 1_T 🔻			
	42. Touch probe pos2 pos value	<not assigned=""></not>	<not assigned=""></not>			
	43. Error code	<not assigned=""></not>	<not assigned=""></not>			
	45. Status of Encoder's Input Slave	<not assigned=""></not>	<not assigned=""></not>			
	46. Reference Position for csp	<not assigned=""></not>	<not assigned=""></not>			

Figure 2.2.3

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Parameters setup

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

V	▼ Detailed Settings					
	Reset to Default					
		Function Name	Device	Process Data		
		 Output (Controller to Device) 				
+ Input (Device to Controller)						
		- Digital inputs				
		28. Positive limit switch	Node : 2 E1 CoE Drive(E002)	60FDh-00.1(TxPDO 1_E 🔻		
		29. Negative limit switch	Node : 2 E1 CoE Drive(E002)	60FDh-00.0(TxPDO 1_E 🔻		
		30. Immediate Stop Input	<not assigned=""></not>	<not assigned=""></not>		
32. Encoder Phase Z Detection			<not assigned=""></not>	<not assigned=""></not>		
33. Home switch			Node : 2 E1 CoE Drive(E002)	60FDh-00.2(TxPDO 1_E 🔻		
		37. External Latch Input 1	<not assigned=""></not>	<not assigned=""></not>		
		38. External Latch Input 2	<not assigned=""></not>	<not assigned=""></not>		

Figure 2.2.4

2.3 Set unit conversion

1. Set the electronic gear ratio Pt20E, Pt210 to 1:1 or 2ⁿ:1 in Thunder. Save the parameters to the drive and restart to take effect.

Parameters Setup :					
Diff	. Pt0XX Pt1XX	Pt2XX Pt3XX	Pt4XX Pt5XX	Pt6XX Pt7XX	Others
	Parameter Name	Default Value	Modified Value	Unit	Description ^ 🛨
	Pt200	0×0000	0×0000		[Position command form selection]
	Pt204	0×0010	0x0010		[Settings of unlimited rotation function]
	Pt205	0	0	1 revolution	[Upper limit of motor rotation number]
	Pt207	0x0000	0x0001		[Position control function selection]
	Pt208	0x0002	0x0002		[Excellent Smart Cube (ESC) function selection]
	Pt209	1	2	1 times	[Number of times for encoder feedback interpolation co
	Pt20A	20000	20000	1 um	[Feed length of external encoder]
	Pt20B	1000	1000	1 nm	[Linear unit length (resolution) of external encoder]
	Pt20C	1	1	1 revolution	[Gear ratio at motor side (full-closed loop)]
	Pt20D	1	1	1 revolution	[Gear ratio at load side (full-closed loop)]
	Pt20E	32	1	1	[Electronic gear ratio (numerator)]
	Pt210	1	1	1	[Electronic gear ratio (denominator)]
	Pt212	8192	8192	1 pulse edge	[Number of encoder output pulses]
	Pt216 (I)	0	0	0.25 ms	[Position command acceleration/deceleration time cons.
	Pt217 (I)	0	0	0.25 ms	[Average position command movement time]
	Pt218 (I)	1	1	x 1	[Command pulse input multiplier]
<					>

Figure 2.3.1

When using linear motor and direct drive motor, it is recommended to set the drive's electronic gear ratio to 1:1 and set the unit conversion in Sysmac Studio.

Important

2. Click the added motion controller MC_Axis000 and select **Unit Conversion Settings** icon

💣 MC_Axis0	•00(0) ×
Ŕ	Unit Conversion Settings
	I▼ Unit
₩₩₩ ↓ ↑	Unit of display 🕒 pulse 🔿 mm 🕒 um 🕒 nm 🕒 degree 🌢 inch
HHH	▼ Travel Distance
	Command pulse count per motor rotation 8388608 pulse/rev (1)
	O Do not use gearbox
	Work travel distance per motor rotation 5 mm/rev (2)
	Reference: Unit conversion formula
	Number of pulses [pulse] = $\frac{(1) \text{ Command pulse could permotor rotation [ODINT]}}{(2) \text{ Work travel distance per motor rotation [LREAL]}^*$ Travel distance [Unit of display]

3. Set the variables of **Unit of display**, **Work travel distance per motor rotation**, **Work gear ratio**, and **Motor gear ratio** according to the user scenarios. Set **Command pulse count per motor rotation** according to the motor resolution, Pt20E, and Pt210.

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Parameters setup

Example

Take EM1 series servo motor with a 5 mm/rev lead screw for example:

- If motor resolution is 8388608 cnt/rev, set Command pulse count per motor rotation to 8388608 * Pt210 / Pt20E.
 - (2) Select mm in Unit of display and set 5 mm/rev for Work travel distance per motor rotation. If there is no matching reducer, select Do not use gearbox; if there is a matching reducer, select Use gearbox and set Work gear ratio and Motor gear ratio according to the reduction ratio.
- (3) Refer to the example diagram of the linear mechanism in **Unit Conversion Settings** for setting.

Figure 2.3.3

2.4 Operation settings

1. Click the added motion control axis **MC_Axis000** and select the **Operation Settings** icon **O**.

W MC_Axis	000 (0) ×				-
R.	Operation Settings	S			
	▼ Velocity/Acceleration/Deceleration	on			^
₩₩ ₩ ₩	Maximum velocity Start velocity Maximum iog velocity	250 mm/s 0 mm/s 250 mm/s	Velocity warning value	0 %	
	Maximum acceleration	250 mm/s^2	Acceleration warning value	0 %	
3	Maximum deceleration Acceleration/deceleration over Use Operation selection at Reversing Dec	250 mm/s^2 e rapid acceleration/deceleration (celeration stop 🔻	Deceleration warning value Blending is changed to Buffered)	0 %	
	▼ Torque				
	Positive torque warning value	0 %	Negative torque warning value	0 %	
	▼ Monitor				
Ø	In-position range Actual velocity filter time constant	10 mm 0 ms	In-position check time Zero position range	0 ms 10 mm	
-					
123	2				

Figure 2.4.1

2. Set the parameter of Maximum velocity, Maximum jog velocity, Maximum acceleration, and Maximum deceleration according to the user scenarios.

💞 MC_A	cis0	00 (0) 🗙				•
ţ,	Ê	Operation Settin	ngs			
	I	▼ Velocity/Acceleration/Deceleration	ation			
₩₩₩ ₩₩₩	l	Maximum velocity Start velocity Maximum jog velocity	250 mm/s 0 mm/s 250 mm/s	Velocity warning value	0 %	
	H	Maximum acceleration	250 mm/s^2	Acceleration warning value	0 %	
	H	Maximum deceleration	250 mm/s^2	Deceleration warning value	0 %	
	I	Acceleration/deceleration over Operation selection at Reversing	Use rapid acceleration/dece Deceleration stop	eration (Blending is changed to Buffered) 🔻		
	H	▼ Torque				
	H	Positive torque warning value	0 %	Negative torque warning value	0 %	
	H	▼ Monitor				
	H	In-position range	10 mm	In-position check time	0 ms	
9	H	Actual velocity filter time constant	0 ms	Zero position range	10 mm	
	H					
н	I					
Ψ	H					
	Ľ					
בכו						
						\sim
	\sim				>	

Figure 2.4.2

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Parameters setup

3. If the setting value of parameter exceeds the limit of controller, take **Maximum velocity** for example, if the value after conversion into pulse unit pulse exceeds the upper limit 500MHz, there will be a red frame line to remind users to reduce the value.

Figure 2.4.3

2.5 Select homing methods

If there are any requirements for homing operation, click the added motion control axis MC_Axis000 and

select **Homing Settings** icon . Users can select different homing methods according to incremental or absolute encoders.

🐨 MC_Axis0	000 (0) ×	· · · · · · · · · · · · · · · · · · ·
st.	Homing Settings	
	▼ Homing Method	4
₩₩₩ +++	Homing method Home input signal Use Z-phase input as	lome 🔻
	Homing start direction Positive direction V Home input detection direction Positive direction V	Operation selection at positive limit input Reverse turn/immediate stop Operation selection at negative limit input Reverse turn/immediate stop
3	Home proximity signal	
	Z-phase input	
+	Positive limit input	
	Negative limit input	
Ø	Start from negative side of limit signal input	Normal end
+	Start from turning ON of limit signal input	Normal end
123 6	Start from positive side of limit signal input	Normal end

Figure 2.5.1

2.5.1 Incremental homing method

Select incremental homing method (need to use methods of Z-phase, Positive limit, and Negative limit), and set the relevant parameters.

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Parameters setup

2. Set Homing velocity and Homing approach velocity.

Figure 2.5.1.2

2.5.2 Absolute homing method

1. Select absolute homing method Zero position preset.

Absolute homing method **Zero position preset** needs to be used with an absolute encoder. When performing homing, the current position would be used as the home position, which may still be recorded after power off and restart.

MC Axis000 (0) × <u>s</u> ⊕ ▼ Homina Method **₩** ++ Homing method Zero p on preset 🔻 Home input signal Homing start direction Home input detection direction e 🔻 Operation selection at positive limit input Operation selection at negative limit input stop 🔻 $\mathbf{\mathbf{b}}$ Home proximity signal 7-phase input Positive limit input Negative limit input (⊕

Figure 2.5.2.1

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2. Select Position Count Settings icon . In Position Count Settings window, set Encoder type to Absolute encoder.

Figure 2.5.2.2

2.6 Transfer parameter settings to the controller

1. After completing parameter settings of the motion control axis, click **Build Controller** icon in the upper toolbar to compile the project. Check if there are no errors in the message window below.

Figure 2.6.1

2. Click the **Online** icon to connect to the controller. After the connection is established, click

Synchronize icon 🖸 to compare if the setting of Sysmac Studio is consistent with the setting of

the controller.

File Edit View Insert Project	t Controller Simulation Tools Window Help
X 🖷 🖬 🖬 ५ ८ 🖻	┃ 図 년 4 월 8 월 8 일 武 <mark> ▲ <mark>☆ ♀ ♀ ▶</mark> ○ ³ 달 달 ◎ 요 ♡</mark>
Multiview Explorer 🗸 👎	🥂 MC Auis000 (0) 🗙
new_Controller_0 V	Homing Settings
Configurations and Setup Theread Setup	
∟ ⇔ Node2 : E1 CoE Drive (Homing start direction Positive direction Coperation selection at positive limit input Reverse turn/immediate stop Home input detection direction Positive direction Operation selection at negative limit input Reverse turn/immediate stop
CPU/Expansion Racks # I/O Map	Home proximity signal
► R Controller Setup	
▼ ⊕ Motion Control Setup ▼ ⊕ Axis Settings	Positive limit input
∟ @ MC_Axis000 (0)	Negative limit input
∟ & Axes Group Settings & Cam Data Settings	
► Event Settings	
Task Settings Data Trace Settings	
Programming	
	ā

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Parameters setup

3. In **Synchronize** window, click **Transfer To Controller**, and transfer the settings of the project to the controller.

Transfer To Controller is to overwrite the controller's current settings with the project's settings. **Transfer From Controller** is to overwrite the project's settings with the controller's current settings.

Important

📓 Syno	hronization					_		×
	Computer: Data Name	Computer: Update Date	Controller: Update Date	Controller: Data Name	Compare			
Image:	NJ501	2023/5/12 下午 03:23:05	2023/4/10 下午 05:27:00	NJ501				
Legend:	Synchronized Different A Exists only	on one side 🚺 Not chec	ked					
Clear	the present values of variables with Retain	attribute (Valid for Transfe	r to Controller).					
🔳 Do no	ot transfer the POU program source (Valid f	or Transfer to Controller). A	All data will be re-transferr	ed when this option is changed.				
Do n - CJ-s	Do not transfer the following. (All items are not transferred.) - Chseries Special Unit parameters and EtherCAT slave backup parameters. Chan Terrein a Unit of the content of the conten							
Do no	ot transfer the EtherNet/IP connection setting	ngs (i.e., tag data link settin	ıgs).					
	lata will be transferred because the project	s in the computer and the	controller are different.					
- '								
		The second se						
		Tansier To Controller	ansier From Controller	Close				

Figure 2.6.3

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Parameters setup

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

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3. Test run

3.	Test run		3-1
	3.1	Add program	3-2
	3.2	Enable and homing	3-4
	3.3	Relative movement	3-8

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Test run

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

This chapter will introduce the way to compile simple programs with function blocks through **Programming** in Sysmac Studio for test run.

- (1) When setting the parameters of the motion axis, it cannot be connected to the controller. If it is connected, please click the **Offline** icon in the toolbar on the upper screen to cut off the connection with the controller.
- (2) This manual only introduces the basic functions. For other functions, please refer to the official operation manual of OMRON.
- The test run follows the example in section 2.3: an EM1 series servo motor with a 5 (3) mm/rev lead screw.

3.1 Add program

Go to **Programming** \rightarrow **POUs** on the left side of the screen and double-click **Section0** to open the 1.

programming screen.

Figure 3.1.1

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Test run

2. Go to **Toolbox** on the right side of the screen, select the desired function block and drag it to the line on the screen to start programming.

WC_Axis500 (0) Section0 - Program0 ×	Toolbo	эх – Ф
Variables	<clear< th=""><th>search> マタ×</th></clear<>	search> マタ×
2 Deter Function Block	FB-	- MC_ImmediateStop
Enter Vanible Axis — Axis Inter Variable	FB-	- MC_Move
Enable Status	FB-	— MC_MoveAbsolute
Busy inter Variable	FB-	– MC_MoveCircular2D
Error inter Variable	FB-	- MC_MoveFeed
enonu – nev variable	FB-	– MC_MoveJog
	FB-	– MC_MoveLinear
	FB-	– MC_MoveLinearAbsolute
	FB-	— MC_MoveLinearRelative
	FB-	- MC_MoveLink
	FB-	— MC_MoveRelative
	FB-	- MC_MoveVelocity
	FB-	- MC MoveZeroPosition
	FB-	– MC Phasing
	FB-	– MC Power
	FB -	– MC ReadAxisParameter
Output - a x	FB-	– MC Reset
	FR-	- MC ResetFollowingError
		– MC SaveCamTable

Figure 3.1.2

3. After programming is completed, transfer the program to the controller, which applies the same steps

for transferring parameter settings to the controller in section 2.6: first click **Build Controller** icon in the upper toolbar to compile the project. If there are no errors in the message window below, click the **Online** icon **a** to connect to the controller. After the connection is established, click **Synchronize** icon **a**, and click **Transfer To Controller** in **Synchronize** window to upload the project settings and programs to the controller.

3.2 Enable and homing

 The motor needs to be enabled before homing. Drag the motor enabled function block MC_Power to the line, customize the block name (such as servo_on), and input the motion control axis MC_Axis000 to Axis parameter.

File Edit View Insert Project Controller Simulation Tools Window Help	
米 ● ■ ● ウイ ■ 回 舟 木 路 扇 扇 糸 帯 圓 枚 ▲ ≫ ⇔ ≫ ゅ つ 입 ご 其 ● ④ 徴	
Multiview Explorer 🔹 🖣 🥌 Sectional (Negranal)X 🔹	Toolbox 🗸 🗸
Image: Controller Q Variables Serve on * Controller Setup * Window Control Setup * Window Control Setup Endow Status * Workshow Endow Status * Bogs Schup Settings Endow Status * Data Taree Settings Endow Status * Data Taree Settings * Data Status * In Pogram0 * In Pogram0	Hennish C. Movel in an and the constraints of
Let Section Build - 1 × Let Function Blocks > 1 Description I Program Location I I Description I Program Location I I I Description I Program Location I I Time I Description I Program	IR MC_SeatAssParameter IR MC_Reset IR MC_SeatFollowingError IR MC_SeatFollowingError IR MC_SeatCom bable IR MC_SeatCom bable IR MC_SeatCom bable IR MC_SeatCoverride IR MC_SeatCoverride IR MC_SeatCoverride IR MC_SeatCoverride INdiana Controll Power seavo Inter ready to operate.

Figure 3.2.1

2. On the line corresponding to **Enable** parameter of the function block **MC_Power**, right-click and select **Insert Input** to add a switch.

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Test run

Figure 3.2.3

3. Drag the homing function block **MC_Home** to the line, input the block name and **Axis** parameter, and add a switch.

Section0 - Program0 ×	•	Toolbox 🗸 🖡
Variables 0 Enable_motor En	homing No. Source Kecute Execute Done Busy—Enter Variable CommandAborted—Enter Variable ErrortD—Enter Variable ErrortD—Enter Variable	KongeleasePosition M. GroupReadPosition M. GroupReadPosition M. GroupRest M. GroupSet0vemde M. M. GroupSet0vemde M. M. GroupSyndhoveAbs M. M. GroupSyndhoveAbs M. M. Ho seWithParamete M. M. Jin seWithParamete M. M. Jin seWithParamete
	Figure 3.2.4	FB MC_Move FB MC_MoveAbsolute FB MC_MoveCircular2D

- 4. Compile the program and transfer to the controller.
- 5. In the case of connecting to the controller, check if **Contoller Status** light on the lower right of the screen is green.

File Edit View Insert Project Controller Simulation Tools Window Help	
X ● M ● ウイ M 回 舟 A X 尿 扇 ☆ A Q R A X & A A A A A A C 品 ピ 口 の の ら	
Multiview Explorer	Toolbox 🚽 🗸
<pre>inex_Controlled if in interview interview</pre>	Sequence Control Subarrows Subarrow
▶ m Doba ▲ ▲ → → → → → → → → → → → → → → → → →	Controller Status 🚽 🗜
	ONLINE 192.168.250.1 ERR/ALM RUN mode

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Test run

6. Double-click the switch of the function block **MC_Power** and select **True** to enable the motor. Check if the motor is enabled via **Servo ready** light on the lower left in Thunder.

Figure 3.2.7

7. Double-click the switch of the function block **MC_Home** and select **True** to start the homing method selected in section 2.5.

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Test run

8. After homing is completed, select **View** on the upper screen and click **Watch Tab Page**.

S Ne	ew Proj	ect - new_Co	ontroller_0 - S	ysmac Studio	(64bit)							
File	Edit	View In	ert Project	Controller	Simulation	Tools	Windo	w He	lp			
X	i 1	Multivie	v Explorer		Alt+1		63. J		家	A	*	
	_	Project S	Sortcut View		Alt+Shift	+1	300 -					
Mul	tiview E	Toolbox	4		Alt+2	A	wis000 (D)				
		3D Visua	azer		Alt+Shift	+2						
nev	v_Conu	Output	b Page		Alt+3			servo	on			
v (onfigu	Watch T	ab Page		Alt+4			MC_P	ower	-		
10	▼ 20) E	Watch T	ab Page(Table	e)	Alt+Shift	+4	AXI:	s <u> </u>	Axe	ML_A	XISUUU	
	L	Cross Re	eference Tab F	age	Alt+5		Ena	ble	Status	_	_	-
	► 🗟 C	Build Ta	b Page		Alt+6				Busy	Enter		
	/I مي	Search a	and Replace R	esults Tab Pad	ge Alt+7				Erro	Enter		
-	► R C	Simulati	on Pane		Alt+8				Franklin			
105	V⊕N	Differen	tial Monitor		Alt+9				Enone	Enter		
	▼ 5	Program	nming Group	Tab Page		- 1						
		Variable	Table		Ctrl+Shif	t+V						
12. 12.		Variable	Manager									
20	60	D	i i c		C1 1 C1 1							
	► E	Smart Pi	roject Search		Ctri+Shir	t+F						
		Recently	Closed Wind	OWS	Ctrl+Shif	t+H						
	⊠ U	Clear Re	cently Closed	Windows His	tory							
	rogram	Zoom				•						
		Manage	Window Layo	out Templates	i							
		Reset W	indow Layout									
		L Sect	tion0			_						
-	L3	Functions										
		Function B	llocks									
10	► m D			< <								
-	► m T	asks		Build								
				0 Errors	0 Warning	S						
				I I	Descr	iption		I P	rogram		Lc	oca
	Filter			Output P. 1								
	ritter			outhor Bull								

Figure 3.2.9

9. In Watch window on the lower screen, enter MC_Axis_000.Act.Pos (motor position feedback, unit: mm) in Name column to check if the value is close to 0.

Watch (Project)1								- ‡ ×
Device name	Name	Online value	Modify	l Comment	I Data type	I AT	Display format	I
new_Controller_0	MC_Axis000.Act.Pos	0.021			LREAL		Real	
new_Controller_0	MC_Axis000.Cmd.Pos	0.021999999			LREAL		Real	

The units of variables in Watch window are the same as Unit of display set in section 2.3.

Test run

3.3 Relative movement

1. Since the motor needs to be enabled before performing relative movement, the motor enabled function block **MC_Power** should be added into the program first.

 Add the relative moving function block MC_MoveRelative to the program and input the block name. Then, set Axis parameter to MC_Axis000; Distance to 100 mm; Velocity to 50 mm/s; Acceleration/ Deceleration to 50 mm/s², and add a switch.

The units of motion-related variables in function blocks are the same as **Unit of display** set in section 2.3.

Important

- 3. Compile the program and transfer to the controller.
- 4. In the case of connecting to the controller, check if **Contoller Status** light on the lower right of the screen is green.
- 5. Double-click the switch of the function block **MC_Power** and select **True** to enable the motor. Check if the motor is enabled via **Servo ready** light on the lower left in Thunder.

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Test run

- 6. Before the motor moving, ensure there are no obstacles within the moving distance.
- Double-click the switch of the function block MC_MoveRelative and select True to start moving to the position of 100 mm.

8. After the motor stops, select **View** on the upper screen and click **Watch Tab Page**. In **Watch** window on the lower screen, enter **MC_Axis_000.Act.Pos** in **Name** column and check if the value is 100 mm.

Watch (Project)1							- ů ×
Device name	I Name	Online value	Modify	l Comment	I Data type	I AT	Display format I
new_Controller_0	MC_Axis000.Act.Pos	100			LREAL		Real
new_Controller_0	MC_Axis000.Cmd.Pos	100			LREAL		Real
		*					

Figure 3.3.4

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Test run

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

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4. Other applicational settings

4.	Other app	licational settings	4-1
	4.1	Example: Rotary mechanism of a multi-turn absolute servo motor with a reducer	4-2

4.1 Example: Rotary mechanism of a multi-turn absolute servo

motor with a reducer

When using EM1 multi-turn absolute servo motor with the rotary mechanism of the reducer (with such as 1:50 reduction ratio), if the motor continuously runs in one direction, the motor's absolute position may eventually exceed the memorized turns, which may cause absolute position loss of the drive and controller after powered off and restarted. To avoid this situation, E series servo drive and OMRON controller should be set based on the following steps:

1. Set the electronic gear ratio **Pt20E** and **Pt210** to 2ⁿ:1 (such as the default value of 32:1) in Thunder.

Diff.	Pt0XX Pt1XX	Pt2XX Pt3XX	Pt4XX Pt5XX	Pt6XX Pt7XX	Others
	Parameter Name	Default Value	Modified Value	Unit	Description
	Pt200	0×0000	0×0000		[Position command form selection]
	Pt204	0x0010	0×0000	-	[Settings of unlimited rotation function]
	Pt205	0	0	1 revolution	[Upper limit of motor rotation number]
	Pt207	0×0000	0x0000	-	[Position control function selection]
	Pt208	0×0002	0x0002	-	[Excellent Smart Cube (ESC) function selection]
	Pt209	1	2	1 times	[Number of times for encoder feedback interpolation co
	Pt20A	20000	20000	1 um	[Feed length of external encoder]
	Pt20B	1000	1000	1 nm	[Linear unit length (resolution) of external encoder]
	Pt20C	1	1	1 revolution	[Gear ratio at motor side (full-closed loop)]
	Pt20D	1	1	1 revolution	[Gear ratio at load side (full-closed loop)]
	Pt20E	32	32	1	[Electronic gear ratio (numerator)]
	Pt210	1	1	1	[Electronic gear ratio (denominator)]
	Pt212	8192	8192	1 pulse edge	[Number of encoder output pulses]
	Pt216 (I)	0	0	0.25 ms	[Position command acceleration/deceleration time cons.
	Pt217 (I)	0	0	0.25 ms	[Average position command movement time]
	Pt218 (I)	1	1	x 1	[Command pulse input multiplier]

Figure 4.1.1

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Other applicational settings

2. Set Pt204.□□0□ and disable the multi-turn absolute encoder rotation number overflow error detection. This is to avoid the occurrence of drive alarm AL.800 when the motor runs in one direction for a long time.

🕗 Modify [Pt204.all] window	-	×
3 2 1 0 Current value = 0 0 1 0 New value = 0 0 0 Cancel		
Pt204.all : [Settings of unlimited rotation function] Pt204. 0 0 X : Reserved (Do not modify.) Pt204. 0 0 X 0 : Selections of multi-turn absolute encoder rotation number overflow error detection. 0 - Do not detect rotation number overflow error. 1 - Detect rotation number overflow error. Pt204. 0 X 0 0 : Reserved (Do not modify.) Pt204. X 0 0 0 : Reserved (Do not modify.)		

- 3. After saving the parameters to the drive, restart to take effect.
- In Sysmac Studio, please set Unit Conversion Settings according to the electronic gear ratio in step
 1 in Thunder: set Unit of display to degree; Command pulse count per motor rotation to 262144
 pulse/rev.
- 5. Select **Use gearbox**, and set **Work travel distance per motor rotation** to 360 degree/rev. If the reduction ratio is 1:50, set **Work gear ratio** to 1; **Motor gear ratio** to 50.

The calculation formula of **Command pulse count per motor rotation** is: EM1 series motor resolution of 8388608 (cnt/rev) * Pt210 / Pt20E.

Example

For the settings, users can refer to the example diagram of the rotary mechanism in **Unit Conversion Settings**.

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Other applicational settings

Figure 4.1.3

6. In **Position Count Settings** window in Sysmac Studio, set **Count mode** to Rotary mode; **Modulo maximum/minimum position setting value** to 360 deg/0 deg; **Encoder type** to Absolute encoder.

In **Position Count Settings** window, set **Count mode** to Rotary mode, and the value of the controller would maintain between **Modulo minimum position setting value** and **Modulo maximum position setting value**. If the value is set to 0~360 deg, the position range could be corresponding to the single-turn position of the load side.

Important

Figure 4.1.4

E Series EtherCAT Drive Complete Setup with OMRON Sysmac Studio

Other applicational settings

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- 7. Add a new program for test run. Add the motor enabled function block **MC_Power**, the JOG function block **MC_MoveJog**, and the homing function block **MC_Home** to the program.
- 8. For **MC_MoveJog** variables, set **Velocity** to 20 deg/s; **Acceleration/Deceleration** to 20 deg/s², and run the load side at a speed of 20 deg/s.

Important

- (1) The variables of the function block **MC_MoveJog** may correspond to the load side.
- (2) To jog in a negative direction, set a variable for the jogging function block parameter **NegativeEnable**.

9. First click the switch of **MC_Power** to enable the motor, and then click the switch of **MC_MoveJog** to jog the motor in a positive direction.

	Section0 - Program0 ×										
	Variables										
Rung Com	0	motor_ena	MC_Axis000	S_ON MC_Powe Axis Enable	er — Axis MC_ Status	is MC_Axis000 jog_positiv	iog_positive	MC_Axis000	JO(MC_Mo Axis — — PositiveEnable	G veJog — Axis 1 Busy	MC_Axis000
men					Busy Ente	er Variable	1	(False) jog_negative	NegativeEnable Co	ommandAborted =	Enter Variable
t List					Error Ente			20	Velocity	Error 🗖	Enter Variable
					ErrorID Ente	er Variable		20	Acceleration	ErrorID =	Enter Variable
								20	Deceleration		

10. It is visible that after the variable **MC_Axis_000.Act.Pos** accumulated from 0 deg to 360 deg, it will be accumulated again from 0 deg.

l	Name	Online value	Name	Online value
	MC_Axis000.Act.Pos	353.0756	MC_Axis000.Act.Pos	17.1756
	MC_Axis000.Cmd.Pos	353.0756	MC_Axis000.Cmd.Pos	17.1756000(

Figure 4.1.7

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11. First, turn off the switch of **MC_MoveJog** and click the variable (such as **jog_negative**) which is corresponded to the parameter **NegativeEnable**. Then, select **True** to jog the motor in a negative direction.

Figure 4.1.8

12. It is visible that after the variable **MC_Axis_000.Act.Pos** decreased from 360 deg to 0 deg, it will be decreased again from 360 deg.

Name	Online value	Name	Online value	
MC_Axis000.Act.Pos	19.673	MC_Axis000.Act.Pos	351.373	
MC_Axis000.Cmd.Pos	19.6730199	MC_Axis000.Cmd.Pos	351.37302	

Figure 4.1.9