

DIADesigner-AX Software Manual



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Related Documents

Document Name	Document ID
DIADesigner User Manual	DIAS-Manual-0003-EN
DIAScreen User Manual	DIAS-Manual-0004-EN
Software Download Manual	DIAS-Manual-0005-EN
DIADesigner-AX Online Help	N/A

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2 nd	2021/02/19	1. Chapter 3.1: Added Support Controller AX- 308EA0MA1P, AX-364ELA0MA1T, AX- 300NA0PA1, AX- 324NA0PA1P
		2. Chapter 4.1.1: Added how to Add RIO Module Process.
		3. Chapter 4.1.2: Added Models that Support the firmware update function.
		4. Chapter 4.2.2: Updated the running clock configuration tab to the system settings tab and add the device IP address setting field.
		5. Chapter 4.2.5: Updated Ethernet General Tab.
		 Chapter 4.2.7: Added high-speed IO Settings, divided into AX-364EL/AX-308 and AX- 324.
		7. Chapter 4.4.4: Added Introduction to the new free encoder.
		8. Chapter 7.1: Added Introduction to the new device storage library.

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Chapter 1: DIADesigner-AX Overview

1.1 Introduction

DIADesigner-AX is the IEC 61131-3 programming tool for Delta's new generation motion controller – AX series and adopts a large number of applied instructions, especially Motion library. The multilingual environment and the user-friendly interface provide the user a convenient and efficient development environment.

1.2 DIADesigner-AX Overview

Features

- All editors of the IEC 61131-3 (FBD, LD, ST, SFC) and different variants of the standard editors.
- Powerful and proven library concept for the reuse of application.
- Project configuration through wizards.
- Input assistance for the input and configuration of data.
- User-friendly programming with mouse and keyboard in all IEC 61131-3 editors.
- Extensive debugging and online features for the fast optimization of the application code and to speed up testing and commissioning.
- Numerous security features for the protection of the source code and for safeguarding the operation of the controller.
- Programmable devices from different manufacturers.
- The user interface is extendible and adaptable without leaving the framework.
- Transparent internal structures of the development tool and the available components.
- Many seamlessly integrated tools for different kinds of automation tasks.

There are two built-in configurations.

- Hardware Configuration: It is used to configure hardware for a system, and manage parameters.
- Network Configuration: It is used to configure networks for a PLC system, and manage data exchanges.

DIADesigner-AX provides various solutions for motion control including PLCopen MC function block, G-code editor, E-CAM editor, positioning planning chart tool and many more.

- Support PLCopen POUs for single and multi-axis movements
- Support PLCopen POUs for add-on functions like diagnostics, stop, CAM controller
- Additional POUs for different tasks like monitoring dynamic data or following error, operating CAMs and CAM controllers
- Integrated graphical CAM editor with extensive configuration options
- Virtual and logical axes are supported.
- Integrated drivers for numerous, CANopen and EtherCAT drives.
- Configuration of the Drives/Servo based on standard field devices.

Chapter 2: Software Setup

2.1 Installation and Uninstallation

2.1.1 Installing DIADesigner-AX

Pre-requisites:

Ensure that the target computer follows the minimum criteria mentioned in 2.2 *System Requirements*, and DIAInstaller is operating in it.

DIAInstaller is a resident program to manage all Delta Industrial Automation software. User can check for download, install and update Delta Industrial Automation software in DIAInstaller without any burden, and everything will be handled in background. DIAInstaller can be downloaded from below website:

https://diastudio.deltaww.com/home/downloads

Follow the steps to install software:

- 1. Open DIAInstaller, and check for latest version of DIADesigner-AX.
- 2. Click *Download* to download DIADesigner-AX installation file, as shown in Figure 2-1.

1000							English (Vishnudevi G
DIA	Studio							
i	Product Name DIADesigner	Issue Date 2020/12	Release Version	Installed Version	Size	↓ Download	🛕 Uninstall	
i	DIASelector	2020/12	1.0		815.1 MB	🚽 Download	1 Uninstall	
P	DIAScreen	2020/12	1.0	1.0.0	1.8 GB	Installed	🔔 Uninstall	Download Patch
i	COMMGR	2020/12	2.0	2.0.0	267.2 MB	Installed	📤 Uninstall	
i	DIADesigner-AX	2020/11	1.0.0		1.6 GB	🛓 Download	🛃 Install	

Figure 2 - 1: Downloading DIADesigner-AX

3. After completing the download, click *Install* to start installation in background.

							English 🚯 Vishnudevi
DIA	Studio						
	Product Name	Issue Date	Release Version	Installed Version	Size		
i	DIADesigner	2020/12	1.0		1.1 GB	bownload	🛕 Uninstall
i	DIASelector	2020/12	1.0		815.1 MB	bownload	Anstall
i	DIAScreen	2020/12	1.0		1.8 GB	Downloaded	🛃 Install
i	COMMGR	2020/12	2.0		267.2 MB	Downloaded	La Install
i	DIADesigner-AX	2020/11	1.0.0		1.6 GB	Downloaded	🛃 install

Figure 2 - 2: Installation of DIADesigner-AX

Result: DIADesigner-AX has been installed.

NOTE:

- 1. Click Check for Updates to refresh in case user install or uninstall software themselves without using DIAInstaller.
- 2. Click Download All to download all available software.
- 3. User can assign a dedicated directory to install by clicking Option button.
- 4. User can set options in Option.

DIAInstaller			- 🗆 🗙
	DIAInstaller	English	Vishnudevi Govindasa
Software List	Download Path: C:\Users\vishnudevi.govindasa\downloads\DIAInstaller\ Browse Limit download speed to: 1000000 KB/s ✓ Alert when the download target directory disk space is not enough Minimum disk space: 8		
	Enable DIAInstaller to delete executable file after an application is installed (including update installation) Application checks for updates when DIAInstaller is opened. Display the new version notification window of this software Check for update automatically Check for Update Frequency: Daily Last Checked on: 22 January, 2021 01:04:57 PM Check for Updates		
Software Manual			Cancel Apply Settings

Figure 2 - 3: DIAInstaller Option

2.1.2 Uninstalling DIADesigner-AX

Follow the steps to uninstall DIADesigner-AX:

1. Open DIAInstaller, and then click *Uninstall* in target software.

DIA	Studio						English 💽 Vishnudevi
	Product Name	Issue Date	Release Version	Installed Version	Size		
i	DIADesigner	2020/12	1.0		1.1 GB	bownload	Install
i	DIASelector	2020/12	1.0		815.1 MB	↓ Download	Linstall
i	DIAScreen	2020/12	1.0		1.8 GB	Downloaded	🛃 Install
i	COMMGR	2020/12	2.0		267.2 MB	Downloaded	🛃 Install
i	DIADesigner-AX	2020/11	1.0.0	1.1.0	1.6 GB	Downloaded	ሷ Uninstall

Figure 2 - 4: Uninstallation of DIADesigner-AX

2. Uninstallation process will be started in the background.

Result: DIADesigner-AX is uninstalled.

NOTE: Refer to DIAInstaller User Manual to complete DIADesigner-AX uninstallation.

2.1.3 Update of DIADesigner-AX

Follow the steps to update DIADesigner-AX:

Open DIAInstaller. If there is a new version available, a \square new version icon is displayed as shown in the following figure.

DIA	Studio						English 💽 Vishnud
-	Product Name	Issue Date	Release Version	Installed Version	Size		
i	DIADesigner	2020/12	1.0		1.1 GB	↓ Download	ሷ Uninstall
i	DIASelector	2020/12	1.0		815.1 MB	↓ Download	
Ŷ	DIAScreen	2020/12	1.0	1.0.0	1.8 GB	Installed	Luninstall ↓ Downlo
i	COMMGR	2020/12	2.0		267.2 MB	Downloaded	🛃 Install
i	DIADesigner-AX	2020/11	1.0.0		1.6 GB	Downloaded	🛃 Install

Figure 2 - 5: New version icon of DIAInstaller

- 1. Click *Download Patch* button, the latest update file will be downloaded.
- 2. After download is completed, click *Install* button to install update in background.

NOTE: User can set options like check for update frequency in Option.

2.2 System Requirements

The following table provides the specifications for DIADesigner-AX operating environment:

Please refer to the table below for software installation.

ltem	System Requirement
Runtime System	The DIADesigner-AX runs all versions of the system in real time
	AX-8xxEP0, AX-308EA0MA1T
Operating System	Windows 7 / 8.1/10 32/64 bits
CPU	Intel Celeron 540 1.8 GHz (min.), Intel Core i5 M520 2.4 GHz (min.)
Memory	2GB or above (recommend to use 4GB or more)
Hard Disk Drive	10GB or more
Monitor	Resolution 1920 x 1080 Pixels recommend
Keyboard/Mouse	General Keyboard Mouse or Windows compatible device
	EtherNet, USB, Serial port (depends on product
PC interface	interface)
Software	Need to support Microsoft .Net Framework 4.6.2

Chapter 3: Getting Started

3.1 Supported Devices

DIADesigner-AX V1.1 supports the following devices. Refer the device documentation for more information on the devices.

Туре	Product Series
Controller	 AX-8xxEP0 Linux series AX-8xxEP0 Windows series MotionPLC: AX-308EA0MA1T, AX-308EA0MA1P, AX-364ELA0MA1T Logic PLC: AX-300NA0PA1, AX-324NA0PA1P
AC Motor Drives	C2000 series, MS300 series
Servo Drive	ASDA-A2-E series, ASDA-B3-E series, ASDA-A3-E series
Remote IO	 EtherCAT: R1-EC series, R2-EC series, RTU-ECAT series. EtherNet/IP: AS 200 series, AS 300 series.

3.2 Device and Function Guide

The devices and functions supported by DIADesigner-AX v1.1 are shown in the following table. Subsequent versions will gradually increase device support and features.

	Communication Setup	Network Configuration	Hardware Configuration	Parameter Setup	Program Edit	
Controller				CH4	CH7	
AC Drive	CH4	CH5	CH4	CH 3.3.1.2	N/A	
Servo Drive				CH 3.3.1.2	N/A	

	Download
Controll	CODESYS Development System > Updating an Application on the PLC > Execution of a
er	Download

	Download
AC Drive	Link: https://help.CODESYS.com/webapp/_cds_performing_a_download;product=CODESYS;ve rsion=3.5.10.0
Servo Drive	

3.3 Quick Start

3.3.1 Example

In this example, user will program a simple refrigerator controller. The completed project RefrigeratorControl.project_archive can be found in the DIADesigner-AX installation directory in the Projects directory. In addition to the sample project, user will create one here step-by-step.

- As with a conventional refrigerator, the temperature is specified by the user via rotary control.
- The refrigerator determines the actual temperature using a sensor. When it is too high, the refrigerator starts the compressor with an adjustable delay.
- The compressor cools until the desired temperature is reached, minus a hysteresis of 1 degree. The hysteresis is intended to prevent the actual temperature from fluctuating too much around the set temperature, which would result in the compressor constantly switching itself off and on.
- When the door is open, a lamp lights up inside the refrigerator. When the door is open too long, a beeping acoustic signal sounds.
- If the compressor does not reach the set temperature despite activity of the motor over a long period of time, then the buzzer emits a steady acoustic signal.

Engineering:

The cooling activity is controlled in the main program of the application. The signal management is controlled in another POU. The required standard function blocks are available in Standard library. Because no physical temperature sensors and no physical actuators are connected in this sample project, user will also write a program to simulate the increase and decrease of the temperature. This will allow user to monitor the operation of the refrigerator controller afterwards in online mode.

Preparation

User has installed DIADesigner-AX and launched it with the default profile. The frame window of the development system opens with the standard menu bar: No project is open yet.

3.3.1.1 Create a Project

Follow the steps to create a project:

 Double-click on DIADesigner-AX shortcut icon on the desktop to open the software.



Figure 3-1: DIADesigner-AX shortcut icon

2. Click in new project icon in the quick access toolbar.

Or

Click *File > New Project*.

File	Edit	View	Project	Build	Online	Debug
徇	New Pr	oject			Ctrl	-N
2	Open P	roject			Ctrl-	-0
	Close P	roject				
	Save Pr	oject			Ctrl	+S
	Save Pr	oject As.				
	Project	Archive				•
	Source	Upload				
	Source	Downlo	ad			
6	Print					
	Print Pr	eview				
	Page Se	etup				
	Recent	Projects				×
	Exit		0.000		Alt+	F4

Figure 3-2: Creating new project

Result: The *New Project* window opens with *Standard Project* as shown in the following figure. Specify a name and a storage location for the project and click *OK*.

Categories			Templates	Standard project			
			Empty project	Standard			
	ning one devic	e, one app	plication, and an	empty implem	nentation for P	PLC_PRG	
	\Users\vishnud	levi.govind	lasa\Documents				×

Figure 3- 3: New project template

3. Select the required model and PLC_PRG in *CFC*.

Result: The project opens in the DIADesigner-AX frame window as shown in the following figure.

Standard Project		\times
	You are about to create a new standard project. This wizard will create the following objects within this project:	в
	 One programmable device as specified below Two programs PLC_PRG and Motion_PRG in the language specified be One cyclic task which calls PLC_PRG and one cyclic task which calls Motion_PRG A reference to the newest version of the Standard library currently instal 	
Information		
Name	AX-364ELA0MA1T	1
Vendor	Delta Electronics, Inc.	
Description	AX-364ELA0MA1T motion controller with 16 points Built-in IO (digital output type: NPN). It can supports up to 64 EtherCAT axes and 4 pulse out axes.	
Device	AX-364ELA0MA1T (Delta Electronics, Inc.)	~
Version	1.0.1.0	~
PLC_PRG in	Continuous Function Chart (CFC)	~
	OK Ca	ncel

Figure 3- 4: Standard project

🖻 sample project.project - DIADesigner-AX	- 0 ×
File Edit View Project Build Online Debug Tools Window Help	
🖹 📽 📓 (香) い つ 当 階 龍 X (晶 谷 晶 谷 川 雅 雅 雅)陰 (智・音) (囲) Application (Device: PLC Logic) ・ 🧐 等 🕟 🔳 🛞 (印 句 句 名) や (第) ギ) *	V
Devices v 4 X	
= 🕼 sample project	
Device (AX-36-4ELA0MAIT)	
→ 🔏 Hardware Configuration	
두 웹P PLC Logic	
© Q Application	
Charsy Manager Motion, PRG (PRG)	
E 📓 Task Configuration	
B BeherCAT_Task	
- 创 Motion_PRG 日 愛 MainTask	
- ⊕ Maniask - ⊕1 PLC PRG	
F 🗊 Buttin JO (Buildh JO) PLC_PRG	
Tolta_LocaBus_Master (Delta_LocaBus Master) Tolta_LocaBus_Master (Delta_LocaBus Master) Tolta_LocaBus_Master_SoftMotion (AX-3 Series EtherCAT Master SoftMotion)	
EmerLaT_instate_provide (Ar-3 benes EmerLaT Master Softwoor) Softwoor General Ask Pool	
<>	
Sevices ID POUS	
Messages - Total 0 error(s), 0 warning(s), 2 message(s)	
Last build: 📀 0 😗 0 Precomple 🗸 👘	Project user: (nobody)

Figure 3- 5: New project window

3.3.1.2 Add Devices

DIADesigner-AX supports controllers, Servo drives and AC drives.

A sample *Add Device* controllers is shown in the following figure.

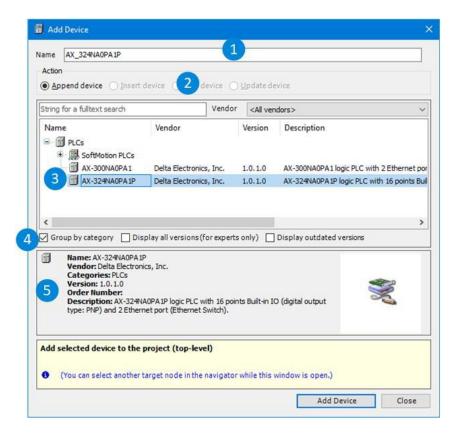


Figure 3- 6: Add device window

The Add Device window consists of the following information:

Legend	Description
1	Allows to either Append device, Insert device, Plug device or Update device.
2	Allows to search based on name and Vendor.
3	Displays the device tree with the device name, vendor, version and description of the devices.

Legend	Description
4	Allows to group the devices by category. To display either all versions or display only updated versions.
5	Displays the details of the selected device.

Follow the steps to add devices at project level:

- 1. Create a project (Refer to <u>3.3.1.1 Create a Project</u> for creating a project).
- 2. Right-click on the project name and click Add Device.

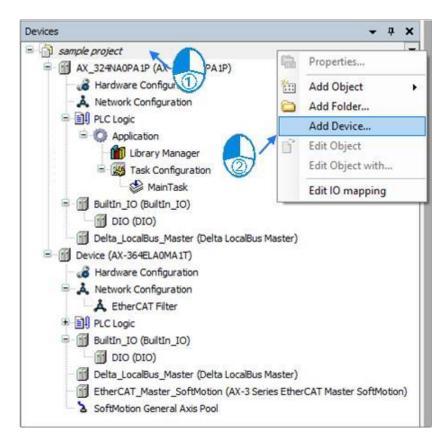


Figure 3-7: Adding device

Result: The *Add Device* window displays with a list of devices as shown in the following figure.

Action					
Append de	wice O Insert device O Plug de	vice 🔾	Jpdate device		
String for a ful	text search	Vendor	<all vendors=""></all>		
Name		Vendo	r	Version	De
- 1	AX-308EA0MA1T	Delta E	lectronics, Inc.	1.0.1.0	AX-
1	AX-364ELA0MA1T	Delta E	lectronics, Inc.	1.0.1.0	AX-
-1	AX-8xxEP0 Linux SM Series	Delta E	lectronics, Inc.	3.5.15.20	COI
- 1	AX-8xxEP0 Linux SM-CNC Series	Delta E	lectronics, Inc.	3.5.15.20	COL
	AX-8xxEP0 Windows Series	Delta E	lectronics, Inc.	3.5.14.15	COL
- I	CODESYS SoftMotion RTE V3	35 - Sn	art Software Solutions GmbH	3.5.15.30	AC
		00 00	iai t Sontware Solutions Gribin	5.5.15.56	
<					>
 Group by c Group by c Name Vende Categ Versie Order 	ategory Display all versions (fo x AX-8xxEP0 Windows Series or Delta Electronics, Inc. ories: SoftMotion PLCs ori 3.5.14.15 Number: AX-8xxEP0 Windows Serie Number: AX-8xxEP0 Windows Serie pioton: cODESYS Control from Delta i	or experts o			

Figure 3-8: Device list of Add Device window

3. Select the required device and click Add Device button.

Result: The selected device is added to the project in *Devices* tree as shown in the following figure.

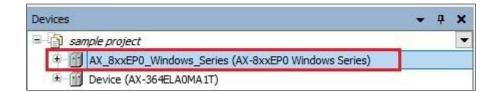


Figure 3-9: Add device to device tree

Follow the steps to add devices to the project at device level:

- 1. Create a project (3.3.1.1 Create a Project for creating a project).
- 2. Right-click on the device and click *Add Device* as shown in the following figure.

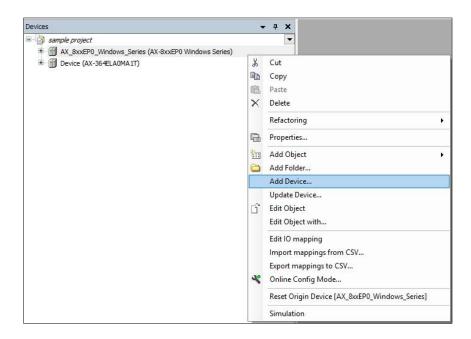


Figure 3- 10: Add Device

Result: The Add Device window displays with a list of devices.

ame Action Append deviceInsert device	O <u>P</u> lug d	evice OU	Ipdate	e device		
String for a fulltext search		Vendor	<all 1<="" td=""><td>vendors></td><td></td><td>~</td></all>	vendors>		~
Name	Vendo	r		Version	Description	^
🗏 📆 Miscellaneous						
Delta LocalBus Master	Delta E	lectronics,In	c.	0.50.0.0	Delta LocalBus Master Devic	e
DMC_Axis_Group	Delta El	lectronics, In	ю.	0.5.1.0	Axis Group Module that supp	port
Fieldbuses						
EtherCAT						
Ethernet Adapter						~
<						>
Group by category Display all	versions (f	or experts o	nly)	Display o	outdated versions	
Please sele	ct a device i	from the list a	above			
						_

Figure 3- 11: List of devices in Add Device window

3. Select the required device and click *Add Device*.

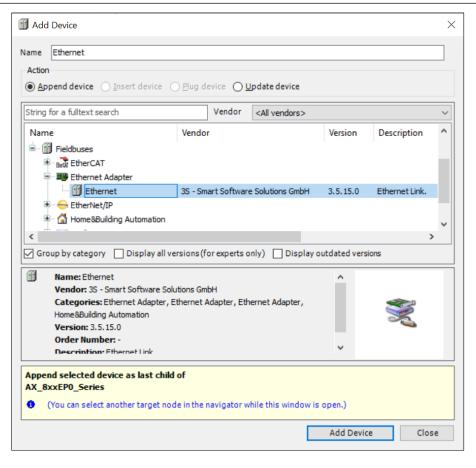


Figure 3-12: Add Device

Result: The device is added to the *Devices*Tree as shown in the following figure.

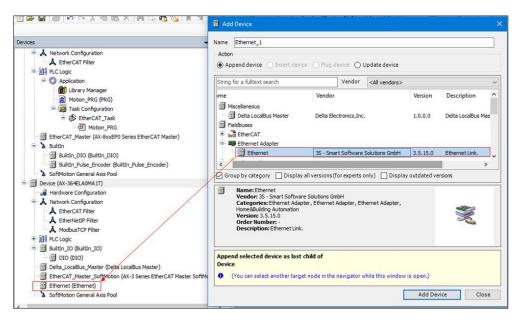


Figure 3-13: Device added to project tree

3.3.1.3 Communication Settings

In the Devices tree, double-click Device (AX-8xxEP0 window series).

The Communication Settings tab opens in the Device editor.

Devices	* 0 X	AX_8xxEP0_Windows_5	ieries X
sample project Sample project MX_8xxEP0_Windows_Series (AX-8xxEP0 Windows Series)	ies)	Communication Settings	Scan Network Gateway • Device •
 I MX_BootFP0_Windows Series (AX-BooFP0 Windows Series (A	ies)	Applications Backup and Restore Synchronized Files Files Log PLC Settings PLC Shell Users and Groups Access Rights Symbol Rights Parameters IEC Objects Task Deployment	Cateway Cateway Cateway P-Address Icalinat Paddress Icalinat Paddress Icalinat
	>	Status	
Devices POUs		<	

Figure 3- 14: Communication Settings tab

NOTE: First, the user need to connect communication configuration with DIADesigner-AX, then need to define the local gateway server. If they already defined the gateway server, then it is shown on the Communication Settings tab. In this case, user can continue with Defining the communication channel.

Now define the communication channel to the device, which is then used via the gateway that user have set. To do this, double-click *Device* in the device tree to open the *Communication Settings* tab of the device editor.

Click Scan Network to search the local network for all available devices.
 Result: The Select Device dialog appears with a list of all devices with

which user can establish a connection.

Device Name: Gateway-1 Driver: TCP/IP IP-Address: localhost Port: 1217	Scan Network Vřířík
	Gateway-1 Driver: TCP/IP IP-Address: localhost Port:

Figure 3- 15: Select network

- 2. Select the tree entry with the name of user controller.
- 3. Click OK button.

Result: The channel is now active and the associated information appears below the device graphic on the *Communication Settings* tab.

NOTE: All communication actions now refer exactly to this channel. Remember this later if user have multiple communication channels in the project.

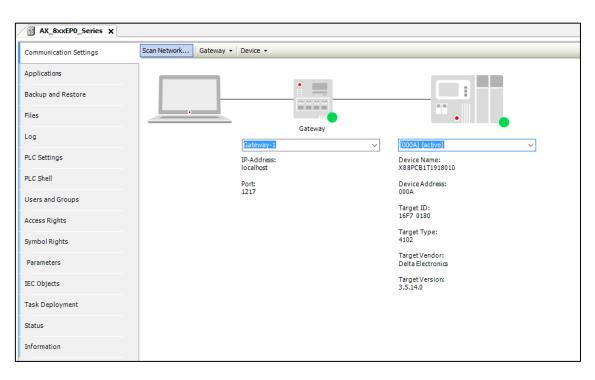


Figure 3-16: Commnication channel active

3.3.1.4 Network Configuration

The *Network Configuration* diagram shows the industrial network connection of all Delta Industrial Automation products. Users can configure and plan the network here.

Network Configuration is the graphical representation of connections between devices that allows user to plan their networks.

Chapter 3

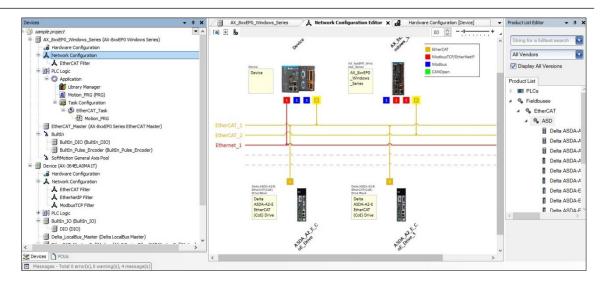


Figure 3-17: Network Configuration

3.3.1.5 Hardware Configuration

In *Hardware Configuration*, user can perform functions such as configuration of modules, manage RIO, parameter settings for modules, I/O Scan with the help of Hardware Configuration.

A sample Hardware Configuration is shown in the following figure.





3.3.1.6 Variable Declaration

First of all, declare the variables that user wish to use in the entire application. To do this, create a global variable list below *Application:*

1. Right-click *Application* entry and click *Add object > Global Variable List*.

Devices	→ ₽ X	🖉 🔏 Hardware	Configura	tion [Device] 🗙
sample project AX_8xxEP0_Windows_Series (AX-8xxEl AX_8xEP0_Windows_Series (AX-8xxEl AX_8xEP0_Win	P0 Windov	B ≥ EtherCA		Alarm Configuration Application Axis Group Cam table
Motion_PRG (PRG) Motion_PRG (PRG) Motion_PRG (PRG) Motion_PR Second particular	Cut Copy Paste Delete Refactoring			CNC program CNC settings Data Sources Manager DUT External File
BuiltIn BuiltIn_DIO (BuiltIn_DI)	Properties			Global Variable List Image Pool Interface
Builtin_Pulse_Encoder Builtin_Pulse_Encoder Builtin_Pulse_Encoder Device (AX-364ELA0MA1T) A Hardware Configuration A Network Configuration	Add Folder Edit Object Edit Object with Set Active Application		- 	Network Variable List (Receiver) Network Variable List (Sender) Persistent Variables POU
A EtherNetIP Filter	Login Delete applic	ation from device		POU for implicit checks Recipe Manager Redundancy Configuration Symbol Configuration

Figure 3- 19: New Global Variable List

2. The default global variable name is *GVL*.Click on *Add Object>Global Variable List.*

Result: The *GVL* object appears below *Application*. The GVL Editor opens to the right of the device tree.

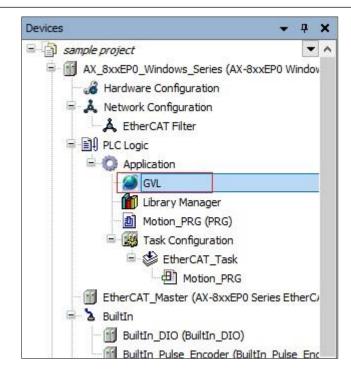


Figure 3- 20: Adding GVL

When the textual view appears, it already contains the keywords
 VAR_GLOBAL and END_VAR. For our example, activate the tabular

view by clicking the button in the right side bar of the editor. An empty row appears.



Figure 3- 21: GVL textual view

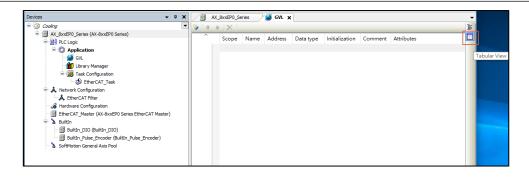
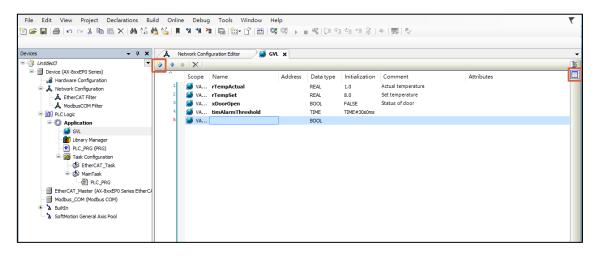


Figure 3- 22: GVL tabular view

4. Select 🖹 icon in the context menu.

Result: An input field opens. At the same time, the Scope *VAR_GLOBAL* and the Data type *BOOL* are automatically entered in the row.





/ 🛐 🗛	8xxEP0_Series	GVL X						
^	Scope	Name	Address	Data type	Initialization	Comment	Attributes	
	VAR_GLOBAL]	BOOL				
	VAR_GLOBAL			BOOL				

Figure 3- 24: Default GVL display

- 5. Type *rTempActual*" in the *Name* field.
- 6. Double-click the field in the *Data type* column (BOOL).

Result: The field is now editable and the Delta button appears.

AX_8xxEP0_Series SVL X											
🎭 🔹 🔹 🗙											
			Sc	ope	Name	Address	Data ty	pe	Initialization	Comment	Attri
	2		۸	VAR_GLOBAL	rTempActual		BOOL	>			
	1	S VAR_GLOBAL					BOOL		Input Assistant		
									Array Wizard		
								_			· · · ·

Figure 3- 25: Edit Data Type

7. Click for more settings (\square) and then click *Input Assistant*.

Result: The Input Assistant dialog opens.

Input Assistant			×
Text Search Categories Standard Types Structured Types	 Name UXINT XINT XWORD BIT BOOL BYTE DATE DATE DINT DT DWORD INT LINT LREAL LITME LWORD 		
Structured view Documentation		Insert with arguments	Insert with namespace prefix
			OK Cancel

Figure 3- 26: Input Assistant

- 8. Select the data type REAL and click OK.
- 9. Enter a numerical value in the Initialization column (**Example**: 8.0).

Declare the following variables in the same way:

Name	Data Type	Initialization	Comment
rTempActual	REAL	1.0	Actual temperature
rTempSet	REAL	8.0	Set temperature

Name	Data Type	Initialization	Comment
xDoorOpen	BOOL	FALSE	Status of door
timAlarmThreshold	TIME	TIME#30S	Time after compressor runs that a signal sounds
timDoorOpenThreshold	TIME	TIME#10S	Time after opening the door that a signal sounds
xCompressor	BOOL	FALSE	Control signal
xSignal	BOOL	FALSE	Control signal
xLamp	BOOL	FALSE	Status message

The following figure shows the GVL tab after the settings are complete.

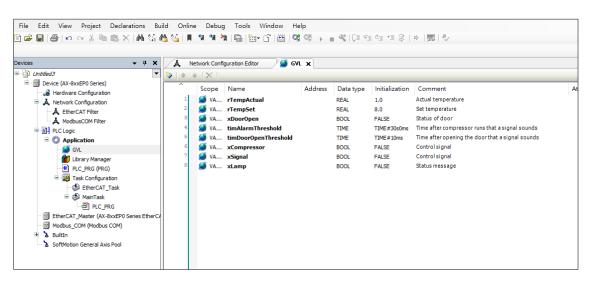


Figure 3- 27: Complete GVL settings

3.3.1.7 Programming

Creating the main program for the cooling control in the CFC editor

User can describe the main function of the application program in the main program block PLC_PRG, which is created by default. The compressor is activated and cools if the actual temperature is higher than the temperature set

point plus a hysteresis. The compressor is switched off if the actual temperature is lower than the set point minus the hysteresis.

NOTE: Create a new project with Standard template.

To describe the functionality in the CFC implementation language, follow these steps:

1. Double-click *PLC_PRG* in the device tree.

Result: The CFC editor opens. At the top of the editor window, the declared variable area will be displayed in text or table format. The *Toolbox* tab is displayed on the right side of the window.

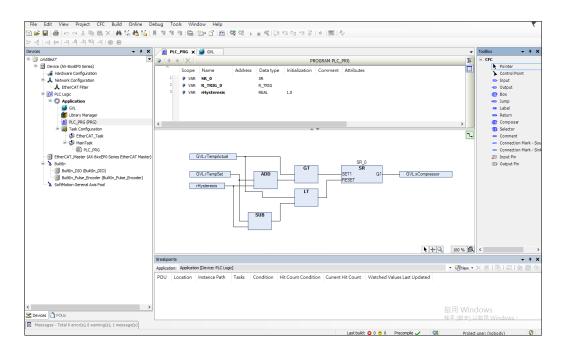


Figure 3-28: PLC_PRG tab programming window

2. In the *Toolbox* window on the right, select the input component and drag it to the CFC editing area.

Result: Added the unnamed ??? component.

3. In the CFC editing area, click the ??? component, and then click is to open the *Input Assistant*. In the variable category, please select the

variable *rTempActual* from *Application* > *GVL*.

Result: The input name is GVL.rTempActual.

- As in Step 3, create another input with the name of the global variable GVL.rTempSet.
- 5. Create another input, and then click ??? in addition, replace them with the name rHysteresis.

Result: Because this is not the name of a known variable, the *Declare Variable* dialog opens. The name is already used in the dialog.

 In the *Declare Variable* dialog, specify *Data Type* with REAL and *Initialization value* with 1. Click *OK*.

Result: The variable rHysteresis appears in the declaration editor.

7. In the *ToolBox* view, select *Box* element and drag it to a point in the CFC editor.

Result: The POU opens in the CFC Editor.

8. Replace ??? with ADD.

Result: The POU adds all inputs that are connected to it.

- 9. Connect the GVL.rTempSet input pin to the ADD operation block.
- 10. As the above steps, connect the *rHysteresis* input pin to the ADD operation block.

Result: *rHysteresis* and *GVL.rTempSet* become the input of ADD operation block

- 11. If you want to move a component in the editor, click the blank area in the component or click the outer frame to select the component (red box) and drag it to the position you want.
- 12. In order to compare the sum of *GVL.rTempActual* and *GVL.rTempSet* and rHysteresis, create another *GT* operation block on the right side of the ADD operation block.

Result: The operation of the *GT* operation block is as follows:

"IF (upper input > lower input) THEN output := TRUE;"

- 13. *GVL.rTempActual* input is connected to the upper pin of the *GT* calculation block.
- 14. ADD operation block output pin is connected to the lower pin of *GT* operation block.
- 15. In this step, create an arithmetic block on the right side of the GT arithmetic block, which will be based on the input conditions.

(Set-Reset) Start/stop the cooling compressor. Press Enter in the ??? field of the operation block.

Result: Open the declare variable dialog.

16. Declare that the variable name is *SR_0* and the data type is *SR*. Click *OK*.

Result: The SR function block from the standard library is instantiated. (Input) *SET1* and *RESET* appear.

17. Connect the output pin on the right side of the *GT* operation block to the *SET1* input of the *SR_0* function block.

Result: *SR* can set the Bool variable from *FALSE* to *TRUE*, and vice versa. When the input *SET1* condition is met, the Boolean variable will be set to *TRUE*. When the *RESET* condition is met, the variable will be reset. Here is an example of setting *GVL.xCompressor* as a Bool (global) variable.

18. Create an output component and assign it to the global variable GVL.xCompressor. Pull out the connecting wire between GVL.xCompressor and SR output pin Q1.

Now specify a condition under which the compressor should be turned off again (under this condition, the RESET input of the SR function block will get a TRUE signal). To do this, please make an opposite condition; use SUB (subtraction) and LT (less than) operation blocks.

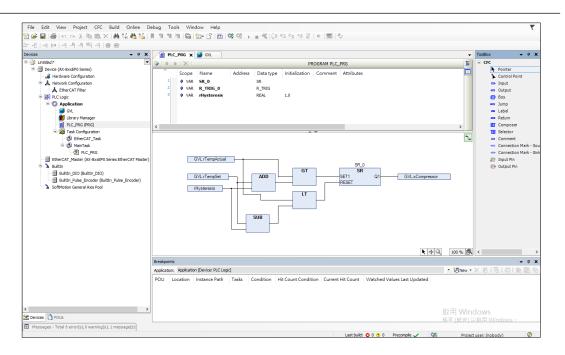


Figure 3- 29: Complete window of CFC implementation language to describe functionality

Creating a POU for signal management in the ladder diagram editor

In another POU, user will now implement the signal management for the alarm buzzer and for switching the lamp on and off. The ladder diagram (LD) implementation language is suitable for this.

Handle each of the following signals in their own networks:

- When the compressor runs too long because the temperature is too high, a continuous acoustic signal sounds.
- When the door is open too long, an intermittent signal sounds.
- The light is on as long as the door is open.
- Below *Application* in the device tree, create a POU object of type *Program* using the *Ladder Diagram (LD)* implementation language. Specify the name Signals for the program.

Cooling		•			
AX_8xxEP0_Series (A	X-8xxEP0 Series)		11	Communication Settings	Scan N
PLC Logic					
Applic 🐰	Cut			Applications	1
GVI 📄	Сору			Backup and Restore	- 1
	Paste				- 1
⊟-∰ Tas ^{III} & ×	Delete			Files	4
□ Å Network Co	Refactoring	•		Log	
- 🔏 Hardware C 🗎	Properties		<u> M</u>	Alarm Configuration	
EtherCAT_N	Add Object	•	0	Application	
BuiltIn	Add Folder		\mathcal{D}	Axis Group	
BuiltIn 🗍 BuiltIn	Edit Object		8	Cam table	
SoftMotion	Edit Object with		8	CNC program	
OS	Login			CNC settings	
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				Image Pool	
			∞	Interface	
			۵	Network Variable List (Receiver)	
			3	Network Variable List (Sender)	
			T	Persistent Variables	
			Ð	POU	
		,	æ	POU for implicit checks	
Cevices POUs			A	Recipe Manager	
Messages - Total 6 error(s)), 0 warning(s), 1 message(s)		ø	Redundancy Configuration	
			•;	Symbol Configuration	
			B	Text List	
			@ ₿	Trace	
			2	Trend Recording Manager	
			0	Unit Conversion	
			-	Visualization	
				Visualization Manager	

Figure 3- 30: Adding POU

Add POU X
Create a new POU (Program Organization Unit)
Name
Туре
Program
O Function block
Extends
Implements
Final Abstract
Access specifier
Method implementation language
Continuous Function Chart (CFC)
○ Function
Return type
Implementation language
Continuous Function Chart (CFC)
Continuous Function Chart (CFC) Continuous Function Chart (CFC) - page-oriented Function Block Diagram (FBD)
Ladder Logic Diagram (LD) Sequential Function Chart (SFC) Structured Text (ST)

Figure 3-31: Choosing implementation language

Result: Signals is listed in the device tree next to PLC_PRG. The ladder diagram editor opens in the Signals tab. The declaration editor appears in the upper part, the *ToolBox* view to the right. The LD contains an empty network.

- 2. Add a new network to the POU: "When the compressor runs for too long and does not reach the target set temperature, an acoustic signal will be issued." To do this, insert a TON timer function block. After a specified period of time, it will switch the Boolean signal to TRUE. Select TON under the function block in the toolbox, and then drag it to the empty network and the start from here box is displayed. Release the mouse button when the arrow turns green.
- 3. Press Enter: User have confirmed the instance name. The *Declare Variable* dialog opens (*Auto Declare*).

Auto Declare		×
Scope VAR	Name TON_0	Type TON V >
Object Signal [Application]	Initialization	Address
Flags CONSTANT RETAIN PERSISTENT	Comment	^ ~
		OK Cancel

Figure 3- 32: Declare variable

4. Click OK to confirm the dialog.

Result: Now the inserted POU TON is instantiated with the name TON_0. Moreover, the top input is displayed by default as a contact preceding the POU.

NOTE: To read the help for the function block TON, place the cursor in/on the POU in the "TON" string and press F1.

5. Now user program so that the function block is activated as soon as the cooling compressor starts to run. For this purpose, name the contact at the upper input of the POU GVL.xCompressor. User have already declared this Boolean variable in the GVL Glob_Var.

NOTE: When user begin to type a variable name at the input position, user automatically get a list of all variables with names that begin with the typed characters and can be used at this point. This assistance is a default setting in the DIADesigner-AX options for smart coding.

- Insert the signal that is to be activated. To do this, drag a *Coil* from the Ladder Diagram Elements toolbox category to the output Q of TON POU. Specify the name GVL.xSignal for the coil.
- Define the time from the activation of the POU TON_0 until the signal should sound. This definition takes place via the variable

GVL.timAlarmThreshold, which user insert for this purpose at the input PT of TON_0. To do this, click the fine-edged box to right of the input pin and enter the variable name.

8. Select the POU TON and click *Remove unused FB call parameters* in the context menu.

Result: The unused output ET is removed.

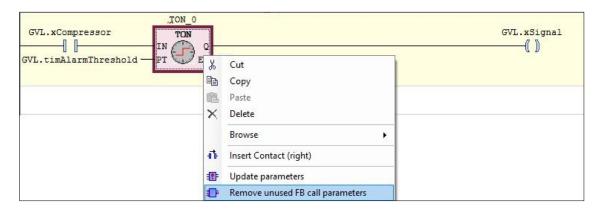


Figure 3- 33: Remove unused FB call parameters

9. In the second network of the LD, program so that the signal sounds intermittently when the door is open too long. In the editor window, click below the first network. In the context menu, click *Insert network*.

Result: An empty network with the number 2 appears.

- 10. As in the first network, implement a POU TON for time-controlled activation of the signal. This time it is triggered by the global variable GVL.xDoorOpen at the input IN. At the input PT, add the global variable GVL.timDoorOpenThreshold.
- 11. In addition, from the library Unit, add a POU BLINK at the output Q of the POU TON in this network and instantiate it as Blink_0.
- 12. The POU BLINK_0 clocks the signal forwarding Q and therefore GVL.xSignal.

First, drag two *Contact* elements from the *ToolBox* view to the OUT output of the POU. Assign the variable TON_1.Q to the contact directly

after the output Q and the global variable GVL.xDoorOpen to the second contact.

- 13. Insert a *Coil* element after the two contacts and assign the global variable GVL.xSignal to it.
- 14. To do this, declare the local variable timSignalTime : TIME := T#1S; and insert this variable at the inputs TIMELOW and TIMEHIGH. The cycle time is 1 second for TRUE and 1 second for FALSE.
- 15. Select the POU TON and click *Remove unused FB call parameters* in the context menu.

Result: The unused output ET was removed.

- 16. In the third network of the LD, program so that the lamp lights up as long as the door is open. To do this, insert another network. In that network on the left, insert a contact GlobVar.xDoorOpen, which leads directly to an inserted coil GVL.xLamp.
- 17. DIADesigner-AX processes the networks of an LD in succession. Now install a jump to Network 3 at the end of Network 1 in order to ensure that either only Network 1 or only Network 2 is executed:

Select Network 3 by clicking in the network or in the field with the network number. In the context menu, click *Insert Label*. Replace the text Label: in the upper left part of the network with DoorlsOpen:

Select Network 1. In the *ToolBox* view, in the *Common* category, drag a *Jump* element to the network. Place it on the *Add output or jump here* box that appears.

Result: The jump element appears. The jump destination is still specified as ???.

Result: The label to Network 3 is implemented.

The LD program now looks as shown in the following figure:

File Edit View Project FBD/LD/IL Build	Online Debug Tools Window Help		T
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A Notion Bellin, Loto (Buildin, 200) Buildin, Loto (Buildin, 200) Buildin, Lote, Encoder (Buildin, Puler, Encoder SoftWoton General Axis Pool	GVL.xDoorOpen TON blink TON_1.Q GVL.xDoorOpen GVL.xSignal		
	G/L.xDoorOpen G/L.xLamp		
	GVL.xDoorOpen GVL.xLamp		
	< <u>1</u>		
	Breakpoints		• • ×
	Application: Application [Device: PLC Logic]	BNew • × 應 [帝] (田)	的關係
K >	POU Location Instance Path Tasks Condition Hit Count Condition Current Hit Count Watched Values Last Updated		
Messages - Total 6 error(s), 0 warning(s), 1 message			
	Last buld: 📀 0 📀 0 Precomple 🗸 🔯 Project user: (nobody)	INS Ln 9 Col 8 Ch 8	0

Figure 3- 34: LD program

Calling the Signals program in the main program

In our program example, the main program PLC_PRG should call the Signals program for signal processing.

1. In the device tree, double-click PLC_PRG.

Result: PLC_PRG opens in the editor.

- 2. In the *ToolBox* view, drag a *Box* element to the editor of PLC_PRG.
- 3. Using *Input Assistant*, add this POU from the *POU Calls* category to the call of the Signals program.

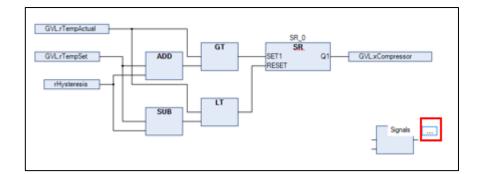


Figure 3- 35: Call signal

ext Search Categories	
Signal	
1 item(s) found.	
Name	Туре
🕂 <mark>Signal</mark>	PROGRAM
	Filter None
	THE NODE
	Insert with arguments Insert with namespace prefix
ocumentation	
PROGRAM Signal	

Figure 3- 36: Input assistant

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Figure 3- 37: Creating signal to LD

Creating an ST program block for a simulation

Since the application in this example project is not linked to real sensors and actuators, user must now also write a program for the simulation of rises and falls in temperature. This will allow user to monitor the operation of the refrigerator controller afterwards in online mode.

User can create the simulation program in structured text.

The program increases the temperature until the main program PLC_PRG determines that the temperature set point has been exceeded and activates the cooling compressor. The simulation program then lowers the temperature again until the main program deactivates the compressor once more.

- 1. Under the application, insert a POU of the type *Program* and the implementation language *ST* and with the name Simulation.
- 2. Implement the following in the ST editor:

PROGRAM Simulation

VAR

T1: TON; //The temperature is decreased on a time delay, when the compressor has been activated

P_Cooling: TIME:=T#500MS;	
xReduceTemp: BOOL; temperature	//Signal for decreasing the
T2: TON; time delay, when the compressor has be	//The temperature is increased on a een activated
P_Environment: TIME:=T#2S; closed	//Delay time when the door is
P_EnvironmentDoorOpen: TIME:=T open	#1S; //Delay time when the door is
xRaiseTemp: BOOL; temperature	//Signal for increasing the
timTemp: TIME;	//Delay time
iCounter: INT;	
END_VAR	

iCounter := iCounter+1; // No function, just for demonstration purposes.

// After the compressor has been activated due to TempActual being too high, the temperature decreases.

// The temperature is decremented by 0.1°C per cycle after a delay of P_Cooling

IF GVL.bCompressor THEN

```
T1(IN:= GVL.bCompressor, PT:= P_Cooling, Q=>xReduceTemp);
```

IF xReduceTemp THEN

GVL.rTempActual := GVL.rTempActual-0.1;

T1(IN:=FALSE);

END_IF

END_IF

//If the door is open, the warming occurs faster; SEL selects P_EnvironmentDoorOpen

timTemp:=SEL(GVL.rDoorOpen, P_Environment, P_EnvironmentDoorOpen);

//If the compressor is not in operation, then the cooling chamber becomes warmer.

//The temperature is incremented by 0.1°C per cycle after a delay of tTemp

T2(IN:= TRUE, PT:= timTemp, Q=>xRaiseTemp);

IF xRaiseTemp THEN

GVL.rTempActual := GVL.rTempActual + 0.1;

T2(IN:=FALSE); END_IF

NOTE: The use of a visualization is recommended for convenient operation and monitoring of the entire control program. A visualization created with DIADesigner-AX is installed in the completed sample project for this tutorial, which is provided with the standard DIADesigner-AX Visualization installation (Projects directory). User can load this project to the controller and start it to see it working together with the visualization.

On starting, the Live_Visu starts up with an illustration of the refrigerator that reproduces the operation of the simulation program without user having to make any entries. However, user can bring about the opening and closing of the door with a mouse click the on/off switch and it is possible to adjust the temperature preset on the needle of the rotary control. We will not deal with the creation of the visualization in the context of this tutorial. An appropriate tutorial is planned in the context of DIADesigner-AX Visualization help.

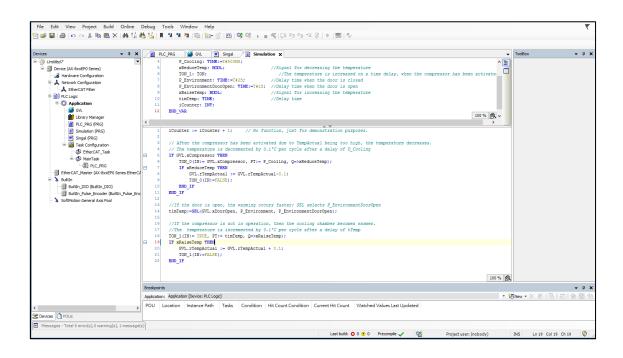


Figure 3-38: Creating ST program

Defining the programs to be executed in the task configuration

The default task configuration contains the call for the main program PLC_PRG. For our sample project, user also need to add the call for the Simulation program.

1. In the device tree, drag the Simulation entry to Main Task below *Task Configuration.*

Result: The Simulation program is inserted into the task configuration.

2. To view the task configuration, double-click the Main Task entry to open the editor.

Result: In the table in the lower part of the editor, user will see the POUs that are called by the task: PLC_PRG (entered by default) and Simulation. The call type of the task is *Cyclic* at intervals of 20 milliseconds. In online mode, the task will execute the two POUs one time per cycle.

evices - A X		ToolBox • 4 X
CriteRof Content of the second served in the second served in the second served in the second served in the second second served in the second se	Configuration Priority (0.31): Priority (0.31): Output Vachage Vachage Densitie The (e.g. #200ms) Sensitivity Add Call × Remove Call © Change Call © Move Up + Move Down 1 th Open POU OU Comment Add Call × Remove Call © Change Call © Move Up + Move Down 1 th Open POU POU Comment Add Call × Remove Call © Change Call © Move Up + Move Down 1 th Open POU POU POU	
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Devices POUs	POU Location Instance Path Tasks Condition Hit Count Condition Current Hit Count Watched Values Last Updated	

Figure 3- 39: Task configuration main task

Debugging the application program

During the input of code, DIADesigner-AX immediately alerts user to syntax errors by a red wavy line underneath the text concerned. Press F11 to have the entire application checked for syntax. The result of the check is shown in the message view. If necessary, open the message view using *View* > *Messages* command. User can then select a message and jump to the corresponding point in the code with the F4 key.

User can only load an error-free application to the controller afterwards.

3.3.1.8 Download and Upload

Downloading the application to the PLC

NOTE: Refer to <u>Debugging the application program</u>. The application has been compiled without errors.

1. Click *Online* > *Login*.

Result: A dialog prompt opens to ask whether or not the application should be downloaded to the controller.



Figure 3- 40: Downloading application to PLC

2. Click Yes.

Result: The application is downloaded to the controller. The entries for the controller and the application in the *Devices* view are highlighted in green. Stop appears after the *Application* object. The status of the controller appears in the taskbar:

Devices 🗸 🗸 X	🕑 Signal 📄 Sin	mulation 👔 Device 🗙	•
Cooling Cooling Original Connected] (AX-8xxEP0 Series)	cation Settings	Scan Network Gateway - Device -	^
PLC Logic	anc		
- 10 Library Manager - 10 PLC_PRG (PRG)	nd Restore		
- e Signal (PRG) - i Simulation (PRG)		Gateway	
Task Configuration StherCAT_Task (IEC-Tasks)		Gateway-1 V [0301.D00A] (active) V	
Image: Section 1, Jack (EC-198a) Image: Section 2, Jack (EC-198a) Image: Section	ngs	IP-Address: Device Name: localhost x88rC511918010	
		Port: Device Address: 1217 0301.D00A	
	i Groups	Target ID:	
	ghts	16F7 0180	
	ights	Target Type: 4102	
	irs	Target Vendor: Delta Electronics	
د >	ts	Target Version: 3.5.14.0	~
DPOUs 🛣 Devices	<	>	
Messages - Total 0 error(s), 0 warning(s), 5 message(s)		- a s	×
Build • O erro	or(s) 🕐 0 warning(s) 🚯 5	5 message(s) 🗙 🕅	
Watch 1		• ¢ 3	×
Device user: Anonymous Last build: O 0 • 0 Pred	compile 🧹 🔒 ST	OP Program loaded Program unchanged Project user: (nobody)	C

Figure 3-41: Controller stop status

Starting the application

If user have followed this tutorial precisely up until now, then user can use *Application* on the PLC *Device*.

In the Devices view, in the context menu of the Application object, click Start.

Result: The program starts running. The entries for the controller and the application in the *Devices* view are highlighted in green. Run appears after the *Application* object. The current status of the controller appears in the taskbar:

Devices - 7 ×	💌 Signal 📄 Sin	ulation 💮 Device 🗙		
Cooling Co	cation Settings	Scan Network Gateway + Device +		
PIC Logic Application [run]	ons			
fill Library Manager All PLC_PRG (PRG) 면 Signal (PRG) 를 Simulation (PRG)	nd Restore		Gateway	••••
문 (정) Task Configuration 영 Ether CAT_Task (EC-Tasks) 문 영 ManTask (EC-Tasks) 권 Smulation 권 Pu-C_PRG	ngs	Gateway-1 IP-Address: localhost	Contraction (0301.D00A) Device Nam X88PCB1T1	e: 918010
Comparison of the second	i Groups ghts	Port: 1217	DeviceAdd 0301.D00A Target ID: 16F7 0180	
	ights		Target Type 4102 Target Vend Delta Electr	lor:
< >> POUs 22 Devices	ts c		Target Vers 3.5.14.0	ion:
Messages - Total 0 error(s), 0 warning(s), 5 message(s)				
Build • O erro	r(s) 🕐 0 warning(s) 🟮 5	message(s) 🗙 💥		
Device user: Anonymous Last build: O O Prec	omple 🗸 🖓 RL	N Program loaded	Program unchanged	Projec

Figure 3- 42: Controller run status

3.3.1.9 HMI Tag Sharing

DIADesigner-AX supports export of variables. User can define the variables in DIADesigner-AX and export the xml file of *symbol configuration*. User can import the xml to DIAScreen to communicate between controller and Delta HMI functions. Please refer to <u>Chapter 6: HMI Interactive</u> for more information.

Chapter 4: Setting Device Hardware Configuration

4.1 Configuration

In *Hardware Configuration*, user can perform functions such as configuration of modules, parameter settings for modules, simple on-line detection and diagnosis.

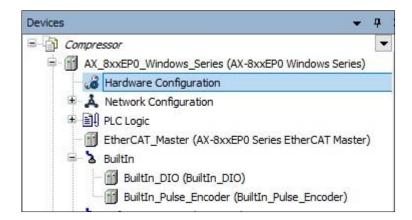


Figure 4 - 1: Hardware Configuration

The *Hardware Configuration* toolbar is shown in the following figure.

Y •••		
🖻 🖄 EtherCAT 🖂	100 💭	

Figure 4 - 2: Hardware Configuration toolbar

The functions in *Hardware Configuration* toolbar are described in the following table:

Function	Description	
e <mark>n</mark>	Click to display module information.	
送	Click to perform I/O scan.	
EtherCAT 🗸	Select Remote I/O network from the drop-down list.	
100 💭	Enter or select value to zoom-in or zoom-out.	
+	Click and drag to zoom-in and zoom-out.	

4.1.1 Hardware Module Configuration

In the *Hardware Configuration* screen, when the device is connected, a small icon will be displayed on the left of the device to provide information about the device status:

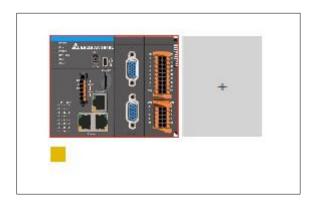
Online Status

- O: The PLC is connected, the application is running, the device is in operation, and data is being exchanged. The *Refresh I/Os in stop* check box on the *PLC Settings* tab can be selected or cleared.
- Set The PLC is connected and in *STOP*; and the *Refresh I/Os in stop* check box on the *PLC Settings* tab is cleared.
- *: The PLC is connected and the application is running. Diagnostic information is available.
- A: The device is in preoperative mode and is not running yet. Diagnostic information is available.
- A: The device is not exchanging data; bus error, no configuration, or simulation mode.
- • •: The device is running in demo mode for 30 minutes. When this time has elapsed, demo mode will expire and the fieldbus will end the data exchange.
- A: The device is configured, but not operational. No data is exchanged.
 Example case: CANopen devices when booting and in preoperative mode.
- A: Redundancy mode is active. The fieldbus master is not sending any data because another master is active.
- **1** The device description could not be found in the device repository.
- Sa: The device itself is running, but a child device is not running. The child device is not visible due to a collapsed device tree

4.1.1.1 AX-3 Series Module Configuration:

This section applies to AX-308EA0MA1T, AX-308EA0MA1P, AX-364ELA0MA1T. Refer the following for example, AX-308EA0MA1T

The AX-308EA0MA1T PLC has a non-backplane design with expansion module placed only on the right side (+ position) of the device in *Hardware Configuration*.





Follow the steps to create configuration for AX-308EA0MA1T:

1. Double-click Hardware Configuration in the Devices tree.

Result: The Hardware Configuration window displays with

- A place holder to the right of the device to add I/O modules.
- A *Product List Editor* pane to the right of the *Hardware Configuration* window.



Figure 4 - 4: Hardware Configuration device

2. Click on the CPU expansion placeholder.

Result: Product List displays the list of I/O modules.



Figure 4 - 5: Product list

3. Expand *Product List* and select the required I/O module. Either double-click on the modules or drag and drop the modules to the placeholder.

Result: The modules are added to the right side of the device as shown in the following figure.

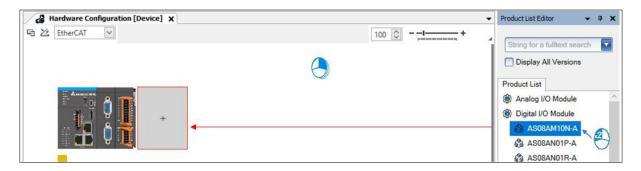


Figure 4 - 6: Adding I/O Module

NOTE: Click on the required IO module. The information about the particular module is displayed below the *Product List pane*.



Figure 4 - 7: IO module information

4. Double-click the *Network Configuration* on the device tree to add RIO Module.

NOTE: AX-300NA0PA1 and AX-324NA0PA1P do not support adding RIO modules.

Result: The Network Configuration Editor is as shown below.

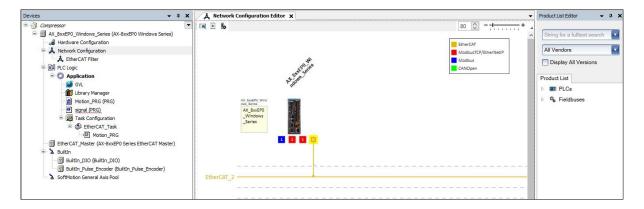
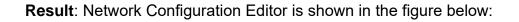


Figure 4 - 8: Add RIO module from network configuration

 Expand the Product List on the right side of the screen. Fieldbus> EtherCAT> R1-EC> R1-EC5500 EtherCAT to E-BUS adapter Module. Double-click R1-EC5500 or drag R1-EC5500 to enter the Network Configuration Editor.



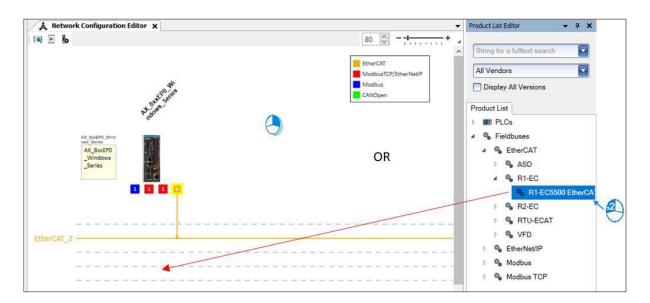


Figure 4 - 9: Add R1-EC EC5500 to the network configuration Editor

6. Connect this R1-EC5500 to the same yellow EtherCAT line as the master station.

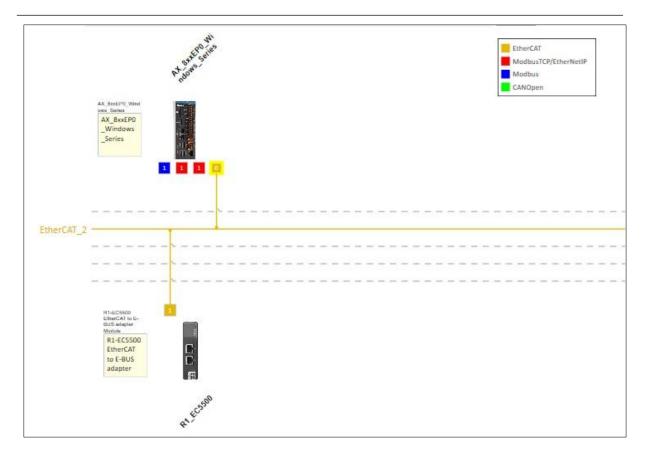


Figure 4 - 10: R1-EC5500 is connected to the main station EtherCAT line

 Go back to the AX-308EA0MA1T *Hardware Configuration* screen and you can see the RIO Coupler module is displayed under the I/O module. Same as I/O modules, users can click the reserved position (+) on the right to add RIO modules, as shown in the figure below.



Figure 4 - 11: Add RIO Module

Result: In the AX-3 series hardware configuration, up to 64 RIOs can be added.

Device Group Menu

The device group menu provides the option to cut, copy, paste, and delete the module.

Function	Description
Cut	Cut the module and paste to other place
Сору	Copy the module and paste to other place
Paste	Paste the cut or copy module
Delete	Delete the selected module

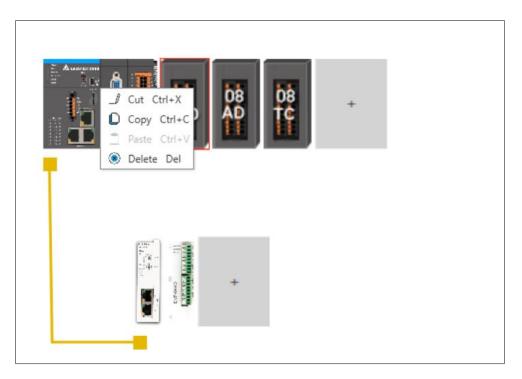


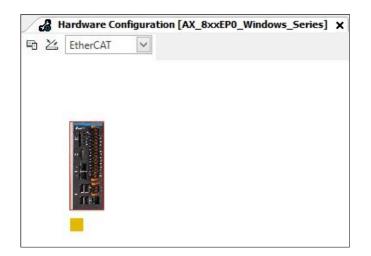
Figure 4 - 12: Device Context Menu - AX-308EA0MA1T

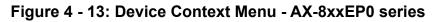
4.1.1.2 AX-8xxEP0 Series Configuration:

This section applies to AX-8xxEP0 Linux series and AX-8xxEP0 Windows series.

AX-8xxEP0 Windows series as an example.

The AX-8xxEP0 series PAC does not support the expansion of modules. User can add only RIO modules in *Hardware Configuration* in the case of AX-8xxEP0 series.



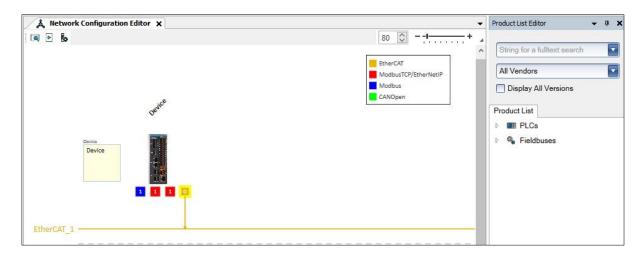


Follow the steps to create Hardware Configuration for AX-8xxEP0 series:

1. Double-click the *Network Configuration* in the *Devices* tree.

Result: The Network Configuration window displays with

• A *Product List Editor* pane to the right of the *Hardware Configuration* window.





 Expand the product list on the right side of the screen: Fieldbuses> EtherCAT> R1-EC> R1-EC5500 EtherCAT to E-BUS adapter Module. Double-click R1-EC5500 or drag R1-EC5500 to enter the network configuration Editor.

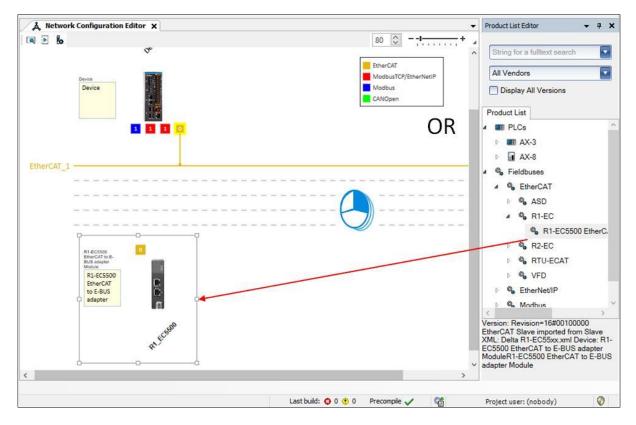


Figure 4 - 15: Add R1-EC5500 to the Network Configuration Window

3. Connect this R1-EC5500 to the yellow EtherCAT line.

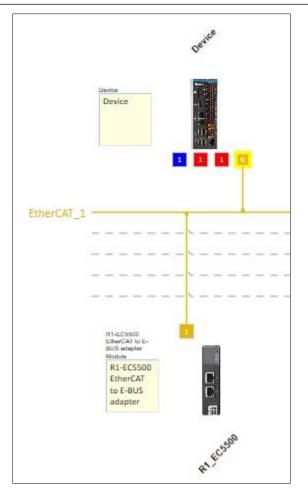


Figure 4 - 16: R1-EC5500 is connected to the yellow EtherCAT line

 Double-click the *Hardware Configuration* in the *Devices* tree, you can see the newly added R1-EC5500. Users can click the reserved position (+) on the right to add RIO modules, as shown in the figure below.

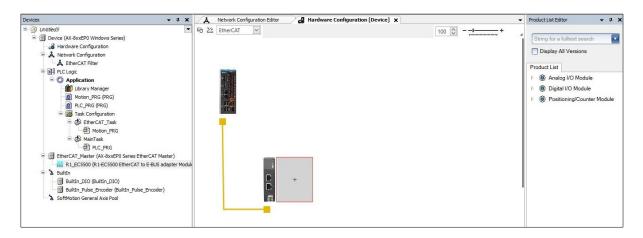


Figure 4 - 17: Add RIO Module

Device Context Menu of RIO-R1 EC series

The device context menu provides the option to cut, copy, paste or delete the module.

Function	Description
Cut	Cut the module and paste to other place
Сору	Copy the module and paste to other place
Paste	Paste the cut or copy module
Delete	Delete the selected module

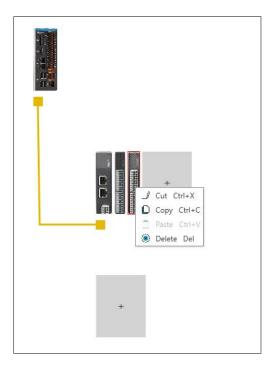


Figure 4 - 18: Device Context Menu - AX-8xxEP0 series

4.1.2 Hardware Firmware Update

With the update of the host and module versions, different controllers may have different available functions and parameters. DIADesigner-AX provides a device description file that defines functions and parameters; when the software is installed,

the latest version of the device description file will be installed into the system. The version of the device description file will include all the firmware version information. When there is a need for new functions or parameters, the firmware version of the hardware needs to be updated. The firmware of the hardware can be updated through the firmware update function supported by DIADesigner-AX version.

Hardware series currently supporting firmware update:

- AX-308EA0MA1T
- AX-308EA0MA1P
- AX-364ELA0MA1T
- AX-300NA0PA1
- AX-324NA0PA1P

Please follow the steps below to perform the firmware update:

1. On the menu bar, click Tools > Firmware Update.

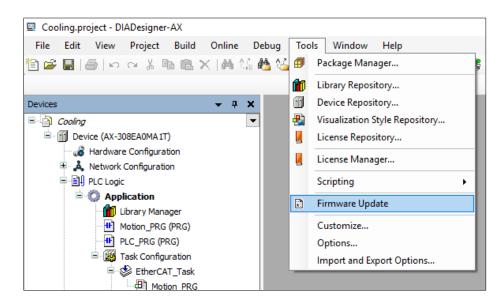


Figure 4 - 19: Firmware update path

Result: The *firmware Package updater* window pops-up.

- 2. Select the firmware package to be updated in *Path*.
- 3. Select the updated device from the Online Device.

🖾 Firmware Package Updater 🛛 🗌 🗙
Firmware Package
Path: D:\Codesys\AX-308EA0MA1T Sei 🔽 🗌 Protected Package
Vendor: Delta Electronics, Inc.
Device Type: 4102
Device ID: 16F7 0313
Device Version: 0.40.3.0
Mini FW Version: 0.40.0.0
▷ Integrity Details
Online Device
Gateway-1/0301.B005
Name: AX-308EA0MA1T
Device Type: 4102
Device ID: 16F7 0313
Device Version: 0.40.3.0
⊿ Update Progress
Progress:
Update

Figure 4 - 20: Firmware update window

4. After confirming that the device type of the hardware matches the ID, click *Update* to start the firmware update.

Firmware Package Updater	_		\times
Firmware Package			
Path: D:\Codesys\AX-308EA0MA1T Sei	Prot	ected Pa	ckage
Vendor: Delta Electronics, Inc.			
Device Type: 4102			
Device ID: 16F7 0313			
Device Version: 0.40.3.0			
Mini FW Version: 0.40.0.0			
▷ Integrity Details			
Online Device			
Gateway-1/0301.8005			
Name: AX-308EA0MA1T			
Device Type: 4102			
Device ID: 16F7 0313			
Device Version: 0.40.3.0			
⊿ Update Progress			
Progress:			
		Updat	e

Figure 4 - 21: Firmware update progress

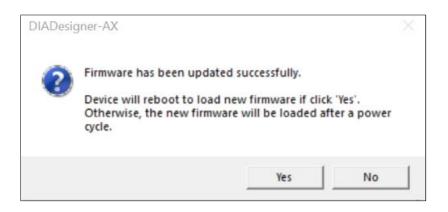


Figure 4 - 22: Successful firmware update

The following table explains the firmware update window options:

Features	Description			
Firmware package				
Path	Select the path where the firmware is stored. After selecting the firmware file that needs to be updated, the manufacturer/device type code/device ID/device version number information will be displayed automatically.			
Vendor	Firmware package manufacturer			
Device Type	Firmware package device type number			
Device ID	Firmware package device ID			
Device Version	Firmware package device version number			
Mini FM Version	The firmware package is compatible with the minimum hardware version that can be updated.			
Integrity details				
Signature verification	Verify the firmware signature file, it will be automatically verified after the firmware path is selected.			
Hash value verification	Verify the firmware hash value, it will be automatically verified after the firmware path is selected.			
	Online device			
Online device	After clicking browse in the drop-down menu, select the controller to be updated in the select device window			
Name	Controller name			
Device Type	Controller device type number			
Device ID	Controller device ID			
Device Version	Controller device version number			
	Update progress			
Progress	After clicking update, the update progress will be displayed.			

4.2 AX-3 Series Parameter Setting

The content in this chapter is applicable to the following models. The following will use AX-308EA0MA1T as an example of operation.

Motion PLC	Logic PLC
AX-308EA0MA1T, AX-308EA0MA1P,	AX-300NA0PA1, AX-324NA0PA1P
AX-364ELA0MA1T	AA-SUUNAUFAT, AA-SZ4NAUFATF

After completing Hardware Module Configuration, user can set the device & module parameters with the help of Parameter Setting. (For more information on the hardware and operations of the CPU or modules, refer to *Catalogs*, *Hardware Manual* and *Operation Manual*.)

Before the performing Parameter Setting in a device, user have to refer to the Operation Manual. User have to make sure of the facts that affect the CPU module and the whole system, to prevent damage to the system or staff. Parameter Settings are not effective until they are downloaded to the CPU device module.

4.2.1 System Parameter Tab

Double-click on the **AX-308EA0MA1T** series to open the system-setting page. The *Communication Settings* tab displays by default as shown in the following figure.

A Hardware Configuration [Device]					
Communication Settings	Scan Network Gateway + Device +				
Applications					
Backup and Restore					
Files	Gateway				
Log	Gateway-1 V INBLRPC0024 V				
PLC Settings	IP-Address: localhost				
PLC Shell	Port				
Users and Groups	1217				
Access Rights					
Symbol Rights					
Runtime Clock Configuration					
System Parameters					
Task Deployment					
Status					
Information					
	Your device can be secured. Learn more				

Figure 4 - 23: Communication Setting

Click the *System Parameters* tab. The device parameters are displayed as shown in the following figure.

Communication Settings	Parameter	Туре	Value	Default Value	Unit	Description
	PU module Stop when I/O Module No Response	Enumeration of BOOL	Stop	Stop	1	
Applications	CPU module Stop when I/O Module Occurred Error	Enumeration of BOOL	Keep Run	Keep Run		
Backup and Restore	I/O module CONFIG by Manual/Max when Power On	Enumeration of BOOL	Manual	Manual		
backup and Restore	Select Action when 24V dc Input unstable	Enumeration of BOOL	Continue Running wh	Continue Running wh		
Files	Show Battery Low Voltage Error	Enumeration of BOOL	Enable	Enable		
PLC Shell						
Users and Groups Access Rights						
Users and Groups Access Rights Symbol Rights Runtime Clock Configuration						
Users and Groups Access Rights Symbol Rights Runtime Clock Configuration						
Users and Groups Access Rights Symbol Rights Runtime Clock Configuration System Parameters						
PLC Shell Users and Groups Access Rights Symbol Rights Runtime Clock Configuration System Parameters Task Deployment Status						

Figure 4 - 24: System Parameters

The System Parameters tab displays the following parameters:

Item	Description
Parameter	Parameter name, not editable
Туре	Data type of the parameter, not editable
Value	Initially displays the default value of the parameter, directly or the corresponding symbol name. Non-editable parameters are displayed in light gray. If the parameter is editable user can open an input field, a drop-down list or a file selection dialog with a double-click in the table field and use it to change the value.
Default value	Default value of the parameter defined by the device description, not editable
Unit	Unit of measure for the value (Example : ms for milliseconds; not editable).
Description	Short description of the parameter specified by the device description, not editable.

4.2.2 System Settings Tab (Runtime Clock & IP Address Setting)

Double-click on the *AX-308EA0MA1T* series to open the System Settings Tab (Runtime Cock & IP Address Setting) to set the controller clock.

Communication Settings	Runtime Clock		
	PLC Time:		Read PLC Time
Applications	Date:	08 February 2021	Write PLC Time
Backup and Restore	Time:	14:33:44	Sync with Local Time
Synchronized Files	-Time Zone		
Files	PLC Timezone:		Read Timezone
Log	Timezone:	(UTC+05:30) Chennai, Kolkata, Mumbai, N $ \smallsetminus $	Write Timezone
PLC Settings	Network		
PLC Shell	cpsw0		
Users and Groups	IP Address Mo	ode: Static 🗸	
Access Rights	IP address: Subnet mask:	192 . 168 . 1 . 5 255 . 255 . 255 . 0	
Symbol Rights	Default gatew		
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
System Settings	O Obtain DN	S server address automatically	
	Contraction of the second	S server address automatically lowing DNS server addresses:	
System Parameters	Contraction of the second	lowing DNS server addresses:	
System Settings System Parameters Task Deployment Status	O Use the following the fol	lowing DNS server addresses:	

Figure 4 - 25: System Settings Tab

• Runtime Clock:

ltem	Description
PLC Time	Click Read PLC Time to read time information from PLC
Date	Set Date YYYY MM DD and click <i>Write PLC Time</i> to write the Date and time to PLC
Time	Set Time and also can sync with local time

• Time Zone:

Item	Description	
PLC Time zone	Read PLC time zone information form PLC	
Timezone	Set new time zone and write back to PLC	

• Network:

It Contains AX-3 series device network IP address settings, user can also click to read PLC settings to update device IP address information.

	Stati	с		~					
P address:	192		168		1		5		
Subnet mask:	255		255		255	×	0		
Default gateway:	0	۲	0		0	•	0		
) Obtain DNS server a									
Use the following DI Preferred DNS server:	1		0	e	0	×	0		

Figure 4 - 26: Netwrok Settings

4.2.3 COM Port Setting

Right-click AX-308EA0MA1T Device and choose Add Device and select Fieldbus> MODBUS> MODBUS Serial Port to add Delta_MODBUS_COM Device.

User can set the MODBUS serial port parameters of the controller on this fieldbus.

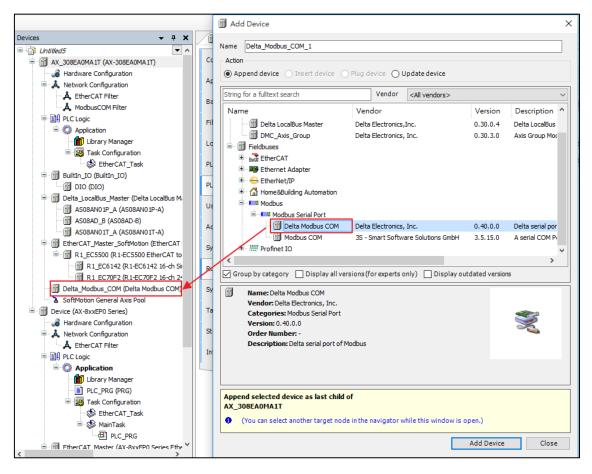


Figure 4 - 27: Setting Delta_MODBUS_COM

4.2.3.1 Tab Delta MODBUS COM

User can set the serial port parameters of the controller on this page, such as selecting COM Port (RS-232/RS-485) and setting the communication format.

General

Delta_Modbus_COM X		
General		
Status	- Serial Port Configuration	I
Information	COM Port	RS-232 ¥
Inormation	Baudrate	9600 ~
	Parity	Even 🗸
	Data Bits	7 ~
	Stop Bits	1 ~
	Transmission Mode	○ RTU

Figure 4 - 28: Delta_MODBUS_COM – General tab

Functions in the *Delta_MODBUS_COM – General* tab are described in the table.

Name	Description					
COM Port	Communication interface	RS-232/RS-485				
Baudrate	Tandem transmission rate	9600/19200/38400/57600/115200				
Parity	Parity	None/Odd/Event				
Data Bits	Data length	7/8 (when selecting RTU communication format, the length must be 8)				
Stop Bits	-	1 bit/2bits				
Transmission Mode	Transmission mode	RTU/ASCII				

• Status

User can monitor the status of MODBUS Serial port in the *Delta_MODBUS_COM – Status* tab as shown in the following figure.

Delta_Modbus_COM X						
General	ModbusSerial :	Running				
Status						
Information						

Figure 4 - 29: Delta_MODBUS_COM – Status tab

• Information

Delta_MODBUS_COM – Information tab displays -- Device information, including Device ID, Type, Vendor etc.

Delta_Modbus_COM X	
General	General
	Name: Delta Modbus COM
Status	Vendor: Delta Electronics, Inc.
	Categories: Modbus Serial Port
Information	Type: 40001
	ID: 16F7 8702
	Version: 0.30.1.0
	Order Number: -
	Description: Delta serial port of Modbus

Figure 4 - 30: Delta_MODBUS_COM - Information

4.2.3.2 Tab Delta MODBUS Master COM Port

The Delta MODBUS Master COM Port function is used to set the entry when the AX-3 series controller is used as the MODBUS master station.

AX-308E series not only provide the MODBUS standard communication, but also covert the address of Delta PLC controller (X, M, D devices etc), which can save user looking up address table. Right-click *Delta MODBUS COM* and choose *Add device* in *MODBUS Serial Master* to add *Delta MODBUS Master COM port* to project tree.

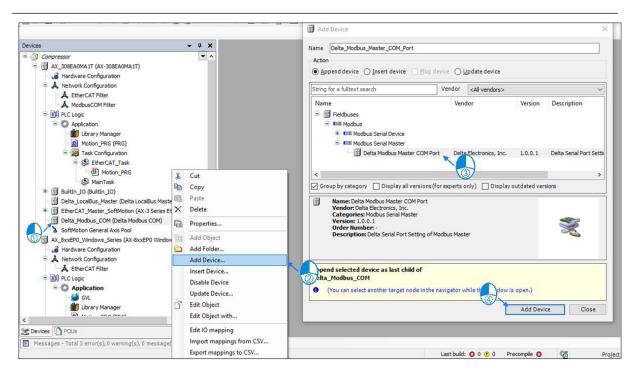


Figure 4 - 31: Adding Delta MODBUS Master COM Port to project tree

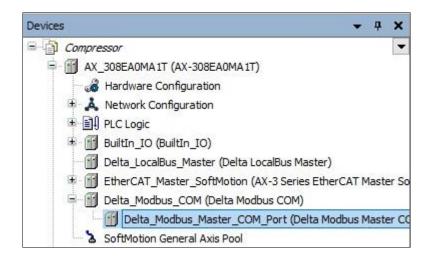


Figure 4 - 32: Adding Device

• General:

General	General Configuration
DeltaModbusSerialMaster I/O Mapping	
DeltaModbusSerialMaster IEC Objects	Retry Count 3
Status	
Information	

Figure 4 - 33: Delta_MODBUS_Master_COM_Port

Name	Description
Retry Count	Set COM Port re-communication times.
Auto-Reconnect	After a communication error, CODESYS automatically confirms the error and attempts to continue executing the MODBUS command.

• MODBUS Serial Master I/O Mapping

Delta_Modbus_Master_COM_Port				×
General ModbusSerialMaster I/O Mapping	Bus Cycle Options Bus cycle task	mdbsComTask 🗸		
Status				

Figure 4 - 34: MODBUS Serial Master I/O Mapping

Name	Description
MODBUS Serial Master I/O Mapping	User can set Bus Cycle Task of MODBUS Serial Master. Please refer to the Hardware manual with PLC Settings.
Status	MODBUS Serial Master operation status.
Information	Show the current Device information, including Device ID, type, and Vendorinformation.

NOTE:

- 1. Each MODBUS Serial Port only can add one MODBUS Serial Master and each MODBUS Serial Master can add 32 MODBUS Slave COM Port.
- User can add 32 MODBUS Slave COM Port with RS232, but RS232 supports only 1-to-1 communication. There is only first MODBUS Slave COM Port operation. RS485 is without this limitation.

4.2.3.3 Tab Delta MODBUS Slave COM port – General

The Delta MODBUS Slave COM Port function is used to set the target slave station to be connected when the AX-3 series controller is used as the MODBUS master station.

User can right-click *Delta MODBUS Master COM Port* and choose *Add Device* to add *Delta MODBUS Slave COM port* under *Delta MODBUS Master COM Port*.

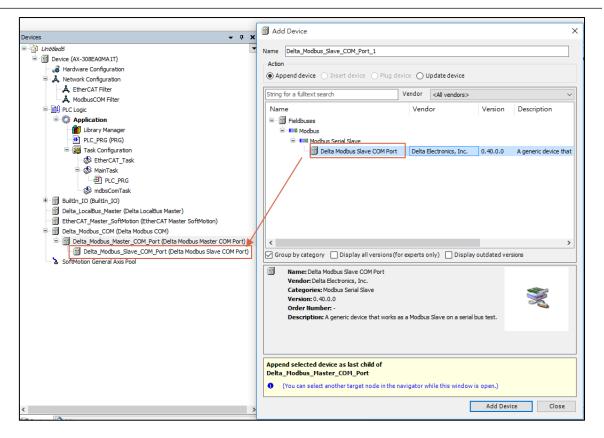


Figure 4 - 35: Adding Delta MODBUS Slave COM Port

• General:

User can set the MODBUS Slave COM Port related information such as station number, response timeout time, communication device format, etc. on this page.

General	General Configuration —	
Modbus Slave Channel	Slave Address [1247]	1
Modbus Slave Init	Response Timeout [ms]	1000
DeltaModbusSerialSlave IEC Objects	Device Type	Standard Modbus Devices V
Status		
Information		

Figure 4 - 36: Delta_MODBUS_Slave_COM_Port – General Tab

Name	Description
Slave Address	Slave station number.
Response Timeout	Slave response timeout.
Device Type	Slave type can choose standard MODBUS communication or Delta specific controller. (If Delta series controller is selected, the device and MODBUS address will be automatically converted to Delta controller address).

4.2.3.4 Tab Delta MODBUS COM Slave – Channel

User can use this table to define the slave channels. Each channel represents a MODBUS request packet. At present, each slave station can establish a maximum of 10 packets.

The AX-3 series controller will send MODBUS request packets in order in the table, and all channels use a MODBUS connection in common.

Delta_Modbus_Slave_COM_Por	x						
General	Name	Access Type		Trigger	READ Offset	Length	Π
Modbus Slave Channel							
Modbus Slave Init							
DeltaModbusSerialSlave IEC Objects							
Status							
Information							
	Move Up	Move Down		Add Channel	Delete	Edit	t

Figure 4 - 37: MODBUS slave channel tab

As shown above, there is an option to *Add Channel* in the *MODBUS Slave Channel* page. The MODBUS Channel will vary with the Device type set on the General page. If user choose a Delta specific controller, it will automatically convert the MODBUS address of the device, eliminating the need to look up.

Modbus Channe		x
Enable		
Channel		
Name	Channel 0	
Access Type	Read Coils	~
Trigger	Cyclic	▶ 100 ms
Comment		
Read Register		
De	vice Address	0x0
Le	ngth	1
En	or Handling	Keep last Value
		OK Cancel

Figure 4 - 38: Standard MODBUS Device

Modbus Chanr	nel	×
Enable		
Channel		
Name	Channel 0	
Access Typ	e Read Coils	v
Trigger	Cyclic	✓ 100 ms
Comment		
Read Regist	er	
	Device Address	X Coll 🗸 0x0
	Length	1
	Error Handling	Keep last Value
		OK Cancel

Figure 4 - 39: AH Series

MODBUS Channel Description:

odbus Channel			
Enable			
Channel			
Name	Channel 1		
Access Type	Read Coils		>
Trigger	Cyclic	~ 100	ms
Comment			
Read Colls			
De	evice Address	0x0	
Le	ngth	1	
		Set to ZERO	European Contract Con

Figure 4 - 40: Standard MODBUS Device

Name	Description
Enable	Decide whether this channel is effective.
Name	Define this channel name.
	MODBUS Communication function code:
	• Read coils (0x01).
	Read discrete inputs (0x02).
	Read holding registers (0x03).
	Read input registers (0x04).
Access Type	• Read single coil (0x05).
	• Write single register (0x06).
	Write multiple coils (0x0F).
	Write multiple registers (0x10).
	Read/Write multiple registers (0x17).
Trigger	Cyclic: MODBUS request is triggered according to the set cycle time
Trigger	Rising edge: MODBUS request is triggered by a Bollinger variable, which is defined on the I/O Mapping page.

Name	Description
	Application: MODBUS request can be triggered through the function block MODBUS Channel.
Comment	Channel annotations.
Device Address	Delta Series Controller address of Register.
Length	Length of data read/written (Maximum length is 100 coils and 100 registers).
Error Handing	When a communication error occurs, the setting action of Register data
	Set To ZEROKeep last value

De	evice Type	AH Series	
odbus Channel			
Enable			
Channel			
Name	Channel 0		
Access Type	Read Coils		~
Trigger	Cyclic	✓ 100	ms
Comment			
Read Coils			
De	vice Address	X Coil	✓ 0x0
Ler	ngth	1	
Err	or Handling	Keep last Value	~
		0	Cance

Figure 4 - 41: AH Series

Name	Description
Enable	Decide whether this channel is effective.
Name	Define this channel name.
Access Type	Channel read and write actions:

Name	Description
	 Read coils Read registers Write coils Write register NOTE : The controller will select the corresponding MODBUS function code according to the type of device being read/written.
Trigger	Cyclic: MODBUS request is triggered according to the set cycle time. Rising edge: MODBUS request is triggered by a Bollinger variable, which is defined on the I/O Mapping page. Application: MODBUS request can be triggered through the function block MODBUS Channel.
Comment	Channel annotations.
Device Address	Device Address of Delta Series Controller.
Length	Length of data read/written (Maximum length is 256 coils and 100 registers).
Error Handing	 When a communication error occurs, the setting operation of the Registers data is performed. Set To ZERO Keep last value

4.2.3.5 Tab Delta MODBUS COM Slave – Init

The Delta MODBUS Slave COM Port function is used to set the entry when the AX-3 series controller is used as a MODBUS slave.

User can use this table to decide whether to write the initial values to the slave's Coils/Registers after the AX-3 series controller successfully establishes a MODBUS connection with the slave.

Delta_Modbus_Slave_COM_Port								
General	Line	Access Type	•	WRITE Offset	: Defau	lt Value	Length	Com
Modbus Slave Channel								
Modbus Slave Init								
Status								
Information								
	М	ove Up	Move Down	Add Channe	l (Delete	Ed	it

Figure 4 - 42: MODBUS slave Init Tab

4.2.3.6 Tab Delta MODBUS Serial Device Slave

After completing the procedure <u>4.2.3.2 Tab Delta MODBUS Master COM Port</u> to add Delta MODBUS Master COM Port.Right-click AX-308EA0MA1T > Add Device >MODBUS serial Port> Delta MODBUS COM, and the project tree displays Delta_MODBUS_COM_1.

Right-click *Delta_MODBUS_COM_1* and select *Add device*, after that, select *Delta MODBUS Serial Device* under MODBUS Serial Device.

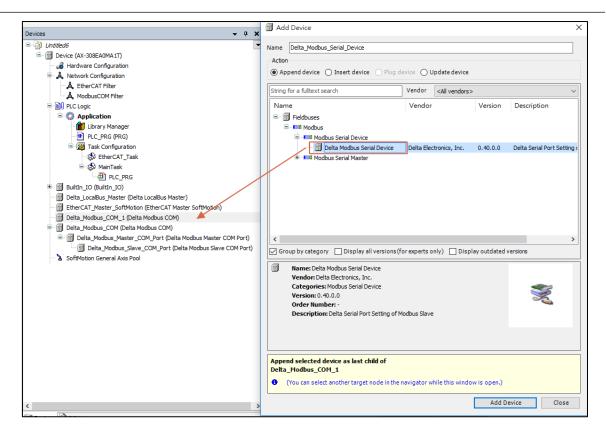


Figure 4 - 43: Adding Delta MODBUS Serial Device

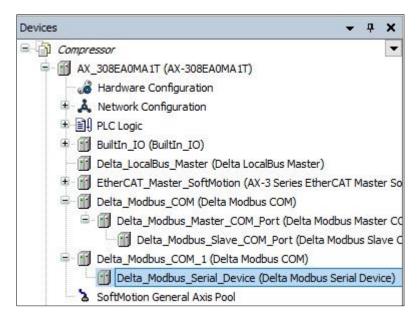


Figure 4 - 44: Devices - Delta MODBUS Serial Device

General

User can set the station number of the AX-3 series controller and the allowed Coils/Registers section on this page. If MODBUS Serial Master uses Delta specific communication protocol, all sections can be accessed without restrictions.

General	Serial Port Setting					
Delta Modbus Serial Slave Device I/O Mapping	COM ID	A V				
Status						
nformation	Address Information Setting —					
	Holding Register			Coils		
	%MW	0	A V	%MW	0	+
	%MW Quantity	10	+	%MW Quantity	10	×
	Modbus Start Address	0	+	Modbus Start Address	0	*
	Holding Register			Coils		
	%QW	0	*	%QW	0	*
	%QW Quantity	10	×	%QW Quantity	10	*
	Modbus Start Address	256	*	Modbus Start Address	256	A
	Input Register			Input Coils		
	%IW	0	*	%IW	0	A V
	%IW Quantity	10	4	%IW Quantity	10	A V
	Modbus Start Address	0	\$	Modbus Start Address	0	+

Figure 4 - 45: General Window

• MODBUSSerialSlave I/O Mapping:

User can set *Bus Cycle Task* on MODBUS TCP Slave Device. For more information on the bus cycle task, please refer to AX-3 operation manual "PLC Settings".

Delta_Modbus_Serial_Device			
General	Bus Cycle Options		
ModbusSerialSlave I/O Mapping	Bus cycle task	mdbsComTask	~
Status			
Information			

Figure 4 - 46: MODBUS Serial Slave I/O Mapping

4.2.4 EtherCAT Setting

NOTE: The EtherCAT settings in this section are not applicable to AX-300NA0PA1 and AX-324NA0PA1P.

4.2.4.1 EtherCAT Master Setting

Click on the device tree> EtherCAT_Master_SoftMotion.

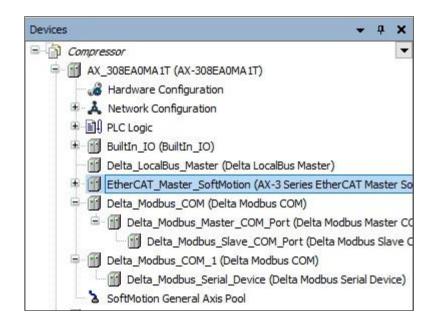


Figure 4 - 47: EtherCAT Master Setting

Result: EtherCAT Master Setting window displays as shown in the following figure.

Chapter 4

General	① Autoconfig Master/Slaves	EtherCAT
Sync Unit Assignment	2 EtherCAT NIC Setting	
Log	Destination address (MAC) FF-FF-FF-FF-FF-FF	Broadcast Enable redundancy
EtherCAT Parameters	Source address (MAC) 00-00-00-00-00 Network Name	Browse
EtherCAT I/O Mapping	Select network by MAC Select network by	name
EtherCAT IEC Objects	③▲ Distributed Clock④▲ Op	otions
Status	Cycle time 4000 👻 µs	Use LRW instead of LWR/LRD
Information	Sync offset 20 😴 %	Enable messages per task Automatic restart slaves
	Sync window 1 🌩 µs	

Figure 4 - 48: General Tab

General

① Autoconfig Master/Slaves: This option activates the master for quick and easy basic configuration. It is generally recommended to check this setting.

- 2 EtherCAT NIC Setting
 - Destination address (MAC): EtherCAT MAC address of the device on the network that will receive the telegram.
 - Source address (MAC): MAC address of PLC network interface (Use Browse to scan slaves, please select CPSW1 module).
 - Network Name: The name or MAC of the network.
 - Select Network by MAC: Net-route MAC-ID designation (The default name is CPSW1 * NOTE 1).
 - Select network by name: Network routing network name identification, and the project has nothing to do with the device.
- ③ Distributed Clock
 - Cycle time: The master station will send the corresponding data message to the slave station according to the cycle time.

- Sync offset sets the delay time of the PLC cycle time corresponding to the EtherCAT slave SYNC interrupt. For example, if the sync offset is set to 20%, the PLC cycle is delayed by 20% of the cycle time of the SYNC interrupt of the EtherCAT slave, which means that the PLC cycle still has 80% of the cycle time margin. If the PLC cycle is within this time margin, delayed without losing synced data.
- Sync window monitoring: When started, the synchronization of the slaves can be monitored.
- Sync window: Set the synchronization time range of the monitoring slaves.
- ④ Options
 - Use LRW instead of LWR/LRD: preset with separate read (LRD) and write commands (LWR). When the option is activated, the PDO is issued with a combined read / write command (LRW).
 - Enable messages per task.
 - Automatically restart slaves: When the EtherCAT master is disconnected after restart, the slaves will be restarted immediately.

NOTE: EtherCAT_Master_SoftMotion is preset to Network by MAC and the name is CPSW1.

• Log

This screen is recorded and displayed after the error is abnormal.

General	! 0 warning(s) 🕴 0 error(s)	E 0 excep	tion(s)	 0 information(s) 	0 debug message(s)	ľ
Sync Unit Assignment	UTC time						
	Severity	Time Stamp	۵	escript	ion		
Log							
EtherCAT Parameters							
EtherCAT I/O Mapping							
EtherCAT IEC Objects							
Status							
Information							

Figure 4 - 49: Log window

• EtherCAT I/O Mapping

This chapter introduces that EtherCAT needs to select the corresponding task. When the task is selected, the scan time of the task will be synchronized according to the build cycle.

Bus cycle task: Select a Task to synchronize time with EtherCAT. If user select parent bus cycle setting, the system will automatically select the shortest cycle time in the task and change it to EtherCAT cycle time.

General	Bus Cycle Options	
	Bus cycle task	EtherCAT_Task 🗸
Sync Unit Assignment		Use parent bus cycle setting
		EtherCAT_Task
Log		MainTask mdbsComTask
EtherCAT I/O Mapping		
EtherCAT IEC Objects		
Status		
Information		

Figure 4 - 50: EtherCAT I/O Mapping

4.2.4.2 EtherCAT Slave Settings

Select EtherCAT Slave from the following path: right-click *EtherCAT_Master_SoftMotion> Add Device> Slave.*This chapter introduces the *EtherCAT_Slave* screen.

Chapter 4

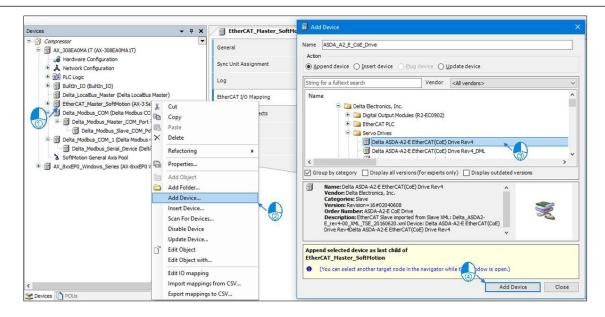


Figure 4 - 51: Add EtherCAT Slave

There are two ways to add slaves. The first is to add the slave device of the selected axis, and the second is to add the scanning method.

General	Address				tional		Ether CAT
Process Data	AutoInc address	0	4		Enable e Optiona	expert settings I	
Startup Parameters	▲ Distributed Clock	_					
EtherCAT Parameters	2 Select DC	DC-Synch	ronous			~	
EtherCAT I/O Mapping	🖂 Enable	4000	Sync u	nit cycle (µs)		
EtherCAT IEC Objects	Sync0:						
Status	Sync unit cycle	x 1	\sim	4000	*	Cycle time (µs)
Information	O User-defined			0	*	Shift time (µs)	
	Sync1:						
	Enable Sync 1						
	Sync unit cycle	x 1	\sim	4000	A V	Cycle time (µs)
	O User-defined			0	*	Shift time (µs)	

Figure 4 - 52: General Window

- General
 - o Address

① EtherCAT address: address assigned to the slave by the master during startup.

o Distributed Clocks

② Select DC: Set the slave distributed clock.

Process Data

The data exchange on the EtherCAT network is a PDO mapping of CoE, which is a periodic data exchange between the master and the slave architecture; the data that the slave sends to the master will be packaged in TxPDO, and the slave will read The data is included in RxPDO. The input settings and output settings on the *PDO Mapping* page list the PDOs available for data exchange, and the PDO content can be edited. In the ESI file of the device, the contents of the preset checked PDO and PDO have been defined, and according to the definition of ESI, the PDO content of some devices allows user to edit it by themselves.

General	Select the Outputs	Select the Outputs				Select the Inputs			
	Name	Туре	Index	Name	Туре	Index			
Process Data	16#1600 1st RxPDO Mapping (exclu			🗌 16#1A00 1st TxPDO Mappi	ng (e				
0	Control Word	UINT	16#6040:00	Status Word	UINT	16#6041:0			
Startup Parameters	TargetPosition	DINT	16#607A:00	ActualPosition	DINT	16#6064:0			
EtherCAT Parameters	TargetVelocity	DINT	16#60FF:00	Velocity actual value	DINT	16#606C:0			
Etherewit Parameters	TargetTorque	INT	16#6071:00	ActualTorque	INT	16#6077:0			
EtherCAT I/O Mapping	ModeOfOperation	SINT	16#6060:00	ModeOfOperationDisplay	SINT	16#6061:0			
	16#1601 2nd RxPDO Mapping	✓ 16#1601 2nd RxPDO Mapping			✓ 16#1A01 2nd TxPDO Mapping				
EtherCAT IEC Objects	Control Word	UINT	16#6040:00	Status Word	UINT	16#6041:0			
	TargetPosition	DINT	16#607A:00	ActualPosition	DINT	16#6064:0			
Status	16#1602 3rd RxPDO Mapping (exclu			16#1A02 3rd TxPDO Mappi	ing (e				
	Control Word	UINT	16#6040:00	Status Word	UINT	16#6041:0			
Information	TargetVelocity	DINT	16#60FF:00	ActualPosition	DINT	16#6064:0			
	16#1603 4th RxPDO Mapping (exclu			Velocity actual value	DINT	16#606C:0			
	Control Word	UINT	16#6040:00	16#1A03 4th TxPDO Mappi	ing (e				
	TargetTorque	INT	16#6071:00	Status Word	UINT	16#6041:0			
				ActualPosition	DINT	16#6064:0			
				ActualTorque	INT	16#6077:0			

Figure 4 - 53: Process Data Window

User can choose different groups of PDO to use according to their needs. The more data user choose for PDO, the greater userr PLC performance.

• Startup Parameters

After the EtherCAT communication is established, the master station will download all the parameters in the table to the slave station, and the list will bring out the pre-defined commands of the ESI file. The user can add, delete or modify as required.

Features	Description
Add	Added parameters
Edit	Editing parameters
Move Up	Move selection parameter up one line
Move Down	Move selection parameter down one line

Process Data	Line	Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Error	Next Line	Comment
Process Data	- 1	10-0060:16#00	Op mode	8	8			0	Op mode
tartup Parameters	- 2	16#60C2:16#01	Interpolation time period	4	8			0	Interpolation time period
	- 3	16#60C2:16#02	Interpolation time index	-3	8			0	Interpolation time index
therCAT Parameters									
PherCAT I/O Mapping									
EtherCAT I/O Mapping									
EtherCAT I/O Mapping									
therCAT IEC Objects									
therCAT IEC Objects									
therCAT IEC Objects									
therCAT IEC Objects									

Figure 4 - 54: Startup Parameter

After pressing the *Add* button, the *Select Item from Object Directory* window will appear. First, select the parameter to be written from the directory. After clicking *OK*, it will be added to the command list.

ndex:Subindex	Name	Flags	Туре	Default		^
16#1A01:16#00	2nd Transmit PDO Mapping					
- 16#1A02:16#00	3rd Transmit PDO Mapping					
- 16#1A03:16#00	4th Transmit PDO Mapping					
- 16#1C12:16#00	RxPDO assign					
- 16#1C13:16#00	TxPDO assign					
16#1C32:16#00	SM output parameter					
6- 16#1C33:16#00	SM input parameter					
16#2001:16#00	DRV's Parameter P0-01	RW	UINT			
16#2002:16#00	DRV's Parameter P0-02	RW	UINT			
16#2003:16#00	DRV's Parameter P0-03	RW	UINT			
16#2004:16#00	DRV's Parameter P0-04	RW	UDINT			
16#2005:16#00	DRV's Parameter P0-05	RW	UDINT			
16#2006:16#00	DRV's Parameter P0-06	RW	UDINT			
16#2007:16#00	DRV's Parameter P0-07	RW	UDINT			
16#2011:16#00	DRV's Parameter P0-17	RW	UINT			
16#2012:16#00	DRV's Parameter P0-18	RW	UINT			*
Name [DRV's Parameter P0-01					
Index: 16#	2001 🔹 Bit len	gth 16		* *	[ОК 💌
SubIndex: 16#	0 🔷 Value	0		\$		Cancel

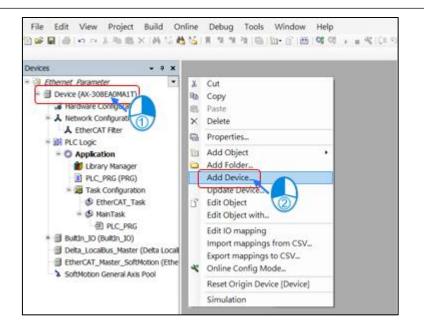
Figure 4 - 55: Selecting the Object Directory

4.2.5 EtherNet Setting

Ethernet Setting is related with Controller Ethernet parameter setting. User has to add the Ethernet Adapter Device to set parameter and internet related function, and all internet function is under *Ethernet* device, like MODBUS TCP and EtherNet/IP.

• Add Ethernet Adapter Device

Right-Click on the AX-3 Series device and click Add Device> Fieldbus> Ethernet Adapter> Ethernet to add the EtherNet device.



lame Ethernel		×				11
Action		1115				-4
Append device O Insert devi	or: O Plug devic	a ⊖Up	date device			_
String for a fultext search		Vendor	<al th="" vendors:<=""><th>•</th><th></th><th>×</th></al>	•		×
Name + Miscelaneous = Hiscelaneous + Can CANbus + Lithercat	Vendor			Version	Description	^
EtherNet/IP G Home&Building Automa Modbus Profibus	3				3	~
Group by category Display a	Il versions (for expe	rts only)	Display o	utdated vers	ions	
Name: Ethernet Vendor: 3S - Smart Softwa Categories: Ethernet Adap Home&Bukling Automation Version: 3.5.15.0 Order Number: - Description: Ethernet Link.	ter, Ethernet Adapt	er, Ethernet	Adapter,		No.	
a state da state a state i se	hild of					

Figure 4 - 56: Configuring Ethernet

Devices 🗸 🗸 🗙	EtherCAT_Master_SoftMa	otion 🔐 Ethernet 🗙	
- 1 Compressor	General	Interface	
Hardware Configuration A Network Configuration	Log		
LitherCAT Filter LitherNetIP Filter	Status		
ModbusCOM Filter	Ethernet Device I/O Mapping		
BI PLC Logic Builtin IO (Builtin IO)	Ethernet Device IEC Objects		
Delta_LocalBus_Master (Delta LocalBus Master)	Information		
EtherCAT_Master_SoftMotion (AX-3 Series EtherCAT Master So Master_SoftMotion (AX-3 Series EtherCAT Master So Master_SoftMotion (AX-3 Series EtherCAT to E-BUS adapter Moc Master_SoftMotion (AX-42-E EtherCAT(CoE) t Master_SoftMotion (AX-42-E EtherCAT(AX-42-EtherCAT(AX-42-EtherCAT(AX-42-E			
Delta_Modbus_COM (Delta Modbus COM) Delta_Modbus_Master_COM_Port (Delta Modbus Master CC Delta_Modbus_Slave_COM_Port (Delta Modbus Slave C			
Delta_Modbus_COM_1 (Delta Modbus COM) Delta_Modbus_Serial_Device (Delta Modbus Serial Device)			
SoftMotion General Axis Pool			
AX_8xxEP0_Windows_Series (AX-8xxEP0 Windows Series)			

Figure 4 - 57: Ethernet added to Application

• EtherNet Device – General

General	Interface	
og		
Status		
Ethernet Device I/O Mapping		
Ethernet Device IEC Objects		
Information		

Figure 4 - 58: General Tab

Name	Description
Interface	Current controller communicate interface

• Ethernet Device – Status

User can check this page to know operation status of EtherNet Device, like Running/Stopped status.

Last Diagnostic Message EthDlag EthDlag Current IP Current subnet mask Current gateway address IP changes IP changes	Acknowledge
Ethernet Device IEC Objects Current IP Current subnet mask Current gateway address IP changes	
Ethernet Device I/O Mapping Current subnet mask Current gateway address IP changes	
themet Device IEC Objects IP changes	
nformation	

Figure 4 - 59: Status Tab

Name	Description
Ethernet Device	Controller Internet status
Last Diagnostic Message	Diagnosis Status

• Ethernet Device – EtherNet Device I/O Mapping

User can set *Bus Cycle Task* on MODBUS TCP Slave Device. For more information on the bus cycle task, please refer to AX-3 operation manual "PLC Settings".

ieneral	Bus Cycle Options		
	Bus cycle task	Use parent bus cycle setting \sim	
og			
tatus			
thernet Device I/O Mapping			
thernet Device IEC Objects			
nformation			



• Ethernet Device IEC Objects

This tab displays the status of the Ethernet Device. User can check the eState to monitor the operation status.

General	🕂 Add 🗹 Edit 🔀 Delete 🔭 Go to Variable						
Log	Variable Ø Ethernet	Mapping	Type IoDrvEthernet				
Status							
Ethernet Device I/O Mapping							
Ethernet Device I/O Mapping Ethernet Device IEC Objects							

Figure 4 - 61: Ethernet Device IEC Objects Tab

4.2.5.1 Tab Delta MODBUS TCP Master

The Delta MODBUS TCP Master function is used to set the entry when the AX-3 series controller is used as the MODBUS TCP master station.

The AX-3 series not only supports standard MODBUS communication, but also supports MODBUS TCP. Right-click the *EtherNet* device and choose *Add device* > *Modbus*> *Modbus* TCP Master> Delta MODBUS TCP Master.

Devices v 4 X	1	Add Device				×
G Unoteds Gevec (AX-308EA0MAIT) Gevec (AX-308EA0MAIT) Gevec (AX-308EA0MAIT) A Network Configuration A Network Configuration A EtherCAT Filter	(mme [Delta_Modbus_TCP_Master_1 Action) Append device O Insert device Plug d String for a fulltext search	evice OL	/pdate device		
A ModusCOM Filter À ModusCOP Filter ⇒ Bill R.C.Logic ⇒ Ø Application → Ø Uterary Manager → Ø PLC R.C.(PRG)		Name ■ I Fieldbuses ■ EtherNet/IP ■ III Modbus = III Modbus = III Modbus TCP Master	Vendor		Version	Descriptic
		Holdos LC Paster Det Modos TCP Master Modous TCP Master Modous TCP Save Device		ronics, Inc. Software Solutions GmbH	0.30.1.0	A device the A device the
Charlow and a match (interaction of the control of the contro		Group by category Display all versions (f)	or experts o	nly) 🗌 Display outdated	versions	>
Jola Jodda U Jolas (Delta Modus COM) Delta Jodda COM (Delta Modus COM) Delta Jodda COM (Delta Modus COM) Delta Jodda COM (Delta Modus Serial Device) Delta Jodda COM (Delta Modus COM) Delta Jodda Joster (COM Port (Delta Modus Master COM Port) Delta Jodda Joster (COM Port (Delta Modus Slave COM Port) Delta Jodda Joster Avis Pool		Name: Delta Modbus TCP Master Vendor: Delta Electronics, Inc. Categories: Modbus TCP Master Versione: 0.30.1.0 Order Humber: - Description: A device that works as a Mo	dbus TCP Ma	aster on Ethernet.	0 // 0	
	E	Append selected device as last child of thernet O (You can select another target node in the	navigator w	hile this window is open.)		
< >				Add	Device	Close

Figure 4 - 62: Adding Delta MODBUS TCP Master

• Delta MODBUS TCP Master I/O Mapping:

Delta Modbus TCP Master I/O Mapping	Bus Cycle Options		
	Bus cycle task	mdbsEtherTask	~
Delta Modbus TCP Master IEC Objects			
objects			
Status			
Information			
Information			

Figure 4 - 63: Delta MODBUS TCP Master I/O Mapping

Name	Description
Delta MODBUS TCP Master I/O Mapping	User can set <i>Bus Cycle Task</i> on MODBUS TCP Slave Device. For more information on the bus cycle task, please refer to AX-3 operation manual "PLC Settings".
Status	MODBUS TCP Master current operation status
Information	MODBUS TCP Master information, including the Vendor, Version etc.

4.2.5.2 Tab Delta MODBUS TCP Slave - General

The Delta MODBUS TCP Slave function is used to set the target slave station to be connected when the AX-3 series controller is used as the MODBUS TCP master station.Right-click *Delta MODBUS TCP Master node> Add Device> MODBUS> MODBUS TCP Slave> Delta MODBUS TCP Slave*.

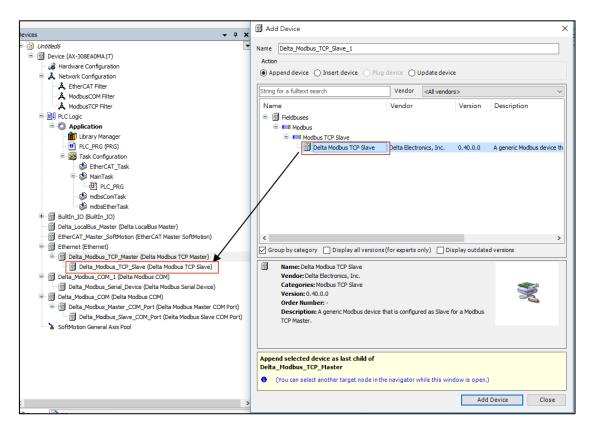


Figure 4 - 64: Delta MODBUS TCP Slave

As shown above, there is an option to add channels in the MODBUS slave channel page, The MODBUS channel will vary with the device type setting in the general page. If user select a specific Delta controller, they can directly select the register location of the Delta controller, eliminating the need to look up the table (as shown below).

• General

User can set MODBUS TCP Slave related information such as station number, IP, communication port, communication format, etc. on this page.

General	- General Configuration	5)	10	9		
Modbus Slave Channel	Slave Address [0247]	0	×			
	Response Timeout [ms]	1000	×			
Modbus Slave Init	Port	502	*			
Delta Modbus TCP Slave IEC Objects	Device Type	Standar	d Modb	us De	vices	~
Status	IP Address	192 .	168 .	1		1
		40				

Figure 4 - 65: Delta MODBUS TCP Slave – General Tab

Name	Description
Slave Address	Slave station number.
Response Timeout	Slave response timeout.
Port	Slave communication port.
Device Type	Slave type can choose standard MODBUS communication or Delta specific controller (If Delta series controller is selected, the device and MODBUS address will be automatically converted).
IP Address	Slave IP address.
Auto-Reconnect	When a timeout or error occurs, reconnection is performed automatically.

4.2.5.3 Tab Delta MODBUS TCP Slave – Channel

• MODBUS Slave Channel:

User can use this table to define slave channels. Each channel represents a MODBUS request packet. At present, each slave station can create up to 100

Channels, the AX-308E series controller will send MODBUS request packets in order in a table order, and all channels share a TCP connection.

Delta_Modbus_TCP_Slave :	×					
General		Name	Access Type	Trigger	READ Offset	Length
Modbus Slave Channel	_					
Modbus Slave Init						
Delta Modbus TCP Slave IEC Objects						
Status						
Information						
					1	
	Movel	Ip	Move Down	Add Channel	Delete	Edit

Figure 4 - 66: Delta MODBUS TCP Slave – MODBUS slave channel Tab

As shown above, there is an option to *Add Channel* in the *MODBUS Slave Channel* page. The MODBUS Channel will vary with the Device Type setting on the General page. If user choose a Delta specific controller, they can directly select the register location of the Delta controller, eliminating the need to look up the table as shown in the following.

Device Type:	Standard Modbus Device	Device Type : AH Series
lodbus Channel		Modbus Channel
Enable		Enable
Channel		Channel
Name Channel 0		Name Channel 0
Access Type Read Colls	×	Access Type Read Colls
Trigger Cyclic	✓ 100 ms	Trigger Cyclic 🔽 100 ms
Comment		Comment
Read Register		Read Register
Device Address	0x0	Device Address X Coil V 0x0
Length	1	Length 1
Error Handling	Keep last Value	Error Handling Keep last Value

Figure 4 - 67: Standard MODBUS Device and AH Series

MODBUS Channel Description:

dbus Channel		
Enable		
Channel		
Name	Channel 0	
Access Type	Read Coils	
Trigger	Cyclic	✓ 100 ms
Comment		
Read Coils		
De	evice Address	0x0
Le	ngth	1
En	ror Handling	Keep last Value

Figure 4 - 68: MODBUS Channel of Standard MODBUS Device

Name	Description
Enable	Decide whether this channel is effective.

Nama	Description
Name	Description
Name	Define this channel name.
Access Type	 MODBUS Communication function code: Read coils (0x01) Read discrete inputs (0x02) Read holding registers (0x03) Read input registers (0x04) Read single coil (0x05) Write single register (0x06) Write multiple coils (0x0F) Write multiple registers (0x10) Read/Write multiple registers (0x17)
Trigger	Cyclic: MODBUS request Trigger at a set cycle time Rising edge: MODBUS request is triggered by a Bollinger variable, which is defined on the I/O Mapping page. Application: MODBUS request can be triggered through the function block <i>MODBUS Channel</i> .
Comment	Channel annotations
Device Address	MODBUS address of Register
Length	Read / write data length
Error Handing	 When a communication error occurs, the setting operation of the Registers data is performed. Set To ZERO. Keep last value.

1		
dbus Channel		
Enable		
Channel		
Name	Channel 0	
Access Type	Read Coils	~
Trigger	Cyclic	✓ 100 ms
Comment		
Read Coils		
D	evice Address	X Coil 🗸 Ox0
Le	ngth	1
	ror Handling	Keep last Value

Figure 4 - 69: AH Series

Name	Description
Enable	Decide whether this channel is effective.
Name	Define this channel name.
	Channel read and write actions:
	Read coils
	Read registers
Access Type	Write coils
	Write register
	NOTE : The controller will select the corresponding MODBUS function code according to the type of device being read/written.
	Cyclic: MODBUS request is triggered according to the set cycle time.
Trigger	Rising edge: MODBUS request is triggered by a Bollinger variable, which is defined on the I/O Mapping page.
	Application: MODBUS request can be triggered through the function block <i>MODBUS Channel</i> .
Comment	Channel annotations.
Device Address	Device Address of Delta Series Controller.
Length	Length of data read/written (Maximum length is 256 coils and 100 registers).

Name	Description
	When a communication error occurs, the setting operation of the Registers data is performed.
Error Handing	Set To ZERO.
	Keep last value.

4.2.5.4 Tab Delta MODBUS TCP Slave – Init

The user can use this table to decide whether to write the initial value to the registers of the slave station after the AX-308E series controller successfully establishes a TCP connection with the slave station.

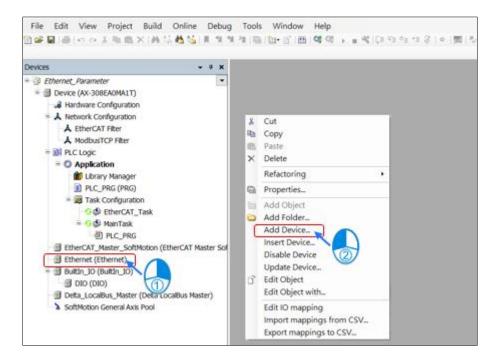
eneral	Line Access Ty	pe WRITE Offset	Default Value	Length	Comment	
lodbus Slave Channel						
lodbus Slave Init						
elta Modbus TCP Slave I/O Japping						
tatus						
formation						

Figure 4 - 70: Delta_MODBUS_TCP_Slave – MODBUS slave Init

4.2.5.5 Tab Delta MODBUS TCP Slave Device

The Delta MODBUS TCP Slave function is used to set the entry when the AX-3 series controller is used as a MODBUS slave.As AX-308E controller is MODBUS TCP Slave, user adds the *Delta MODBUS TCP Slave Device* tool to set the register area. If user uses the Delta specific fieldbus on MODBUS TCP Master, the register area is not limited and can read/write to all registers.

Right-click the EtherNet node> Add device> MODBUS TCP Slave Device> Delta MODBUS TCP Slave Device.



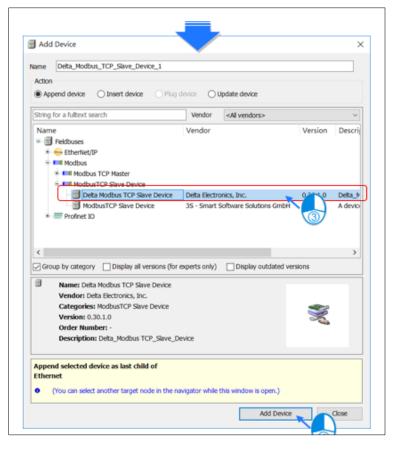


Figure 4 - 71: Adding EtherNet to Device



Figure 4 - 72: Adding Delta_MODBUS_TCP_Slave Device

• General:

User can set the controlled port, station ID, and the register area in this page. If the MODBUSTCP Master is using Delta specific communication, the register is not limited.

General	General Configuration					
Delta Modbus TCP Slave Device I/O Mapping	TCP Port 502	141				
itatus	Station ID 3	0				
nformation						
	Address Information Setting -					
	Holding Register (%MW)			Coils (%MW)		
	Device Start Address	0	\$	Device Start Address	0	
	Device Quantity	10	\$	Device Quantity	10	
	Modbus Start Address	0	-	Modbus Start Address	0	4
	Holding Register (%QW)			Colls (%QW)		
	Device Start Address	0	•	Device Start Address	0	4
	Device Quantity	10		Device Quantity	10	4
	Modbus Start Address	256	1	Modbus Start Address	256	1
	Input Register (%IW)			Input Colls (%IW)		
	Device Start Address	0	*	Device Start Address	0	1
	Device Quantity	10	\$	Device Quantity	10	+
	Modbus Start Address	0		Modbus Start Address	0	

Figure 4 - 73: Delta_MODBUS_TCP_Slave Device – General Tab

• Delta MODBUS TCP Slave Device I/O Mapping:

User can set *Bus Cycle Task* on MODBUS TCP Slave Device. For more information on the bus cycle task, please refer to *AX-308E Operation manual PLC Settings*.

ieneral	Bus Cycle Options		
elta Modbus TCP Slave Device I/O lapping	Bus cycle task	mdbsEtherTask	~
tatus]		
nformation			

Figure 4 - 74: Delta_MODBUS_TCP_Slave Device I/O Mapping Tab

4.2.6 EtherNet/IP Settings

The EtherNetIP plug-in provides a dialog box for setting up the EtherNet/IP scanner and target device. This dialog box will be displayed in the device editor dialog box.

EtherNet/IP based on standard TCP and UDP allows communication between office networks and control systems. The EtherNet/IP target device supports DHCP and BootP to assign IP addresses. Start the EtherNet/IP network (diagnosis), user can use the Web server integrated with the logic control interface module, or user can use the Web server of other EtherNet/IP devices.

Like other standard EtherNet-based networks, the EtherNet/IP protocol is not suitable for real-time applications.

(< 1 millisecond), such as servo system, because the typical cycle of EtherNet/IP network is 10 milliseconds.

Install and add EtherNet/IP devices

In order to add and configure EtherNet/IP devices in the project tree, user need to install related device description files (EtherNet/IP device description files (*.eds)) in *Tools > Device Repository*.

Adding an EtherNet/IP scanner to the project tree will add the specific library collection of the related device to the library manager. There are two ways to insert one or more EtherNet/IP remote adapters or devices into the scanner:

• Module configuration

Under one target device is another target device, called the "chassis", which can be inserted into a fixed number of slots. Use the "insert device to..." command to insert the so-called "IO point" into the slot, thereby controlling the input and output.

• Non-modular configuration

The target device is equipped with input and output.

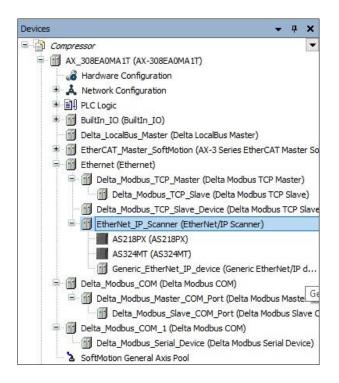


Figure 4 - 75: EtherNet/IP Configuration

Double-click on EtherNet/IP object in the project tree, or select a device in the project tree and call the edit object command in the menu to open the device editor for configuring EtherNet/IP devices. (The settings of the editor itself, such as displaying the general configuration dialog box, are implemented in the device editor options).

The title bar of the EtherNet/IP configuration dialog box is marked with the name of the specified EtherNet device; depending on the device, the label included in the dialog box will be different. Note that the bus cycle time is adjusted in the PLC settings.

- EtherNet/IP Scanner
- EtherNet/IP Remote Adapter

Access EtherNet/IP configuration through the app

Each EtherNet/IP scanner will automatically add a related function block instance to the project tree. The name of this variable and the type of the function block will appear in the EtherNetIP scan I/O map of the IEC object tab. Variables can be configured through the project address, such as allowing start, stop or application scan status check.

4.2.6.1 EtherNet/IP

The AX-3 series supports EtherNet/IP scanner function. Right-click on the *EtherNet* node > Add Device > Fieldbus > EtherNetIP Scanner > EtherNet/IP Scanner.

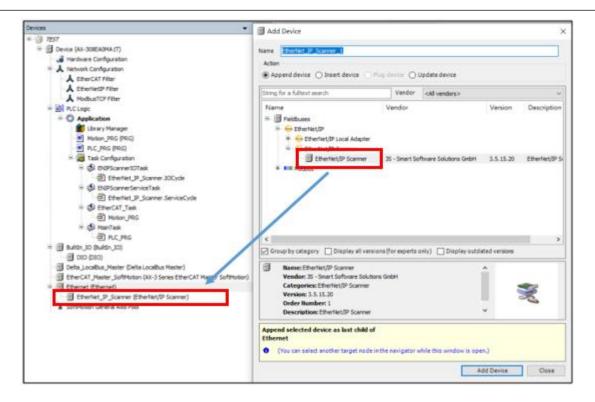


Figure 4 - 76: Increase EtherNet/IP Scanner

EtherNet/IP Scanner General tab

4	A Network Configuration Editor	Device EtherNet_IP_Scanner X	
	General	Options	
	Log	Auto-reestablish connections	Ether Net/IP
	EtherNet/IP Scanner I/O Mapping		
	EtherNet/IP Scanner IEC Objects		
	Status		
	Information		

Figure 4 - 77: EtherNet/IP Scanner General tab

Project	Description
Auto re-establish connections	When a timeout or error occurs, it will automatically reconnect.

EtherNet/IP Scanner I/O Map tab

_	EtherNet_IP_Scanner X			
	General	Bus Cycle Options Bus cycle task	ENIPScannerIOTask V	
	Log			
	EtherNet/IP Scanner I/O Mapping			
	EtherNet/IP Scanner IEC Objects			
	Status			
	Information			

Figure 4 - 78: EtherNet/IP Scanner I/O Map tab

Project	Description		
	Select bus cycle task.		
Bus cycle task	For more information about bus cycle tasks, please refer to AX-3 Operation Manual: "PLC Settings".		

EtherNet/IP Scanner IEC Object tab

This tab displays the definition status of EtherNet/IP devices. User can know the running status from the status.

EtherNet_IP_Scanner X							
General	🕂 Add 📝 Edit 🗙 Delete 😁 Go to Variable						
Log	Variable	Mapping	Type IoDrvEtherNetIP				
EtherNet/IP Scanner I/O Mapping							
EtherNet/IP Scanner IEC Objects							
Status							
Information							

Figure 4 - 79: EtherNet/IP Scanner IEC Object tab

4.2.6.2 EtherNet/IP Remote Adapter

AX-308E supports EtherNet/IP remote adapter function. Right-click on the *EtherNetIP Scanner node* > *Add Device* > *Fieldbus* > *EtherNetIP* > *EtherNet/IP Remote Adapter.*

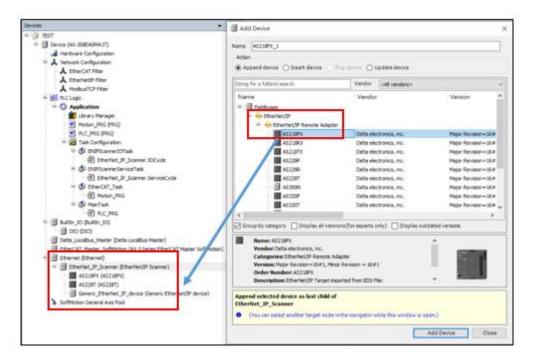


Figure 4 - 80: Add EtherNet/IP Remote Adapter

If user want to use a third-party EtherNet/IP remote adapter, please go to *Tools* > *Device Library* > Import the EtherNet/IP standard EDS file, and then add it in the *Add Device window*.

EtherNet/IP Remote Adapter General Tab

EtherNet_IP_Scanner	AS218PX X	
General	Address Settings	
Connections	IP address 192 . 168 . 0 . 2	EtherNet/IP [*]
Assemblies		
User-Defined Parameters	Electronic Keying	
Log	O Compatibility check	
EtherNet/IP I/O Mapping	Strict identity check	
EtherNet/IP IEC Objects	 ✓ Check device type 14 ✓ Check vendor ID 799 	
Status	Check product code 532	
Information	Check major revision	
	Check minor revision 1	
	Restore Default Values	

Figure 4 - 81: EtherNet/IP Remote Adapter General Tab

Project	Description			
Address Settings – IP Address	EtherNet/IP remote adapter IP Address			
Electronic keying				
Keying Options- Compatibility check	Start: The adapter performs a compatibility check on its EDS file. All key values will be sent to the device. The device decides whether it is compatible with the received value.			
Keying options- Strict identity check	The adapter performs a compatibility check on its own EDS file. The user decides which keying information should be checked. If the check fails, no I/O connection with the device will be established, and an error message will be posted on the status page.			
Check device type	Check device type			
Check vendor ID	Check supplier code			
Check product code	Check product code			
Check major revision	Check major revisions			
Check minor revision	Check minor revisions			
Restore Default values	Restore preset values for general equipment			

EtherNet/IP Remote Adapter Connection Tab

The top of this setting screen displays a list of all configured connections. If there is an *exclusive owner* connection in the EDS file, it will be automatically inserted when adding a device. The configuration data of these connections can be modified at the bottom of the screen.

neral	Connection Name	RPI (ms)	O>T Size (Bytes)	T>0	Size (Bytes)	Proxy Config	Size (Bytes)	Target C	Config Size (Bytes)	Connec
nnections	- 1. Connection 1	10	200	200				16	;;;;;	20 04 24
semblies										
er-Defined Parameters										
g										
nerNet/IP I/O Mapping										
ierNet/IP IEC Objects										
nerNet/IP IEC Objects										
atus	<									;
	 Add Connection Configuration Data Raw data value 			Connection					Defz	
atus	Add Connection			Connection	 Data Type	Minimum	Maximum	Default	Defa Help String	
atus	Add Connection Configuration Data Raw data value Parameters S - Connection1	s 🗹 Show Para	neter Groups			Minimum	Maximum	Default		
tus	Add Connection Configuration Data Raw data value Parameters Connection1 C Target Co	s 🗹 Show Para	neter Groups Value			Minimum	Maximum	Default 0		
us	Add Connection Configuration Data Configuration Data Raw data value Parameters Connection1 Contaction1 Con1_Con1_	s 🗹 Show Paran	value		Data Type				Help String	
us	Add Connection Configuration Data Configuration Data Raw data value Parameters Connection1 Con1 Con1 Con1 Con1	s 🗹 Show Para nfig data Input DeviceTyp	e D ntity 200		Data Type	0	3	0	Help String	
us	Add Connection Configuration Data Configuration Data Raw data value Parameters Connection1 Con1 Con1 Con1 Con1	s Show Para nfig data Input DeviceTyp Input DeviceQua Input DeviceInde	e D ntity 200		Data Type UINT UINT	0	3	0 200	Help String New Help String New Help String	
us	Add Connection Configuration Data Configuration Data Raw data value Parameters Connection1 Conn1 Co	s Show Para nfig data Input DeviceTyp Input DeviceQua Input DeviceInde	e D ntity 200 o 0		Data Type UINT UINT INT	0	3 200	0 200 1000	Help String New Help String New Help String New Help String	
tus	Add Connection Configuration Data Configuration Data Raw data value Parameters Connection1 Target Co Conn1 Conn	nfig data Input DeviceTyp Input DeviceInde Input DeviceInde	e D ntity 200 ex 1000 o pe D		Data Type UINT UINT INT INT	0 0	3 200 0	0 200 1000 0	New Help String New Help String New Help String New Help String New Help String	aults
itus	Add Connection Configuration Data Configuration Data Raw data value Parameters Connection1 Con1 Con1 Con1 Con1 Con1 Con1 Con1 C	s ☑ Show Parad Input DeviceTyp Input DeviceTyp Input DeviceInde d_0 Output DeviceTy	e D ntity 200 ex 1000 pe D nantity 200		Data Type UINT UINT INT UINT UINT	0 0 0 0	3 200 0 3	0 200 1000 0 0	Help String New Help String New Help String New Help String New Help String New Help String	

Figure 4 - 82: EtherNet/IP Remote Adapter Connection Tab

The configurable data will be defined in the EDS file and transmitted when the connection with the adapter is opened.

Project	Description
Connection name	Connection name
RPI (ms)	Requested packet interval: the exchange interval of input/output data
$O \rightarrow T$ size (Bytes)	The size of producer data from scanner to adapter (Originator \rightarrow Target)
$T \rightarrow O \text{ size}(Bytes)$	Consumer data size from adapter to scanner

Project	Description
	$(Target \rightarrow Originator)$
Proxy Config size (Bytes)	The size of the proxy configuration data
Target Config size (Bytes)	Target configuration data size
Connection path	The connection path data is represented as: address- configuration object-input object-output object
Add connection	Open the "New Connection" dialog box. Determine the parameters of the new connection here.
Delete connection	Remove the selected connection from the list
Edit connection	Open the Edit Connection dialog box. The parameters of the existing connection are modified here

• Add connection: Click Add Connection, the following dialog box will display, which contains the parameters of the new connection.

New Connection				
Generic connection (f	reely configurable)			ОК
Predefined connectio				
Choice of Connection	(2001110)			Cancel
Connection Name	O>T Size (Bytes)	T>O Size (Bytes)	Proxy Config Size (Bytes)	Tai ^
Connection2	200	200	····· · · · · · · · · · · · · · · · ·	16
Connection3	200	200		16
Connection4	200	200		16
Connection5	200	200		16
Connection6	200	200		16
Connection7	200	200		16
Connection8	200	200		16 🗸
<				>
	20 04 24 81 2C 66 2C 67 Cyclic ~	RPI (ms)	20	
Transport type	Exclusive owner	Timeout multip	lier 4 \vee	
Scanner to Target (Out	put)	Target to Scanne	r (Input)	
0>T size (bytes) Proxy config size (by Target config size (by		T>0 size (by	200 200	
Connection type	Point to Point	Connection typ	e Multicast	\sim
Connection Priority	Scheduled \checkmark	Connectionprio	ority Scheduled	~
Fixed/Variable	Fixed	Fixed/Variable	Fixed	
Transfer format	32-bit run/idle	Transfer forma	t Pure data	
Inhibit time (ms)	0	Inhibit time (m	s) 0 🗘	

Figure 4 - 83: Add Connection Screen

• **Generic connection** (free configuration): The dialog contains the parameters of the new connection.

New Connection		100					
Generic connection (h	reely configurable)						OK
Predefined connectio	n (EDS file)						Cancel
Connection Path Setting	s						-
O Automatically ger	ierated path						
Configuration	assembly						
Class ID: 16	z-4 Instan	ce ID: 16# 0	Attribute ID: 16#3				
Consuming a	sembly (0->T)						
Class ID: 16	4 Instan	ce ID: 16# 0	Attribute ID: 16≠3				
Producing est	embly (T->0)						
Class ID: 16		ce ID: 16# 0	Attribute ID: 16#3				
User-defined path							
O Path defined by s							
0							
General Parameters							
Connection Path	20 04 24 81 2C 66 2	C 67					
Trigger type	Cyclic		RPI (ms)	20	•		
and the second	exection repairs	*	and the second second				
Transport type	Exclusive owner	¥.	Timeout multiplier	4	¥		
Scanner to Target (Outp	xut)		Target to Scanner (Inp	ut)			
0>T size (bytes)	200	- 1 I	T>0 size (bytes)	200			
Proxy config size (by		_	C. C. C. Sant Geltung			_	
		_					
Target config size (b)	(tes) 16						
Connection type	Point to Point	÷	Connection type	Multicast		÷.	
Connection Priority	Scheduled	÷	Connection priority	Scheduled		Ŷ	
Fixed/Variable	Fixed	~	Fixed/Variable	Fixed		~	
Transfer format	32-bit run/idle	~	Transfer format	Pure data		~	
Inhibit time (ms)	0 2		Inhibit time (ms)	0	4		

Figure 4 - 84: Universal Connection (Free configuration)

Project	Description
	Connection Path
Automatically generated path	The connection path is automatically generated based on the combined configuration, combined consumption and combined production values.
User-definied path	The connection path is manually specified in the corresponding input field.
Connection Path	The path is specified by the symbolic name. NOTE : The connection path setting must support symbolic connection path.

Project	Description					
General parameters						
Connection path	The connection path is used to address one or more objects in the adapter that provide input data and receive output and configuration data. NOTE : The connection path is set to a custom path.					
Path defined by symbolic name	Use ANSI strings instead of ordinary connection paths. For the allowed ANSI strings, please refer to the corresponding EtherNet / IP adapter manual. NOTE : The connection path is set as the connection label.					
Trigger type	 Cyclic: periodically exchange data at intervals set by RPI. Status change: After changing the scanner output or adapter input, data will be exchanged automatically. Application: Not implemented 					
Transport type	For details, please refer to the CIP specification.					
RPI (ms)	The time interval (in milliseconds) at which the transmitting application requests data to be transmitted to the target application. The value must be a multiple of the bus cycle task.					
Timeout multiplier	If the device fails, there will be a time delay (RPI *timeout multiplier) before the device status switches to <i>error</i> .					

• **Pre-defined connection (EDS file**): Use this option to use the existing connection in the EDS file, and the user can change the configuration data defined in the EDS file.

Generic connection (fr Predefined connection							OK
hoice of Connection	n (cos	(me)					Cancel
Connection Name		O>T Size (Bytes)	T>O Size (Bytes)	Proxy Config Size (Bytes)	Ta	^	
Connection2		200	200		16		
Connection3		200	200		16		
Connection4		200	200		16		
Connection5		200	200		16		
Connection6		200	200		16		
Connection7		200	200		16	1	
Connection8		200	200		16	¥	
<					>		
		4 81 2C 66 2C 67					
Trigger type	Cyclic	~	RPI (ms)	20			
Trigger type	Cyclic		RPI (ms) Timeout multipli				
Trigger type (Transport type E	Cyclic Exclusiv	~		ler 4 v]		
Trigger type (Transport type E	Cyclic Exclusiv out)	~	Timeout multipli	er 4 🗸			
Trigger type	Cyclic Exclusiv out)	ve owner	Timeout multipli	er 4 🗸		ľ	
Trigger type [Transport type E Scanner to Target (Outp 0>T size (bytes)	Cyclic Exclusiv out) tes)	ve owner	Timeout multipli	er 4 🗸			
Trigger type (Transport type E Scanner to Target (Outp O>T size (bytes) Proxy config size (byt	Cyclic Exclusiv put) tes) vtes)	ve owner	Timeout multipli	(Input) (s) 200			
Trigger type (Transport type E Scanner to Target (Outp O->T size (bytes) Proxy config size (byt Target config size (by	Cyclic Exclusiv xut) tes) (tes)	ve owner	Timeout multipli Target to Scanner T>O size (byte	er 4 ~ (Input) ts) 200			
Trigger type Transport type Econner to Target (Outp O>T size (bytes) Proxy config size (byt Target config size (byt Connection type	Cyclic Exclusiv xut) tes) (tes)	ve owner	Timeout multipli	er 4 ~ (Input) ts) 200			
Trigger type (Transport type E Scanner to Target (Outp O>T size (bytes) Proxy config size (byt Target config size (byt Connection type Connection Priority	Cyclic Exclusiv xut) (tes) (tes) Sche Fixed	ve owner	Timeout multipli	er 4 ~ (Input) es) 200 Multicast rity Scheduled Fixed			

Figure 4 - 85: Predefined Connection (EDS file)

Project	Description				
	Scanner to Target (Output)				
$O \rightarrow T size (Bytes)$	The size of producer data from scanner to adapter (Originator \rightarrow Target)				
Proxy Config size (Bytes)	The size of the proxy configuration data				
Target config size (Bytes)	Target configuration data size				
Connection Type	 Empty: no network connection is established. Multicast: The network connection has been established. Connection data can be received by multiple user. Point-to-point: A network connection has been established. Connection data can only be received by one user. 				

Project	Description
Connection Priority	Using two scanners with different priorities for a target may cause conflicts. Adjusting the connection priority can solve this problem.
Fixed/variable	For detailed information on parameters, see CIP specifications.
Transfer format	Conversion format
Inhibit time	Prohibited time
Heartbeat multiplier	Extend the time interval for the scanner to send heartbeat messages to the adapter. This value is multiplied by the RPI value. Example: RPI = 10ms, and heartbeat multiplier = 10 causes a message to be sent every 100ms.
	NOTE : The transmission format is Heartbeat
	Target to Scanner (Input)
$T \rightarrow O$ Size (bytes)	Consumer data size from adapter to scanner (Target – > Originator)
Connection Type	 Empty: No network connection established. Multicast: A network connection has been established. Connection data can be received by multiple user. Point-to-point: A network connection has been established. Connection data can only be received by one user.
Connection Priority	Using two scanners with different priorities for a target may cause conflicts. Adjusting the connection priority can solve this problem.
Fixed/variable	Fixed/variable
Transfer format	Conversion format
Inhibit time	Prohibited time

• Configuration data

On the connection page, under the configuration data, the connection with the configuration parameters in the EDS file is displayed. The connections are subdivided into configuration groups.

Project	Description
	If scaling parameters are defined for the data in the EDS file, the value can be displayed as raw data or converted data.
Raw data value	 Startup: Display data without any conversion. For the Enum data type, the index of the enumeration value will be displayed.
	 Not started: Display data and convert. For the Enum data type, the enumeration value will be displayed.
Display parameter group	Display parameter group
default	Set as default
value	Double-click to change the value. According to the data type, user can specify the value directly in the input field, or user can select from the drop-down list.

Component Tab

The upper half of the screen on this tab displays a list of all configured connections. After selecting the connection, the relevant data configuration will be displayed in the lower part of the screen.

General	Connections								
Connections	Connection Name	O>T Size (Bytes) T>O Si:	ze (Bytes)	Prox	y Config Size (Bytes)	Target Config Size	(Bytes)	
ssemblies	- 1. Connection 1	200	200				16		
Iser-Defined Parameters									
	Output Assembly "Inpu					Input Assembly "Output Add × Delete		In the Design	
og	Add X Delete	☆ Move Up ♣ I	Move Down						_
therNet/IP I/O Mapping	Name	Data Type	Bit Length	Help Strir	^	Name	Data Type	Bit Length	Help Stri 1
	Register	UINT	16	New Help S		Register	UINT	16	New Help :
herNet/IP IEC Objects	Input Data_Param	BYTE	8			Output Data_Parar	n1 BYTE	8	
	Input Data_Param	BYTE	8			- Output Data_Parar	n2 BYTE	8	
atus	Input Data_Param	BYTE	8			- Output Data_Parar	n3 BYTE	8	
	Input Data_Param	BYTE	8			- Output Data_Parar	n4 BYTE	8	
formation	Input Data_Param	BYTE	8			- Output Data_Parar	n5 BYTE	8	
	Input Data_Paramé	BYTE	8			Output Data_Parar	n6 BYTE	8	
	Input Data_Param	BYTE	8			Output Data_Parar	n7 BYTE	8	
	Input Data_Param8	BYTE	8			Output Data_Parar	n8 BYTE	8	
	Input Data_Params	BYTE	8			Output Data_Parar	n9 BYTE	8	
	Input Data_Param	0 BYTE	8			Output Data_Parar	n10 BYTE	8	
	Input Data_Param	1 BYTE	8			- Output Data_Parar	n11 BYTE	8	
	Input Data_Param	2 BYTE	8			- Output Data_Parar	n12 BYTE	8	
	Input Data_Param	3 BYTE	8			Output Data_Parar	n13 BYTE	8	
	Input Data_Param	4 BYTE	8			- Output Data_Parar	n14 BYTE	8	
	Input Data_Param	5 BYTE	8			 Output Data_Parar 	n15 BYTE	8	
	Input Data_Param	6 BYTE	8			- Output Data_Parar	n16 BYTE	8	
	Input Data_Param	7 BYTE	8			- Output Data_Parar	n17 BYTE	8	
	Input Data_Param	8 BYTE	8			Output Data_Parar	n18 BYTE	8	
	Input Data_Param	9 BYTE	8			Output Data_Parar	n19 BYTE	8	
	Input Data_Param	0 BYTE	8			- Output Data_Parar	n20 BYTE	8	
	Input Data_Param	1 BYTE	8			- Output Data_Parar	n21 BYTE	8	
	Input Data_Param	2 BYTE	8		~	Output Data_Parar	n22 BYTE	8	

Figure 4 - 86: EtherNet/IP Remote Adapter Component Tab

• Output component Input Data / Input Component Output Data

Project	Description
Add	Open the select parameter dialog box, select the parameter to be added.
Delete	Delete selected parameter.
Move Up/Move Down	Move the selected parameter up/down in the list, the order in the list determines the order in the I/O mapping.
Name/Data Type/ Bit Length/Help String	These values can be changed by double-clicking on the text field.

• Export/Import Components>Add > Select parameter window

ame	Class	Instance	Attribute	Туре	Minimum	Maximum	Default	Unit	
Size	15	3	1	UINT	2	400	2		
Conn1_Input DeviceType	15	12	1	UINT	0	3	0		
Conn1_Input DeviceIndex	15	13	1	INT			1000		
Conn1_Input DeviceQuantity	15	14	1	UINT	0	200	200		
Conn1_Output DeviceType	15	15	1	UINT	0	3	0		
Conn1_Output DeviceIndex	15	16	1	INT			0		
Conn1_Output DeviceQuantity	15	17	1	UINT	0	200	200		
IO data size	15	18	1	UINT	0	200	200		
Conn2_Input DeviceType	15	19	1	UINT	0	3	0		
Conn2_Input DeviceIndex	15	20	1	INT			1100		
Conn2_Input DeviceQuantity	15	21	1	UINT	0	200	200		
Conn2_Output DeviceType	15	22	1	UINT	0	3	0		
Conn2_Output DeviceIndex	15	23	1	INT			100		
Conn2_Output DeviceQuantity	15	24	1	UINT	0	200	200		
Conn3_Input DeviceType	15	25	1	UINT	0	3	0		
Conn3_Input DeviceIndex	15	26	1	INT			1200		
Conn3_Input DeviceQuantity	15	27	1	UINT	0	200	200		
Conn3_Output DeviceType	15	28	1	UINT	0	3	0		
Conn3_Output DeviceIndex	15	29	1	INT			200		
Show parameter groups	Gen Data typ	eric parameter				200			O Car

Figure 4 - 87: Select Parameters

Project	Description
Show parameter groups	 Start: This dialog box displays all parameters in the EDS file according to the group.

Project	Description
	 Not activated: This dialog box displays all parameters in the EDS file according to the structure.
	By clicking <i>OK</i> , user can select each parameter in this list and add it to the parts list.
Generic parameters	User can add common parameters and edit the values of the parameters.

User parameters tab

This tab shows all other parameters that are only transferred to the bus system during the phase of the startup process assigned to it. When the connection is reestablished (for example, after the remote adapter fails), the user parameters will be sent again.

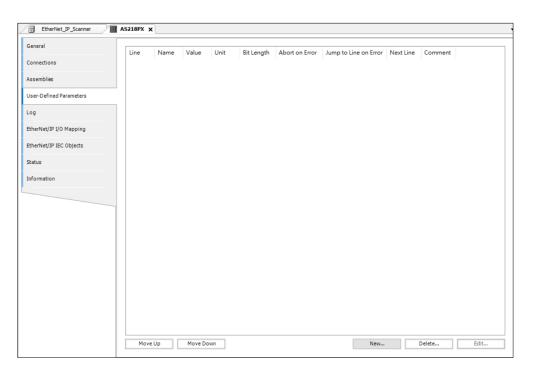


Figure 4 - 88: EtherNet/IP Remote Adapter user Parameters Tab

Project	Description
New	Open the Select Parameters dialog to add new parameters. The new parameter will be inserted in front of the selected row.

Project	Description
Delete	Select the parameter to be deleted to delete
Edit	Open the <i>Select Parameters</i> dialog to change existing parameters.
Move up/Move Down	Change the order of user parameters. The order of the parameters in the list corresponds to the order of initialization.
Value	User can directly change the value of the corresponding parameter by double-clicking the value.
Abort on error	Start: When an error occurs, the complete transmission of parameters is aborted.
Jump to the line on Error	When an error occurs, the program will continue from the line specified in the <i>Next Line</i> column. Therefore, complete blocks can be skipped during initialization, or a return can be defined.
	NOTE : If user can never write a specific parameter, returning will result in an infinite loop.

4.2.6.3 EtherNet/IP Local Adapter

AX-3 series supports EtherNet/IP local adapter function. Right-click on the *EtherNet* node > Add Device > Fieldbus > EtherNet/IP Local Adapter > Delta EtherNet/IP Adapter.

Devices – 4 X	Add Device		
PLC Logic Application DeltaAxisGroup	Name EtherNet_IP_Scanner_1		
Dibrary Manager Minoton_PRG (PRG) Dic_PRG (PRG)	Action Append device O Insert device O Plug o	device O Update device	
Task Configuration	String for a fulltext search	Vendor <all vendors=""></all>	~
BNIPScannerIOTask EtherNet_IP_Scanner.IOCycle Set ENIPScannerServiceTask EtherNet_IP_Scanner.ServiceCycle Set EtherCAT_Task	Name	Vendor Delta electronics, inc. 35 - Smart Software Solutions GmbH	Version ^ 1.0.0.0 3.5.15.20
Motion_PRG MainTask PLC_PRG Motion_IO Delta LocalBus Master	Comp by category Display all versions (3S - Smart Software Solutions GmbH	3.5.15.20
	Name: EtherNet/IP Scanner Vendor: 35 - Smart Software Solutions Gr Categories: EtherNet/IP Scanner Version: 3.5.15.20 Order Number: 1 Description: EtherNet/IP Scanner	mbH	N
SoftMotion General Axis Pool SM_Drive_Virtual (SM_Drive_Virtual) SM_Drive_Virtual_1 (SM_Drive_Virtual)	Append selected device as last child of Ethernet (You can select another target node in the	navigator while this window is open.)	
C Devices POUs		Add Device	Close
Messages - Total 0 error(s), 0 warning(s), 2 message(s)			Last bui

Figure 4 - 89: EtherNet/IP Local adapter

Follow the procedure to set the AX-3 series adapter:

1. Right-click on Add device> Fieldbus > EtherNetIP Module > Delta EtherNetIP Module.

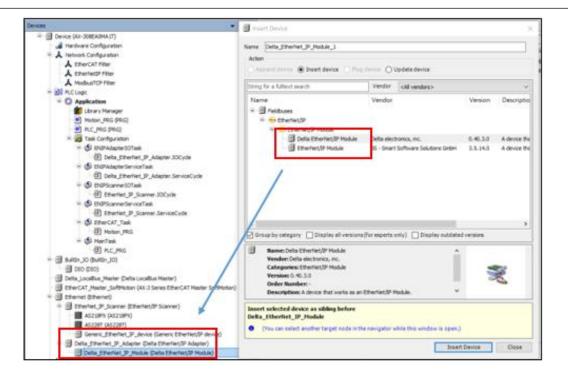


Figure 4 - 90: AX-308E Adapter settings

 Repeat the previous step to add 2 Delta EtherNet/IP Modules and change the names to IN and OUT.(Right-click Delta EtherNet/IP Module> Properties> Modify the name in the General tab).

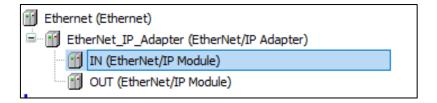


Figure 4 - 91: Add Delta EtherNet/IP Module

 Double-click on IN (Delta EtherNet/IP Module) > General tab > Module > Word Input Module.

General	Module Informat	ion	
EtherNet/IP Module IEC Objects	Module	Byte Input Module 🗸	EtherNet/IP [*]
		Byte Input Module	Ethenvel/IP
Status	Vendor name	Byte Output Module	
	Vendor name	Word Input Module Word Output Module	
Information	Vendor ID	DWord Input Module	
		DWord Output Module	
	Product name	Real Input Module	
	Product code	Real Output Module Big Input Module	
	Malananialan	Big Output Module	J
	Major revision	1	
	Minor revision	1	

Figure 4 - 92: Word Input Module

 EtherNet/IP Module I/O Mapping tab > Always update variables > Enabled 2 (always in bus cycle task).

General	Find		Filter Show	all			- 🕂 Add F	FB for IO Channel
EtherNet/IP Module I/O Mapping	Variable	Mapping	Channel Input Data	Address %IW0	Type WORD	Unit	Description	
EtherNet/IP Module IEC Objects	*		Bit0	%IX0.0	BOOL			
	* >		Bit1	%IX0.1	BOOL			
Status	* >		Bit2	%IX0.2	BOOL			
	*		Bit3	%IX0.3	BOOL			
Information	*		Bit4	%IX0.4	BOOL			
	*		Bit5	%IX0.5	BOOL			
	*		Bit6	%IX0.6	BOOL			
	- ···· *>		Bit7	%IX0.7	BOOL			
	*		Bit8	%IX1.0	BOOL			
	*		Bit9	%IX1.1	BOOL			
	*		Bit10	%IX1.2	BOOL			
	*		Bit11	%IX1.3	BOOL			
	No		Bit12	%IX1.4	BOOL			
	*		Bit13	%IX1.5	BOOL			
	*		Bit14	%IX1.6	BOOL			
	i 🍫		Bit15	%IX1.7	BOOL			
		Reset	Mapping	Always update	variables	Use pare	nt device setting	

Figure 4 - 93: EtherNet/IP Module I/O Map tab

5. Double-click on *OUT* (*EtherNet/IP Module*) > *General tab* > *Module* > *Word Output Module*.

General	Module Informat	tion	
EtherNet/IP Module IEC Objects	Module	Byte Input Module 🗸 🗸	EtherNet/IP
Status	Vendor name	Byte Input Module Byte Output Module Word Input Module	Ethenvet/IP
Information	Vendor ID	Word Output Module DWord Input Module DWord Output Module DWord Output Module	
	Product name	Real Input Module Real Output Module	
	Product code	Big Input Module Big Output Module	
	Majorrevision	1	
	Minor revision	1 *	

Figure 4 - 94: Word Output Module

 EtherNet/IP Module I/O Mapping > Always update variables > Enabled 2 (always in bus cycle task).

MUT X									
General	Find		Filter Show a				• ⊕ A	dd FB for IO Channel	Ţ
EtherNet/IP Module I/O Mapping	Variable	Mapping	Channel Output Data	Address %QW0	Type WORD	Unit	Description		
EtherNet/IP Module IEC Objects									
Status									
Information									
		Reset	Mapping	Always updat	evariables		arent device settir	-	~
	🍫 = Create new variable	~∳ = M	ap to existing va	riable		Enable	arent device settir ed 1 (use bus cycle ed 2 (always in bus	e task if not used in any ta	sk)

Figure 4 - 95: EtherNet/IP Module I/O Map tab

 Double-click EtherNet_IP_Adapter (EtherNet/IP Adapter) in the project tree to open the setting page. In the General tab, click Export EDS File... to export the EDS file to a third-party configuration environment.

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vices 👻 🕈 🗙	Delta_EtherNet_IP_Adapte	r X		
Delta_EtherNet_IP_Adapter.ServiceCyc A ENIPScannerIOTask	General	EDS File		
	Log Delta EtherNet/IP Adapter I/O Mapping Delta EtherNet/IP Adapter IEC Objects Status Information	Vendor name Vendor ID Product name Product code Major revision Minor revision Install to Device	Delta electronics, inc. 799 • AX-308EA0MAIT 16386 • 1 • 1 • e Repository Export EDS File	EtherNet/IP

Figure 4 - 96: Export EDS file

Delta EtherNet/IP Local adapter general tab

The local adapter displays the general information in the device description file, and the user can define this information to export the EDS file.

General	EDS File		
Log	Vendor name		EtherNet/IP
Delta EtherNet/IP Adapter I/O Mapping	Vendor ID	1	
Delta EtherNet/IP Adapter IEC Objects	Product name Product code	0	
Status	Major revision	1	
Information	Minorrevision	1	
	Install to Device	e Repository Export EDS File	2

Figure 4 - 97: EtherNet/IP Local adapter general tab

Project	Description			
Vendor name	Supplier name			
Vendor ID	Provided by ODVA Association			
Product name	EDS file name			
Product Code	Product Code			

Project	Description			
Major revision	Major revision			
Minor revision	Minor revision			
Install to Device Repository	If a device with the same device ID is already installed, it will ask if the device should be overwritten. If the device is plugged under the EtherNet/IP scanner as a remote adapter, user will be asked to update the device automatically.			
Export EDS file	The EDS file will be created and stored on the local computer. This can use EDS files in an external setting environment.			

EtherNet/IP Module General Tab

Supports modules of different data types. After setting multiple data type modules, return to the local adapter to output EDS files.

General	Module Information	tion	
EtherNet/IP Module IEC Objects	Module	Byte Input Module 🗸	EtherNet/IP
Status	Vendor name	Byte Input Module Byte Output Module Word Input Module	Etherivet/II
Information	Vendor ID	Word Output Module DWord Input Module DWord Output Module	
	Product name	Real Input Module Real Output Module	
	Product code	Big Input Module Big Output Module	
	Major revision		1
	Minor revision	1	

Figure 4 - 98: EtherNet/IP Module General Tab

4.2.7 High-Speed IO Setting

NOTE: This section does not apply to AX-300NA0PA1.

The following table is a comparison table of high-speed IO configurations:

	AX-324	AX-364EL/AX-308	Description		
DIO Configuration	\checkmark	\checkmark	AX-324 lacks a differential encoder.		
SSI	-	\checkmark	-		
Counter/Timer	6 groups	8 groups	AX-324 lacks a differential encoder.		
Capturer/Comparator	\checkmark	\checkmark	-		
Pulse output shaft	-	\checkmark	-		
Interrupt	\checkmark	\checkmark	AX-324 lacks Channels 16 & 17.		

4.2.7.1 High-speed IO setting (AX-364EL/AX-308)

4.2.7.1.1 BuiltIn IO: Hardware IO configuration

Click *BuiltIn_IO* from the device tree to configure hardware IO.

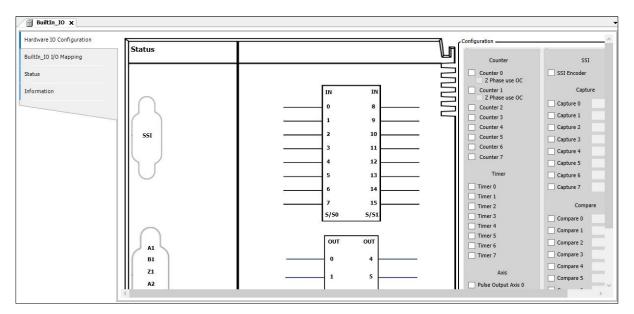


Figure 4 - 99: Hardware I/O Configuration

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Devices – 4 ×	DIO X							
7EST Device (AX-308EA0MA1T) Hardware Configuration	DIO Configuration Configuration							
A Network Configuration	DIO I/O Mapping	Interrupt		Port	Filter (0.01us)	Polarity		
	DIO I/O Mapping Status Information	 IN 0 IN 1 IN 2 IN 3 IN 4 IN 5 IN 6 IN 7 IN 8 IN 9 IN 10 IN 11 IN 12 		Port IN 0 IN 1 IN 2 IN 3 IN 4 IN 5 IN 6 IN 7 IN 8 IN 9 IN 10 IN 11 IN 12 IN 13 IN 14 IN 15 Encoder A1	Filter (0.01uc)	Polarity 1 1/2		
		IN 13		Encoder B1	100			
		IN 14	j f]ff	Encoder Z1	100			
		IN 15		Encoder A2	100			
		Encoder Z	ſŢŢŢ	Encoder B2	100	+F +V		
		Encoder Z	2	Encoder Z2	100	⊣⊦ ↓/		
				SSI DATA	100			

Figure 4 - 100: DIO Bookmark

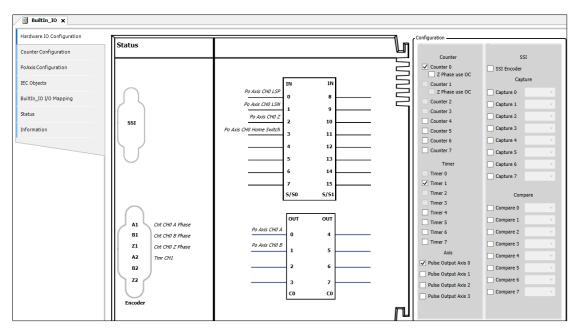


Figure 4 - 101: Counter

High-speed I/O on the host provides the following function settings:

• DIO: Can set interrupt, filter, polarity and other functions.

- SSI Encoder: Can set SSI encoding type, clock frequency, SSI data length and other functions.
- Counter: Can set high-speed counter variable and counting mode, whether Zphase signal is enabled or other functions or high-speed timer variable declaration.
- Capture/Compare: User can declare the Variables of the high-speed capture or high-speed comparators.
- Pulse Output: user can set the pulse output mode, direction, and origin return mode and parameters.

4.2.7.1.2 BuiltIn IO: SSI Encoder Configuration

The AX controller body supports a set of SSI encoder functions on the IO end. It is connected to the PLC through the D-SUB interface. This interface provides 5V power output for the encoder power. The parameters required by the encoder can be received through the hardware configuration channel.

1. SSI Encoder architecture.

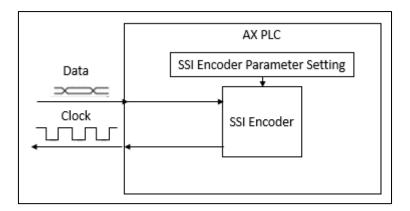


Figure 4 - 102: SSI Encoder Architecture

2. SSI Encoder function activated

In the *BuiltIn_IO* screen, click *SSI Encoder Configuration* and then select *SSI Encoder Configuration tab.*

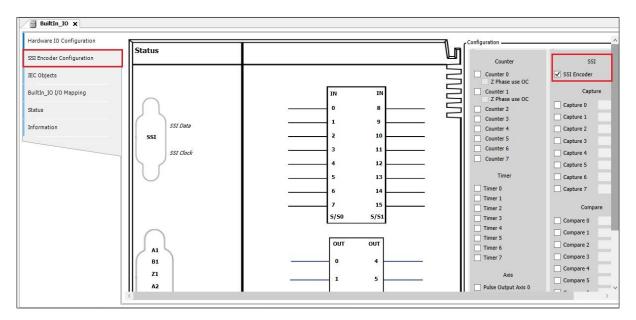


Figure 4 - 103: SSI Encoder Configuration

SSI related settings can be set in the *SSI Encoder Configuration* screen. The following explains the settings:

ardware IO Configuration	General
I Encoder Configuration	Clock Frequency Clock Pause Time
C Objects	
ultIn_IO I/O Mapping	
atus	
formation	Multi-Turn Data Single-Turn Data
	Encoder Type: Gray Code ~ Clock Frequency: 500
	2 Axis Standard Encoder Type: SSI Encoder
	Axis Type Axis Type
	Modulo: 360 ∯ [Unit] ○ Reverse On ○ Q
	Transmission Mechanism
	Mechanism Type Ball Screw Mechanism Setting (1) (2) (4) (1) (2) (4) (1) (2) (4) (1) (4) (1) (1) (4) (1)
	Gear Box
	(3) (2) Gear ratio numerator 1
	Gear Ratio = (3) Gear ratio denominator 1

Figure 4 - 104: SSI Encoder Configuration Tab

① General

Name	Features	Set value (default value)
Encoder Type	SSI Encoder type	Gray code/ Binary code (Gray code)

Name Features		Set value (default value)	
Clock Frequency	Frequency of the transmission clock signal used for SSI encoder communication (requires the SSI encoder data sheet as a reference)	(500)	
Single Turn Setting	Data length of single turn data (Need to use the SSI encoder data sheet as a reference)	(13)	
Multiple Turns Setting	Data length of multi-turn data (Need to use the SSI encoder data sheet as a reference)	(12)	
Clock Pause Time	After the last falling edge of the clock, the data line will remain low for a period of time until the data line is pulled high (Need to use the SSI encoder data sheet as a reference)	(80)	

2 Axis Standard

Name	Features	Set value (default value)
Encoder Type	Encoder type display	-

③ Axis Type

Name	Features	Set value (default value)
Linear Axis/ Rotary Axis	Set linear or rotary axis	Linear Axis Rotary Axis (Linear Axis)
Modulo	When the rotation axis is selected, the value of one rotation of the rotation axis can be set.	(360)

④ Positive/Negative Command

Name	Features
Reverse OFF/On	Set forward and reverse commands

⑤ Transmission Mechanism

The following are introduced for different architectures:

Ball Screw

Aechanism Type Ball Screw v (4)	Mechanism Setti (1) Command p	ng ulse per motor rotation: 1		[Pulse]
	(4) Pitch: 1	🛔 [Unit]		
(3)		(2) Gear ratio numerator	1	\$
	Gear Ratio =	(3) Gear ratio denominator	1	+

Figure 4 - 105: Transmission Mechanism – Ball screw Type

Legend	Features
(1)	Command pulse per motor rotation
(4)	Pitch
(2)	Gear ratio numerator
(3)	Gear ratio denominator

Round Table

Mechanism Type	(2)	× (4)		ng ulse per motor rotation: 1 Istance per motor rotation: 1) 🗣 (Pulse] [Unit]
	C ()	U;	Gear Box	(2) Gear ratio numerator	1	A.
v —	(3)		Gear Ratio =	(3) Gear ratio denominator	1	4

Figure 4 - 106: Transmission Mechanism – Round Table Type

Legend	Features
(1)	Command pulse per motor rotation
(4)	Movement distance per motor rotation
(2)	Gear ratio numerator
(3)	Gear ratio denominator

Belt Pully

Mechanism Type Belt Pully ×	(4) Diameter: 1	Ilse per motor rotation: 1		Pulse]
	Gear Box	nce per motor rotation: Diamete	r*n	
(3)	Gear Ratio =	(2) Gear ratio numerator	1	\$
	Geal Ratio =	(3) Gear ratio denominator	1	\$

Figure 4 - 107: Transmission Mechanism – Belt Pully Type

Legend	Features
(1)	Command pulse per motor rotation
(4)	Diameter (Movement distance per motor rotation: Diameter * n)
(2)	Gear ratio numerator
(3)	Gear ratio denominator

Follow the steps to set up SSI Encoder Mapping variable.

1. Right-click *BuiltIn_IO*, select *Edit IO Mapping*.

Devices	→ 쿠 X	/ 🖬 D
Chtitled 1	•	
Device (AX-308EA0MA1T)		Status
Hardware Configurat		Inform
Retwork Configuratio	n	Inform
A EtherCAT Filter		
PLC Logic		
Application		
PLC_PRG (PR		
- POU (PRG)		
Task Configu	ration	
🖻 🥩 EtherCA		
B PLC	PRG	
Delta_LocalBus_Mast	er (Delta LocalBus Master)	
EtherCAT_Master_So	ftMotion (EtherCAT Master SoftMotion)	
BuiltIn_IO (BuiltIn_IO		L
DIO (DIO)	ut	
SoftMotion General A		
	Paste	
	× Delete	
	Properties	
	Add Object	
	🚞 Add Folder	
	Insert Device	
	Disable Device	
	Update Device	
	ାଁ Edit Object	
	Edit Object with	
	Edit IO mapping	
	Import mappings from	
	Export mappings to C	7

Figure 4 - 108: Edit I/O Mapping

2. In the *Edit IO mapping* screen, click is to add variables

Edit IO mapping	<			
Find	F	ilter Show a	1	 Add FB for IO Channel
Variable	Channel	Address	Туре	Description
🖻 - 🚮 DIO				
😟 🔧	IN:0-7	%IB0	BYTE	8-CH Open Collector Input
18- * >	IN:8-15	%IB1	BYTE	8-CH Open Collector Input
😟 – 🍫	Encoder	%IB2	BYTE	2-CH of Incremental Encoder Input
😟 🦄	OLT 7	%QB0	BYTE	8-CH Open Collector Output
SSI_Encoder	10			
🍫	Encoder Position	%ID1	DINT	Encoder Current Position
L	ErrorID	%ID2	DWORD	ErrorID :No Error (0x0) / Error Communication (0x2501) / Wrong Parameter Setting (0x2502)

Figure 4 - 109: Adding Variable

Name	Content
Encoder Position	SSI Actual location

Name	Content
	SSI Encoder Communication status, the status is as follows:
ErrorID ^{*Note}	0 : No Error
	1 : Error Communication
	2 : Wrong Parameter Setting

NOTE:

• ErrorID :

ErrorID = 1 when SSI Encoder is not connected or the SSI Encoder is disconnected from the CPU.

When MultiTurns + SingleTurns is greater than 32, ErrorID = 2 The above error conditions will cause BusCycle to stop updating the EncoderPosition, and the EncoderPosition will maintain the previous value. The purpose is to prevent other slave axes from bouncing if the Encoder has a synchronously moving spindle.

• ErrorID Clear :

When the SSI Encoder is not connected or the SSI Encoder is disconnected from the CPU, Status Data = 1, BusCycle will stop updating, and the EncoderPosition will maintain the previous value. The purpose is to prevent other slave axes from occurring if the Encoder has a synchronously moving spindle beat:

Check the connection between the SSI Encoder and the CPU. After the correction, the firmware will determine that the connection communication channel is correct and the BusCycle's EncoderPosition update will resume. There may be many reasons for the error, such as: SSI Encoder not plugged in, SSI Encoder broken, Drive board Abnormal.

When MultiTurns + SingleTurns is greater than 32, Status Data = 2 : Download the parameters of MultiTurns + SingleTurns within 32.

• SSI Encoder Used in programs :

The encoder axis variable that comes with the SSI encoder device. This variable is used by the user's motion function block in the POU (**Example**: MC_CamIn).

1. *BuiltIn_IO* sceen, click the *IEC Objects* tab.

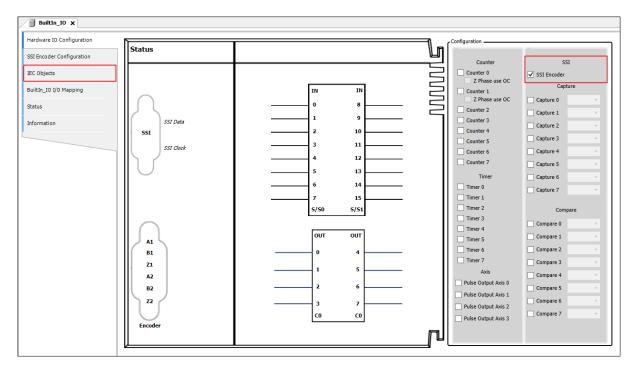


Figure 4 - 110: Hardware Configuration Window

2. *IEC Objects* in the picture: Is an example of configuration function, and *Encoder_Axis* must be filled in for the axis name used in the POU.

	[r		1)
Hardware IO Configuration	Variable	Туре	Configuration Function
	SSI_Encoder	DFB_SSI_ENCODER_REF	SSI Encoder
SSI Encoder Configuration	Encoder_Axis	DMC_ENCODER_AXIS_REF	SSI Encoder/FreeEncoder_Axis
IEC Objects			
Status			
Information			

Figure 4 - 111: IEC Objects Window

3. For the *MC_CamIn* function block in the POU, the source of the spindle can use SSI as the source. The input axis name is Encoder_Axis.

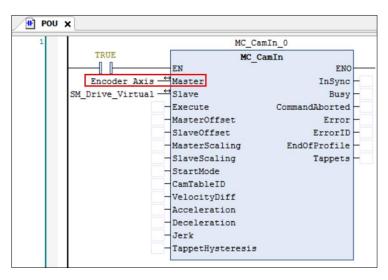


Figure 4 - 112: Encoder Axis

4.2.7.1.3 BuiltIn IO: Counter/timer configuration

The connection between AX-3 series and pulse encoder supports differential input (2 groups) and open collector input (56 groups) interfaces. The differential interface is connected to the PLC through the D-SUB15 interface. This interface has 2 sets of high-speed counting The (timer) device can count the pulse value or frequency of the (timer) encoder; the external encoder with open collector input needs to be connected through the Input point on the IO board. There are 6 sets of high-speed counter (timer) in this area to count (Timing) The pulse wave value or frequency of

the encoder, the user needs to check the pulse wave type encoder function to enable and set the parameters required by the encoder, and the encoder data can be received through the hardware configuration channel.

In this section, user can find the describtion of the pulse encoder function module of the body IO. The AX-308 supports up to 8 groups of high-speed counters and high-speed timers.

• High-speed counter (Cnt)

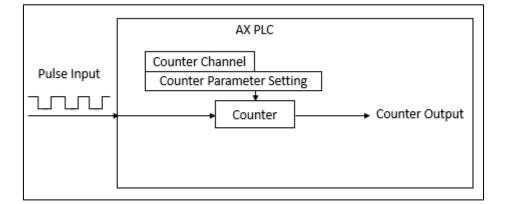


Figure 4 - 113: High-Speed Counter

- High-speed counting function is activated.
 - 1. In the *BuiltIn_IO* screen, there are 8 counters in total. Click *Counter 0* and then click *Counter Configuration*.

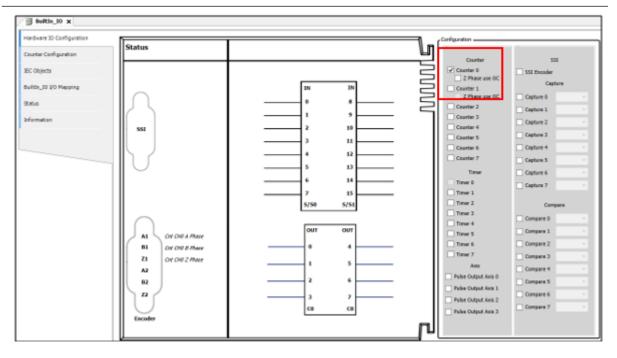


Figure 4 - 114: Activating Counter Configuration

2. See the *counter 0* page in the *counter configuration* screen .

Hardware IO Configuration Counter 0 Counter Mode Counter Mode						
Counter configuration			Counter Mode	Description		
IEC Objects				Clockwise Pulse		
Status		0	UD	Counter-clockwise Pulse		
Information						

Figure 4 - 115: Counter Configuration Window

3. Counter related settings can be set in the *Counter Configuration* screen. The following explains the settings:

ardware IO Configuration	Counter 0	1				
I Encoder Configuration	Counter	Mode				
ounter Configuration		Counter Mode			Description	
C Objects		UD	Clockwise Pulse Counter-clockwise Pulse			
illIn_IO I/O Mapping atus formation	0	PD	Pulse DirectionClockwise			Inter-clockwise
	•	AB	A-Phase Pulse			- <u> </u>
	0	4AB	A-Phase Pulse			f_t
] External Trigge	er i			
	Axis Ty ⓐ Line	er Type: Incre pe var Axis	emental Encoder	Reverse OFF	Positive Command	Negative Command
	Module	360	A [Unit]	O Reverse On	Con.	Go)
	Transmis	ssion Mechanism			ccw	CW
		hism Type Ball S		Mechanism Setti (1) Command p (4) Pitch: 1	ng ulse per motor rotation: 1	Territoria (Pulse)
	j j	CO	(3)	Gear Box	(2) Gear ratio numerator	1
				Gear Ratio =	(a) ocar rato numerator	· ·

Figure 4 - 116: Counter Configuration Setting

① Counter Mode

Name	Features
UD	Forward pulse train and reverse pulse train
PD	Pulse train + direction
AB	AB Phase pulse train
4AB	AB phase pulse train (4x)
External Trigger	Phase Z signal is enabled.

2 3 4 5 Software setting screen: refer to SSI Encoder Function Settings

Set Counter mapping variable

1. Right-click BuiltIn_IO and select Edit IO Mapping.

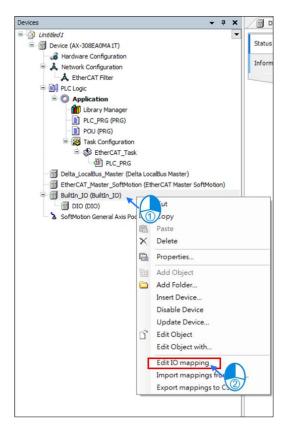


Figure 4 - 117: Setting Counter Mapping Variable

2. In the *Edit IO mapping* screen, click to add a new variable.

Edit IO mapping 🗙					
Find	Filter Sh	ow all		 Add FB for IO Channel 	
Variable	Channel	Address	Туре	Description	
🖃 🖷 BuiltIn_IO					
🖶 🚮 DIO					
🗎 🏘	IN:0-7	%IB0	BYTE	8-CH Open Collector Input	
🕸 🧤	IN:8-15	%IB1	BYTE	8-CH Open Collector Input	
🗎 🦄	Encoder	%IB2	BYTE	2-CH of Incremental Encoder Input	
🖻 - 🍫	OUT:0-7	%QB0	BYTE	8-CH Open Collector Output	
🖻 📲 Pulse_Encoder					
🖹 🛱 Counter_0					
	Counter	%ID2	DINT	Counter Value	

Figure 4 - 118: Edit I/O Mapping

• Counter Used in programs:

High-speed counter's own encoder axis variable. This variable is used by the user in the POU's motion function block.

1. In *BuiltIn_IO* screen, select the *IEC Objects* tab.

ardware IO Configuration					Configuration
Status				<u>l</u> ní	
Junter Configuration					Counter
C Objects					Counter 0 Z Phase use OC
uiltIn_IO I/O Mapping		IN	IN	2	Counter 1 Z Phase use OC
atus		0	8	- 5	Counter 2
formation		1	9	_	Counter 3
551		2	10		Counter 5
		3	11	23	Counter 6
			12		Counter 7
		5	13	-	Timer
		6	14		Timer 0
		7	15	_	Timer 1
		5/50	5/51		Timer 3
			5		Timer 4
	nt CH0 A Phase	τυο	оυт		Timer 5
	nt CHU A Phase Int CHU B Phase	0	4	_	Timer 7
Z1 C	Int CHO Z Phase	1	5		Axis
A2			,	-	Pulse Output Axis

Figure 4 - 119: IEC Window

2. In the *IEC Objects* tab, is an example of configuration function, and *Encoder_Axis* must be filled in for the axis name used in POU.

Hardware IO Configuration	Variable	Туре	Configuration Function 1
	Counter_0	DFB_COUNTER_REF	Counter 0
Counter Configuration	Encoder_Axis_1_1	DMC_ENCODER_AXIS_REF	Counter 0/FreeEncoder_Axis
IEC Objects	5		
BuiltIn_IO I/O Mapping			
Status			
Information			

Figure 4 - 120: BuiltIn_IO – IEC Objects Tab

3. In the POU for the *MC_GearIn* function block, the source of the spindle can use Counter as the source, and the entered axis name is Encoder_Axis.

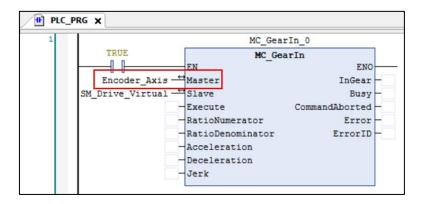


Figure 4 - 121: Encoder Axis

• High-speed timing (Tmr)

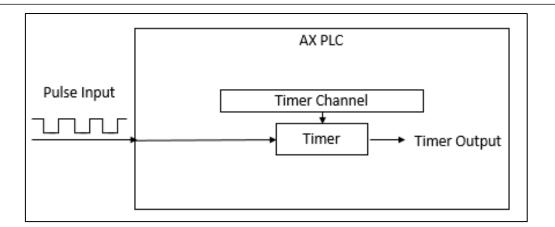


Figure 4 - 122: High-speed Timing

 Quick timer function activated: In the *BuiltIn_IO* screen, there are 8 groups of timers. Click *Timer 0*. Timer does not need to set the screen, so user can start it after selecting it. High-speed timer in AX series internal clock is 0.1µs.

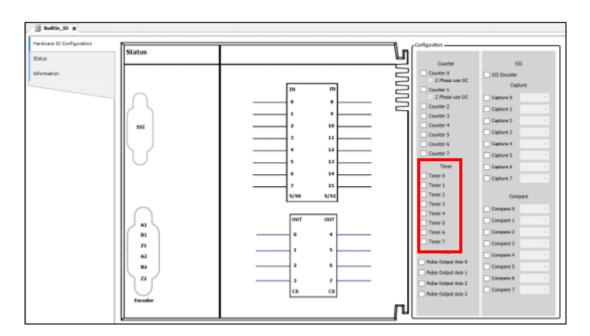


Figure 4 - 123: Timer

- Set Timer mapping variables
- 1. Right-click *BuiltIn_IO* and select *Edit IO Mapping*

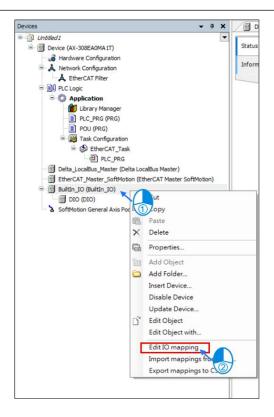


Figure 4 - 124: Edit I/O Mapping

2. In the *Edit IO Mapping* screen, click is to add a new variable.

Find	Filter S	how all		-	Add FB for IO Channel
Variable =- 🕤 BuiltIn_IO	Channel	Address	Туре	Description	
i - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	IN:0-7	%IB0	BYTE	8-CH Open Collector I	nput
	IN:8-15 Encoder	%IB1 %IB2	BYTE	8-CH Open Collector I 2-CH of Incremental E	
🗈 🐄	OUT:0-7	%QB0	BYTE	8-CH Open Collector C	
Pulse_Encoder	Timer Value	%ID1	DWORD	HSIO Timer Value	

Figure 4 - 125: Set timer mapping variables

Timer Used in programs: This variable is used by the user's motion function block in the POU.

1. In *BuiltIn_IO* screen, select the *IEC Objects* tab.

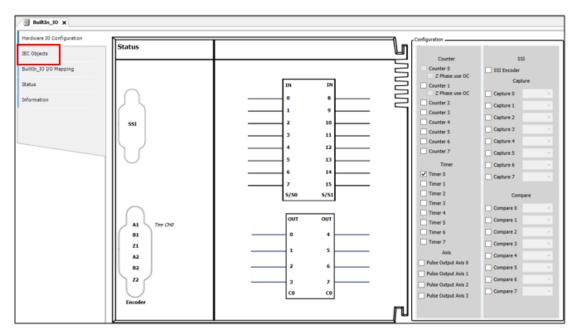


Figure 4 - 126: IEC Object window

 In the *IEC Objects* tab: The following is an example of configuration function, and *Timer_0* is required for the axis name used in the POU. the POU.

ardware IO Configuration	Variable	Туре	Configuration Function
EC Objects	Timer_0	DFB_TIMER_REF	Timer 0
tatus			
formation			

Figure 4 - 127: Setting timer

3. For the DFB_HTmr function block in the POU, enter the axis name as Timer_0.

POU 🗙	1		
1		DFB_H	Tmr_0
	TRUE	DFB 1	HTmr
	[]	EN	ENO
	Timer_0 -	Timer	bValid -
		bEnable	bBusy -
	_	TriggerMode	bError -
			ErrorID -
			dwTimerValue -

Figure 4 - 128: Entering Axis name

4.2.7.1.4 BuiltIn IO: Po axis configuration

This section describes the IO pulse wave output function module. It supports up to 4 sets of pulse wave output devices for Selection.

- Axis Function start
- 1. In the *BuiltIn_IO* screen, *Axis* has 4 axis pulse wave outputs, click one of them to start.

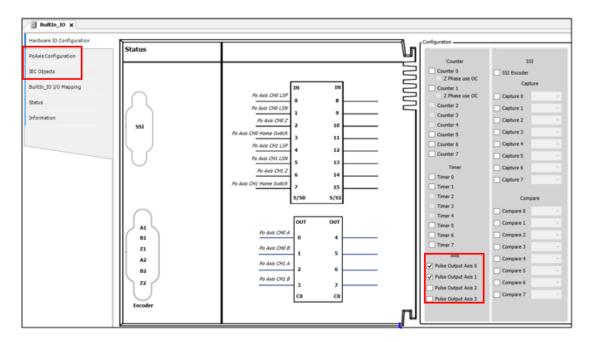


Figure 4 - 129: Selecting Pulse Output Axis

2. After starting Axis, click *PoAxis Configuration*.

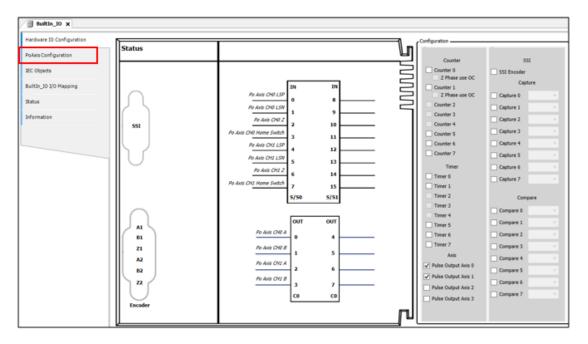


Figure 4 - 130: PoAxis Configuration

3. Click the Axis 0 tab after the PoAxis Configuration setting.

lode Set	*		Axis Type and Li	CHI W
	Positive Command	Negative Command	Linear Axis Rotary Axis	Linear Axis Software Limits
) Reverse OFF	Con.	62		Negative [u]: 0 + Positive [u]: 1000 + Rotary Axis Modulo Setting
	cow	cw	Motion Paramet	
Reverse On	(d)	(0)	Quick Stop	Deceleration [u/s ²]: 1000
/ Reverse On	CW	ccw	Velocity Ramp Trapezoid	Type Sin ² Quadratic Quadratic(smooth)
(1)		(1) Com (4) Pitch	mand pulse per motor	rotation: 1 🗘 [Pulse] Unit]
	ČČ)	Gear Box	(2) Gear	ratio numerator
	(5)	Ge	ar Ratio = (3) Gear	r ratio denominator 1
ming Setting				
loming Mode Mo	de 1 v			
	no search for switch	🔹 [Unit/s]		
loming speed duri	ing search for switch o			

Figure 4 - 131: Axis0 Tab

4. The related settings of Axis can be set in the *Pulse Output Setting* screen:

Axis 0	
Pulse Output Setting Mode Setting	Axis Type and Limits
Mode A/B	v Virtual mode
	Linear Axis 3 Linear Axis Software Limits
	Positive Command Negative Command Rotary Axis Activated
	Negative [u]: 0
	Positive [u]: 1000
Reverse OFF	A Rotary Axis Modulo Setting
	Modulo value [u]: 360
	CCW CW
	Motion Parameter
1	(5) Error Reaction
O Reverse On	Quick Stop Deceleration [u/s ²]: 1000
O Reverse On	6 Velocity Ramp Type
	Trapezoid Sin ² Quadratic Quadratic(smooth)
	CW CCW
Transmission Mechan	nism
Mechanism Type	Ball Screw v Mechanism Setting
	(1) Command pulse per motor rotation: 1
	(2) (4) Pitch: 1 (Unit]
(1)	
Λ — Γ	
•	Gear Box
	(2) Gear ratio numerator
V	(3) Gear Ratio =
	(3) Gear ratio denominator 1
8 Homing Setting	
Homing Mode Mo	ode 1 V
Homing speed duri	ing search for switch 0 븆 [Unit/s]
Homing speed duri	ing search for z phase pulse 0
Homing Acceleratio	
Description	epending on the negative limit switch and Z pulse
Mode T. De	epending on the negative limit switch and 2 pulse
CASE 1 :	The homing instruction is executed when the negative limit switch is OFF and the axis moves in the
	negative direction at the first-phase speed (Homing speed during search for switch). The motion direction
	changes and the axis moves at the second-phase speed (Homing speed during search for Z phase
	pulse) when the axis encounters that the negative limit switch is ON. Where the first Z pulse is met is the
	home position when the negative limit switch is OFF.
CASE 2 :	The homing instruction is executed when the negative limit switch is ON and the axis moves in the
CHOE Z :	positive direction at the second-phase speed (Homing speed during search for Z phase pulse) . Where
	the first Z pulse is met is the home position when the negative limit switch is OFF.
	nn
	Start point
Cas	
	Positive direction
	Start point . Stop point
Cas	
1923 - N	
Z pu	JSE
Negative limit sw	ntch
<u>.</u>	

Figure 4 - 132: Mode Setting

① Mode Setting

Name	Features	Set value (default value)
Mode	Set output pulse type	CW/CCW Pulse and Direction (A/B)
Reverse On /Reverse OFF	Set pulse axis forward/reverse	Reverse On Reverse OFF (Reverse OFF)

^② Axis Type and Limits

Name	Features	Set value (default value)
Virtual mode	Start virtual axis	TRUE FALSE (FALSE)
Linear Axis/ Rotary Axis	Set linear or rotary axis	Linear Axis Rotary Axis (Linear Axis)

③ Linear Axis Software Limits

Name	Features	Set value (default value)
Activated	Start software limit (only supports linear axis)	TRUE/FALSE (FALSE)
Negative [u]	Reverse Software Limit	(0)
Positive [u]	Forward software limit	(1000)

④ Rotary Axis Modulo Setting

Name	Features	Set value (default value)
Modulo Value [u]	Set a circle range (only supports rotation axis)	(360)

⑤ Error Reaction

Name	Features	Set value (default value)
Quick Stop	Emergency stop	(360)
Deceleration [u/s ²]	Axis decelerating to stop (only effective when Quick Stop is not activated)	(10000)

6 Velocity Ramp Type

Name	Features	Set value (default value)
Trapezoid/Sin2/Quadratic/ Quadratic(Smooth)	Set axis motion curve	(Trapezoid)

⑦ Software setting screen: refer to SSI Encoder Function Settings

⑧ Homing Setting

Name	Features	Set value (default value)
Homing Mode	Set origin mode	(Mode 35)
Homing speed during search for switch	Set the homing switch speed	(100)
Homing speed during search for z phase pulse	Set Z-Seek Speed	(50)
Homing Acceleration	Origin speed	(1000)

• Pulse Axis Used in programs:

Pulse Axis is used in the POU. User need to use this variable in the motion function block in the POU.

1. Select *IEC Objects* in the *BuiltIn_IO* screen.

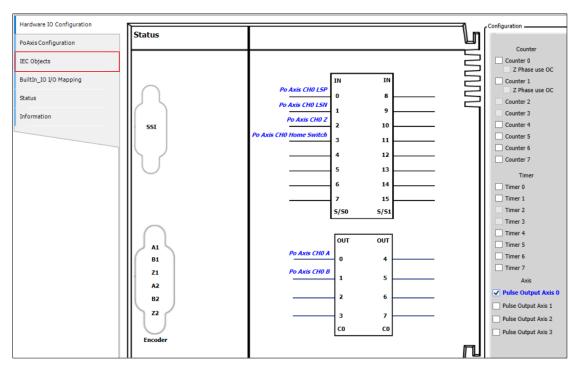


Figure 4 - 133: IEC Object window

In the *IEC Objects* screen, in the following IEC object screen is an example of configuration function. For the axis name used in the POU, *Pulse_Output_Axis_0* should be filled in.

BuiltIn_IO X			0
Hardware IO Configuration	Variable	Туре	Configuration Function
PoAxis Configuration	Pulse_Output_Axis_0	DMC_PULSE_AXIS_REF	Pulse Output Axis 0
IEC Objects			
Status			
Information			

Figure 4 - 134: Selecting Pulse_Output_Axis_0

 In the POU for the *MC_Power* function block, the input axis name is Pulse_Output_Axis_0.

1		1	MC_Power_0
	TRUE		MC Power
	[]	EN	ENO
	Pulse_Output_Axis_0 -	Axis	Status
		Enable	bRegulatorRealState
		bRegulatorOn	bDriveStartRealState
		bDriveStart	Busy
			Error
			ErrorID

Figure 4 - 135: Entering axis name

4.2.7.1.5 BuiltIn IO: IEC object

This section describes the high-speed counter comparator and capture function modules of the main body IO. The AX-3 series supports up to 8 sets of high-speed capturer and high-speed counter comparators.

• High-Speed Counter Capture

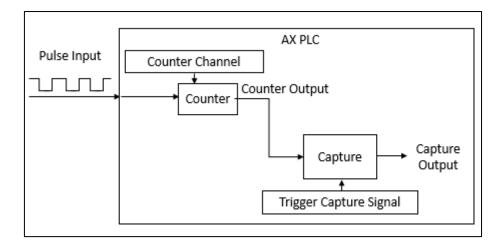


Figure 4 - 136: High-Speed Counter Capture

- Capture function is activated.
- 1. In the *BuiltIn_IO* screen, *Capture* has a total of 8 points, click one of them to start.

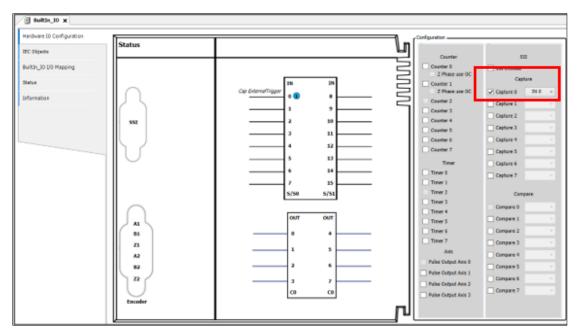


Figure 4 - 137: Capture

2. After launching *Capture*, click the drop-down menu to select the external trigger source.

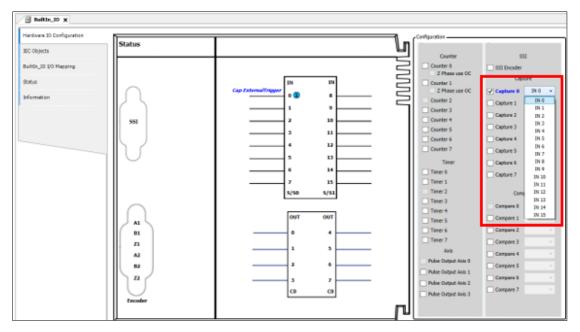


Figure 4 - 138: Capture drop-down menu

- *Capture* is used in the program: This variable is used by the user's motion function block in the POU.
- 1. Select *IEC Objects* in the *BuiltIn_IO* screen.

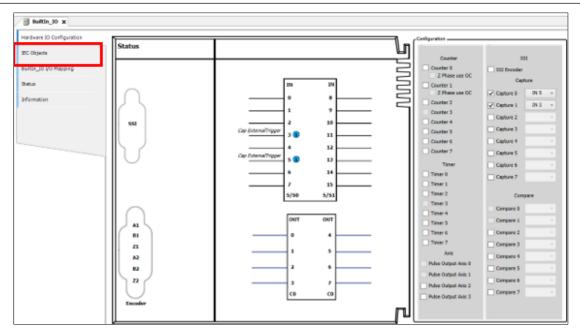


Figure 4 - 139: IEC Object

2. In the following *IEC Objects* screen, is an example of configuration function introduction, Capture_0 is required for the axis name used in POU.

Hardware IO Configuration	Variable	Туре	Configuration Function
IEC Objects	Capture_0	DFB_CAPTURE_REF	Capture 0
Status			
Information			

Figure 4 - 140: Using Capture_0 Axis Name

3. For the DFB_Capture function block in the POU, the axis name entered is Capture_0.

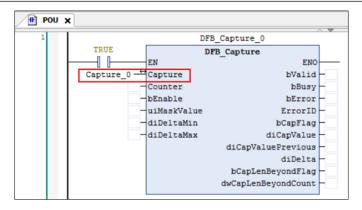


Figure 4 - 141: Entered Axis Name

• High-Speed Counting Comparator (Compare)

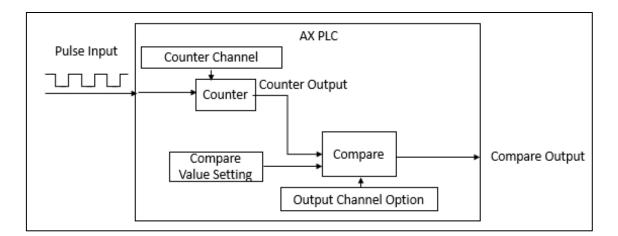


Figure 4 - 142: High speed Counting comparator

- Compare Function start
- 1. In the *BuiltIn_IO* screen, *Compare* has a total of 8 points, click one of them to start.

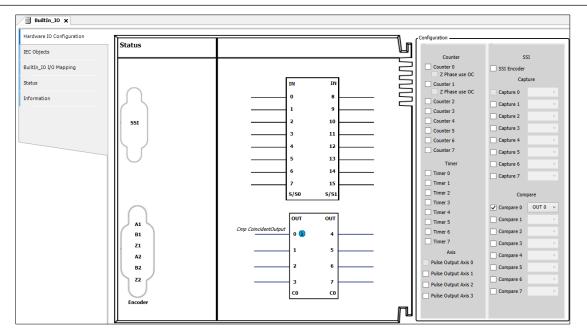


Figure 4 - 143: Compare

2. After clicking *Compare*, click the drop-down menu, select *Compare* to output the external contacts successfully.

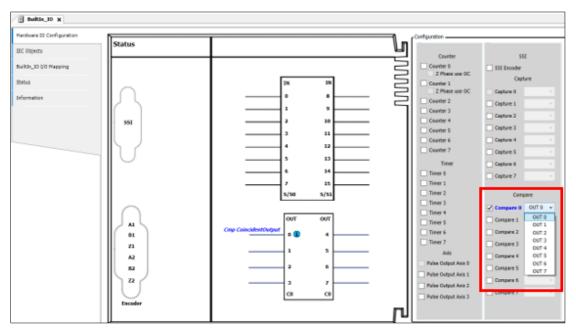


Figure 4 - 144: Compare pull-down menu

• Compare is used in the program :

This variable is used by the user's motion function block in the POU.

1. Select IEC Objects in the BuiltIn_IO screen.

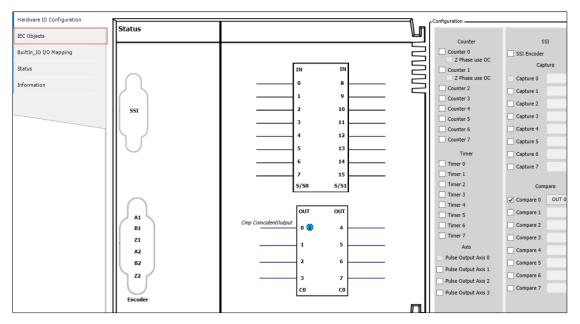


Figure 4 - 145: Select IEC Objects

 In the following *IEC Objects* screen, is an example of configuration function introduction, for the axis name used in the POU, user need to fill in Compare_0.

lardware IO Configuration	Variable	Туре	Configuration Function
EC Objects	Compare_0	DFB_COMPARE_REF	Compare 0
itatus			
nformation			

Figure 4 - 146: Enter the Axis name

3. For the DFB_Compare function block in the POU, enter the axis name as Compare_0.

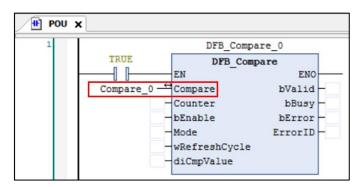


Figure 4 - 147: Axis name compare_0

4.2.7.1.6 DIO: DIO configuration

This section describes the DIO device, which sets the I/O points of the host to interrupt, filter, and polarity.

Double-click *DIO* to enter the setting screen.

res 🗸 🕈 🕹 🗸	DIO X						
See ENIPScannerIOTask A EtherNet_IP_Scanner.IC	DIO Configuration	Configuratio	n .	2	3	-4	1
ENIPScannerServiceTask	DIO I/O Mapping		Interrupt	Port	Filter (0.01us)	Polarity	
EtherCAT_Task	Status		f l fl	IN O	100	++ +/-	
MainTask	Information			IN 1	100	HF HF	
mdbsComTask				IN 2 IN 3	100 ×	++ +/- ++ -/-	
BuiltIn_IO (BuiltIn_IO)				IN 4	100		
Delta_LocalBus_Master (Delta LocalBos 1/2)	□ IN 4		IN 5	100	++ +/-	
EtherCAT_Master_SoftMotion (AX-3 Sen Ethernet (Ethernet)	/	IN 5		IN 6	100	4F -N-	
Delta_Modbus_TCP_Master (Delta M Delta_Modbus_TCP_Slave_Device (C		IN 6	f f	IN 7 IN 8	100 ×	++ +/- ++ -//-	
* EtherNet_IP_Scanner (EtherNet/IP S		🗌 IN 7	f , fl	IN 9	100		
Delta_EtherNet_IP_Adapter (Delta E Delta_Modbus COM (Delta Modbus COM		🗌 IN 8	f l fl	IN 10	100	HF H	
Delta_Modbus_COM_1 (Delta Modbus CC SoftMotion General Axis Pool		🗆 IN 9	<u>F</u>	IN 11	100	HF -N-	
AX_8xxEP0_Windows_Series (AX-8xxEP0 Wi		IN 10	J J JJ	IN 12 IN 13	100 ×	+F +/- +F -//-	
Hardware Configuration A Network Configuration		🗌 IN 11	J. I.	IN 14	100	H H H	
A EtherCAT Filter		🗌 IN 12	L L L	IN 15	100	+ F - M-	
PLC Logic O Application		IN 13	L L L	Encoder A1	100	HF -1/-	
evices POUs		🗌 IN 14	<u>f</u> ff	Encoder B1 Encoder Z1	100 ×	+ F + / F	

Figure 4 - 148: DIO Configuration

Configuration

Features	Description	
	□ default value	
	Enable external interrupt	
① Interrupt	When external interrupt is enabled, set the input contact to upper differential signal.	
	When external interrupt is enabled, set the input contact to the lower differential signal.	
	When external interrupt is enabled, set the input contacts to the upper and lower differential signals.	
2 Port	Corresponding external contact number	
3 Filter	■ Set filtering time (0.01us), the setting range is (0 ~ 30000000), the default is 100x0.01us.	
	E Set the input contact polarity. The default value is A contact.	
④ Polarity	Set the input contact polarity to B contact	

• I/O Interrupt Usage:

After enabling the interrupt function on the DIO setting screen, click on the *Task* that needs the interrupt function.

Devices		-	q	×
Compressor			•	^
- M AX_308EA0MA1	T (AX-308EA0MA1T	7		
- 🔏 Hardware C	onfiguration			
🖲 🙏 Network Co	nfiguration			
E I PLC Logic				
😑 🔘 Applicat	ion			
Libr	ary Manager			
1 Mot	ion_PRG (PRG)			
😑 🎆 Tas	k Configuration			
1	ENIPAdapterIOTas	k		
H 🔂	ENIPAdapterServic	eTas	¢	
+ 😆	ENIPScannerIOTas	ĸ		
± 🗳	ENIPScannerServic	eTas	ĸ	
÷ 🗳	EtherCAT_Task			
- 3	MainTask			
- 3	mdbsComTask			
- 3	mdbsEtherTask			
	Task	122		
BuiltIn_IO (I	2010-00-00-00-00-00-00-00-00-00-00-00-00-	2)		

Figure 4 - 149: Add Task to Interrupt function

1. Open *Task* setting screen, click *Type* and select *External*.

Task 🗙			
figuration			
iority (031): 1			
ype			
Cyclic	V Interval (e.g. t#200ms)	20	ms
) Cyclic			- La contracta de la contracta
Event External			
Freewheeling Status			
ne (eigi (#200ilis)			ms
ensitivity 1			
Sensitivity 1			
		ove Up 🐳 Move Down += Open POU	
Add Call 🗙 Remov			
Add Call X Remov	e Call 📝 Change Call 🏾 🛊 M		
Add Call 🗙 Remov	e Call 📝 Change Call 🏾 🛊 M		
Add Call X Remov	e Call 📝 Change Call 🏾 🛊 M		
Add Call X Remov	e Call 📝 Change Call 🏾 🛊 M		
Add Call X Remov	e Call 📝 Change Call 🏾 🛊 M		
Add Call X Remov	e Call 📝 Change Call 🏾 🛊 M		
Add Call X Remov	e Call 📝 Change Call 🏾 🛊 M		
	e Call 📝 Change Call 🏾 🛊 M		

Figure 4 - 150: Selecting external

2. After selecting *External*, click *External event* to select the corresponding interrupt contact.

🔮 Task 🗙	
Configuration	
Priority (031):	
Type Image: Second se	Interrupt_0_IN0 Interrupt_0_IN0 Interrupt_1_IN1 Interrupt_2_IN2
Enable Time (e.g. t#200ms)	Interrupt_3_IN3 Interrupt_4_IN4 Interrupt_5_IN5 Interrupt_6_IN6 Interrupt_7_IN7 Interrupt_7_IN7
Sensitivity 1 Add Call X Remove Call Z Change Call	Interrupt_0_IN9 Interrupt_10_IN10 Interrupt_11_IN11 Interrupt_12_IN12 Interrupt_13_IN13 Interrupt_14_IN14
POU	Interrupt_15_IN15 Interrupt_16_Encoder21 Interrupt_17_Encoder22

Figure 4 - 151: Selecting external

- The setting time of the hardware filtering time is less than the time of inputting Duty On at the IN point, as shown in the figure below:
- 1. Hardware filter input range is $1 \sim 50000000$, the unit is 0.1us.

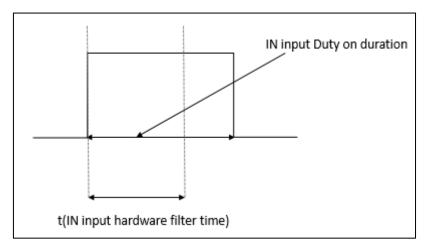


Figure 4 - 152: Hardware filtering time less than inputting Duty On at IN point time

2. The relationship between filtering frequency and time is as follows:

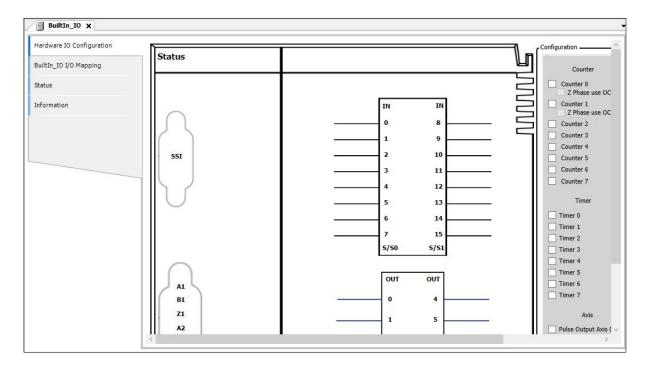
Filtering frequency * 2 (Hz): Filtering frequency = $1/(2^{*}t)$; t is the setting value of filtering time (unit 0.01 µs).

When the input frequency is higher than the filtering frequency range, the signal will be filtered.

This function is for the IN input points such as DFB_Capture, DFB_Hcnt, DFB_HTmr, DFB_Compare, and the body IO interrupt.

4.2.7.2 High-speed IO setting (AX-324)

4.2.7.2.1 BuiltIn IO: Hardware IO configuration





DIO Configuration	Configuration	8				_
DIO I/O Mapping		Interrupt	Port	Filter (0.01us)	Polarity	
Status	IN 0	ſŢſ	IN 0	100		
Information			IN 1	100	-1F -1/F	
	IN 1	ŢŦŢŧ	IN 2	100	-1F -1/F	
	IN 2	<u>f</u> tt	IN 3	100		
	IN 3	f t ft	IN 4	100	-1F -1/F	
	IN 4	F 1 F1	IN 5	100	-11/-	
			IN 6	100	11-11-	
			IN 7	100	11-11-	
	IN 6		IN 8	100	++ +/+	
	IN 7	<u>f</u> tt	IN 9	100	-1F -1/F	
	IN 8	flft	IN 10	100	-1F -1/F	
	IN 9	F I FI	IN 11	100	-1F -1/F	
	IN 10		IN 12	100	11-11-	
			IN 13	100	11-11-	
	IN 11		IN 14	100	-1F -1/F	
	🗌 IN 12	LT I II	IN 15	100	++ +/+	
	IN 13	f t ft	Encoder A1	100	11-11-	
	IN 14		Encoder B1	100	++ +/+	

Figure 4 - 154: DIO Tab

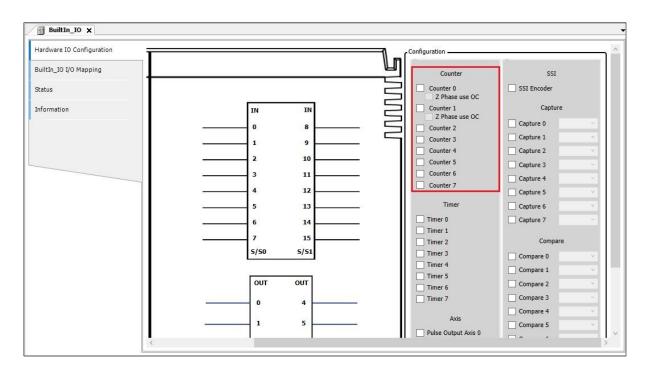


Figure 4 - 155: Counter

On the host, high-speed I/O provides the following function settings:

- DIO: interrupt, filter, polarity and other functions can be set.
- Counter: You can set the variable and counting mode of the high-speed counter and whether the Z-phase signal is enabled or not, or the high-speed timer variable declaration.
- Capturer/Comparator: You can declare the variables of the high-speed capture or high-speed comparator.

4.2.7.2.2 BuiltIn IO: Counter/timer configuration

Here will describe the pulse encoder function module of the main body IO. The AX-324 supports up to 6 groups of high-speed counters and high-speed timers.

High-speed counter (Cnt)

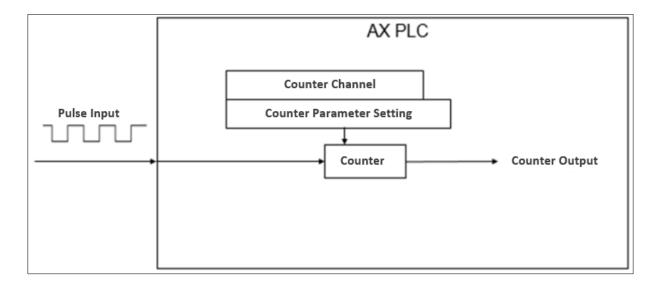


Figure 4 - 156: High-speed Counter

High-speed counting function activated

1. In the BuiltIn_IO screen, there are 6 groups of counters, check counter 0 and then click counter configuration.

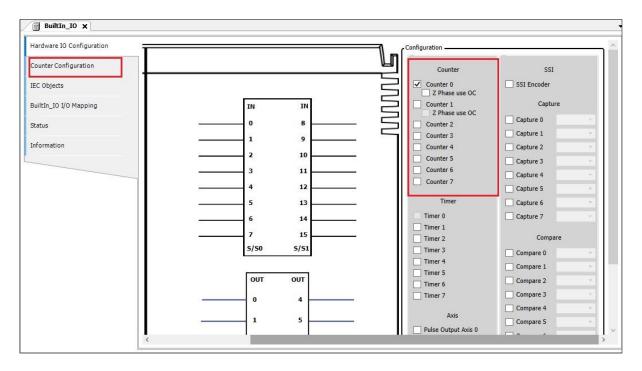


Figure 4 - 157: Counter

2. See the counter 0 page in the counter configuration screen.

Hardware IO Configuration	Counter 0		
Counter Configuration	Counter	Mode	
IEC Objects		Counter Mode	Description
BuiltIn_IO I/O Mapping	0	UD	
Status			Counter-clockwise Pulse
Information		20	Pulse
	0	PD	Direction Clockwise Counter-clockwise

Figure 4 - 158: Counter configuration tab

3. The relevant settings of the counter can be set in the counter configuration screen. The following is a description of the setting:

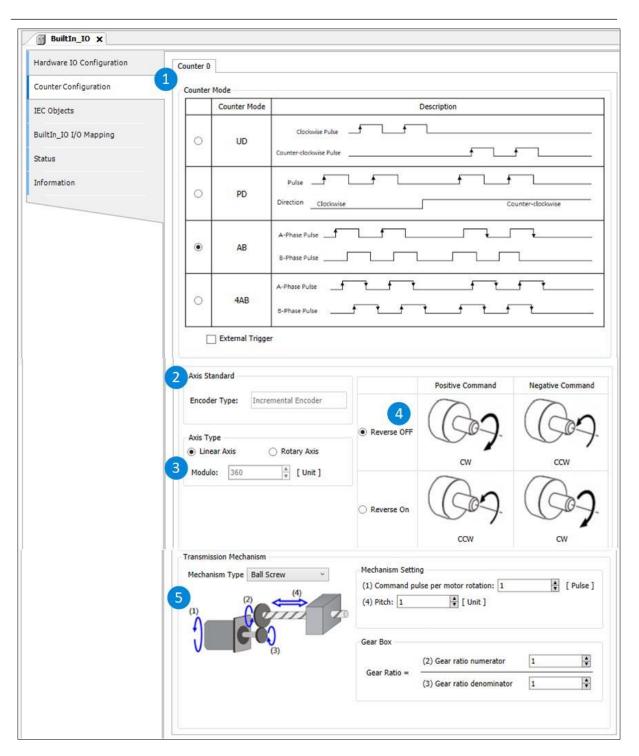


Figure 4 - 159: Counter configuration screen

① Counting Mode

Name	Features
UD	Forward pulse train and reverse pulse train

Name	Features
PD	Pulse train + direction
AB	AB phase pulse train
4AB	AB phase pulse train (4x)
External Trigger	Z phase signal enabled

② Shaft standard

Name	Features	Set value (default value)
Encoder type	Encoder type display	(Incremental encoder)

③ Shaft Type

Name	Features	Set value(default value)
Linear axis/rotary axis	Set linear axis or rotary axis	Linear axis Axis of rotation (Linear axis)
Modulus value	When the rotation axis is selected, the rotation axis can be set to a larger value	(360)

④ Positive/Negative Instructions

Name	Features
Reverse Close/Reverse Open	Set forward/reverse command

⑤ Transmission mechanism: The following is introduced for different architectures

• Ball screw drive

Mechanism Type Ball Screw	Mechanism Setti (1) Command p (4) Pitch: 1	ng ulse per motor rotation: 1	¥	[Pulse]
	Gear Box	(2) Gear ratio numerator	1	÷
	Gear Ratio =	(3) Gear ratio denominator	1	÷

Figure 4 - 160:Ball Screw Drive

Name	Features
(1) Command pulse per motor revolution	Command pulse per motor rotation
(2) Gear ratio numerator	Gear ratio numerator
(3) Gear ratio denominator	Gear ratio denominator
(4) Pitch	Screw Pitch

• Round Table Drive

Mechanism Type	Round Table	(4)		ng ulse per motor rotation: 1 istance per motor rotation: 1	÷	[Pulse]
			Gear Ratio =	(2) Gear ratio numerator	1	Å
	(5)			(3) Gear ratio denominator	1	\$

Figure 4 - 161: Round Table Transmission

Name	Features
(1) Command pulse per motor rotation	Command pulse per motor rotation
(2) Gear ratio numerator	Gear ratio numerator
(3) Gear ratio denominator	Gear ratio denominator
(4) The moving distance of the motor per rotation	Movement distance per motor rotation

• Belt Drive

Mechanism Type	Belt Pulley ~	Mechanism Setti (1) Command p	ng ulse per motor rotation: 1	Pulse]
		(4) Diameter:	L Transformed Tran	er * n
		Gear Box		-
v	(3)	Gear Ratio =	(2) Gear ratio numerator	1
			(3) Gear ratio denominator	1

Figure 4 - 162: Belt Drive

Name	Features
(1) Command pulse per motor rotation	Command pulse per motor rotation
(2) Gear ratio numerator	Gear ratio numerator
(3) Gear ratio denominator	Gear ratio denominator
(4) Diameter (moving distance per revolution of the motor: diameter*n	Diameter (moving distance per motor revolution: diameter*n)

Set counter mapping variable

1. Right click *BuiltIn_IO> Edit IO mapping*.

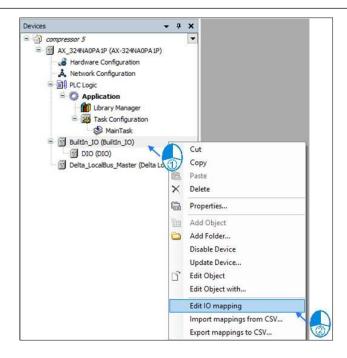


Figure 4 - 163: Edit IO mapping

2. In the edit IO mapping screen, click to add variables.

Find		F	ilter Sho	w all	 Add FB for IO Channel
Variable	Channel	Address	Туре	Description	
🖻 - 🔐 DIO					
1 - No	IN:0-7	%IB0	BYTE	8-CH Open Collector Input	
😐 🦄 🔔	IN:8-15	%IB1	BYTE	8-CH Open Collector Input	
÷-*> .	OUT:0-7	%QB0	BYTE	8-CH Open Collector Output	

Figure 4 - 164: Edit IO mapping to add new variables

The counter is used in the program: the encoder axis variable of the high-speed counter, this variable is used by the user in the motion function block in the POU.

1. Click the *IEC object* on the *BuiltIn_IO screen*.

ware IO Configuration	Status			ion -	
ter Configuration	Status			nter Capture	
bjects				unter 0 Capture 0	
n_IO I/O Mapping	IN	IN		unter 1 Capture 1	
n_to yo mapping	Cnt CH0 A Phase			unter 2 Capture 2	
s	Cnt CH0 B Phase	8		unter 4 Capture 3	1 v 1
mation	1	9	Con	unter 5 Capture 4	1.00
	Cnt CH0 Z Phase 2	10	Tin	Capture 5	Ψ.
	3	11	Tim	Capture 6	Ψ.
	4	12	Tim	Canture 7	2
	5	13	Tim	er 2 Compare	
		14	Tim	er 3	
	6	The second s	Tim		
	7	15	Tim		
	5/50	5/51		Compare 2	
				Compare 3	
	OUT	OUT			
	0	4		Compare 5	
	, i i i i i i i i i i i i i i i i i i i	12		Compare 6	
	1	5	8	Compare 7	1. No. 1

Figure 4 - 165: IEC Object Tab

2. The following is an example of configuration function. Encoder_Axis is required for the axis name used in POU.

Hardware IO Configuration	Variable	Туре	Configuration Function
	Counter_0	DFB_COUNTER_REF	Counter 0
Counter Configuration	Encoder_Axis	DMC_ENCODER_AXIS_REF	Counter 0/FreeEncoder_Axis
BuiltIn_IO I/O Mapping Status			

Figure 4 - 166: IEC object tab Encoder_Axis

3. For the MC_GearIn function block in the POU, the spindle source can use the counter as the source, and the input axis name is Encoder_Axis.

1	1	MC G	GearIn 0
	TRUE		GearIn
		EN	ENO
	Encoder_Axis -	Master	InGear
	SM_Drive_Virtual	Slave	Busy
		Execute	CommandAborted
		RatioNumerator	Error
		RatioDenominato	r ErrorID
		Acceleration	
		Deceleration	
		Jerk	

Figure 4 - 167: Encoder_Axis

High-speed timing (Tmr)

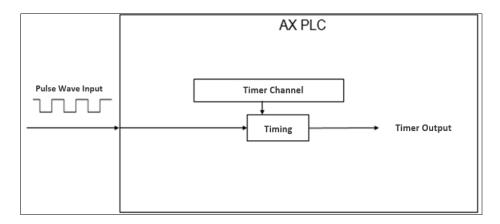


Figure 4 - 168: High-speed timing

The high-speed timing function is activated: In the BuiltIn_IO screen, there are 6 groups of timers. Click *Timer 0.* Since the timer does not need to set the screen, it can be started after checking. The internal timing clock of the high-speed timer in the AX series is 0.1μ s.

IO Configuration				figuration		
0 I/O Mapping	itatus			Counter	Capture	
				Counter 0	Capture 0	
on				Counter 1	Capture 1	
on	IN	IN	5	Counter 2 Counter 3	Capture 2	
	0	8	- 21	Counter 3	Capture 3	
	1	9	- 1	Counter 5	Capture 4	
	2	10	- 16	Timer	Capture 5	
	3	11	- 1	Timer 0	Capture 6	
	4	12	_	Timer 0	Capture 7	
	5	13		Timer 2	Compare	
	6	14	E	Timer 3	Compare 0	
			_	Timer 4	Compare 1	
	7	15	-	Timer 5	Compare 2	
	5/50	5/51			Compare 3	
		4			Compare 4	
	OUT	OUT			Compare 5	
	0	4	_		Compare 6	
	1	5			Compare 7	

Figure 4 - 169: Timer

Set timer mapping variable

1. Right-click *BuiltIn_IO* and select *Edit IO mapping*.

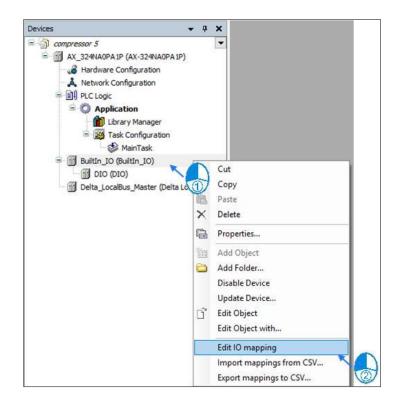


Figure 4 - 170: Edit IO mapping

2. In the edit *IO mapping screen*, click to add variables.

Find		F	ilter Sho	w all	 Add FB for IO Channel
Variable	Channel	Address	Туре	Description	
🖻 🔐 DIO					
÷*	IN:0-7	%IB0	BYTE	8-CH Open Collector Input	
😐 🍫 👝	IN:8-15	%IB1	BYTE	8-CH Open Collector Input	
÷-*•	OUT:0-7	%QB0	BYTE	8-CH Open Collector Output	

Figure 4 - 171: Edit IO mapping to add new variables

The timer is used in the program: this variable is used by the user in the motion function block in the POU.

1. Click the *IEC* object on the *BuiltIn_IO* screen.

BuiltIn_IO X			
Hardware IO Configuration	Status		· · · · · · · · · · · · · · · · · · ·
IEC Objects		Counter	Capture
BuiltIn_IO I/O Mapping		Counter 0	Capture 0
Status	IN IN	Counter 1	Capture 1
Information	Tmr CH0 0 8	Counter 3	Capture 2
Information	1 9	Counter 4	Capture 3
	2 10	Counter S	Capture 5
	3 11	Timer	Capture 6
	4 12	✓ Timer 0 Timer 1	Capture 7
	5 13	Timer 2	Compare
	6 14	Timer 3	Compare 0
	7 15	Timer 5	Compare 1
	5/50 5/51		Compare 2
			Compare 3
	ουτ ουτ		Compare 4
	0 4	_	Compare 5
			Compare 7
	1 5	_	
	2 6		~

Figure 4 - 172: IEC Objects Tab

2. The following is an example of the configuration function. For the axis name used in the POU, Timer_0 is required.

Variable	Туре	Configuration Function
- Timer_0	DFB_TIMER_REF	Timer 0
-		
	Timer_0	Timer_0 DFB_TIMER_REF

Figure 4 - 173: IEC Object Timer_0

3. For the DFB_HTmr function block in the POU, the input axis name is Timer_0.

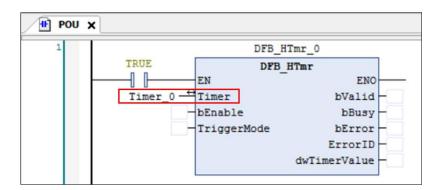


Figure 4 - 174: Timer 0

4.2.7.2.3 BuiltIn IO: IEC object

Here is a description of the high-speed counter comparator and catcher function modules of the main body IO. The AX-324 supports up to 8 groups of high-speed catcher and high-speed counter comparator.

High-speed counter capture

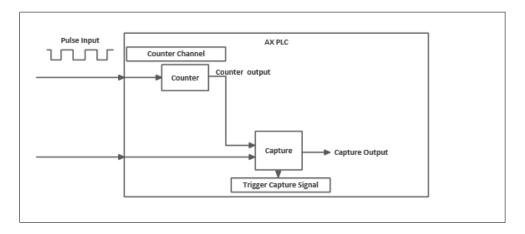


Figure 4 - 175: High-speed counter capture

Capture function starts:

1. In the BuiltIn_IO screen, there are a total of 8 points for the capture, click one of them to start.

BuiltIn_IO X			
Hardware IO Configuration		Configuration —	
IEC Objects	Status	Counter	Capture
BuiltIn_IO I/O Mapping Status Information	Cap ExternalTrigger 2 10	Counter 0 Counter 1 Counter 2 Counter 3 Counter 4 Counter 5 Timer	Capture 0 IN 1 Capture 1 Capture 2 Capture 3 Capture 4 Capture 5 Capture 5
	3 11 4 12 5 13 6 14 7 15 5/50 5/51	Timer 0 Timer 1 Timer 2 Timer 3 Timer 4 Timer 5	Capture 6 Capture 7 Compare Compare 0 Compare 1 Compare 2 V
	OUT OUT 0 4 1 5 2 6		Compare 3 Compare 4 Compare 5 Compare 6 Compare 7 Compar

Figure 4 - 176: Capture

2. After starting the capturer, click the drop-down menu and select the external trigger source.

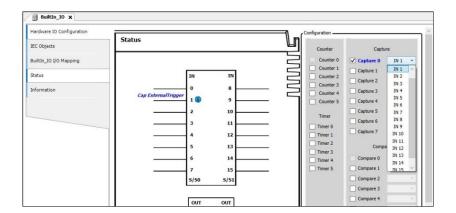


Figure 4 - 177: Capture drop-down menu

The catcher is used in the program: this variable is used by the user in the motion function block in the POU.

1. Click the IEC object on the BuiltIn_IO screen below.

🗃 BuiltIn_IO 🗙			
Hardware IO Configuration	Shakur		
IEC Objects	Status	Counter	Capture
BuiltIn_IO I/O Mapping		Counter 0	Capture 0 IN 1 ···
Status	IN IN	Counter 1	Capture 1
status		Counter 2 Counter 3	Capture 2
nformation	Cap ExternalTrigger	Counter 4	Capture 3
	1 9 9	Counter 5	Capture 4
	2 10	Timer	Capture 5
	3 11	Timer 0	Capture 6
	4 12	Timer 1	Capture 7
	5 13	Timer 2	Compare
	6 14	Timer 3	Compare 0
	7 15	Timer 5	Compare 1
	5/50 5/51		Compare 2
	10 10		Compare 3
			Compare 4
	ουτ ουτ		Compare 5
	0 4		Compare 6
	1 5		Compare 7
	2 6		

Figure 4 - 178: IEC objects

2. The following is an example of the configuration function. Capture_0 is required for the axis name used in the POU.

Figure 4 - 179: IEC object Capture_0

3. For the DFB_Capture function block in the POU, the input axis name is Capture_0.

• POU X		
1		DFB_Capture_0
	TRUE	DFB Capture
		- ENO
	Capture_0 - Capture	bValid
	Counter	bBusy
	- bEnable	bError
	-uiMaskValue	e ErrorID
	- diDeltaMin	bCapFlag
	- diDeltaMax	diCapValue
		diCapValuePrevious
		diDelta
		bCapLenBeyondFlag
		dwCapLenBeyondCount

Figure 4 - 180: Capture_0

High-speed counting comparator

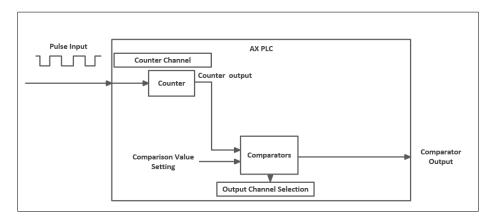


Figure 4 - 181: High-speed counting comparator

1. Comparator function start: In the BuiltIn_IO screen, the comparator has a total of 8 points, click one of them to start.

BuiltIn_IO X			
Hardware IO Configuration		Configuration	1
IEC Objects	Status	Count	er Capture
BuiltIn_IO I/O Mapping			
Status	IN IN	Coun	Capture 1
Information	0 8	Coun	ter 3
	1 9	Coun	
		Time	Capture 5
		Timer	0 Capture 7
	5 13	Timer	Compare
	6 14		
	7 15	Timer	
	5/50 5/51		Compare 2
			Compare 3
	ουτ ουτ		Compare 5
	Cmp CoincidentOutput 0 ① 4		Compare 6
	1 5		Compare 7
	2 6		

Figure 4 - 182: Comparators

2. After starting the comparator, click the drop-down menu to select the comparator output external contact.

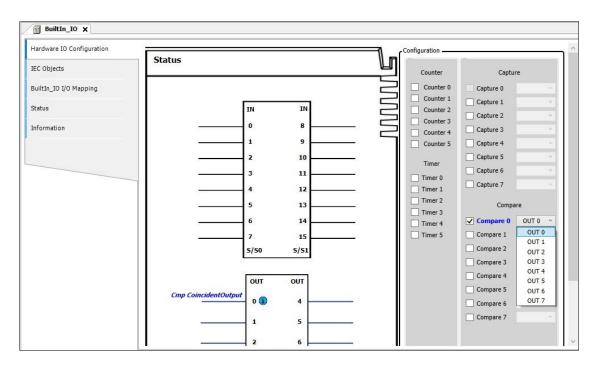


Figure 4 - 183: Comparator drop-down menu

The comparator is used in the program: this variable is used by the user in the motion function block in the POU.

1. Click the IEC object on the BuiltIn_IO screen below.

are IO Configuration	Status] m [Configuration	-	
iects	Juito	U	Counter	Capt	ure
IO I/O Mapping		2	Counter 0	Capture 0	
	IN I	, S	Counter 1 Counter 2	Capture 1	v
			Counter 2	Capture 2	
ation			Counter 4	Capture 3	~
			Counter 5	Capture 4	
	2 1	·	Timer	Capture 5	
	3 1	ı	Timer 0	Capture 6	4
	4 1	2	Timer 1	Capture 7	
	5 1	3	Timer 2	Comp	Jare
	6 1	1	Timer 3	✓ Compare 0	OUT 0
	7 1	5	Timer 5	Compare 1	
	5/50 5/5	1		Compare 2	
		-		Compare 3	
	ουτ ουτ	1		Compare 4	
	Cmn CoincidentOutout			Compare 5	
	0 1 4			Compare 6	
	1 5			Compare 7	

Figure 4 - 184: IEC objects

2. The following is an example of configuration function. Compare_0 should be filled in for the axis name used in POU.

lardware IO Configuration	Variable	Туре	Configuration Functio
EC Objects	Compare_0	DFB_COMPARE_REF	Compare 0
BuiltIn_IO I/O Mapping			
Status			
status			

Figure 4 - 185: IEC Object Compare_0

3. For the DFB_Compare function block in the POU, the input axis name is Compare_0.

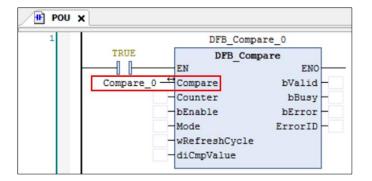


Figure 4 - 186: Compare_0

4.2.7.2.4 DIO: DIO configuration

Here describes the DIO device, setting the interrupt, filtering, polarity and other functions of the host I/O point.

Click DIO twice to enter the setting screen.

Devices 👻 🕈 🗙	DIO X						
☐ ☐ AX_324NA0PA1P (AX-324NA0PA1P)	DIO Configuration	Configuration	1	2	3	4	
- 🔏 Hardware Configuration	DIO I/O Mapping	1	Interrupt	Port	Filter (0.01us)	Polarity	
ELC Logic	Status	IN 0	FIR	IN O	100	<u>++</u> +/-	
Library Manager	Information			IN 1	100	++ +/-	
Task Configuration MainTask				IN 2 IN 3	100 ×		
Builtin_IO (Builtin_IO)		IN 3		IN 4	100	H H	
Delta_LocalBus_Master (Delta Local2)	st	🗌 IN 4	FIFI	IN 5	100	- H - H-	
\smile		🗌 IN 5	flfl	IN 6 IN 7	100 ×	++ +/+	
		🗌 IN 6	flfl	IN 7	100 🔹	+ - /- + - /-	
		🗌 IN 7	f l fl	IN 9	100	HF +/-	
			f l fl	IN 10	100	++ +/+	
		🗌 IN 9	f l fl	IN 11 IN 12	100 ×	+	
		🗌 IN 10	Flf	IN 12 IN 13	100		
		🗌 IN 11	flfl	IN 14	100	++ +/-	
		🗌 IN 12	fìfi	IN 15	100	++ +/+	
		🗌 IN 13					
Devices POUs	-	🗌 IN 14	T ft				

Figure 4 - 187: Enter DIO setting screen

The following table lists detailed function descriptions:

Features	Description
	□ default value
	Start external interrupt
1 Interrupt	When the external interrupt is activated, the input contact is set as the upper differential signal.
	When the external interrupt is activated, the input contact is set as the lower differential signal.
	When the external interrupt is activated, the input contact is set as the upper and lower differential signal.
2 port	Corresponding external contact number
③ Filter	Set the filter time (µs), the setting range is (0~10000000), and the default is 100µs.
④ polarity	Set the polarity of the input contact, the default value is A contact.

Features	Description
	$rac{W}{M}$ Set the input contact polarity to B contact \circ

How to use I/O interrupt: After starting the interrupt function on the DIO setting screen, click the Task that needs interrupt function.

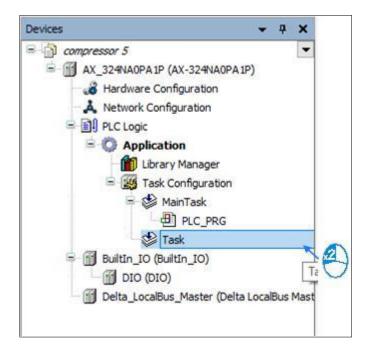


Figure 4 - 188: I/O interrupt method

1. Enter the Task setting screen, and select External from the Type drop-down menu.

Priority (031):	1		
Туре			
4 External	~	External event	Interrupt_0_INC
 Cyclic Event 			
💰 External			
Status			
Sensitivity	1		

Figure 4 - 189: Task setting screen

2. After selecting external, click external event to select the corresponding interrupt contact.

onfiguration	93. 		
Priority (031):			
Туре			
🗳 External	 External event 	Interrupt_0_IN0	
here a second		Interrupt_0_IN0	
Watchdog		Interrupt_1_IN1 Interrupt_2_IN2	
		Interrupt_2_IN2 Interrupt_3_IN3	
Enable		Interrupt_4_IN4	
		Interrupt_5_IN5	
Time (e.g. t#200ms)		Interrupt_6_IN6	
		Interrupt_7_IN7	
Sensitivity	1	Interrupt_8_IN8	
		Interrupt_9_IN9	
		Interrupt_10_IN10 Interrupt 11 IN11	
		Interrupt 12 IN12	
	<u> </u>	Interrupt_12_IN12	
P Add Call X Rem	ove Call 📝 Change Call	Interrupt_14_IN14	
POU		Interrupt 15_IN15	

Figure 4 - 190: External event drop-down menu

The hardware filter time setting value is less than the input Duty On time of IN point, as shown in the figure below:

1. The input range of hardware filter is $1\sim 50000000$, and the unit is $0.1 \mu s$.

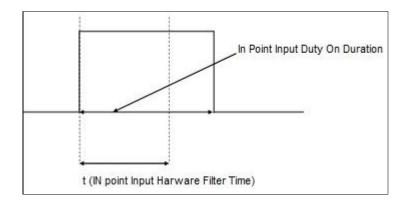


Figure 4 - 191: Hardware filter time setting value

2. The relationship between filtering frequency and time is as follows:

Filter frequency *2 (Hz): Filter frequency = 1 / (2 * t); t is the filter time setting value (unit

0.01 µs)

When the input frequency is higher than the filter frequency range, the signal will be filtered out. This function is for IN input points, such as DFB_Capture, DFB_Hcnt, DFB_HTmr, DFB_Compare, and body IO interrupt.

4.3 AX-8xxEP0 Series Parameter Setting

After completing Hardware Configuration, user can set the device & module parameters with the help of Parameter Setting (For more information on the hardware and operations of the CPU or modules, refer to *Catalogs*, *Hardware Manual* and *Operation Manual*).

Before performing Parameter Setting in a device, user have to refer to the Operation Manual.

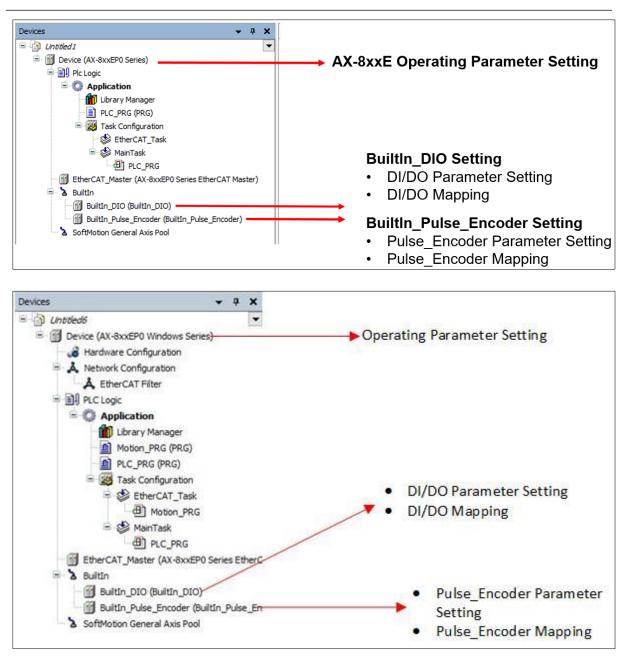


Figure 4 - 192: AX-8 Parameter setting

AX-8 is PAC-based standalone controller and supports the DIO and Pulse Encoder on controller. In addition, it can connect the remote IO R1EC.

4.3.1 System Setting Page

System setting supports the communication and controller basic parameters.

Double-click the AX-8xxEP0 series device in the device tree to open the parameter tab.

• Parameters Tab

Item	Description
Application Run Mode	 Set RTE and PLC "Run" status when controller active Setting Value True, False Default Value False NOTE : Only can change the setting when offline. After Download, the status will be Run.
Serial Communication Mode	 Set Serial port communication mode Setting Value: RS-485, RS-422, SSI Default Value: RS-485 NOTE: Only can change the setting when offline. After Download, the status will be Run.

Communication Settings	Para	ameter	Туре		Unit	Description
	-	Application Run Mode	BOOL	1		[True]:Enable Run Mode [False]:Disable Run Mode
Applications		Serial Communication Mode	Enumeration of BYTE			Choose Serial Communication Mode
Backup and Restore	9-6	GLAN1 NetworkInterface				
backup and Rescore		GLAN 1 NetworkInterfaceMode	Enumeration of BOOL			Configure NetworkInterface Mode of the Controller on the EtherNet GLAN 1
Synchronized Files		🖤 🏟 GLAN1 IPAddress	ARRAY[03] OF BYTE			Configure IP Address of the Controller on the EtherNet GLAN1 (IP).
•	-	GLAN1 SubnetMask	ARRAY[03] OF BYTE			Configure IP Address of the Controller on the EtherNet GLAN1 (Mask).
Files	<u> </u>	GLAN2 NetworkInterface				
		GLAN2 NetworkInterfaceMode	Enumeration of BOOL			Configure NetworkInterface Mode of the Controller on the EtherNet GLAN2
Log		🖤 🖗 GLAN2 IPAddress	ARRAY[03] OF BYTE			Configure IP Address of the Controller on the EtherNet GLAN2 (IP).
PLC Settings		GLAN1 SubnetMask	ARRAY[03] OF BYTE			Configure IP Address of the Controller on the EtherNet GLAN2 (Mask).
Users and Groups Access Rights	-					
PLC Shell Users and Groups Access Rights Symbol Rights	-					
Users and Groups Access Rights	-					
Users and Groups Access Rights Symbol Rights						
Users and Groups Access Rights Symbol Rights Parameters IEC Objects						
Users and Groups Access Rights Symbol Rights Parameters						

Figure 4 - 193: AX-8xxEP0 series device parameter tab

ltem	Description
Parameter	Parameter name, not editable
Туре	Data type of the parameter, not editable
Value	Initially displays the default value of the parameter, directly or the corresponding symbol name. Non-editable parameters are displayed in light gray. If the parameter is editable user can open an input field, a drop-down list or a file selection dialog with a double-click in the table field and use it to change the value.
Default value	Default value of the parameter defined by the device description, not editable
Unit	Unit of measure for the value (example: "ms" for milliseconds; not editable)
Description	Short description of the parameter specified by the device description, not editable

4.3.2 COM Port Settings

AX-8 series support MODBUS COM Setting. A MODBUS network consists of a MODBUS master and one or more MODBUS slaves.

4.3.2.1 MODBUS COM Port

Right-click on the AX-8xxEP0 device *node*> *Add Device*> *Fieldbus*> *MODBUS*> *MODBUS Serial Port*> *MODBUS COM*.

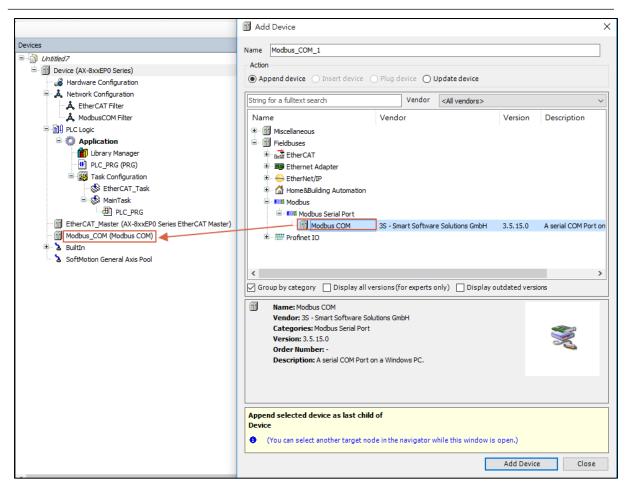


Figure 4 - 194: Adding MODBUS COM

General Tab

Serial Port Configuration		
ltem	Description	
COM port	Number of the serial port	
Baud rate	Parameter of the serial port	
Parity	Parity	
Data bits	Data Length	
Stop bits	Stop bits	

4.3.2.2 MODBUS Master COM Port

The MODBUS Master function is used to set the entry when the AX-8 series controller is used as the MODBUS master station.

Right-click on the MODBUS COM *node> Add Device> MODBUS> MODBUS Serial Master> MODBUS Master, COM Port* to add to the project tree.

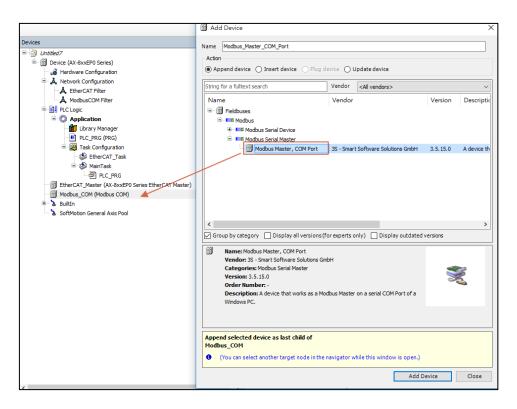


Figure 4 - 195: Adding MODBUS Master, COM Port

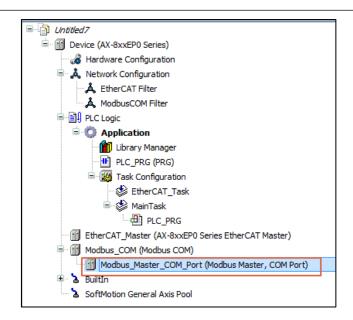


Figure 4 - 196: Adding MODBUS Master COM

This includes the basic settings for MODBUS communication.

Item	Description
Transmission mode	 <i>RTU</i>: Transmission in binary <i>ASCII</i>: Transmission in ASCII code (currently not supported by all drivers)
Response timeout (ms)	The response timeout sets the time interval that the master will wait for the answer from a slave node. If the nodes do not answer within this time interval, then an error is recorded for the implicit slave function block. The value entered for the time interval is also the default value for each node. For each node, user can still set a specific value within its slave configuration.
Time between frames (ms)	The time between the frames is the send pause of the master between the last response (and a timeout) and the next request. Use this parameter to make the communication less liable to disruption.
Auto-restart communication	 After a communication error, CODESYS automatically confirms the error and attempts to continue executing the MODBUS command. The error must be explicitly confirmed in the slave function block.

4.3.2.3 MODBUS Slave COM Port

The MODBUS Slave function is used to set the target slave station to be connected when the AX-8 series controller is used as the MODBUS master station.

Right-click MODBUS Master COM port to choose Add Device to add MODBUS Slave COM port.

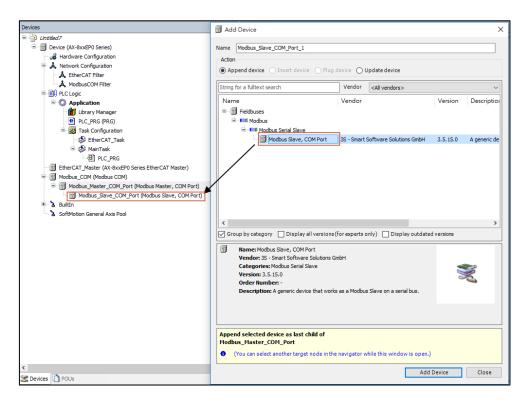


Figure 4 - 197: Adding MODBUS Slave COM port

• General

Item	Description
Slave address [1247]	Address of a serial MODBUS device (value between 1 and 247)

ltem	Description
Response timeout [ms]	Time interval for the master to wait for the response from the slave. This is especially configured for this slave node and overwrites the general response timeout setting of the respective master.

• Channel

User use this tab to define slave channels. Each channel represents a single MODBUS request.

ltem	Description
Add Channel	Opens the dialog <i>MODBUS Channel</i> . Here user can create new channels for this MODBUS slave. In the device description file of the MODBUS slave, user can predefine descriptions for individual MODBUS registers or entire channels.

ModbusChannel	×
Channel Channel 0	
Access type Read Holding Registers (Function Code 3) \checkmark	
Trigger Cyclic \checkmark Cycle time (ms) 100	
Comment	
READ Register	
Offset 0x0000 ~	
Length 1	
Error handling Keep last Value 🗸	
WRITE Register	
Offset 0x0000 🗸	
Length 1	
OK Cancel	

Figure 4 - 198: MODBUS Slave Channel window

The following table describes each item in the MODBUS channel window:

Aisle:

Channel	Channel	
ltem	Description	
Name	A string that contains the name of the channel	
Access type	 Read coils (function code 1) Read discrete inputs (function code 2) Read holding registers (function code 3) Read input registers (function code 4) Read single coil (function code 5) Write single register (function code 6) Write multiple coils (function code 15) Write multiple registers (function code 16) Read/Write multiple registers (function Code 23) 	
Trigger	 CYCLIC: The request occurs periodically. <i>Rising edge</i>: The request occurs as a reaction to a rising edge of the Boolean trigger variables. The trigger variable is defined in the tab <i>I/O Mapping</i>. <i>Application</i>: The MODBUS request is triggered by the PLC application. This happens by means of the MODBUS Channel function block, which is included in the respective I/O driver library. This function block provides complete control of and information about the execution of this command, for example the start time, the processing time, and the result. 	
Cycle time (ms)	For Trigger = CYCLIC: Request interval NOTE : The request interval should be the same as or a multiple of the cycle time of the application.	
Comment	t Description of the channel	
READ Register		
ltem	n Description	
Offset	Start address where reading should start (value range 0 ~ 65535)	
Length	ngth Number of registers to be read (for word access) or number of discrete inputs to be read (for bit access)	

Error handling			
WRITE F	WRITE Register		
ltem	Description		
Offset	Number of the register to be written to (value range 0 ~ 65535)		
Length	Number of registers to be written to (= Words) The value range of the parameter depends on function code.		

MODBUS slave initialization tab:

User uses this tab to define initialization commands. Initialization commands are executed one time when starting the bus or activating the slave (setting the *Enabled* flag of the slave instance). When setting up or editing a slave initialization value, the following parameters are available in the respective dialog boxes:

ltem	Description
Move Up Move Down	The order of channels also determines the order of initialization.
New	Opens the dialog box <i>Initialization Value</i> . The initialization commands are defined.

Initialization Value	×
Access type	Write Multiple Registers (Function Code 16) $$ $$ $$ $$ $$
Register offset	0x0000 ~
Length	1
Initialization value	1
Comment	
	OK Cancel

Figure 4 - 199: Initialization value

Item	Description	
Access Type	 Write single coil (function code 5) Write single register (function code 6) Write multiple coils (function code 15) Write multiple registers (function code 16) 	
Register offset	Number of the register to be written to (value range 0 ~ 65535)	
LengthNumber of registers to be written to (= Words)Value range of the parameter depends on function code		
Initialization value	Initialization value for the register	
Comment Short description of the data		

4.3.2.4 MODBUS Serial Device

The MODBUS Serial Device function is used to set the entry when the AX-8 series controller is used as a MODBUS slave station.

Right-click on the *MODBUS_COM node> Add Device> MODBUS Serial Device> MODBUS Serial Device* to add it to the project tree.

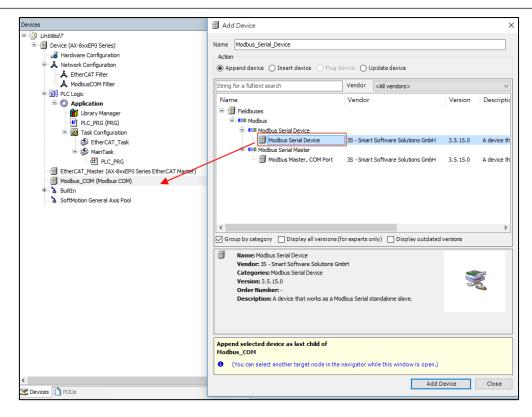


Figure 4 - 200: Adding MODBUS Serial Device

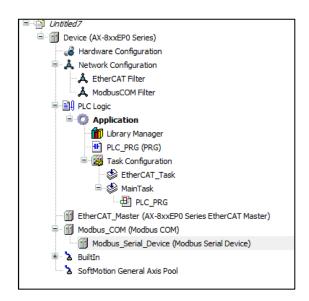


Figure 4 - 201: Project tree

• General

Item	Description
Unit ID	Unit ID of the slave
Watchdog	Activates the watchdog function The incoming data (Holding Registers / %I range) is set to zero when the MODBUS device does not receive any valid query from the master.
Holding registers (%IW)	Number of holding registers: possible values are 1 - 500. The maximum number can be limited in the device description. <i>Writable</i> : ☑: For the holding register, writable I/O mappings (%QW addresses) are generated instead of read-only I/O mappings (%IW addresses). This allows the holding registers to be set by the MODBUS device application (= server application) by means of the usual I/O mapping.
Input registers (%QW)	Number of input registers: possible values are 1 - 500. The maximum number can be limited in the device description.

MODBUS defines for I/O data a data model with four areas (Start addresses).

- Coils: Outputs of type BIT
- Discrete Inputs: Inputs of type BYTE
- Holding Register: Outputs of type WORD (16-bit)
- Input Register: Inputs of type WORD (16-bit)

Inputs and outputs are included as with all fieldbuses, but from the point of view of the host. These data areas have any number of logical start offsets as defined by the manufacturer. The I/O data behind the MODBUS data areas can overlap or be independent of each other.

4.3.3 EtherCAT Settings

The configuration of EtherCAT modules is based on the device description files for the master and slave devices employed and can be adapted in the project in configuration dialogs. In order to ensure the simplest and most error-free use possible, we recommend for standard applications that user activate the option for *Automatic Configuration* of the master, so that the majority of the configuration settings are performed automatically.

4.3.3.1 EtherCAT Master

The following figure shows the general tab window displayed after clicking EtherCAT _Master in the project tree. The basic configuration settings of EtherCAT master can be set in the window.

General	Autoconfig Master/Slav	es		Ether CAT.
Sync Unit Assignment	EtherCAT NIC Setting —			
Log	Destination address (MAC)	FF-FF-FF-FF-FF	🗹 Broadcast	Enable redundancy
EtherCAT I/O Mapping	Source address (MAC) Network Name	00-00-00-00-00-00	Browse	
EtherCAT IEC Objects	Select network by MAC	12721074	ork by name	
Status	J Distributed Clock		> Options	
Information	Cycle time 4000	↓ μs		
	Sync offset 20	\$ %		
	Sync window monitoring			
	Sync window 1	÷ μs		

Figure 4 - 202: EtherCAT Master Window

General

ltem	Description
Autoconfig	The greater part of the master and slave configuration is accomplished automatically, based on the device description file and implicit calculations. The dialog for the FMMU/Sync settings is not available.
Master/Slaves	Even if this option of the master is activated, an expert mode can be activated explicitly for each individual slave that permits the manual editing of the automatically generated process data configuration.

EtherCAT NI	EtherCAT NIC Setting					
Item	Description					
	MAC address of the device in the EtherCAT network that is to receive the telegrams. Options					
Destination address (MAC)	 Broadcast: no destination address (MAC) needs to be specified. Enable redundancy: is activated if the bus is constructed in a ring topology and redundancy is to be supported. With this function, the EtherCAT network remains functional even in the case of a cable breakage. If this function is activated, the parameters must be defined in <i>Redundancy EtherCAT NIC Settings</i> area. 					
Source address (MAC)	MAC address of the controller (target system) or network name (name of the card, i.e. PLC (target system))					
Network Name	Name or MAC of the network, depending on which of the following options is activated:					
Select network by MAC	Network is specified by the MAC-ID. The project then cannot be used on another device, since each network adaptor has a unique MAC-ID.					
Select network by Name	In the second					
Browse	Scans the network for the MAC-IDs or names of the target devices that are presently available.					

Redundancy EtherCAT NIC Setting

These settings are shown only if *Enable redundancy* option is activated. Here the parameters of the additional device are defined in accordance with the description to *EtherCAT NIC Settings*.

Distributed Clocks

Item	Description
Cycle time	Time interval after which a new data telegram is dispatched on the bus. If <i>Distributed clocks</i> function is activated in the slave, the master cycle time specified here is transferred to the slave clocks. In this way a precise synchronization of the data exchange can be achieved, which is important in particular if spatially distributed processes require simultaneous actions. Simultaneous actions are, for example, applications in which several axes must execute coordinated movements at the same time. A very precise, network-wide timebased with a jitter of substantially less than 1 microsecond can be achieved in this way.
Sync offset	Enables the time delay of the sync interrupt of the EtherCAT slave to be adjusted to the cycle time of the PLC. Normally the PLC cycle starts 20% later than the sync interrupt of the slave. This means that the PLC cycle could be delayed by 80% of the cycle time without a message being lost.
Sync window monitoring	Synchronization of the slaves can be monitored.
Sync window	Time for <i>Sync window monitoring</i> . If the synchronization of all slaves lies within this time window, then the variable xSynclnWindow (IoDrvEthercat) is set to TRUE, otherwise to FALSE.

Options

Click the *option triangle* to expand the following items:

ltem	Description
Use LRW instead of LWR/LRD	Direct communication from slave to slave is possible. In place of separate read (LRD) and write commands (LWR), combined read/write commands (LRW) are used.
Enable messages per task	Read and write commands, i.e. the handling of the input and output messages, can be controlled with various tasks.
Automatic restart slaves	In the event of a communication breakdown, the master immediately attempts to restart the slaves.

Master setting:

User can edit this setting only when you disable the *Automatic configuration* master/slave option, otherwise it will be configured automatically, and this function will be displayed at the bottom of the general tab.

Image in address	First logical address of the first slave for input data
Image out address	First logical address of the first slave for output data

• Sync Unit Assignment

This tab shows all slaves that are inserted below a particular master with an assignment to the sync units. With the EtherCAT sync units, several slaves are configured into groups and subdivided into smaller units. For each group, the working counter can be monitored for an improved and more precise error detection. As soon as a slave is missing in a sync unit group; the other slaves in the group are shown as missing. Detection occurs immediately in the next bus cycle, as the working counter is continuously checked. With the device diagnostics, the missing group can be remedied as quickly as possible.

EtherCAT_Master X			
General	Device name	Sync Unit	
Sync Unit Assignment	ASDA_A2_E_CoE_Drive	default	
EtherCAT I/O Mapping			
EtherCAT IEC Objects			
Status			
Information			
	- Add		× Delete
	Sync Unit		
	default		

Figure 4 - 203: EtherCAT Master – Sync Unit Assignment Tab

ltem	Description
Device Name	Name of the slave
Sync Unit	Name of the selected sync unit. User can combine individual devices or whole groups (multiple selection) into one sync unit group.
Add	When user type a name in the text field, user can create a new sync unit.
Delete	Removes the selected sync unit. If slaves are assigned to the group to be deleted, then a warning is displayed. If user confirm the dialog prompt by clicking Yes, then these devices are reassigned to the default group.

4.3.3.2 EtherCAT Slave

Support ASDA-A2-E, B3-E, A3-E under EtherCAT Master. User can install 3rd party Device xml file to add under EtherCAT Master.

Right-click EtherCAT Master to choose Add Device and add ASDA-A2-E_SM.

NOTE: Users can install third-party device xml files in the device storage library. For detailed steps, please refer to Section 7.1 Device Storage Library.

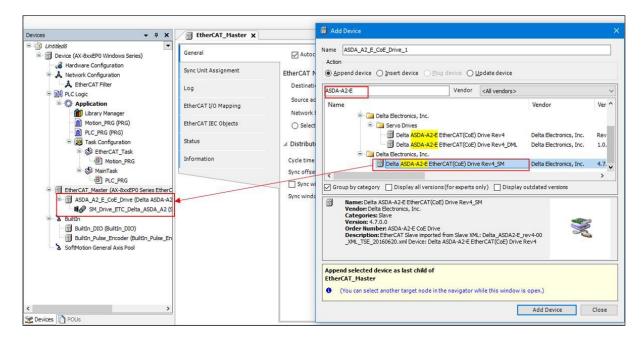


Figure 4 - 204: Adding ASDAA-A2-E-SM to device

• General Tab:

Here we will introduce the EtherCAT_Slave window (double-click the device tree ASDA_A2_E_CoE_Drive). There are two ways to add a slave: the first is to add the slave device of the selected axis, and the second is to add a scan method.

General	Address			Addi	tional -		
Process Data	AutoInc address	0	* ×		Enable e Optiona	xpert settings	Ether CAT.
Startup Parameters	✓ Distributed Clock			the second			
EtherCAT Parameters	2 Select DC	DC-Synch	nronous			~	
EtherCAT I/O Mapping	🖂 Enable	4000	Sync u	nit cycle (µs)		
EtherCAT IEC Objects	Sync0:						
Status	Sync unit cycle	x 1	\sim	4000	*	Cycle time (µs	5)
Information	O User-defined			0	*	Shift time (µs)
	Sync1:						
	Enable Sync 1						
	Sync unit cycle	x 1	\sim	4000	*	Cycle time (µs	5)
	⊖ User-defined			0	*	Shift time (µs)

Figure 4 - 205: General Tab

1. Address

① EtherCAT address: address assigned to the slave by the master during startup.

- 2. Distributed Clocks
 - ② Select DC: Set the slave distributed clock.

Process Data

The data exchange on the EtherCAT network is a PDO mapping of CoE, which is a periodic data exchange between the master and the slave architecture; the data that the slave sends to the master will be packaged in TxPDO, and the slave will read the data is included in RxPDO. The input settings and output settings on the "PDO Mapping" page list the PDOs available for data exchange, and the PDO content can be edited. In the ESI file of the device, the contents of the preset checked PDO and PDO have been defined, and according to the definition of ESI, the PDO content of some devices allows user to edit it by themselves.

General	Select the Outputs	Select the Inputs	Select the Inputs			
	Name	Туре	Index	Name	Туре	Index
Process Data	16#1600 1st RxPDO Mapping (exclu			🗌 16#1A00 1st TxPDO Mapping (e		
Obstant Descentions	Control Word	UINT	16#6040:00	Status Word	UINT	16#6041:0
Startup Parameters	TargetPosition	DINT	16#607A:00	ActualPosition	DINT	16#6064:0
EtherCAT Parameters	TargetVelocity	DINT	16#60FF:00	Velocity actual value	DINT	16#606C:0
EthereAT Parameters	TargetTorque	INT	16#6071:00	ActualTorque	INT	16#6077:0
EtherCAT I/O Mapping	ModeOfOperation	SINT	16#6060:00	ModeOfOperationDisplay	SINT	16#6061:0
	16#1601 2nd RxPDO Mapping			✓ 16#1A01 2nd TxPDO Mapping		
EtherCAT IEC Objects	Control Word	UINT	16#6040:00	Status Word	UINT	16#6041:0
	TargetPosition	DINT	16#607A:00	ActualPosition	DINT	16#6064:0
Status	16#1602 3rd RxPDO Mapping (exclu			16#1A02 3rd TxPDO Mapping (e		
	Control Word	UINT	16#6040:00	Status Word	UINT	16#6041:0
Information	TargetVelocity	DINT	16#60FF:00	ActualPosition	DINT	16#6064:0
	16#1603 4th RxPDO Mapping (exclu			Velocity actual value	DINT	16#606C:0
	Control Word	UINT	16#6040:00	16#1A03 4th TxPDO Mapping (e)		
	TargetTorque	INT	16#6071:00	Status Word	UINT	16#6041:0
				ActualPosition	DINT	16#6064:0
				ActualTorque	INT	16#6077:0

Figure 4 - 206: Process data Tab

User can choose different groups of PDO to use according to their needs. The more data user choose for PDO, the greater userr PLC performance.

• Startup Parameters

After the EtherCAT communication is established, the master station will download all the parameters in the table to the slave station, and the list will bring out the pre-defined commands of the ESI file. The user can add, delete or modify as required.

ltem	Description
Line	Line number
Bit Length	Bit length of the SDO
Abort on Error	☑: The transfer is interrupted in the case of an error with error status.

Item	Description
Jump to Line on Error	Solution: In case of error the transfer is resumed with the SDO at the specified <i>Line</i> .
Next Line	☑: The transfer is resumed with the SDO at the next line.
Comment	Input field for comment
Move Up	Moves the selected line upwards by one line
Move Down	Moves the selected line downwards by one line
	Opens the dialog <i>Select and entry from the object directory</i> . In this dialog, user can change the parameters of the SDO before the SDO is added to the configuration.
Add	By specifying new index/sub index entries, a new object can be added to the SDO that is not yet described in the EDS file. This is useful if only an incomplete object directory or none at all is present.
Delete	Removes the selected entry.
Edit	Opens the dialog <i>Select an Entry from the Object Directory</i> in order to change the parameters of the selected SDOs or IDNs in the table.

After pressing the *Add* button, the *Select Item from Object Directory* window will appear. First, select the parameter to be written from the directory. After clicking *OK*, it will be added to the command list.

Process Data	Line	Subindex	Name	Value	Bit Length	Abort on Error	Jump to Line on Error	Next Line	Comment
Tocess Data	1	10-060:16#00	Op mode	8	8			0	Op mode
Startup Parameters	- 2	16#60C2:16#01	Interpolation time period	4	8			0	Interpolation time period
	3	16#60C2:16#02	Interpolation time index	-3	8			0	Interpolation time index
therCAT Parameters									
EtherCAT I/O Manning									
EtherCAT I/O Mapping									
EtherCAT I/O Mapping EtherCAT IEC Objects									
EtherCAT IEC Objects									
EtherCAT IEC Objects Status									
EtherCAT IEC Objects									
therCAT IEC Objects									
therCAT IEC Objects									

Figure 4 - 207: Startup parameter Tab

Select Item from Ob	oject Directory							
Index:Subindex	Name	F	Flags	Туре	Default			^
€ 16#1A01:16#00	2nd Transmit PDO Mapp	oing						
€ 16#1A02:16#00) 3rd Transmit PDO Mapp	ing						
€ 16#1A03:16#00	4th Transmit PDO Mapp	ing						
€ 16#1C12:16#00	RxPDO assign							
. 16#1C13:16#00) TxPDO assign							
€ 16#1C32:16#00) SM output parameter							
i 16#1C33:16#00) SM input parameter							
16#2001:16#00	DRV's Parameter P0-01	. F	εw	UINT				
16#2002:16#00	DRV's Parameter P0-02	2. R	RW	UINT				
16#2003:16#00	DRV's Parameter P0-03	5 F	RW	UINT				
16#2004:16#00	DRV's Parameter P0-04	F R	RW	UDINT				
16#2005:16#00	DRV's Parameter P0-05	; F	RW	UDINT				
16#2006:16#00	DRV's Parameter P0-06	F R	RW	UDINT				
16#2007:16#00	DRV's Parameter P0-07	7 R	RW	UDINT				
16#2011:16#00	DRV's Parameter P0-17	7 F	RW	UINT				
16#2012:16#00	DRV's Parameter P0-18	R R	RW	UINT				~
Name	DRV's Parameter P0-01							
Index: 16#	2001	Bit length	16		•	[ОК	
SubIndex: 16#	0 🗘	Value	0		•		Cancel	\neg
	Byte array							

Figure 4 - 208: Parameter added

4.3.4 EtherNet Setting

Ethernet Setting related with Controller Ethernet parameter setting. User needs to add the Ethernet Adapter Device to set parameter and internet related function, and all internet functions are under *Ethernet* device, like MODBUS TCP and EtherNet/IP.

Add Ethernet Adapter Device:

Right-click on the *device node>* Add Device> Ethernet Adapter> Ethernet> Add Device.

vices 👻	φ×	EtherCAT_Master X		Add Device	2		
Acces • 0 0 Croffedde Device (AX-80xEP0 Windows Series) Hardware Configuration A EtherCAT Filter A EtherCAT Filter A HothwistCP Filter A ModbustCP Filter A Depication D CL_PRG (PRG) CL_PRG	、 よ 同 総 × 協	General Cut Copy Paste Delete Refactoring Add Object Add Object	Autoc EtherCAT N Destinati Source ac Network Select J Distribut	Name Ethernet_1 Action Action N			
	Edit Object with Edit IO mapping Import mappings from CSV Export mappings to CSV Online Config Mode Reset Origim Device [Device]	Cycle time offse Sync windo	e e W © Group by category Display all versions (for experts only) Display. Sted versions				
SoftMotion General Axis Pool evices	;	Simulation		Append selected device as last child of Device. You can select another target node in the navigator what	Close		

Figure 4 - 209: Adding Ethernet Adapter device

• EtherNet Device – General

The user can set the controller network IP address and gateway interface on this tab.

Modbus_COM Modbu	us_Serial_Device	Ethernet X
General	Interface	
Log	IP address	192 . 168 . 0 . 1
Status	Subnet mask	255 . 255 . 255 . 0
Ethernet Device I/O Mapping	Default gateway Adjust operating	0 . 0 . 0 . 0 system settings
Ethernet Device IEC Objects		
Information		

Figure 4 - 210: General Tab

Interface	Current controller communicate interface	
Interface	Current controller communication interface	
IP address		
Subnet mask	IP address Setting	
Default gateway		
Adjust operating system settings	Replace the current parameter to Controller	

4.3.4.1 MODBUS TCP Master

The MODBUS TCP Master function is used to set the entry when the AX-8 series controller is used as the MODBUS TCP master station.

Right-click on the *Ethernet node*> *Add Device*> *MODBUS*> *MODBUS TCP Master*> *MODBUS TCP Master*.

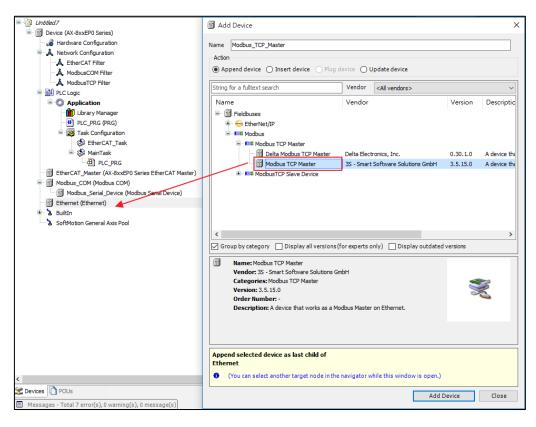


Figure 4 - 211: Adding MODBUS TCP Master

• General

Ethernet Modbus_TCP_Master X					
General	Modbus-TCP	MODBUS			
ModbusTCPMaster I/O Mapping	Response timeout (ms) 1000				
ModbusTCPMaster IEC Objects	Auto-reconnect				
ModbusTCPMasterParameters					
Status					
Information					

Figure 4 - 212: MODBUS TCP Master – General Tab

ltem	Description
Response timeout (ms)	The response timeout sets the time interval that the master will wait for the answer from a slave node. If the nodes do not answer within this time interval, then an error is recorded for the implicit slave function block. The value entered for the time interval is also the default value for each node. For each node, user can still set a specific value within its MODBUS TCP slave configuration.
Socket timeout (ms)	Maximum time to wait for incoming TCP/IP packages. The bus cycle task can be blocked during this time, for example if a MODBUS TCP slave is disconnected.

4.3.4.2 MODBUS TCP Slave

The MODBUS TCP Slave function is used to set the target slave station to be connected when the AX-8 series controller is used as the MODBUS TCP master station.

Right click on *Delta MODBUS TCP Master> Add Device> MODBUS> MODBUS TCP Slave> MODBUS TCP Slave*.

vices 👻 🕈 🗙 🚮 Ether	erCAT_Master 🗙	III Add Device →
Lintbleds Lintbleds General General General General General Sync Unit A EtherNetD Filter A EtherNetD Filter A ModustCD Filter EtherNetD Filter Ging PLC Logic	ZAssignment EtherCAT N Destinati Source ac Network [IEC Objects]	Add Device > Name Modbus_TCP_Slave Action •

Figure 4 - 213: Adding MODBUS TCP Slave

• General

Ethernet Modbus_TCP_Master Modbus_TCP_Slave X					
General	Modbus-TCP				
Modbus Slave Channel	Slave IP address	192 . 168 . 0 . 1	MODBUS		
Modbus Slave Init	Response timeout (ms)	1000			
ModbusTCPSlave Parameters	Port	502			
ModbusTCPSlave IEC Objects					
Status					
Information					

Figure 4 - 214: MODBUS TCP Slave – General Tab

ltem	Description
Slave IP address	IP Address
Response timeout (ms)	Time interval for the master to wait for the response from the slave. This is especially configured for this slave node and overwrites the general response timeout setting of the respective master.
Port	Port number (TCP/IP) of the slave 502 is default for MODBUS

• MODBUS Slave Channel Tab

User will define the slave channel on this tab. Each channel represents a MODBUS request.

ltem	Description
Add Channel	<i>MODBUS slave channel tab</i> > click <i>Add Channel</i> . Here user can add a new channel for the MODBUS slave. In the device description file of the MODBUS slave, you can predefine individual MODBUS registers or the description of the entire channel.

Channel	
Name	Channel 0
Access type	Read Holding Registers (Function Code 3) $\qquad \qquad \lor$
Trigger	Cyclic ~ Cycle time (ms) 100
Comment	
READ Register	
Offset	0x0000 ~
Length	1
Error handling	Keep last Value \checkmark
WRITE Register	
Offset	0x0000 ~
Length	1

Figure 4 - 215: MODBUS Channel Window

Channel		
Item	Description	
Name	A string that contains the name of the channel	
Access type	 Read coils (function code 1) Read discrete inputs (function code 2) Read holding registers (function code 3) Read input registers (function code 4) Read single coil (function code 5) Write single register (function code 6) Write multiple coils (function code 15) Write multiple registers (function code 16) Read/Write multiple registers (function Code 23) 	
Trigger	 CYCLIC: The request occurs periodically. Rising edge: The request occurs as a reaction to a rising edge of the Boolean trigger variables. The trigger variable is defined in the tab <i>I/O Mapping</i>. Application: The MODBUS request is triggered by the PLC application. This happens by means of the MODBUS Channel function block, which is included in the respective I/O driver library. This function block provides complete control and information about the execution of this command, for example the start time, the processing time, and the result. 	

Cycle time (ms)	For Trigger = CYCLIC: Request interval NOTE: The request interval should be the same as or a multiple of the cycle time of the application.	
Comment	Description of the channel	
READ Reg	gister	
ltem	Description	
Offset	Start address where reading should start (value range 0 ~ 65535)	
Length	Number of registers to be read (for word access) or number of discrete inputs to be read (for bit access)	
Error handling	Defines what should happen to the data in case of a communication error Set to ZERO Keep last value 	

WRITE Register	
ltem	Description
Offset	Number of the register to be written to (value range 0 ~ 65535)
Length	Number of registers to be written to (= Words) The value range of the parameter depends on function code.

• Init

User uses this tab to define initialization commands. Initialization commands are executed one time when starting the bus or activating the slave (setting the "Enabled" flag of the slave instance). When setting up or editing a slave initialization value, the following parameters are available in the respective dialog boxes:

Item	Description	
Move Up Move Down	The order of channels also determines the order of initialization.	
New	Opens the dialog box <i>Initialization Value</i> . The initialization commands are defined.	

Initialization Value		×
Access type	Write Multiple Registers (Function Code 16)	\sim
Register offset	0x0000	\sim
Length	1	
Initialization value	1	
Comment		
	OK Cance	el

Figure 4 - 216: Initialization Value

Item	Description	
Access Type	 Write single coil (function code 5) Write single register (function code 6) Write multiple coils (function code 15) Write multiple registers (function code 16) 	
Register offset	Number of the register to be written to (value range 0 ~ 65535)	
Length	Number of registers to be written to (= Words) Value range of the parameter depends on function code	
Initialization value	Initialization value for the register	
Comment	Short description of the data	

4.3.4.3 MODBUS TCP Slave Device

The MODBUS TCP Slave Device function is used to set the entry when the AX-8 series controller is used as a MODBUS TCP slave.

Right-click the *EtherNet* device and choose *Add device* to add *MODBUS TCP Slave Device.*

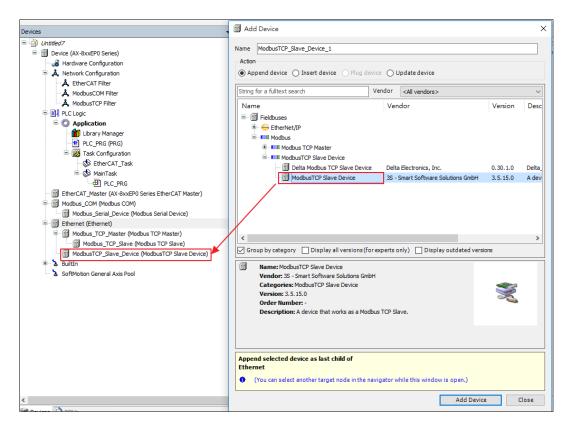


Figure 4 - 217: Adding MODBUS TCP Slave Device

Double-click the newly added MODBUSTCP_Slave_Device, the following picture will be displayed:

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AX_8xxEP0_Series ModbusTCP_Slave_Device X		
General	Configured Parameters	
Modbus TCP Slave Device I/O	Watchdog	500 (ms)
Mapping	Slave port	502
Modbus TCP Slave Device IEC Objects	Unit ID	
Information	Holding registers	10 (%IW) Writeable
	Input registers	10 (%QW)
	Data Model Start Addresses Coils 0 Discrete inputs 0 Holding register 0 Input register 0 Input register 0	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■

Figure 4 - 218: General Tab

• General Tab

ltem	Description	
Watchdog	Activates the watchdog function The incoming data (Holding Registers / %I range) is set to zero when the MODBUS device does not receive any valid query from the master.	
Slave port	Port number of the slave	
Unit ID	Optional: Unit ID of the slave. Only for a TCP/RTU gateway.	
	Number of holding registers: possible values are 2 - 4096. The	
Holding	maximum number can be limited in the device description.	
registers	Writable: For the holding register, writable I/O mappings (%QW	
(%IW)	addresses) are generated instead of read-only I/O mappings (%IW	
	addresses). This allows the holding registers to be set by the	

	MODBUS device application (= server application) by means of the usual I/O mapping.
Input registers (%QW)	Number of input registers: possible values are 2 - 4096. The maximum number can be limited in the device description.
IP Master address	IP address of the master; Example: "192.168.0.1". The device description determines whether the option is displayed in the dialog.
I/O Mapping active	 Activates the I/O scanner. The device description determines whether the option is displayed in the dialog.

MODBUS TCP defines for I/O data a data model with four areas (starting address).

- Coils: Outputs of type BIT
- Discrete Inputs: Inputs of type BYTE
- Holding Register: Outputs of type WORD (16-bit)
- Input Register: Inputs of type WORD (16-bit)

Inputs and outputs are included as with all fieldbuses, but from the point of view of the host. These data areas have any number of logical start offsets as defined by the manufacturer. The I/O data behind the MODBUS TCP data areas can overlap or be independent of each other.

4.3.5 EtherNet/IP Settings

EtherNet/IP based on standard TCP and UDP allows communication between office networks and control systems. The EtherNet/IP target device supports DHCP and BootP to assign IP addresses. Start the EtherNet/IP network (diagnosis), user can

use the Web server integrated with the logic control interface module, or user can use the Web server of other EtherNet/IP devices.

Like other standard Ethernet-based networks, the EtherNet/IP protocol is not suitable for real-time applications (< 1 millisecond), such as servo system, because the typical cycle of EtherNet/IP network is 10 milliseconds.

Install and add EtherNet/IP devices

In order to add and configure EthernNet/IP devices in the project tree, user need to install related device description files (EthernNet/IP device description files (*.eds)) in *Tools > Device Repository*.

Adding an EtherNet/IP scanner to the project tree will add the specific library collection of the related device to the library manager. There are two ways to insert one or more EtherNet/IP remote adapters or devices into the scanner.

• Module configuration

Under one target device is another target device, called the *chassis*, which can be inserted into a fixed number of slots. Use the *insert device* to... command to insert the so-called *IO point* into the slot, thereby controlling the input and output.

• Non-modular configuration

The target device is equipped with input and output.

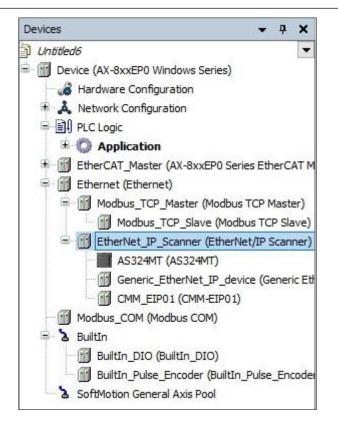


Figure 4 - 219: EtherNet/IP Configuration

Double-click an EtherNet/IP object in the project tree, or select a device in the project tree and call the edit object command in the menu to open the device editor for configuring EtherNet/IP devices. (The settings of the editor itself, such as displaying the general configuration dialog box, are implemented in the device editor options.

The title bar of the EtherNet/IP configuration dialog box is marked with the name of the specified EtherNet device; depending on the device, the label included in the dialog box will be different. Note that the bus cycle time is adjusted in the PLC settings.

- o EtherNet/IP Scanner
- o EtherNet/IP Remote Adapter

Access EtherNet/IP configuration through the app

Each EtherNet/IP scanner will automatically add a related function block instance to the project tree. The name of this variable and the type of the function block will appear in the EtherNetIP scan I/O map of the IEC object tab. Variables can be configured through the project address, such as allowing start, stop or application scan status check.

4.3.5.1 EtherNet/IP Scanner

AX-8xxEP0 Support EtherNet/IP scanner function. Right-click on the *Ethernet node* > Add Device > Fieldbus > Ethernet IP > EthernetIP Scanner > EtherNet/IP Scanner.

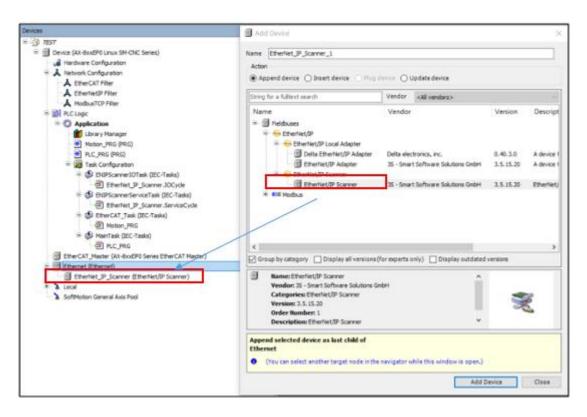


Figure 4 - 220: IncreaseEtherNet/IP Scanner

EtherNet/IP Scanner General tab

EtherNet_IP_Scanner X		
General	Options	
Log	Auto-reestablish connections	EtherNet/IP [®]
EtherNet/IP Scanner I/O Mapping		
EtherNet/IP Scanner IEC Objects		
Status		
Information		

Figure 4 - 221: EtherNet/IP Scanner General tab

Project	Description
Auto re-establish connections	When a timeout or error occurs, it will automatically reconnect.

EtherNet/IP Scanner I/O Map tab

_	EtherNet_IP_Scanner X						
	General	Bus Cycle Options Bus cycle task	ENIPScannerIOTask ~]			
	Log						
	EtherNet/IP Scanner I/O Mapping						
	EtherNet/IP Scanner IEC Objects						
	Status						
	Information						

Figure 4 - 222: EtherNet/IP Scanner I/O Map tab

Project	Description
Bus cycle task	Select bus cycle task. For more information about bus cycle tasks, please refer to AX-8 Operation Manual: PLC Settings.

EtherNet/IP Scanner IEC Object tab

This tab displays the definition status of EtherNet/IP devices. User can know the running status from the status.

2	EtherNet_IP_Scanner X							
	General	✿ Add 📝 Edit 🗙 Delete → Go to Variable						
	Log	Variable	Mapping	Type IoDrvEtherNetIP_diag				
	EtherNet/IP Scanner I/O Mapping							
	EtherNet/IP Scanner IEC Objects	4						
	Status							
	Information							

Figure 4 - 223: EtherNet/IP Scanner IEC Object tab

4.3.5.2 EtherNet/IP Remote Adapter

AX-8xxEP0 Supports EtherNet/IP Remote Adapter function. Right-click on the *EtherNetIP Scanner node > Add Device > Fieldbus > EtherNetIP > EtherNet/IP Remote Adapter.*

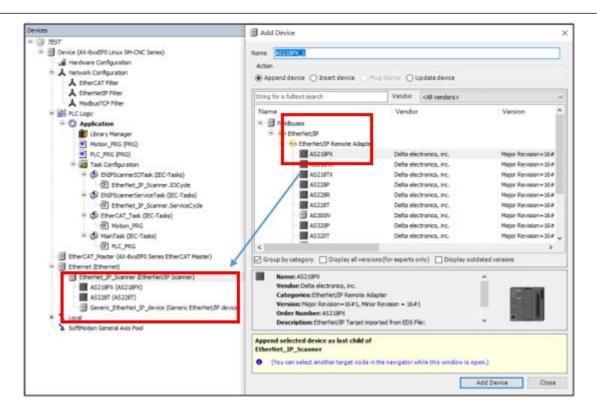


Figure 4 - 224: Add EtherNet/IP Remote Adapter

If user want to use a third-party EtherNet/IP remote adapter, please go to *Tools* > *Device Library* > *Import the EtherNet/IP standard EDS file*, and then add it in the *Add Device window*.

EtherNet/IP Remote Adapter General Tab

Seneral	Address Settings	
Connections	IP address 192 . 168 . 0 . 2	EtherNet/IP
ssemblies		
er-Defined Parameters	Electronic Keying	
og	O Compatibility check	
therNet/IP I/O Mapping	Strict identity check	
EtherNet/IP IEC Objects	 ✓ Check device type 14 ✓ Check vendor ID 799 	
Status	Check product code 532	
nformation	Check major revision 1	
mormation	Check minor revision 1	
	Restore Default Values	

Figure 4 - 225: EtherNet/IP Remote Adapter General Tab

Project	Description		
Address Settings-IP address	EtherNet/IP IP location of the remote adapter		
Electronic keying			
Keying options- compatibility check	Start: The adapter performs a compatibility check on its EDS file. All key values will be sent to the device. The device decides whether it is compatible with the received value.		
Keying options- Strict identity check	The adapter performs a compatibility check on its own EDS file. The user decides which keying information should be checked. If the check fails, no I/O connection with the device will be established, and an error message will be posted on the status page.		
Check device type	Check device type		
Check vendor ID	Check supplier code		
Check product code	Check product code		
Check major revision	Check major revisions		
Check minor revision	Check minor revisions		
Restore Default Values	Restore preset values for general equipment		

Connection tab

The top of this setting screen displays a list of all configured connections. If there is an exclusive owner connection in the EDS file, it will be automatically inserted when adding a device. The configuration data of these connections can be modified at the bottom of the screen.

eneral	Connection Name	RPI (ms)	O>T Size (Bytes)	T>O Si	ize (Bytes)	Proxy Config	Size (Bytes)	Target (Config Size (Bytes)	Connec
onnections	- 1. Connection 1	10	200	200	20 (0)100/		0.20 (0)(00)	16		20 04 24
	1. Connection1	10	200	200				10		20 04 24
semblies										
er-Defined Parameters										
3										
erNet/IP I/O Mapping										
erNet/IP IEC Objects										
tus										
	<	Delete	Connection Edit	Connection						:
tus ormation	< Add Connection Configuration Data	Delete	Connection Edit	Connection	•					;
	Add Connection Configuration Data Raw data values Parameters			Connection	Data Type	Minimum	Maximum	Default	Def Help String	aults
	Add Connection Configuration Data Raw data values Parameters Connection1	Show Par	ameter Groups		1	Minimum	Maximum	Default		aults
	Add Connection Configuration Data Raw data values Parameters Connection1 Connection1	Show Par	ameter Groups Value		Data Type				Help String	
	Add Connection Configuration Data Raw data values Parameters Connection1 Conrection1 Conr1_Ir	Show Par	ameter Groups Value pe D		Data Type UINT	0	3	0	Help String New Help String	
	Add Connection Configuration Data Configuration Data Parameters Connection1 Target Conl Conn1_Ir Conn1_Ir Conn1_Ir	Show Par fig data nput DeviceTy nput DeviceQu	ameter Groups Value pe D Jantity 200		Data Type UINT UINT			0 200	Help String New Help String New Help String	
	Add Connection Configuration Data Raw data values Parameters Connection1 Conn1_Ir	Show Par fig data nput DeviceTy nput DeviceInd nput DeviceInd	ameter Groups Value pe D antity 200 dex 1000		Data Type UINT UINT INT	0	3 200	0 200 1000	Help String New Help String New Help String New Help String	
	Add Connection Configuration Data Raw data values Parameters Connection1 Conn1_Ir Conn1_Ir Conn1_Ir Reserved	Show Par fig data nput DeviceTy nput DeviceInd 1_0	Ameter Groups Value pe D Juantity 200 dex 1000 0		Data Type UINT UINT INT INT	0 0 0 0	3 200 0	0 200 1000 0	Help String New Help String New Help String New Help String New Help String	
	Add Connection Configuration Data Configuration Data Parameters Connection1 Target Conf Conn_1r Conn_1r Reserved Conn_2r Co	Show Par fig data nput DeviceTy nput DeviceQu nput DeviceIni 5_0 utput DeviceT	ameter Groups Value pe D Jaantity 200 dex 1000 0 7ype D		Data Type UINT UINT INT UINT UINT	0 0 0 0 0 0 0 0 0	3 200 0 3	0 200 1000 0 0	Help String New Help String New Help String New Help String New Help String New Help String	
	Add Connection Configuration Data Raw data values Parameters Connection1 Conn1_Ir Conn1_Ir Conn1_Ir Conn1_or	Show Par fig data put DeviceTy put DeviceQu put DeviceInd 1_0 utput DeviceInd utput DeviceInd 1_0	ameter Groups Value pe D Daantity 200 dex 1000 0 ype D Quantity 200		Data Type UINT UINT INT UINT UINT UINT	0 0 0 0	3 200 0	0 200 1000 0 0 200	Help String New Help String New Help String New Help String New Help String New Help String New Help String	
	Add Connection Configuration Data Raw data values Parameters Connection1 Conn1_Ir Conn1_Ir Conn1_Ir Conn1_or	Show Par fig data put DeviceTy put DeviceQu put DeviceInd f_0 utput DeviceI utput DeviceI utput DeviceI utput DeviceI	ameter Groups Value pe D Daantity 200 dex 1000 0 ype D Quantity 200		Data Type UINT UINT INT UINT UINT	0 0 0 0 0 0 0 0 0	3 200 0 3	0 200 1000 0 0	Help String New Help String New Help String New Help String New Help String New Help String	

Figure 4 - 226: EtherNet/IP Remote Adapter Connection Tab

The configurable data will be defined in the EDS file and transmitted when the connection with the adapter is opened.

Project	Description
Connection name	Connection name
RPI (ms)	Requested packet interval: the exchange interval of input/output data
$O \rightarrow T$ size (Bytes)	Connection The size of producer data from scanner to adapter (Originator \rightarrow Target)
$T \rightarrow O$ size (Bytes)	Consumer data size from adapter to scanner (Target \rightarrow Originator)
Proxy Config size (Bytes)	The size of the proxy configuration data
Target Config size (Bytes)	Target configuration data size
Connection path	The connection path data is represented as: Address- configuration object-input object-output object.

Project	Description
Add Connection	Open the <i>New Connection</i> dialog box. Determine the parameters of the new connection here.
Delete Connection	Remove the selected connection from the list
Edit Connection	Open the Edit Connection dialog box. The parameters of the existing connection are modified here.

Click *Add Connection*, the following dialog box will pop up, which contains the parameters of the new connection.

Generic connection	(freely configurable)					OK
Predefined connect	tion (EDS file)					Cano
hoice of Connection						
Connection Name	e O>T Size	(Bytes)	T>O Size (Bytes)	Proxy Config Size (Bytes)	Tai ^	
Connection2	200	2	200		16	
Connection3	200	2	200		16	
Connection4	200	2	200		16	
Connection5	200	2	200		16	
Connection6	200	2	200		16	
Connection7	200	2	200		16	
Connection8	200	2	200		16 🗸	
					>	
Connection Path	20 04 24 81 2C 66 2C 67 Cvelic	~	RPI (ms)	20		
Connection Path Trigger type	Cyclic	~	RPI (ms)			
Connection Path Trigger type		~	RPI (ms) Timeout multip			
Connection Path Trigger type Transport type	Cydic Exdusive owner	~		olier 4 \checkmark		
Connection Path Trigger type Transport type canner to Target (Or	Cyclic Exclusive owner utput)	~	Timeout multip	r (Input)		
Connection Path Trigger type Transport type canner to Target (Or O>T size (bytes)	Cydic Exclusive owner utput) 200		Timeout multip	r (Input)		
Connection Path Trigger type Transport type canner to Target (O O>T size (bytes) Proxy config size (b	Cyclic Exclusive owner utput) 200 0		Timeout multip	r (Input)		
Connection Path Trigger type Transport type canner to Target (O O>T size (bytes) Proxy config size (t Target config size (Cyclic Exclusive owner utput) 200 0		Timeout multip	olier 4 ~		
Connection Path Trigger type Transport type canner to Target (Or O>T size (bytes) Proxy config size (b Target config size (Connection type	Cyclic Exclusive owner utput) 200 oytes) 0 (bytes) 16 Point to Point		Timeout multip Target to Scanne T>0 size (by Connection typ	olier 4 ~		
Connection Path Trigger type Transport type canner to Target (Or O>T size (bytes) Proxy config size (t Target config size (Connection type Connection Priority	Cyclic Exclusive owner utput) 200 oytes) 0 (bytes) 16 Point to Point		Timeout multip Target to Scanne T>0 size (by Connection typ	olier 4 ~ r (Input) tes) 200 Multicast ority Scheduled		
eneral Parameters Connection Path Trigger type Transport type canner to Target (Or O>T size (bytes) Proxy config size (t Target config size (Connection type Connection Priority Fixed/Variable Transfer format	Cyclic Exclusive owner utput) 200 bytes) 0 (bytes) 16 Point to Point Y cheduled		Timeout multip Target to Scanne T>0 size (by Connection typ Connection pri	plier 4 ~ r (Input) tes) 200 Multicast ority Scheduled Fixed		

Figure 4 - 227: Add connection screen

• **Generic Connection (freely configurable)**: The dialog contains the parameters of the new connection.

Generic connection (free	ely configurable)		ОК
Predefined connection ((EDS file)		Cancel
Connection Path Settings			
 Automatically gener 	rated path		
Configuration a	ssembly		
Class ID: 16#4	Instance ID: 16# 0	Attribute ID: 16#3	
Consuming ass	embly (0>T)		
Class ID: 16#4	Instance ID: 16# 0	Attribute ID: 16# 3	
Producing asse	mbly (T>0)		
Class ID: 16#4		Attribute ID: 16#3	
User-defined path			
Path defined by syn	nholic name		
Connection Path 20	04 24 81 2C 66 2C 67		
Trigger type Cy	dic v dusive owner v	RPI (ms) 20 🔹 Timeout multiplier 4 🗸	
Trigger type Cy	dic v dusive owner v		
Trigger type Cy Transport type Ex	dic v dusive owner v	Timeout multiplier 4 ~	
Trigger type Cy Transport type Ex Scanner to Target (Output	dic dusive owner t) 200	Timeout multiplier 4 V Target to Scanner (Input)	
Trigger type Cy Transport type Ex Scanner to Target (Output 0>T size (bytes)	t) 200 s) 0	Timeout multiplier 4 V Target to Scanner (Input)	
Trigger type Cy Transport type Ex Scanner to Target (Output O>T size (bytes) Proxy config size (bytes Target config size (bytes	t) 200 s) 0	Timeout multiplier 4 V Target to Scanner (Input)	
Trigger type Cy Transport type Ex Scanner to Target (Output O>T size (bytes) Proxy config size (bytes Target config size (bytes Connection type	rdic dusive owner t) 200 s) 0 es) 16	Timeout multiplier 4 V Target to Scanner (Input) T>O size (bytes) 200	
Trigger type Cy Transport type Ex Scanner to Target (Output O>T size (bytes) Proxy config size (bytes Target config size (bytes Connection type I Connection Priority	t) 200 s) 0 clusive owner \checkmark t) 200 clusive owner \checkmark	Timeout multiplier 4	
Trigger type Cy Transport type Ex Scanner to Target (Output O>T size (bytes) Proxy config size (bytes) Target config size (bytes Connection type E Connection Priority E Fixed/Variable	dic v dusive owner v t 200 s) 0 16 Point to Point v Scheduled v	Timeout multiplier 4	

Figure 4 - 228: Universal connection (free configuration)

Project	Description
	Connection Path Settings
Automatically generated path	The connection path is automatically generated based on the combined configuration, combined consumption and combined production values.
User-defined path	The connection path is manually specified in the corresponding input field.
Path defined by symbolic name	The path is specified by the symbolic name. NOTE: Connection path setting must support symbolic connection path.
	General parameters
Connection Path	The connection path is used to address one or more objects in the adapter that provide input data and receive output and configuration data.

Project	Description
	NOTE : The connection path is set to a custom path.
Path defined by symbolic name	Use ANSI strings instead of ordinary connection paths. For the allowed ANSI strings, please refer to the corresponding EtherNet / IP adapter manual. NOTE : The connection path is set as the connection label.
Trigger type	 Cyclic: Periodically exchange data at intervals set by RPI. Status change: After changing the scanner output or adapter input, data will be exchanged automatically. Application: Not implemented.
Transport type	For details, please refer to the CIP specification.
RPI (ms)	The time interval (in milliseconds) at which the transmitting application requests data to be transmitted to the target application. The value must be a multiple of the bus cycle task.
Timeout multiplier	If the device fails, there will be a time delay before the device state switches to "error" (RPI * timeout multiplier).

• Pre-defined connection (EDS file): Use this option to use the existing connection in the EDS file, and the user can change the configuration data defined in the EDS file.

Generic connection ((f)	(and the)				014
						ОК
Predefined connecti	on (EDS fil	le)				Cancel
Choice of Connection						
Connection Name		O>T Size (Bytes)	T>O Size (Bytes)	Proxy Config Size (Bytes)	Tai ^	
Connection2		200	200		16	
Connection3		200	200		16	
Connection4		200	200		16	
Connection5		200	200		16	
Connection6		200	200		16	
Connection7		200	200		16	
Connection8		200	200		16 🗸	
<					>	
Connection Path		81 2C 66 2C 67				
General Parameters — Connection Path Trigger type	20 04 24 8 Cydic	81 2C 66 2C 67	RPI (ms)	20		
Connection Path		~	RPI (ms) Timeout multi			
Connection Path Trigger type Transport type	Cydic Exclusive	~		plier 4 ~		
Connection Path Trigger type	Cydic Exclusive	owner	Timeout multi	plier 4 ~		
Connection Path Trigger type Transport type Scanner to Target (Ou	Cydic Exclusive tput)	owner	Timeout multi	plier 4 ~		
Connection Path Trigger type Transport type Scanner to Target (Ou O>T size (bytes)	Cyclic Exclusive tput) 20 ytes) 0	owner	Timeout multi	plier 4 ~		
Connection Path Trigger type Transport type Scanner to Target (Ou O>T size (bytes) Proxy config size (by	Cyclic Exclusive tput) 20 ytes) 0	owner	Timeout multi	plier 4 ~ er (Input) ytes) 200		
Connection Path Trigger type Transport type Scanner to Target (Our O>T size (bytes) Proxy config size (by Target config size (b)	Cyclic Exclusive tput) 20 ytes) 0 pytes) 16	owner	Timeout multi Target to Scann T>0 size (by Connection ty	plier 4 ~ er (Input) ytes) 200	~	
Connection Path Trigger type Transport type icanner to Target (Ou O>T size (bytes) Proxy config size (by Target config size (b Connection type	Cydic Exclusive tput) 20 ytes) 0 poytes) 16 Point to	owner	Timeout multi Target to Scann T>0 size (by Connection ty	plier 4 ~ er (Input) ytes) 200 pe Multicast iority Scheduled		
Connection Path Trigger type Transport type Scanner to Target (Our O>T size (bytes) Proxy config size (by Target config size (by Connection type Connection Priority	Cyclic Exclusive tput) 20 ytes) 0 poytes) 16 Point to Schedu	owner	Timeout multi Target to Scann T>0 size (b) Connection ty Connection pr	plier 4 ~ er (Input) ytes) 200 Multicast iority Scheduled e Fixed		

Figure 4 - 229: Predefined connection (EDS file)

Project	Description				
	Scanner to Target (Output)				
$O \rightarrow T$ Size (bytes)	The size of producer data from scanner to adapter (Originator \rightarrow Target)				
Proxy config size (bytes)	The size of the proxy configuration data.				
Target config size (Bytes)	Target configuration data size				
Connection type	 Empty: no network connection is established. Multicast: The network connection has been established. Connection data can be received by multiple user. 				

Project	Description
	Point-to-point: A network connection has been established. Connection data can only be received by one user.
Connection Priority	Using two scanners with different priorities for a target may cause conflicts. Adjusting the connection priority can solve this problem.
Fixed/Variable	For detailed information on parameters, see CIP specifications
Transfer format	Conversion format
Inhibit time	Inhibit time
Timeout multiplier	Extend the time interval for the scanner to send heartbeat messages to the adapter. This value is multiplied by the RPI value. Example: RPI = 10ms, and heartbeat multiplier = 10 causes a message to be sent every 100ms. NOTE: The transmission format is Heartbeat
	Target to Scanner (Input)
T →O size (bytes)	Consumer data size from adapter to scanner (Target -> Originator)
Connection type	 Empty: No network connection established. Multicast: A network connection has been established. Connection data can be received by multiple user. Point-to-point: A network connection has been established. Connection data can only be received by one user.
Connection Priority	Using two scanners with different priorities for a target may cause conflicts. Adjusting the connection priority can solve this problem.
Fixed/Variable	Fixed/variable
Tranfer format	Conversion format
Inhibit time	Inhibit time

• Configuration Data

Assemblies User-Defined Parameters Log EtherNet/IP I/O Mapping EtherNet/IP I/O Mapping Status Configuration Data	10 200 200 16 20 04 24 80 20 200 200 16 20 04 24 81 Job 200 Job 200 Job 200 Job 200 Job 200 Job 2
Assemblies User-Defined Parameters Log EtherNet/IP I/O Mapping EtherNet/IP I/O Objects Add Connection Delete Connection Delete Connection EtherNet/IP IEC Objects Add Connection Delete Connection Delete Connection Delete Connection Define Parameter S Value Unit Data Type Minimum Maximum Defaut Help String	20 200 200 16 20042481
User-Defined Parameters Log EtherNet/IP I/O Mapping EtherNet/IP I/C Objects Status Information Information Parameters Value Unit Deta Type Minimum Maximum Defaut Help String	Delete Connection Edit Connection Show Parameter Groups Defaults
Log EtherKet/IP I/O Mapping EtherKet/IP IEC Objects Add Connection Delete Connection Edit Connection Etatus Information Data Parameters Value Unit Data Type Minimum Maximum Default Help String	Delete Connection Edit Connection Show Parameter Groups Defaults
Log EtherNet/IP I/O Mapping EtherNet/IP IEC Objects Status Status Information Parameters Value Unit Defaut D	Delete Connection Edit Connection Show Parameter Groups Defaults
Add Connection Delete Connection Edit Connection Ratus Configuration Data Information Parameter Groups Defaul Parameters Value Unit Data Type Minimum Defaul	Delete Connection Edit Connection Show Parameter Groups Defaults
Add Connection Delete Connection Edit Connection Configuration Data Configuration Data Parameters Value Unit Data Type Minimum Maximum Default Help String	Delete Connection Edit Connection Show Parameter Groups Defaults
EtherNet/IP IEC Objects Add Connection Delete Connection Edit Connection Configuration Data Configuration Data Configuration Data Parameter S Value Unit Data Type Minimum Maximum Default Help String	Delete Connection Edit Connection Show Parameter Groups Defaults
hterNet/IP IEC Objects Add Connection Delete Connection Edit Connection tatus Configuration Data Candiguration Data Candiguration Data Parameters Value Unit Data Type Minimum Maximum Default Help String	Delete Connection Edit Connection Show Parameter Groups Defaults
Add Connection Delete Connection Edit Connection tatus Configuration Data Raw data values S Show Parameter Groups Parameters Value Unit Data Type Minimum Maximum Default Help String	Show Parameter Groups Defaults
tatus Configuration Data Config	Show Parameter Groups Defaults
formation Configuration Lefa Configuration Lefa Raw data values Show Parameter Groups Parameters Value Unit Data Type Minimum Maximum Defaut Help String	
Parameters Value Unit Data Type Minimum Maximum Default Help String	
	Value Unit Data Type Minimum Maximum Default Help String
B Connection2	

Figure 4 - 230: Configuration Data

The following table shows connections with configuration parameters in the EDS file. Connections are subdivided into configuration groups.

Project	Description		
	 If scaling parameters are defined for the data in the EDS file, the value can be displayed as raw data or converted data. 		
Raw data value	 Startup: Display data without any conversion. For the Enum data type, the index of the enumeration value will be displayed. 		
	 Not started: Display data and convert. For the Enum data type, the enumeration value will be displayed. 		
Display parameter group	Display parameter group		
default	Set as default		
value	Double-click to change the value. According to the data type, user can specify the value directly in the input field, or user can select from the drop-down list.		

Component Tab

The upper half of the screen on this tab displays a list of all configured connections. After selecting the connection, the relevant data configuration will be displayed in the lower part of the screen.

eneral	Connections								
onnections	Connection Name	O>T Size (Byte	s) T>O Si	ze (Bytes)	Proxy	/ Config Size (Bytes)	Target Config	Size (Bytes)	
ssemblies	1. Connection 1	200	200				16	16	
ser-Defined Parameters									
	Output Assembly "Inpu					Input Assembly "Output Data" (T>0) Add X Delete A Move Up A Move Down			
og	Add 🗙 Delete	🕆 Move Up 🤴	Move Down			-			_
therNet/IP I/O Mapping	Name	Data Type	Bit Length	Help Strir	^	Name	Data Ty	pe Bit Length	Help Stri 1
	Register	UINT	16	New Help S		Register	UINT	16	New Help :
herNet/IP IEC Objects	Input Data_Param	1 BYTE	8			 Output Data_Parar 	n1 BYTE	8	
	Input Data_Param	2 BYTE	8			Output Data_Parar	n2 BYTE	8	
atus	Input Data_Param	BYTE	8			Output Data_Parar	n3 BYTE	8	
	Input Data_Param	4 BYTE	8			Output Data_Parar	n4 BYTE	8	
formation	Input Data_Param	5 BYTE	8			Output Data_Parar	n5 BYTE	8	
	Input Data_Paramé	5 BYTE	8			- Output Data_Parar	n6 BYTE	8	
	Input Data_Param	7 BYTE	8			Output Data_Parar	n7 BYTE	8	
	Input Data_Parama	BYTE	8			Output Data_Parar	n8 BYTE	8	
	Input Data_Param	BYTE	8			 Output Data_Parar 	n9 BYTE	8	
	Input Data_Param	10 BYTE	8			Output Data_Parar	n10 BYTE	8	
	Input Data_Param	11 BYTE	8			Output Data_Parar	n11 BYTE	8	
	Input Data_Param	12 BYTE	8			 Output Data_Parar 	n12 BYTE	8	
	- Input Data_Param	13 BYTE	8			 Output Data_Parar 	n13 BYTE	8	
	Input Data_Param	14 BYTE	8			Output Data_Parar	n14 BYTE	8	
	Input Data_Param	15 BYTE	8			Output Data_Parar	n15 BYTE	8	
	Input Data_Param	16 BYTE	8			Output Data_Parar	n16 BYTE	8	
	Input Data_Param	17 BYTE	8			 Output Data_Parar 	n17 BYTE	8	
	Input Data_Param	18 BYTE	8			Output Data_Parar	n18 BYTE	8	
	Input Data_Param	19 BYTE	8			Output Data_Parar	n19 BYTE	8	
	Input Data_Param	20 BYTE	8			- Output Data_Parar	m20 BYTE	8	
	Input Data_Param	21 BYTE	8			Output Data_Parar	m21 BYTE	8	
	Input Data_Param	22 BYTE	8		~	Output Data_Parar	n22 BYTE	8	~

Figure 4 - 231: EtherNet/IP

Output component Input Data / Input component Output Data

Project	Description
Add	Open the select parameter dialog box, select the parameter to be added.
Delete	Delete selected parameter
Move Up/ Move Down	Move the selected parameter up/down in the list, the order in the list determines the order in the I/O mapping.
Name/Data type/ Bit Length/Help String	These values can be changed by double-clicking on the text field.

• Add > Select Parameter window

Vame	Class	Instance	Attribute	Туре	Minimum	Maximum	Default	Unit	
Size	15	3	1	UINT	2	400	2		
Conn1_Input DeviceType	15	12	1	UINT	0	3	0		
Conn1_Input DeviceIndex	15	13	1	INT			1000		
Conn1_Input DeviceQuantity	15	14	1	UINT	0	200	200		
Conn1_Output DeviceType	15	15	1	UINT	0	3	0		
Conn1_Output DeviceIndex	15	16	1	INT			0		
Conn1_Output DeviceQuantity	15	17	1	UINT	0	200	200		
IO data size	15	18	1	UINT	0	200	200		
Conn2_Input DeviceType	15	19	1	UINT	0	3	0		
Conn2_Input DeviceIndex	15	20	1	INT			1100		
Conn2_Input DeviceQuantity	15	21	1	UINT	0	200	200		
Conn2_Output DeviceType	15	22	1	UINT	0	3	0		
Conn2_Output DeviceIndex	15	23	1	INT			100		
Conn2_Output DeviceQuantity	15	24	1	UINT	0	200	200		
Conn3_Input DeviceType	15	25	1	UINT	0	3	0		
Conn3_Input DeviceIndex	15	26	1	INT			1200		
Conn3_Input DeviceQuantity	15	27	1	UINT	0	200	200		
Conn3_Output DeviceType	15	28	1	UINT	0	3	0		
Conn3_Output DeviceIndex	15	29	1	INT			200		
Show parameter groups		eric parameter		1.075.07	-	202			

Figure 4 - 232: Select Parameters

Project	Description
	 Start: This dialog box displays all parameters in the EDS file according to the group.
Display parameter group	 Not activated: This dialog box displays all parameters in the EDS file according to the structure
	By clicking <i>OK</i> , user can select each parameter in this list and add it to the parts list.
General parameters	User can add common parameters and edit the values of the parameters.

User parameter tab

This tab shows all other parameters that are only transferred to the bus system during the phase of the startup process assigned to it. When the connection is reestablished (for example, after the remote adapter fails), the user parameters will be sent again.

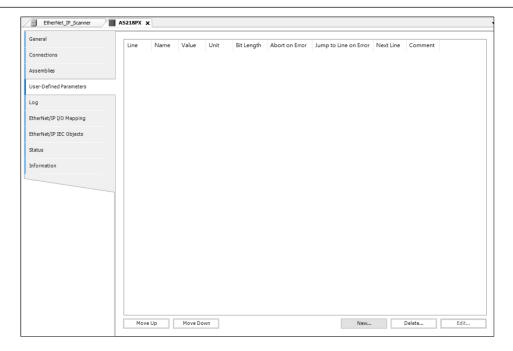


Figure 4 - 233: EtherNet/IP Remote adapter user parameters tab

Project	Description
New	Open the <i>Select Parameters</i> dialog to add new parameters. The new parameter will be inserted in front of the selected row.
Delete	Select the parameter to be deleted to delete
Edit	Open the <i>Select Parameters</i> dialog to change existing parameters.
Move Up/ Move Down	Change the order of user parameters. The order of the parameters in the list corresponds to the order of initialization.
Value	User can directly change the value of the corresponding parameter by double-clicking the value.
Abort an Error	Start: When an error occurs, the complete transmission of parameters is aborted.
Jump to Line on Error	When an error occurs, the program will continue from the line specified in the <i>Next Line</i> column. Therefore, complete blocks can be skipped during initialization, or return can be defined. <i>NOTE:</i> If user can never write a specific parameter, returning will result in an infinite loop.

4.3.5.3 EtherNet/IP Local Adapter

The AX-8xxEP0 series supports EtherNet/IP local adapter function. Right-click on the *Ethernet node> Add Device> Fieldbus> EtherNet/IP> EtherNet/IP Module > EtherNet/IP Module*.

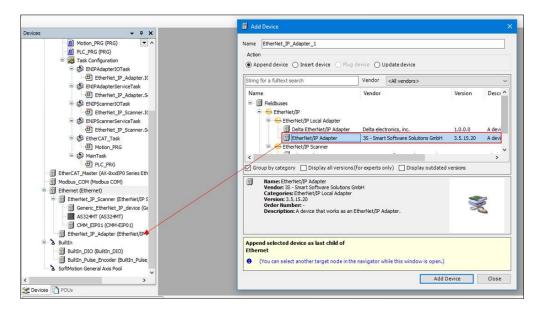


Figure 4 - 234: EtherNet/IP Local adapter

AX-8xxEP0 Set as the EtherNet IP Module as follows:

1. Right-click on EtherNet_IP_Adapter (EtherNet_IP_Adapter) > Add Device > Fieldbus > EtherNet/IP > EtherNet/IP Local Adapter > EtherNet/IP Module.

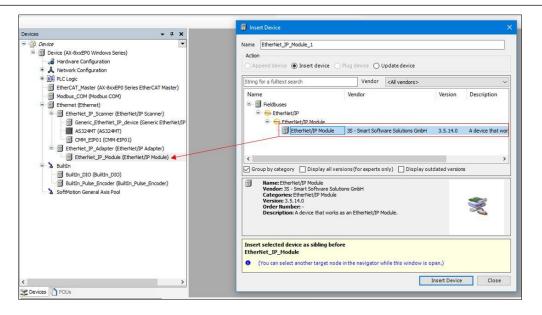


Figure 4 - 235: AX-8xxEP0 Adapter settings

 Repeat the previous step to add 2 Delta EtherNet/IP Modules and change the names to *IN* and *OUT* (right-click Delta EtherNet_IP_Module> Properties> General tab and change the name).

👔 Etherne	et (Ethernet)
🚊 🔐 🛐 Eth	erNet_IP_Adapter (EtherNet/IP Adapter)
🗊	IN (EtherNet/IP Module)
L 🗊	OUT (EtherNet/IP Module)

Figure 4 - 236: Add Delta EtherNet/IP Module

 Double-click on (EtherNet/IP Module) > General tab > Module > Word Input Module.

General	Module Informat	ion	
EtherNet/IP Module IEC Objects	Module	Byte Input Module 🗸	EtherNet/IP
Status	Vendor name	Byte Input Module Byte Output Module Word Input Module	EtherNet/IP
Information	Vendor ID	Word Output Module DWord Input Module DWord Output Module	
	Product name	Real Input Module Real Output Module	
	Product code	Big Input Module Big Output Module	
	Major revision		1
	Minor revision	1	

Figure 4 - 237: Word Input Module

 EtherNet/IP Module I/O Mapping tab > Always update variables > Enabled 2 (always in bus cycle task).

eneral	Find		Filter Show	all			- 🕆 Add	FB for IO Channel
therNet/IP Module I/O Mapping	Variable	Mapping	Channel Input Data	Address %IW0	Type WORD	Unit	Description	
therNet/IP Module IEC Objects	🍫		Bit0	%IX0.0	BOOL			
	···· 🍫		Bit1	%IX0.1	BOOL			
tatus	··· 🍫		Bit2	%IX0.2	BOOL			
	*		Bit3	%IX0.3	BOOL			
formation	···· 🍫		Bit4	%IX0.4	BOOL			
	···· 🍫		Bit5	%IX0.5	BOOL			
	···· 🍫		Bit6	%IX0.6	BOOL			
	*		Bit7	%IX0.7	BOOL			
	···· 🍫		Bit8	%IX1.0	BOOL			
	*		Bit9	%IX1.1	BOOL			
	···· 🍫		Bit10	%IX1.2	BOOL			
	🍫		Bit11	%IX1.3	BOOL			
	···· 🍫		Bit12	%IX1.4	BOOL			
	*		Bit13	%IX1.5	BOOL			
	···· 🍫		Bit14	%IX1.6	BOOL			
	₩		Bit15	%IX1.7	BOOL			
		Reset	Mapping	Always update	variables	Use pare	nt device setting	

Figure 4 - 238: EtherNet/IP Module I/O Map tab

5. Double-click on OUT (EtherNet/IP Module) > General tab > Module > Word Output Module.

General	Module Informat	ion	
EtherNet/IP Module IEC Objects	Module	Byte Input Module 🗸 🗸	EtherNet/IP
Status	Vendor name	Byte Input Module Byte Output Module Word Input Module	Ethenvet/IP
Information	Vendor ID	Word Output Module DWord Input Module DWord Output Module DWord Output Module	
	Product name	Real Input Module Real Output Module	
	Product code	Big Input Module Big Output Module	
	Majorrevision		
	Minorrevision	1	

Figure 4 - 239: Word Output Module

 EtherNet/IP Module I/O Mapping > Always update variables > Enabled 2 (always in bus cycle task).

M TUO									
General	Find		Filter Show a	11			• dh A	dd FB for IO Channel	l
EtherNet/IP Module I/O Mapping	Variable 	Mapping	Channel Output Data	Address %QW0	Type WORD	Unit	Description		
EtherNet/IP Module IEC Objects									
Status									
Information									
		Reset	Mapping 4	Always updat	evariables		arent device settir	-	~
	🍫 – Create new variable	🍅 = Ma	ap to existing va	riable		Enable	arent device settin ed 1 (use bus cycle ed 2 (always in bus	e task if not used in any	task)

Figure 4 - 240: EtherNet/IP Module I/O Map tab

 Double-click on *EtherNet_IP_Adapter (EtherNet/IP Adapter)* in the project tree to open the setting page. In the *General* tab, click *Export EDS File...* to export the EDS file to the third-party configuration environment.

Devices - 7 ×	EtherNet_IP_Adapter ×				
Cence Control	General Log EtherNet/IP Adapter I/O Mapping EtherNet/IP Adapter IEC Objects Status	EDS File Vendor name 35 - Smart Software Solutions GmbH Vendor ID 1285 5 Product name EtherHei/IP Adapter Product cole Product cole 120 5 Major revision 1 5		EtherNet/IP	
Sa3244T (Sa2344T) Gotter Epol (GriefEpol) Gotter Epol (GriefEpol) To (GriefEpol) To (GriefEpol) To (GriefEndel/P Adapter) Saidto, Dio (GriefEndel/P Adapter) Saidto, Dio (GriefEndel/P Adapter) Saidto, Dio (GriefEndel/P Adapter) Saidto, Dio (GriefEndel/P Adapter)	Information	Minor revision	1 🔄 Repository Export EDS File		

Figure 4 - 241: Export EDS file

EtherNet/IP Local adapter general tab

The local adapter displays the general information in the device description file, and the user can define this information to export the EDS file.

General	EDS File	
Log	Vendor name	EtherNet/IP [*]
Delta EtherNet/IP Adapter I/O Mapping	Vendor ID 1	
Delta EtherNet/IP Adapter IEC Objects	Product name Product code 0	
Status	Major revision 1	
Information	Minor revision 1	
	Install to Device Repository Export EDS Fil	e

Figure 4 - 242: EtherNet/IP Local adapter general tab

Project	Description			
Vendor name	Supplier name			
Vendor ID	Provided by ODVA Association			
Product name	EDS file name			
Product code	Product Code			
Major revision	Major revision			
Minor revision	Minor revision			
Install to Device Repository	If a device with the same device ID is already installed, it will ask if the device should be overwritten. If the device is plugged under the EtherNet/IP scanner as a remote adapter, user will be asked to update the device automatically.			
Export EDS File	The EDS file will be created and stored on the local computer. This can use EDS files in an external setting environment.			

EtherNet/IP Module General Tab

Supports modules of different data types. After setting multiple data type modules, return to the local adapter to output EDS files.

General	Module Informati	on	
EtherNet/IP Module IEC Objects	Module	Byte Input Module	EtherNet/IP
Status	Vendor name	Byte Input Module Byte Output Module Word Input Module	Etheritet/II
Information	Vendor ID	Word Output Module DWord Input Module	
	Product name	DWord Output Module Real Input Module Real Output Module	
	Product code	Big Input Module Big Output Module	
	Major revision		
	Minorrevision	1	

Figure 4 - 243: EtherNet/IP Module General Tab

4.3.6 High-Speed IO Setting

4.3.6.1 BuiltIn_DIO Parameter

After double-clicking BuiltIn_DIO in the device tree, the BuiltIn_DIO parameter tab is displayed.

DI Filter Select: Set X0 ~ X7 input filter time

- Setting Value: Not Filter, 0.1ms, 0.5ms, 1ms
- Default Value: Not Filter

NOTE: The setting can be changed when offline. After Download, the status will be Run.

DO Output Inverse: Set Y0 ~ Y7 out reserve

- Setting Value: True, False
- Default Value: False

NOTE: The setting can be changed when offline. After Download, the status will be Run.

	ols <u>W</u> indow <u>H</u> elp						
) 🛎 🖬 🚳 🗠 🖂 🔌 🛍 🛍 🗙 🖊 🎼 🎽 🌿 📗	刘 케 케 陆 铀- 더 🛛 🖽	诸 🗋 🕨 = 🦧 📋 🖅 🖓	• 📰 🖅 🤣				
evices 👻 🕈 🛪 🗙	Device BuiltIn_I	X 010					
Untitled1 Device (AX-8xxEP0 Series)	BuiltIn_DIO Parameters	Parameter	Туре	Value	Default Value	Unit	Description
Plc Logic		🗏 📴 DI Parameters					
🖹 💮 Application	BuiltIn_DIO I/O Mapping	X0 Filter Select	Enumeration of BYTE	NotFilter	NotFilter		Choose the filter time of X0
👘 Library Manager	BuiltIn DIO IEC Objects	X1 Filter Select	Enumeration of BYTE	NotFilter	NotFilter		Choose the filter time of X1
	buildin_bio inc objects	🖤 🖗 X2 Filter Select	Enumeration of BYTE	NotFilter	NotFilter		Choose the filter time of X2
	Status	X3 Filter Select	Enumeration of BYTE	NotFilter 🗸 🗸	NotFilter		Choose the filter time of X3
		X4 Filter Select	Enumeration of BYTE	NotFilter	NotFilter		Choose the filter time of X4
	Information	X5 Filter Select	Enumeration of BYTE	0.1ms 0.5ms	NotFilter		Choose the filter time of X5
PLC_PRG		X6 Filter Select	Enumeration of BYTE	1ms	NotFilter		Choose the filter time of X6
EtherCAT_Master (AX-8xxEP0 Series EtherCAT Master)		X7 Filter Select	Enumeration of BYTE	NotFilter	NotFilter		Choose the filter time of X7
🖻 🔈 BuiltIn		X0 Function Type Choose	Enumeration of BYTE	GeneralInput	GeneralInput		Choose the Function Type of
Builtin_DIO (Builtin_DIO)		🖹 🛅 DO Parameters					
BuiltIn_Pulse_Encoder (BuiltIn_Pulse_Encoder)		Y0 Output Inverse	BOOL	FALSE	FALSE		Reverse the Y0 output(Enable
🔄 🍐 SoftMotion General Axis Pool		Y1 Output Inverse	BOOL	FALSE	FALSE		Reverse the Y1 output(Enable
		Y2 Output Inverse	BOOL	FALSE	FALSE		Reverse the Y2 output(Enable
		Y3 Output Inverse	BOOL	FALSE	FALSE		Reverse the Y3 output(Enable
		Y4 Output Inverse	BOOL	FALSE	FALSE		Reverse the Y4 output(Enable
		Y5 Output Inverse	BOOL	FALSE	FALSE		Reverse the Y5 output(Enable
		Y6 Output Inverse	BOOL	FALSE	FALSE		Reverse the Y6 output(Enable
		Y7 Output Inverse	BOOL	FALSE	FALSE		Reverse the Y7 output(Enable

Figure 4 - 244: BuiltIn DIO Parameter

X0 Function Type Choose: Set X0 as general output or special software functions

• Value: GeneralInput, Stop/Start PLC Control (default value: GeneralInput)

NOTE: The setting can be changed when offline. After Download, the status will be Run.

<u>File Edit View Project Build Online Debug To</u>	ols <u>W</u> indow <u>H</u> elp					
) 🖆 🔲 🕼 🗠 🔍 🖁 🛍 🗙 🛤 😘 🌿 🔳 🖄	위 케 챔 畠 🛅 😚 🛗 🗄	🗱 🐗 🕞 📲 🔏 I (2) 🕾 🗠 🕫 S	· 아 쿬 글 갓			
evices 👻 🕂 🗙	Device BuiltIn_D	io ×				
Untitled1	BuiltIn DIO Parameters		-		Default Value Uni	
Device (AX-8xxEP0 Series)	Builtin_Dio Parameters	Parameter	Туре	Value	Default Value Uni	t Description
Plc Logic	BuiltIn DIO I/O Mapping	DI Parameters				
C Application	buildin_bio t/o happing	X0 Filter Select	Enumeration of BYTE	NotFilter	NotFilter	Choose the filter time of X0
- 🏦 Library Manager	BuiltIn DIO IEC Objects	X1 Filter Select	Enumeration of BYTE	NotFilter	NotFilter	Choose the filter time of X1
PLC_PRG (PRG)	- ,	X2 Filter Select	Enumeration of BYTE	NotFilter	NotFilter	Choose the filter time of X2
🖹 🌃 Task Configuration	Status	X3 Filter Select	Enumeration of BYTE	NotFilter	NotFilter	Choose the filter time of X3
😸 EtherCAT_Task		X4 Filter Select	Enumeration of BYTE	NotFilter	NotFilter	Choose the filter time of X4
🖻 🍪 MainTask	Information	X5 Filter Select	Enumeration of BYTE	NotFilter	NotFilter	Choose the filter time of X5
PLC_PRG		X6 Filter Select	Enumeration of BYTE	NotFilter	NotFilter	Choose the filter time of X6
EtherCAT_Master (AX-8xxEP0 Series EtherCAT Master)		X7 Filter Select	Enumeration of BYTE	NotFilter	NotFilter	Choose the filter time of X7
🖶 🐍 Builtin		X0 Function Type Choose	Enumeration of BYTE	GeneralInput 🗸	GeneralInput	Choose the Function Type of X
BuiltIn_DIO (BuiltIn_DIO)		DO Parameters		GeneralInput		_
BuiltIn_Pulse_Encoder (BuiltIn_Pulse_Encoder)		Y0 Output Inverse	BOOL	Stop/Start PLC G	eneralInput	Reverse the Y0 output(Enable)
SoftMotion General Axis Pool		Y1 Output Inverse	BOOL	FALS	top/Start PLC Control	Reverse the Y1 output(Enable
		Y2 Output Inverse	BOOL	FALSE	FALSE	Reverse the Y2 output(Enable
		Y3 Output Inverse	BOOL	FALSE	FALSE	Reverse the Y3 output(Enable
		Y4 Output Inverse	BOOL	FALSE	FALSE	Reverse the Y4 output(Enable
		Y5 Output Inverse	BOOL	FALSE	FALSE	Reverse the Y5 output(Enable
		Y6 Output Inverse	BOOL	FALSE	FALSE	Reverse the Y6 output(Enable)
		Y7 Output Inverse	BOOL	FALSE	FALSE	Reverse the Y7 output(Enable)

Figure 4 - 245: Entering Input

NOTE: Stop/Start PLC Control Timing diagram.

- When X0 is Low, Application \rightarrow Reset \rightarrow Run
- When X0 is High, Application Stop

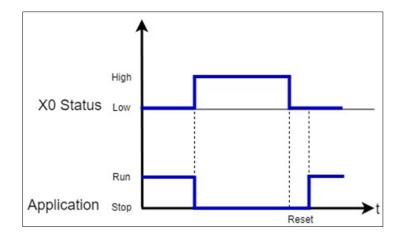


Figure 4 - 246: PLC Control Timing diagram

4.3.6.2 BuiltIn_DIO I/O Mapping

After double-clicking BuiltIn_DIO in the device tree, the BuiltIn_DIO parameter tab is displayed, and then switch to the BuiltIn_DIO I/O mapping tab.

I/O Mapping: Input or output Mapping

- Input 0 or *Output* 0 Mapping (Type: Byte)
- X0 ~ X7 or Y0 ~ Y7 Single in/output Mapping (Type: BOOL)

BuiltIn_DIO Parameters	Find		Filter Show	/all			- 🕂 Ada
BuiltIn_DIO I/O Mapping	Variable	Mapping	Channel	Address	Туре	Unit	Description
	🖙 ··· 🔖		In0	%IB0	BYTE		8-CH Digital Input
BuiltIn_DIO IEC Objects	¥ø		X0	%IX0.0	BOOL		
	- *		X1	%IX0.1	BOOL		
Status	¥ø		X2	%IX0.2	BOOL		
	- 🐪		X3	%IX0.3	BOOL		
Information	- *		X4	%IX0.4	BOOL		
	• 🖌 🖓		X5	%IX0.5	BOOL		
	* >		X6	%IX0.6	BOOL		
	- L *		X7	%IX0.7	BOOL		
	🖮 - 🍢		Out0	%QB0	BYTE		8-CH Digital Output
	* ø		YO	%QX0.0	BOOL		
	* ø		Y1	%QX0.1	BOOL		
	* @		Y2	%QX0.2	BOOL		
	* @		Y3	%QX0.3	BOOL		
	···· **		Y4	%QX0.4	BOOL		
	* ø		Y5	%QX0.5	BOOL		
	* ø		Y6	%QX0.6	BOOL		
			Y7	%QX0.7	BOOL		

Figure 4 - 247: BuiltIn DIO I/O Mapping

4.3.6.3 BuiltIn_Pulse_Encoder Parameter

After double-clicking BuiltIn_Pulse_Encoder in the device tree, the BuiltIn_Pulse_Encoder parameter tab is displayed.

Pulse Encoder input type:

- Setting Value: A/B Phase, CW/CCW
- Default Value: A/B Phase

Pulse Encoder input direction:

- Setting Value: True(Inverse), False(Normal)
- Default Value: False

Pulse Encoder Z Inverse:

• Setting Value: True(Inverse), False(Normal)

• Default Value: False

Devices 🗸 🕂 🗙	Device 🔐 Builtin_DIO	BuiltIn_Pulse_Encoder 🗙					
Untitled1 Device (AX-8xxEP0 Series) Double of the series of the serie	BuiltIn_Pulse_Encoder Parameters	Parameter	Туре	Value	Default Value	Unit	Description
□ □ Pic Logic □ - ② Application	BuiltIn_Pulse_Encoder I/O Mapping	Pulse Encoder Parameters Pulse Encoder input type	Enumeration of BOOL	A/B Phase	A/B Phase		A/B Phase or CW/CCW
- 📶 Library Manager	BuiltIn Pulse Encoder IEC Objects	Pulse Encoder input direction	BOOL	FALSE	FALSE		[TRUE]Inverse [FALSE]Normal
PLC_PRG (PRG)	buildin_Puise_chooder acc objects	Pulse Encoder Z Inverse	BOOL	FALSE	FALSE		[TRUE]Inverse [FALSE]Normal
G - ∰ Task Configuration C EtherCAT_Task G MainTask - ⊕ P.C.PRG	Status Information						
Ether CAT_Master (AV. Bro-Eth Sariae Ether CAT_Master) A Builtin Guidin_D10 (Builtin_D10) Guidin_D10 (Builtin_D4) SoftMotion General Avis Pool							

Figure 4 - 248: BuiltIn Pulse Encoder Parameter

NOTE: The setting can be changed when offline. After Download, the status will be Run.

4.3.6.4 BuiltIn_Pulse_Encoder I/O Mapping

Double-click BuiltIn_Pulse_Encoder in the device tree to display the BuiltIn_Pulse_Encoder parameter tab, and then switch to the BuiltIn_Pulse_Encoder I/O mapping tab.

Pulse Encoder Mapping: Pulse Encoder Input and Reset Mapping

- Counter (Type: DINT)
- Reset (Type: BOOL & Execution)

BuiltIn_Pulse_Encoder Parameters	Find		Filter Show	/all			- 🕂 Add FB for IO ch
BuiltIn_Pulse_Encoder I/O Mapping	Variable	Mapping	Channel Counter	Address %ID1	Type DINT	Unit	Description Counter value
BuiltIn_Pulse_Encoder IEC Objects	K ø		Reset	%QX1.0	BOOL		Reset Counter value(Execution)
Status							
Information							



• Reset Timing diagram

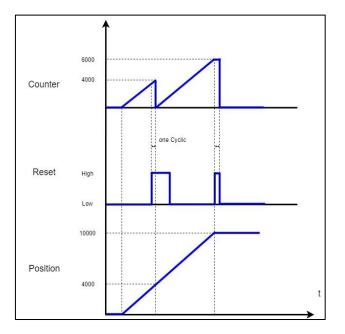


Figure 4 - 250: Reset Timing Diagram

Pulse Encoder example:

Right-click the *SoftMotion General Axis Pool* node in the device tree> *Add Device*> *Free Encoder*> Add *SMC_FreeEncoder* and then map it with Counter.

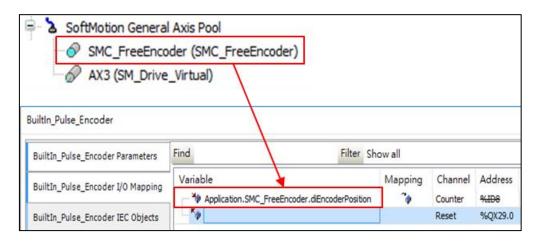
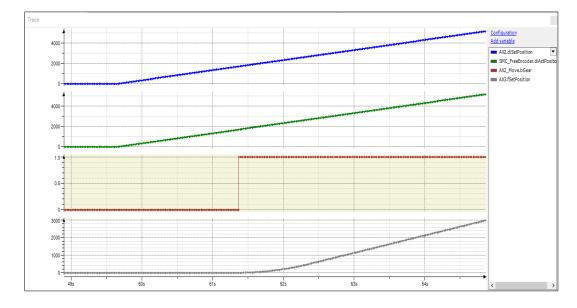


Figure 4 - 251: Pulse encoder mapped with counter

Use Encoder of R1-EC5621 as output to AX-8xxE Pulse Encoder.



Use SMC_FreeEncoder as master axis and do GearIn with virtual axis.

Figure 4 - 252: SMC_FreeEncoder as master axis and do GearIn with virtual axis

4.4 Motion Control Device

Axis setting

Motion control equipment is mainly used to set axis parameters. In most applications, user can set axis parameters in DIADesigner-AX. DIADesigner-AX provides user with a convenient editing environment. In this editing environment, the axis parameter setting of motion control is defined as its single data structure. This data structure contains multiple related parameters.

Axis introduction

In a motion control system, the object of motion control is called an axis. This axis includes physical servo drives, encoders and virtual servo drives. The following table lists all axis types:

Types	Description
Positioning Axis ^{*1}	Perform basic positioning control such as absolute positioning, relative positioning etc and other functions through EtherCAT communication.
Synchronous axis ^{*2}	Servo control is performed through EtherCAT communication, in addition to basic positioning control, it also includes functions such as synchronous motion such as electronic cams.
Pulse type servo axis	Physical servo control through pulse impulse
Virtual axis	The unconnected physical servo used only in the program can execute motion control commands.
Encoder axis	Use physical encoder (SSI encoder, incremental encoder) as signal source
Virtual encoder shaft	The encoder without wiring is only used in the program.

NOTE:

1:Positioning axis should use DL_MotionControl Library

2:Synchronous axis needs to be used with DL_MotionControl and SM3_Basic library.

4.4.1 Synchronous Axis

Support slave device:

- ASDA-A2-E, ASDA-A3-E, ASDA-B3-E
- R1EC-5621

Please follow the steps below to add a synchronous axis: Right-click EtherCAT_Master_SoftMotion in the device tree> Add Device> Search ASDA-A2> ASDA-A2-E_SM.

After selecting the SM servo device name and adding it to the project, the system will automatically generate its positioning axis name (the user can also change its name), as shown in the figure below. The servo axis name generated below is SM_Drive_ETC_Delta_ASDA_A2.

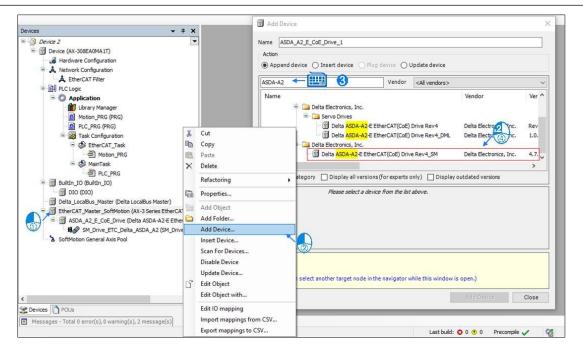


Figure 4 - 253: Added ASDA-A2-E synchronous axis

Perform basic positioning control such as absolute positioning, relative positioning... and other functions through EtherCAT communication. Synchronous axis needs to match DL_MotionControlLight library.

Axis parameter introduction:

When creating a servo axis or virtual axis, the axis will generate corresponding axis parameters. The following table lists its related instructions.

ieneral Setting			-	Motion Parameter			
ioming Setting	Virtual mode	9		Error Reaction			
Commissioning	a period where	Unear Axis Software Limit Activated		Quick Stop			
PI_Drive_ETC_Delta_ASDA_A2: EC Objects		Negative [u]: 0 Positive [u]: 1000	1 6	Velocity Ramp Type Trapezoid	in ² () Quadratic () Qua	dratic(smooth)	
Ratus		Rotary Axis Modulo Settin Modulo value (u): 360		Position Lag Supervis			12
Information			0	Position Lag Reaction	Deactivated - La	g Limit (v): [1	4
	B Transmission Mec Hechanium Type (1)			Mechanism Setting (1) Command pulse (4) Pftchr 1	per motor rotation: [1280080 [] [Unit]	[Pulse]	
)	CO		Gear Box	(2) Gear ratio numerator	1	
				Gear Rabe =	(3) Gear ratio denominator	1	(\$)
		Servo Gear Ratio Setting	1				
	 Reverse OFF 	Postive Command	Registre Com	2			
		COW	CW				

Figure 4 - 254: General Settings Tab

Axis Type and Limits

Name	Description
Virtual mode	Enable virtual mode after checking
Linear Axis/Rotary Axis	Select linear axis/rotary axis

② Linear Axis Software Limits

Name	Description
Activated	Start software limit (only support linear axis)
Negative [u]	Reverse software limit
Positive [u]	Forward software limit

$\ensuremath{\mathfrak{3}}$ Rotary Axis Modulo Setting

Contour (Body)	Description
Modulo value [u]	Set a circle range (only support rotation axis)

④ Motion Parameter

Name	Description
Quick stop	Axis emergency stop
Deceleration [u/s2]	The axis decelerates to a stop (only effective when the quick stop is not started)

⑤ Velocity Ramp type

Name	Description
Trapezoid/Sin2/ Quadratic/ Quadratic (Smooth)	Set axis motion curve

6 Position Lag Supervision

Name	Description
Position Lag Reaction	Set the behavior of the axis after overflow
Lag Limit [u]	Set overflow value

$\ensuremath{\textcircled{}}$ Positive/Negative Command

Name	Description
Reverse OFF/Reverse On	Set forward/reverse command

® Transmission Mechanism

• Ball Screw Drive

Transmission Mechanism	Mechanism Setting		
Mechanism Type Ball Screw v	(1) Command pulse per motor rotation: 1280000 [Pulse]		
(1)	(4) Pitch: 1 [Unit]		
	Gear Box	(2) Gear ratio numerator	1 <u>*</u>
	Gear Ratio =	(3) Gear ratio denominator	1 <u>*</u>
Servo Gear Ratio Setting			

Figure 4 - 255: Ball Screw Drive

	Name	Description
(1) (Command pulse per motor rotation	Command pulse per motor rotation
(2) (Gear ratio numerator	Gear ratio numerator
(3) (Gear ratio denominator	Gear ratio denominator
(4)	Pitch	Pitch

• Round table transmission

Transmission Mechanism Mechanism Type Round Table (4) (2)	Mechanism Setting (1) Command pulse per motor rotation: 1280000 [Pulse] (4) Movement distance per motor rotation: 1 [Unit]		
	Gear Box Gear Ratio =	(2) Gear ratio numerator (3) Gear ratio denominator	
Servo Gear Ratio Setting			

Figure 4 - 256: Round table transmission

	Name	Description
(1)	Command pulse per motor rotation	Command pulse per motor rotation
(2)	Gear ratio numerator	Gear ratio numerator
(3)	Gear ratio denominator	Gear ratio denominator
(4)	Movement distance of the motor per rotation	Movement distance per motor rotation = diameter*n

Belt drive

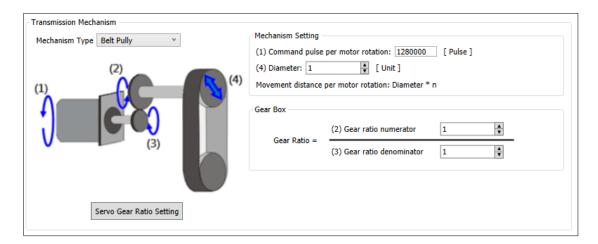


Figure 4 - 257: Belt drive

	Name	Description
(1)	Command pulse per motor rotation	Command pulse per motor rotation
(2)	Gear ratio numerator	Gear ratio numerator
(3)	Gear ratio denominator	Gear ratio denominator
(4)	Diameter (moving distance per motor r rotation: diameter *n)	The moving distance of the motor per r rotation = diameter *n

Servo gear ratio setting

Name	Features
Maximum resolution (PPR)	Maximum resolution (PPR)

Name	Features
Electronic gear ratio numerator	Electronic gear ratio numerator
Electronic gear ratio denominator	Electronic gear ratio denominator
Pulse number/revolution (PPR)	Pulse number/revolution (PPR)

Use axis in the program

When the servo axis is added to the project, the system will automatically generate its servo axis name (the user can also change its name), as shown in the figure below. The name of the servo axis generated by DIADesigner-AX is *SM_Drive_ETC_Delta_ASDA_A2*.

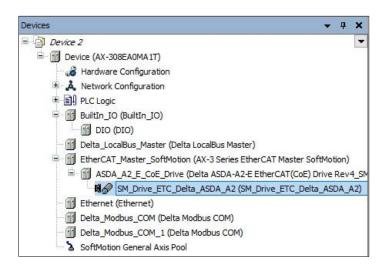
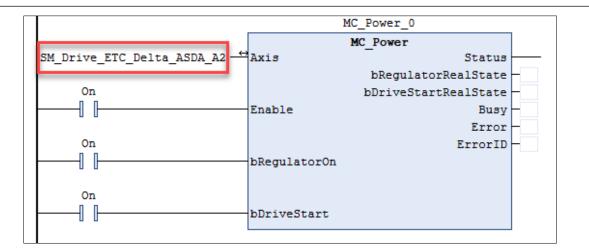


Figure 4 - 258: Add servo axis

Therefore, when using the motion function block, if user needs to input the corresponding axis, they can input *SM_Drive_ETC_Delta_ASDA_A2* in the axis pin as shown in the following figure.





4.4.2 Positioning Axis

This section applies to the following devices:

- ASDA-A2-E, ASDA-A3-E, ASDA-B3-E
- R1EC-5621

Positioning axis Reference (Axis_REF_DML)

Category	Туре	Function group	Description
Single-axis motion control instructions	Motion control type Management	Positioning control speed control Torque control Synchronization control Management function	 "MC_": Motion control instructions based on PLCopen "DMC_": Delta custom motion control instruction "SMC_": Motion instruction "MC_XXX_DML": Delta custom motion control instructions, used for positioning axis

Category	Туре	Function group	Description
Multi-axis motion	Motion control type	Axis group movement	Multi-axis motion
control finger	Management	Multi-axis management function	Multi-axis setting, monitoring, reset

Please follow the steps below to add the positioning axis: Right-click

EtherCAT_Master_SoftMotion in the device tree> *Add Device*> *Search ASDA-A2*> *ASDA-A2-E_DML.*

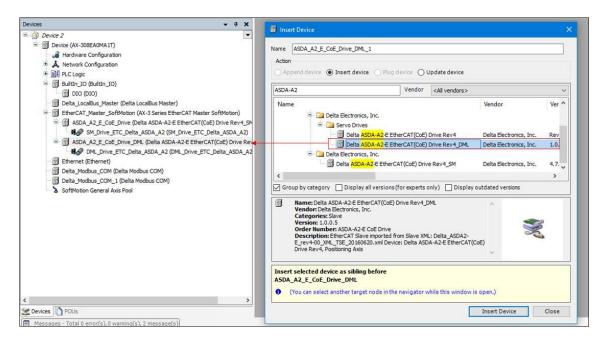


Figure 4 - 260: Added ASDA-A2-E positioning axis

Perform basic positioning control such as absolute positioning, relative positioning... and other functions through EtherCAT communication. The positioning axis needs to be matched with the DL_MotionControlLight library.

Positioning Axis General Setting page

-		
General Setting	1	
General Setting	Axis Type and Limits	Motion Parameter
		Velocity Ramp Type
Homing Setting	Rotary Axis Activated	Trapezoid v
	Negative [u]: 0	Hupczola
DML_Drive_ETC_Delta_ASDA_A2: IEC Objects		
IEC Objects	Positive [u]: 1000	
Status	Rotary Axis Modulo Setting	
Claras	Modulo value [u]: 360	
Information	Hodulo Value [u]. 500	
Information		
	Transmission Mechanism	
		Mechanism Setting
	Mechanism Type Ball Screw ~	_
	(4)	(1) Command pulse per motor rotation: 1280000 [Pulse]
	(2)	(4) Pitch: 10000 🚔 [Unit]
		Gear Box
		(2) Gear ratio numerator
	(3)	Gear Ratio =
		(3) Gear ratio denominator 1
	Servo Gear Ratio Setting	
	Servo Gear Ratio Setting	
	Positive Command Negative Co	mmand
		3
	Reverse OFF	
	÷ •	
	CCW CW	
	\sim	3
	O Reverse On	78 1.
	CW CCW	

Figure 4 - 261: Positioning Axis General Setting Page

• Axis Type and Limits

Name	Features
Linear Axis/Rotary Axis	Set linear axis or rotary axis

• Linear Axis Software Limits

Name	Features
Activated	Start the software limit (only support linear axis)
Negative [u]	Reverse software limit
Positive [u]	Forward software limit

• Setting of Rotary Axis Modulo value

Name	Features
Modulo value [u]	Set a lap range (only support rotation axis)

• Velocity Ramp Type

Name	Features
Trapezoid	Set axis motion curve

Transmission Mechanism

• Ball Screw Drive

Transmission Mechanism Mechanism Type Ball Screw v (1)	Mechanism Setting (1) Command pulse (4) Pitch: 1	(1) Command pulse per motor rotation: 1280000 [Pulse]		
	- Gear Box Gear Ratio =	(2) Gear ratio numerator (3) Gear ratio denominator	1 A V 1 V	
Servo Gear Ratio Setting				

Figure 4 - 262: Ball screw drive

	Name	Description
(1)	Command pulse per motor rotation	Command pulse per motor rotation
(2)	Gear ratio numerator	Gear ratio numerator
(3)	Gear ratio denominator	Gear ratio denominator
(4)	Pitch	Pitch

• Round Table Transmission

Transmission Mechanism			
Mechanism Type Round Table v (4) (2)		per motor rotation: 1280000 nce per motor rotation: 1	[Pulse]
	Gear Box Gear Ratio =	(2) Gear ratio numerator (3) Gear ratio denominator	
Servo Gear Ratio Setting			

Figure 4 - 263: Round table transmission

Name	Description
(1) Command pulse per motor rotation	Command pulse per motor rotation
(2) Gear ratio numerator	Gear ratio numerator
(3) Gear ratio denominator	Gear ratio denominator
(4) Movement distance per motor rotation	The moving distance of the motor per rotation = diameter*n

• Belt Drive Gear Ratio Denominator

- Transmission Mechanism	Mechanism Setting		
Mechanism Type Belt Pully V	-	per motor rotation: 1280000	[Pulse]
(2)	(4) Diameter: 1	[Unit]	
		per motor rotation: Diameter *	n
	Gear Box		
	Gear Ratio =	(2) Gear ratio numerator	1
(3)	Gedi Ratio =	(3) Gear ratio denominator	1 4
Servo Gear Ratio Setting			

Figure 4 - 264: Belt drive

Belt drive	Description
(1) Command pulse per motor rotation	Command pulse per motor rotation
(2) Gear ratio numerator	Gear ratio numerator
(3) Gear ratio denominator	Gear ratio denominator
(4) Diameter (Movement distance per motor rotation: Diameter *n)	The Movement distance per motor rotation: Diameter *n

• Servo Gear Ratio

🖾 Servo Gear Ratio					×
Servo Gear Ratio Settin	g				
Max.resolution(PPR):	1280000	_	Unit Numerator:	1	
Pulses/rotation(PPR):	1280000		Unit Denominator:	1	
				OK Canc	el

Figure 4 - 265: Servo gear ratio

Name	Features
Maximum resolution (PPR)	Maximum resolution (PPR)
Unit Numerator	Unit Numerator
Unit Denominator	Unit Denominator
Pulses/rotation (PPR)	Pulse/rotation (PPR)

• Positive/Negative Command

Name	Features
Reverse OFF/Reverse On	Set forward and reverse commands.

Return to origin setting page

General Setting	Homing Mode 35 V
Homing Setting	Homing speed during search for switch 100 🙀 [0.1 rpm]
Commissioning	Homing speed during search for z phase pulse 20 🛊 [0.1 rpm] Homing Acceleration 100 🛊 [ms]
SM_Drive_ETC_Delta_ASDA_A2: IEC Objects	Description
Status	Mode 35 : Depending on the current position
Information	In mode 35, The homing instruction is executed, the axis does not move and its current position is regarded as the home position.

Figure 4 - 266: Origin return setting

Name	Features	
Homing Mode	Set Homing mode	
Homing Speed during search for switch	Set the speed during search for switch	
Homing speed during search for z phase switch	Set Homing speed during search for z phase switch	
Homing Acceleration	Set Homing acceleration	

Use axis in the program

After selecting the DML servo device name and adding it to the project, the system will automatically generate its positioning axis name (the user can also change its name). The servo axis name generated by the positioning axis is DML_Drive_ETC_Delta_ASDA_A2.

When using the motion function block, if the user needs to input the corresponding axis, you can input DML_Drive_ETC_Delta_ASDA_A2 in the axis pin. As shown below.

Therefore, when using the motion function block, if the user needs to input the corresponding axis, they can input *DML_Drive_ETC_Delta_ASDA_A2* in the axis pin as shown below.

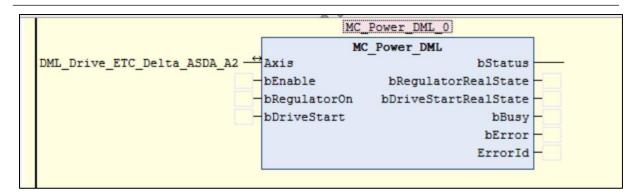


Figure 4 - 267: Shaft pin DML_Drive_ETC_Delta_ASDA_A2

4.4.3 Virtual Drive

A virtual drive is an analog drive in the software. User can test programs or implement extended functions without connecting hardware, such as axis motion control and cam driver control. The virtual drive is not connected to the physical servo and is only used in the program to execute motion control commands.

Add a virtual drive to the project tree

1. Right-click on SoftMotion General Axis Pool> Add Device> Virtual Drive> SM_Drive_Virtual.

Devices		~ ₽ X
E TEST		•
🖻 📆 Device (AX-308EA0MA1T)		
🚟 🚜 Hardware Configuration		
💷 🎄 Network Configuration		
PLC Logic		
Application		
👘 Library Manager		
Motion_PRG (PRG)		
PLC_PRG (PRG)		
Task Configuration		
EtherCAT_Task		
□ ∰ MainTask		
BuiltIn_IO (BuiltIn_IO)		
Delta_LocalBus_Master (Delta	LocalE	us Master)
EtherCAT_Master_SoftMotion	(AX-3	Series EtherCAT Master SoftMotion)
ASDA_A2_E_CoE_Drive_1	L (Delta	a ASDA-A2-E EtherCAT(CoE) Drive Rev4_DML)
ML_Drive_ETC_De	lta_AS	DA_A2 (DML_Drive_ETC_Delta_ASDA_A2)
SoftMotion General Axis Pool	Ж	Cut
		Сору
	R.	Paste
	×	Delete
	Ę.	Properties
	1000	Add Object
		Add Folder
		Add Device
		Insert Device
	ß	Edit Object
		Edit Object with
		Import mappings from CSV
		Export mappings to CSV
	_	

Figure 4 - 268: Add a virtual drive (1)

Virtual Axis Page

SH_Drive_Virtual X		
General Setting Commissioning SM_Drive_Virtual: 2/0 Mapping SM_Drive_Virtual: 2/C Objects Status	Axis Type and Limits Virtual mode Elicear Axis Software Limit Rotary Axis Rotary Axis Rotar	Motion Parameter Error Reaction ✓ Quick Stop Velocity Ramp Type ★ Trapezoid ○ Sin [±] ○ Quadratic ○ Quadratic(smooth)
Information	Modulo value [u]: [260 Transmission Mechanism Mechanism Type Ball Screw * (1) (2) (3) (3)	Mechaniam Setting (1) Cammand pulse per motor rotation: 1 (Pulse) (4) Ptch: 1 (Unit) Gear Box Gear Ratio = (2) Gear ratio dumentor 1 () Gear ratio denominator 1 ()
	Reverse On Reverse On COV CV	we command DDD CW CW CW

Figure 4 - 269: Virtual axis

1. Axis Type and Limits

Name	Description			
Virtual mode	Enable virtual mode after clicking, which is enabled by default.			
Linear axis/Rotary axis	Select Linear axis/Rotary axis			

2. Linear Axis Software Limits

Name	Description
Activated	Start software limit (only support linear axis)

Name	Description		
Negative [u]	Reverse software limit		
Positive [u]	Forward software limit		

3. Rotary Axis modulo Setting

Name	Description
Modulo value [u]	Set a lap range (only support Optional rotation axis)

4. Error Reaction

Name	Description
Quick Stop	Axis emergency stop

3. Velocity Ramp Type

Name	Description
Trapezoid/Sin²/ Quadratic/ Quadratic (smooth)	Set axis motion curve

4. Transmission mechanism

Ball screw drive

- Transmission Mechanism			
Mechanism Type Ball Screw v	Mechanism Setting (1) Command pulse (4) Pitch: 1 Gear Box	per motor rotation: 1	▲ [Pulse]
	Gear Ratio =	(2) Gear ratio numerator (3) Gear ratio denominator	1 ×

Figure 4 - 270: Ball screw drive

Name	Description
(1) Command pulse per motor rotation	Command pulse per motor rotation
(2) Gear ratio numerator	Gear ratio numerator
(3) Gear ratio denominator	Gear ratio denominator
(4) Pitch	Pitch

Round table drive

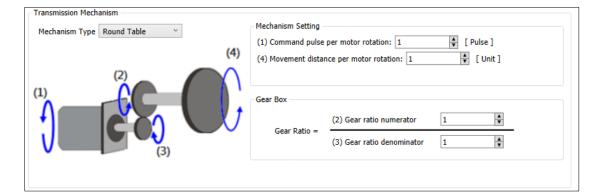


Figure 4 - 271: Round table transmission

	Name	Description	
(1)	Command pulse per motor rotation	Command pulse per motor rotation	
(2)	Gear ratio numerator	Gear ratio numerator	
(3)	Gear ratio denominator	Gear ratio denominator	
(4)	Movement distance per motor rotation	Movement distance per motor rotation = diameter*n	

Belt drive

(1)	(4)	(4) Diameter: 1	(1) Command pulse per motor rotation: 1 [Pulse]			
)		Gear Box Gear Ratio =	(2) Gear ratio numerator	1		
V	(3)		(3) Gear ratio denominator	1		

Figure 4 - 272: Belt Drive

Name		Description
(1) Command pulse per mo	otor rotation	Command pulse per motor rotation
(2) Gear ratio numerator		Gear ratio numerator
(3) Gear ratio denominator		Gear ratio denominator
(4) Movement distance per rotation: Diameter *n	motor	Movement distance per motor rotation: Diameter *n

5. Positive/Negative Commands

Name	Description
Reverse OFF/Reverse On	Set forward/reverse command

4.4.4 Free Encoder

The free encoder function is used to set the connection with the external encoder electronic signal source, which is commonly used for precise positioning during motion control.

Please follow the steps below to add a free encoder to the project tree:

1. Right-click on *SoftMotion General Axis Pool> Add Device> Free Encoder>* DMC_Encoder.

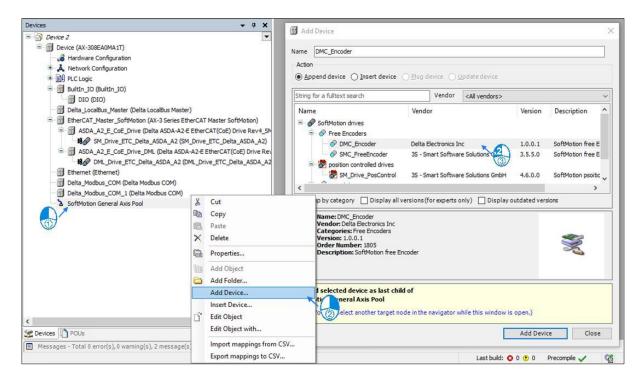


Figure 4 - 273: Add DMC_Encoder

The following figure shows the default display screen after double-clicking DMC_Encoder in the project tree:

Encoder Configuration	Encoder				
DMC Encoder: I/O Mapping	Encoder Standard				
Diric_Licoder, t/o happing	Encoder Device:	Data Source		Positive Command	Negative Command
DMC_Encoder: IEC Objects	Lincoder Device.	Data Julice		60	60
Status	Data Source:		Revers	e OFF	(2)
Information	Encoder Type			ccw	cw
	Linear Axis	Rotary Axis		CCW	CW
	Modulo: 3 Single Turn Settings: 1 Multiple Turn Settings: 0	8 🐳 [bit]	Revers	e On CW	ccw
	Transmission Mechanism				
	Mechanism Type Ball Screw	1 *	Mechanism Setting		
	(2)	(4)	(1) Command pulse (4) Pitch: 1	per motor rotation: 1	tree] € [Pulse]
		7112 20			
			Gear Box	(2) Committee and the first	L A
		(3)	Gear Ratio =	(2) Gear ratio numerator	
				(3) Gear ratio denominator	1 +

Figure 4 - 274: DMC_Encoder preset screen

Parameters Tab:

To add the DMC_Encoder parameter setting tab, please go to the main menu *Tools> Options> Device Editor>* tick *Display Generic Device Configuration Views*.

	Options	×
Jools We dow Help Paci Manager Library Repository Device Repository Visualization Style Repository License Repository License Repository License Manager Scripting Firmware Update Customize C2 Options Import and Export Options	 CFC Editor Croposer Debugging Dedaration Editor Device description download Device editor Device editor FBD, LD and IL editor General Help International Settings Libraries Libraries Libraries Libraries Library download Cada and Save Monitoring PLCopenXML Proxy Settings Refactoring SFC editor 	Device editor View Show generic device configuration views Greate Cross References for IEC addresses (Clean necessary) Communication page Simple mode Show implicit files for application download on the editor of a PLC Show access rights page Luse horizontal tab pages
		QK Qancel

Figure 4 - 275: Add DMC_Encoder parameter setting screen steps

The user can set relevant parameters in the DMC_Encoder parameter tab.

Encoder Configuration	Parameter	Туре	Value	Default Value	Unit	Description
DMC_Encoder: Parameters	wDriveID	WORD	1	1		ID of drive
	w dwRatioTechUnitsDenom	DWORD	1	1		conversion inc./tech.units denominator
DMC_Encoder: I/O Mapping		DINT	1	1		conversion inc./tech.units numerator
DMC Encoder: IEC Objects	iMovementType	INT	1	1		movement type: 0: rotary/modulo, 1: linear
Divic_Encoder: IEC objects	PositionPeriod	LREAL	360.0	360.0		modulo value for rotary drives
Status	MultiTurnsSetup	WORD	0	0	bit	Number of data bits to count turns
	SingleTurnsSetup	WORD	18	18	bit	Number of data bits of per turns
Information	🖃 🚞 AXIS_REF: Scalings					
	ScalingIncs	DINT	1	1		(1) Command pulse per motor rotation
	ScalingEncoderTurns1	DINT	1	1		(2) Gear ratio numerator
	ScalingEncoderTurns2	DINT	1	1		(3) Gear ratio denominator
	🖤 🖗 ScalingUnits	DINT	1	1		(4) Movement distance in user unit per motor rotation
	···· 🕸 InvertDirection	BOOL	FALSE	FALSE		
	Mechanism Type	Enumeration of BYTE	Ball Screw	Ball Screw		0:Ball Screw / 1:Round Table / 2:Belt Pulley
	😑 🧰 possible cyclic driver in-/outputs					
	NumberOfOutputMappingParams	INT	0	0		
	NumberOfInputMappingParams	INT	0	0		
	Automatic Mapping	BOOL	FALSE	FALSE		

Figure 4 - 276: DMC_Encoder parameter tab

Encoder configuration tab

Encoder Configuration	Encoder			
DMC_Encoder: Parameters	Encoder Standard	3	Positive Command	Negative Command
DMC_Encoder: I/O Mapping	Encoder Device: Data Source			
DMC_Encoder: IEC Objects	Data Source:	Reverse 0		(6)
Status	Encoder Type		ccw	cw
Information	Linear Axis O Rotary Axis Modulo: 360 M			
	Single Turn Settings: 18	🔿 Reverse On)n \\$97.	V (SP).
	Multiple Turn Settings: 0		CW	ccw
	4 Transmission Mechanism			
	Mechanism Type Ball Screw ~	lechanism Setting 1) Command pulse per	r motor rotation: 1	Vertical Pulse]
		4) Pitch: 1	Vnit]	
		ear Box		
	(3)	(i Gear Ratio =	2) Gear ratio numerator	•
			3) Gear ratio denominator	-

Figure 4 - 277: Virtual encoder configuration screen

① Encoder Standard

Name	Description
Encoder equipment	Data Source
Data Source	Support variables whose data type is UDINT. Data source Click to enter the input assistant, select a variable under Motion_PRG, and press <i>OK</i> to complete the data source selection.

② Encoder type

Name	Description
Linear axis/rotary axis	Select linear axis/rotary axis
Modulus value	Set a circle range (only support rotation axis)
Single lap setting	Data bit of single revolution (unit: bit)
Multi-turn settings	Multi-turn data bits (unit: bit)

③ Positive/negative instructions

Name	Features
Reverse close/reverse open	Set forward and reverse commands

④ Transmission mechanism

• Ball screw drive

lechanism Type (1)	Ball Screw	(4)	Mechanism Setting (1) Command pulse (4) Pitch: 1	per motor rotation: 1	Pulse]
	CO		Gear Box	(2) Gear ratio numerator	1
			Gear Ratio =	(3) Gear ratio denominator	1

Figure 4 - 278: Ball screw drive

	Name	Description
(1)	Command pulse per motor revolution	Command pulse per motor revolution
(2)	Gear ratio numerator	Gear ratio numerator
(3)	Gear ratio denominator	Gear ratio denominator
(4)	Pitch	Pitch

• Round Table Drive

(2)	0	per motor rotation: 1	↓ [Pulse]	
		Gear Box	(2) Gear ratio numerator	1	
		Gear Ratio =	(3) Gear ratio denominator	1	

Figure 4 - 279: Round table transmission

	Name	Description
(1)	Command pulse per motor revolution	Command pulse per motor revolution
(2)	Gear ratio numerator	Gear ratio numerator
(3)	Gear ratio denominator	Gear ratio denominator
(4)	The moving distance of the motor per revolution	Movement distance per motor revolution

• Belt Drive

Mechanism Type	Belt Pulley v		Mechanism Setting (1) Command pulse	per motor rotation: 1	V [Pulse]
	(2)		(4) Diameter: 1	🗧 [Unit]	
(1)		(4)	Movement distance	per motor rotation: Diameter *	n
Δ	U A		Gear Box		
			2 212	(2) Gear ratio numerator	1
v —	(3)		Gear Ratio =	(3) Gear ratio denominator	1

Figure 4 - 280: Belt Drive

	Name	Description
(1)	Command pulse per motor revolution	Command pulse per motor revolution
(2)	Gear ratio numerator	Gear ratio numerator
(3)	Gear ratio denominator	Gear ratio denominator
(4)	Diameter	Moving distance per motor revolution = diameter*n

When the device is connected, online monitoring information will be added to the encoder configuration tab, as shown in the figure below.

Encoder Configuration	Online			
DMC_Encoder: I/O Mapping	Status: SMC_AXIS_STA	TE.power_off		Communication: operational (100)
one_encodent (or hopping	variable	set value	actual value	Errors
DMC_Encoder: IEC Objects	Position [u] 0		0	Axis Error: 0 [16#0000000]
Status	Velocity [u/s]	0	0	FB Error:
Information	Acceleration [u/s ²]	0	0	SMC_ERROR.SMC_NO_ERROR
Inormation	Torque [Nm]	0	0	uiDriveInterfaceError:
				strDriveInterfaceError:

Figure 4 - 281: Online Monitoring Information

4.4.5 Axis group Setting

The axis group defines the mechanism relationship between the axes, co-locating and orienting multiple axes in space to match the motion function to be used. When multiple axes are executed at the same time and linear interpolation and helical interpolation functions are required to use the axis group movement, the axis needs to be set as the axis group through DIADesigner-AX.

Number of control axes	Maximum number of axes controlled by linear interpolation	6 axes
	Number of control axes for arc interpolation	6 Axes (3 axes following axes)

Applicable equipment: AX-308E, AX-364E.

4.4.5.1 Axis Group Configuration Process And Setting Steps

The parameters used for axis group motion are as follows:

DeltaAxisGroup 🗙				
⊿ Kinematic				
Configuration				
Axis Z				
Axes Group Axis 2	X: (Configure)	Please Enter an Axis N	lapping	
z Axis '	Y: (Configure)	Please Enter an Axis N	lapping	
Axis Y y Axis Z	Z: (Configure)	Please Enter an Axis N	lapping	
Axis X				
Following Axis Following Ratio				
Axis /	A: (Configure)			
	B: (Configure)			
Axes Group Axis	C: (Configure)	Please Enter an Axis N	lapping	
Axis X Axis X Axis X Axis Y Axis Z Axis Z Following Ratio = Target Position of Follo Target Position of Axis				
Motion Parameter				
RampType S Curve ×	1	Max Velocity Limit Max Acceleration Limit Max Deceleration Limit Max Jerk Limit (Reserved)	2000000 ¥ (us 2000000 ¥ (us	ser unit)/s ser unit)/s² ser unit)/s³ ser unit)/s³
Bus Task: <unknown></unknown>				

Figure 4 - 282: Axis group parameters

Kinematic model

Name	Features
Axis X ^{*1}	X axis in axis group
Axis Y ^{*1}	Y axis in axis group
Axis Z ^{*1}	Z axis in axis group
Axis A ^{*1}	A axis in the axis group
Axis B ^{*1}	B axis in axis group
Axis C ^{*1}	C axis in axis group

Motion parameters

Name	Features
Slope type * ²	Velocity curve type
Maximum Velocity Limit * ³	Maximum Velocity of axis group
Maximum Acceleration Limit * ³	Maximum acceleration of axis group
Maximum Deceleration limit * ³	Maximum deceleration of axis group
Maximum jerk Limit (Reserved) * ³	Maximum acceleration (jump) of axis group (this function is reserved)

Task

Name	Features
Bus task	Set axis group update Task

NOTE:

1. Axis X ~ Axis C : Enter single axis name

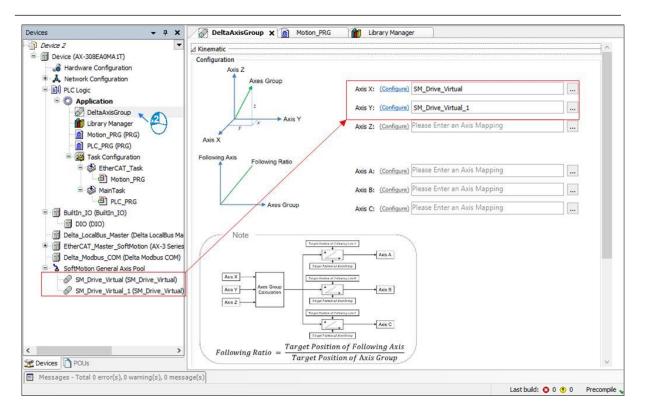


Figure 4 - 283: Kinematic model

2. Slope type: There are two types of curves, trapezoid and S-curve, and the curves are shown as the following two types.

Trapezoid

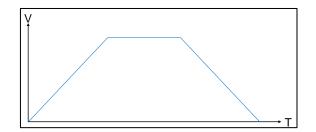


Figure 4 - 284: Trapezoidal curve

S curve

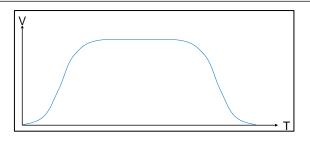
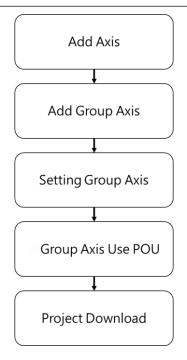


Figure 4 - 285: S curve

- 3.
 - Maximum Velocity Limit: an error will be reported when the axis group movement velocity exceeds the set parameter.
 - Maximum Acceleration Limit: an error will be reported when the axis group movement acceleration exceeds the set parameter.
 - Maximum Deceleration Limit: when the axis group motion deceleration exceeds the set parameter, an error will be reported.

4.4.4.2 Axis Group Parameter Introduction

To use the axis group movement, user need to set the axis group name and corresponding individual axis through DIADesigner-AX. The axis group creation flowchart is as follows:



Follow the steps to create a axis group:

1. Add a single axis, this process takes the creation of 2 virtual axes as an example.

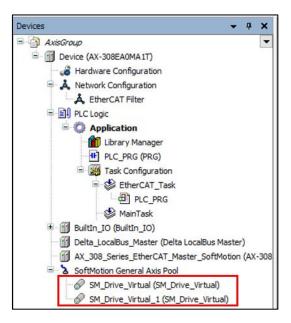
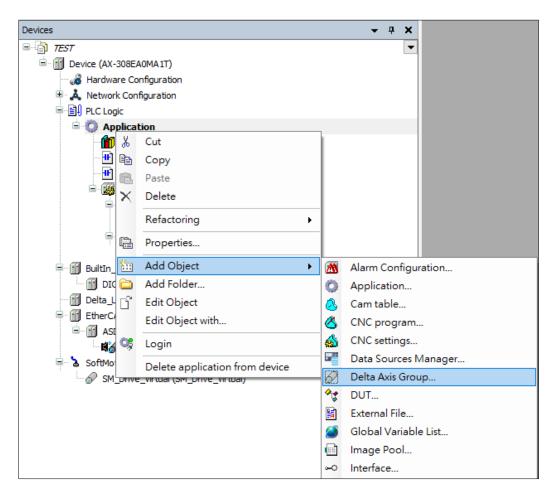


Figure 4 - 286: New Single Axis

2. After the creation is complete, right-click on the Application and select Add



Object > Delta Axis Group as shown in the following figure.

Figure 4 - 287: Delta Shaft group

Result: Opens Add Delta Axis Group window.

Add D	lelta Axis Group X	<
Ø	Delta Axis Group	
Name	:	
DeltaA	AxisGroup	
	Add Cancel	

Figure 4 - 288: Add Delta axis group

Add name in the *Name* field and click on *Add* button.
 Result: The *DeltaAxisGroup* appears on the project tree.

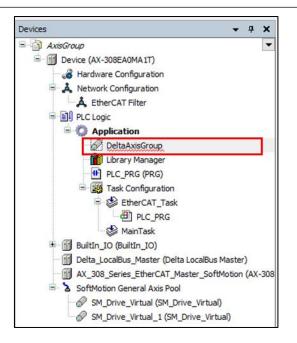


Figure 4 - 289: DeltaAxisGroup

4. Click on *DeltaAxisGroup*, enter the *input assistant* and enter the names of the two-axis virtual axis into *Axis X* and *Axis Y*.

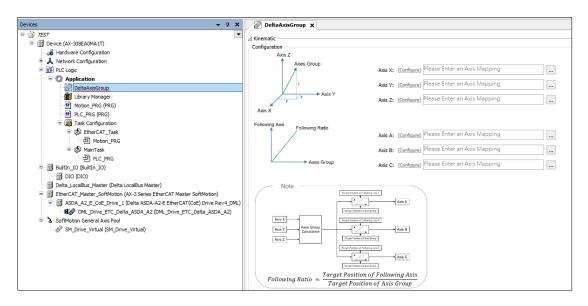


Figure 4 - 290: DeltaAxisGroup Picture

Input Assistant				×
Text Search Categories				
SoftMotion Axes	A Name	Туре	Address	Oı
	DeltaAxisGroupGVL_agDeltaAxisGroup	VAR_GLOBAL		Delta A
	🖹 🧭 IoConfig_Globals	VAR_GLOBAL		
	SM_Drive_Virtual	SM3_Basic.AXIS_REF		SM_Dri
	SM_Drive_Virtual_1	SM3_Basic.AXIS_REF		SM_Driv
	<			>
Structured view]			
		1	z	

Figure 4 - 291: Input assistant

5. Add the *DMC_GroupEnable* function block in Motion_PRG and fill in the axis group name in the AxisGroup pin.

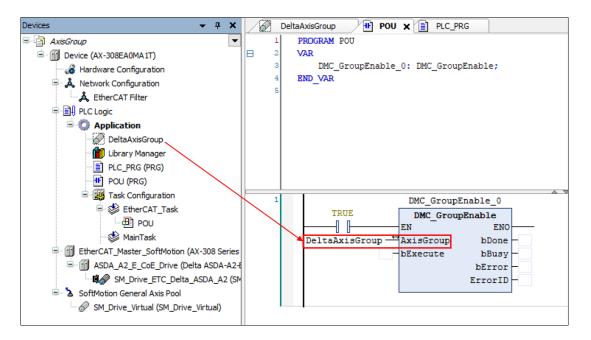


Figure 4 - 292: Added DMC_GroupEnable function block

6. When the program is complete, click compile and confirm whether there are

errors.

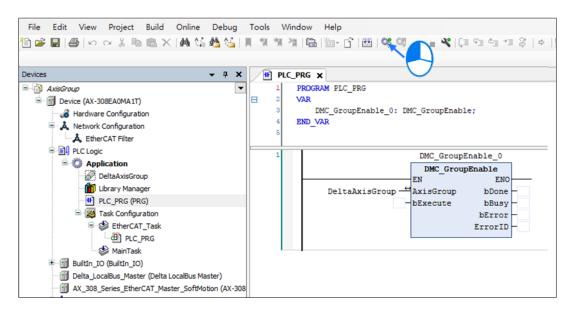


Figure 4 - 293: Compile

7. After confirming that there are no errors after compiling, click Login icon to download the program.

File E	dit View	Project	Build	Online	Debug	Tools	Win	dow	Help						
1	 # 0	~ % P	• • • ×	#4 ¢\$	#5 (<u>6</u>)	JI %I	케게		*** `) = '	∛ (≡	6∃ q∃ +∃	\$ ¢
Devices					- ₽ X		PLC_	PRG >	٢		\smile				
	Device (AX-3) Hardware Network PLC Logic PLC Logic Appl Device (AX-3) PLC Logic Device (AX-3) PLC Logic PLC Logic PL	e Configuratio Configuratio rCAT Filter	up ger G) ration T_Task PRG				2 3	VAR	AR	PRG mpEnable	- oup -↔	DMC_G DMC_ EN	GroupEn GroupE	able_0	

Figure 4 - 294: Compile

8. After confirming that there are no errors after compiling, click Login to download the program.

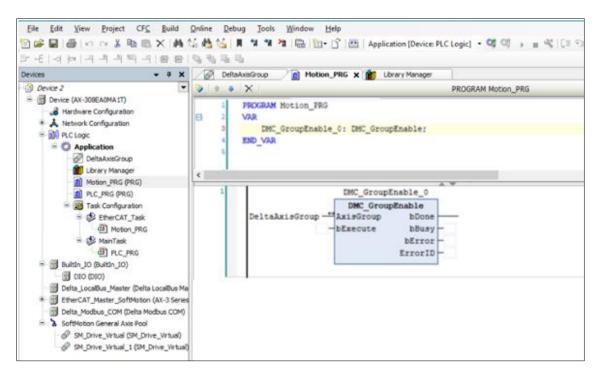


Figure 4 - 295: Log In

Chapter 5: Network Configuration

5.1 Network Configuration

The Network Topology is an industrial network connected to the full range of Delta products, which can be used according to the planned network topology.

The *Network Configuration Editor* is the graphical representation of connections between devices that allows user to plan their networks.

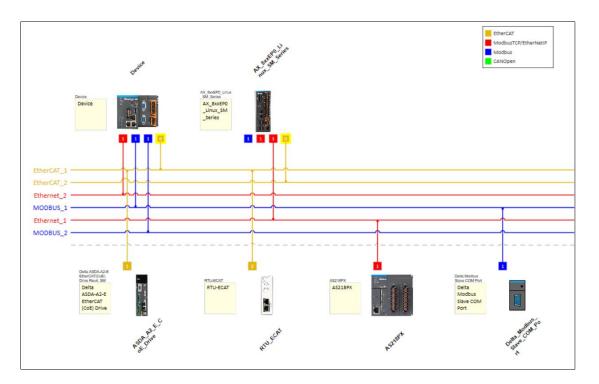


Figure 5 - 1: Network Configuration Editor

Network View Description

Network Configuration window displays two types of information:

- Device information
- Network information

Device information includes the following:

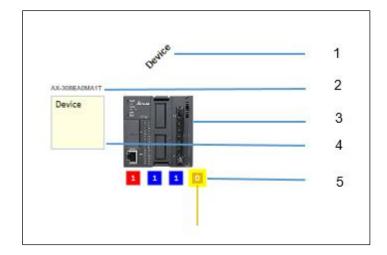


Figure 5 - 2: Device Information

- 1. Device name
- 2. Part number
- 3. Device image
- 4. A NOTE to add text
- 5. Communication ports on the device with protocol support.

Network information includes the following:

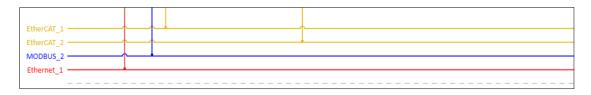


Figure 5 - 3:Network Information

- 1. Name of the Network
- 2. Network lines with Colors
- 3. Connections to the Devices

When the network connection is made between the communication ports in the controller and field devices, the network lines appear in the color described as shown in the following figure:

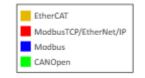


Figure 5 - 4: Color Description

Network configuration diagram toolbar

Toolbar Icon	Function
R	Network Scan by PC

Network Scan

1. User can click to scan connected devices, the result will be listed in *Network Scan* dialog as shown in the following figure. User can select devices from the list and add them into the project.

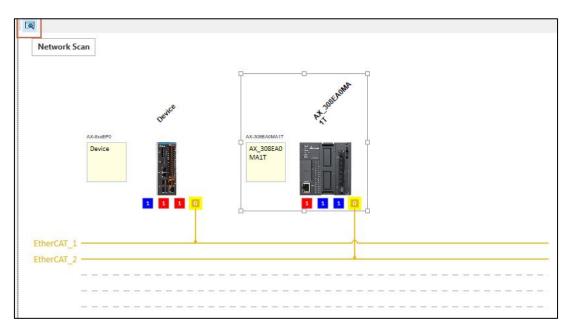


Figure 5 - 5: Network Scan

2. Right-click the EtherCAT node and choose *Scan For Devices* to scan the device under fieldbus.

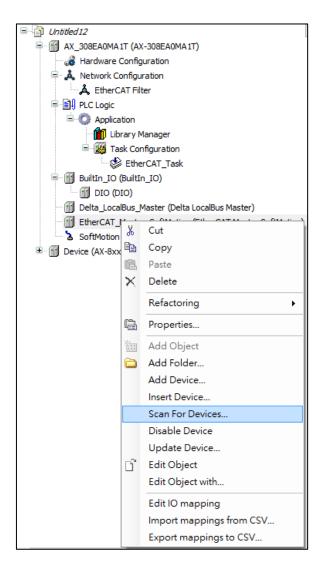


Figure 5 - 6: Scan For Device

Scanned Devices			
Device name	Device type	Address	
ASDA_A2_E_CoE_Drive	Delta ASDA-A2-E EtherCAT(CoE) Drive Rev4_SM (4.6.0.0)	11	
- ASDA_A2_E_CoE_Drive_1	Delta ASDA-A2-E EtherCAT(CoE) Drive Rev4_SM (4.6.0.0)	2	
ASDA_A2_E_CoE_Drive_2	Delta ASDA-A2-E EtherCAT(CoE) Drive Rev4_SM (4.6.0.0)	3	
ASDA_A2_E_CoE_Drive_3	Delta ASDA-A2-E EtherCAT(CoE) Drive Rev4_SM (4.6.0.0)	4	

Figure 5 - 7: Network Scan Window

NOTE: Please LOGIN first to build the map DIADesigner-AX fieldbus scan.

5.2 Configuration

5.2.1 Create a Network Configuration Diagram

Follow the procedure to create a Network Topology:

- 1. Create a Project (refer to 3.3.1.1 Create a Project)
- 2. Add devices (3.3.1.2 Add Devices)
- 3. Double-click *Network Configuration* below the device as shown in the following figure.

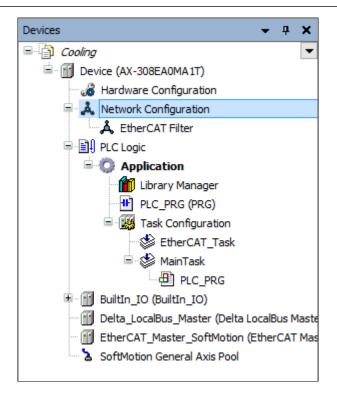


Figure 5 - 8: Creating Network Topology

Result: The *Network Configuration Editor* window displays, including the Topology and Product list.

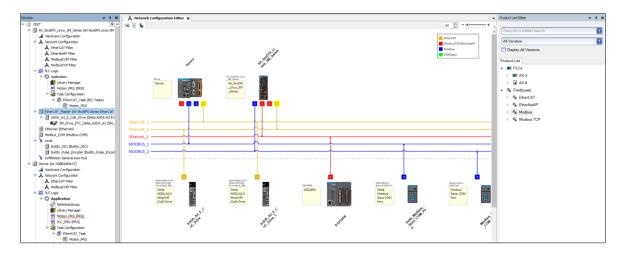


Figure 5 - 9: Network Configuration window

4. User can drag required device from *Product List* to *Network Configuration Editor* and connect the correspond protocol to build project network topology. 5. Press the port to the network protocol line. Connect the devices to the required network.

Result: The network configuration is shown in the following figure.

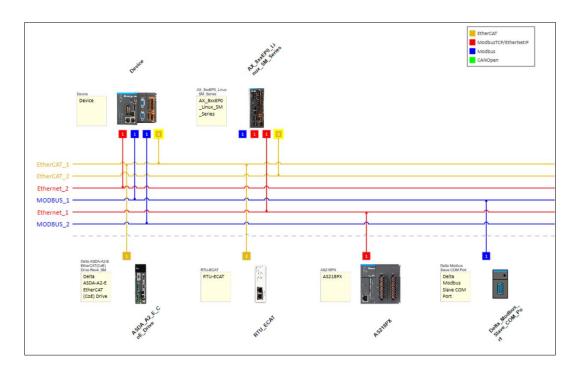


Figure 5 - 10: Network Configuration

6. Set as Master to connect the slave device: Right-click controller and choose Set as Communication Master/Scanner to set the major protocol.

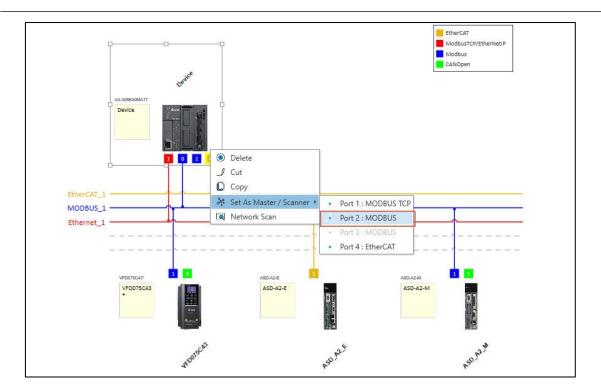


Figure 5 - 11: Setting Major Protocol

Then, project tree will show the related slave device. For example, set MODBUS as Master and the MODBUS slave will be on project tree.

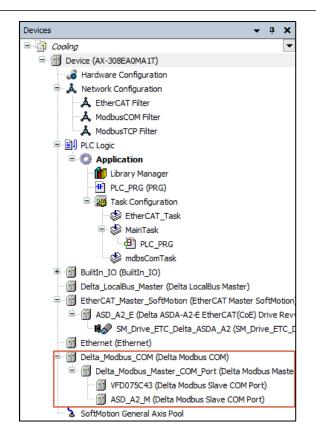


Figure 5 - 12: Project Tree

NOTE:

- 1. In Network Configuration Editor the controller appears above the network line and devices will appear below the network line.
- 2. Under the condition of different versions of the software, if the user imports the project from a higher version to a lower version, the slave device can only restore part of it. The network configuration diagram may also be different because different network devices support different software versions.
- 3. Create a new project without NW/HW Config and export the project. Import the project again. There will be "Errors occurred during the import of the Selected files". This is original CODESYS import error.

5.2.2 Multi Controller Network Topology

Support Multi controller network configuration.

1. Drag a new controller on the topology. The device will be displayed on the topology and shown on the project tree as same time.

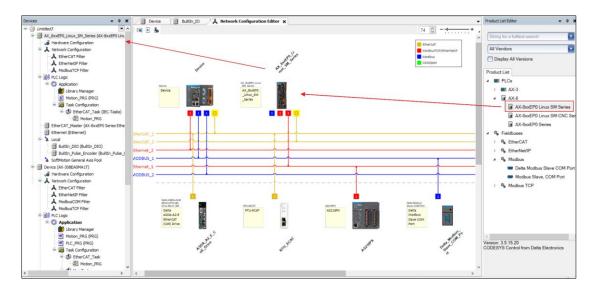


Figure 5 - 13: Network configuration diagram and project tree show controller name at the same time

2. Connect the correspond protocol to build project network topology

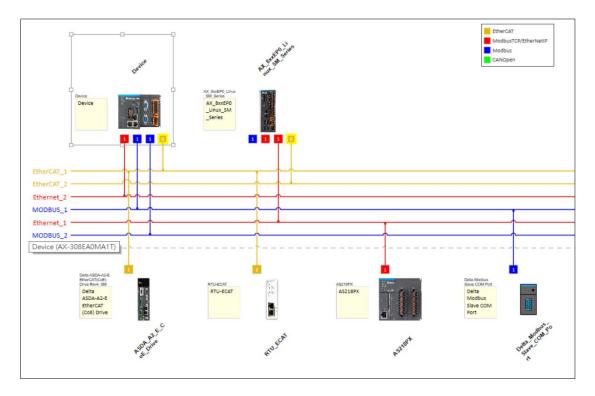


Figure 5 - 14: Connecting Protocol

3. Set as Master to connct the slave device: Right-click controller and choose *Set as Master/Scanner* to set the major protocol.

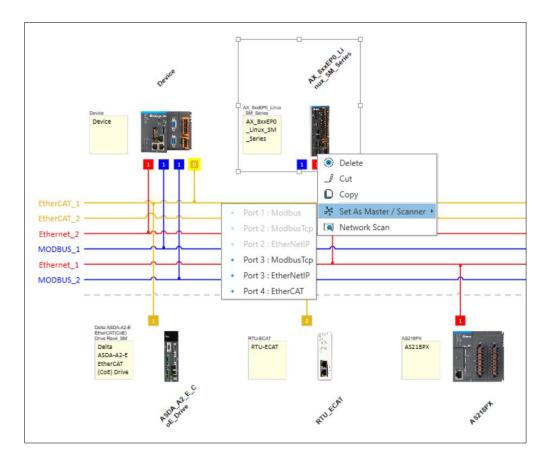


Figure 5 - 15: Setting Major Protocol

Project will show the related slave devices.

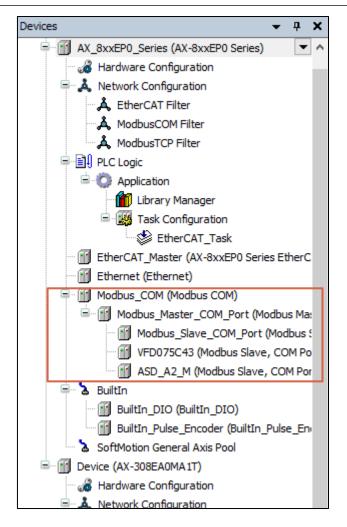


Figure 5 - 16: Slave devices added in Project Tree

4. If the protocol is too complex, user can right-click on the topology blank place and find *Quick Connection* to build device fieldbus line quickly

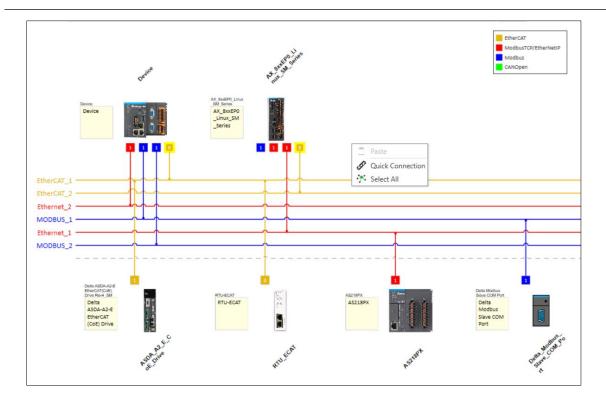


Figure 5 - 17: Quick connection

Quick Connection		×
Please Select Protocol	MODBUS	
Please Select Master Controller Device	 Device Port 1 : MODBUS TCP (Has been used) 	^
	Port 2 : MODBUS (Has been used) O Port 3 : MODBUS	
	 Port 4 : EtherCAT (Has been used) AX_8xxEP0_Series 	
	Port 1 : MODBUS (Has been used) Port 2 : MODBUS TCP (Has been used)	
Please Select Field Devices	 ✓ VFD075C43 ○ Port 2 : MODBUS (Has been used) 	•
	O Port 3 : CANopen	
	 ASD_A2_M Port 3 : MODBUS (Has been used) 	
	O Port 6 : CANopen	
	Build Network Connection	ancel

Figure 5 - 18: Quick Connection Window

Name	Description
Select Protocol	Select one protocol which user want to build the connection line
Select Master controller device	Select the main Master controller based on the selected protocol
Select fieldbus Devices	Select the connection fieldbus based on the selected protocol.
Build Network Connection	Click the button, the selected fieldbus and device will build and connect

5.3 Communication Setting

In this tab of the generic device editor, user can define the connection between DIADesigner-AX and the device where user application should run.

Devices v a x	AX_8xxEP0_Series X			
= ③ ##£1 = ③ AX_BoxEP0_Series (AX-BoxEP0 Series)	Communication Settings	Scan Network Gateway • D	evice •	
PLC Logic Application	Applications			
Library Manager	Backup and Restore			
A Network Configuration A Network Configuration	Files		•	·· .
Ethernet (Ethernet) Modbus_COM (Modbus COM)	Log		Gateway Gateway-1	[0301.C00A] (active)
B Modbus_Master_COM_Port (Modbus Mast	PLC Settings		P-Address: ocalhost	Device Name: X88PCB1T1918010
VFD075C43 (Modbus Slave, COM Por	PLC Shell	P	ort	Device Address:
ASD_A2_M (Modbus Slave, COM Port	Users and Groups	1	217	0301.C00A Target ID:
	Access Rights			16F7 0180
	Symbol Rights			Target Type: 4102
	Parameters			Target Vendor: Delta Electronics

Figure 5 - 19: Communication Setting

Select a gateway and a target device from the list boxes. The possible selections depend on the entries in the *Manage gateways* and *Manage favorite devices* dialogs (see the *Gateway* menu).

User can also type in the target device directly with the IP address (**Example**: 192.168.101.109), device address (**Example**: [056D]), or device name (**Example**:

My Device). After the device is entered successfully, DIADesigner-AX searches for the device in the network of the gateway.

NOTE: The option of searching by device name requires unique device names in the network.

The filled icon on the left side of the device provides information about the connection status:

- O: The PLC is connected, the application is running, the device is in operation, and data is being exchanged. The *Refresh I/Os in stop* check box on the *PLC Settings* tab can be selected or cleared.
- Settings tab is cleared.
- *: The PLC is connected and the application is running. Diagnostic information is available.
- A: The device is in preoperative mode and is not running yet. Diagnostic information is available.
- A: The device is not exchanging data; bus error, no configuration, or simulation mode.
- • •: The device is running in demo mode for 30 minutes. When this time has elapsed, demo mode will expire and the fieldbus will end the data exchange.
- A: The device is configured, but not operational. No data is exchanged.
 Example case: CANopen devices when booting and in preoperative mode.
- A: Redundancy mode is active. The fieldbus master is not sending any data because another master is active.
- **(2)**: The device description could not be found in the device repository.
- Section 12: The device itself is running, but a child device is not running. The child device is not visible due to a collapsed device tree

NOTE: If user login while the device description on the target device is more recent than in the project, then a warning prompt opens with the possibility to cancel the process.

Clicking the filled circle of the target device starts a network scan for the device. This works only if the network is not already being scanned.

can Network Gateway • Device •			
Sateway-1	Gateway	 [0301.C00A] (active) 	~
IP-Address: localhost		Device Name: X88PCB1T1918010	

Figure 5 - 20: Scan Network

Function	Description
Scan Network	This button opens the <i>Select Device</i> dialog. It lists all configured gateways with the associated devices. User can select one target device from this list. Refer to the description of the classic view below for details about this dialog.
Gateway	This menu includes the following commands:
	Add New Gateway: Opens the Gateway dialog for defining a new gateway channel.
	Manage Gateways: Opens the Manage Gateways dialog with an overview of all gateways. User can add or delete entries here or change their order.
	<i>Configure the Local Gateway</i> : Opens the <i>Gateway</i> <i>Configuration</i> dialog. User can configure the block drivers for the local gateway.
Device	 This menu includes the following commands: Add Current Device to Favorites: Adds the currently set device to the list of favorite devices.

Function	Description
	 Manage Favorite Devices: Opens the favorites dialog with a list of all preferred devices. In this dialog, user can add or delete entries or change their order. The top device is the default. Rename Active Device: Opens the Change Device Name dialog. Wink Current Device: Devices that support this function illuminate a flashing signal. Send Echo Service: DIADesigner-AX sends five echo services to the PLC. These are used to test the network connection, similar to the ping function. The services are sent first without data packets and then with data packets. The scope of the data packets depends on the communication buffer of the PLC. A message box opens with information about the average echo service delay and the scope of the sent data packets.
	 Store Communication Settings in Project: DIADesigner-AX saves the communication settings in the project for reuse on the same
	computer. NOTE: If user use the project on another computer, then user have to reset the active path.
	IDADESIGNET-AX saves the communication settings in the options of the local installation for reuse on the same computer.
	NOTE : When using DIADesigner-AX SVN, the option should be cleared in order to prevent blocking the device object.
	Confirmed Online Mode:
	IDADesigner-AX requires user to confirm the following when calling the following online commands (for safety purposes): Force values, write values, multiple loading, Remove force list, Single cycle, Start, Stop.
	Filter Network Scans by Target ID:
	The display is limited on the devices that have the same target ID as the current device configured in the project.
	Encrypted Communication:
	The communication to this controller is encrypted. A certificate of the controller is required in order to log in to the controller. If the

Function	Description	
	certificate is not available, then an error message opens prompting whether or not the certificate should be displayed and installed.	
	Please go to View > Security Screen View Project Build Online Debug Tools POUs Alt+1 Modules Alt+2 Messages Alt+3 Element properties ToolBox Watch Cross Reference List Call Tree Bookmarks Breakpoints Call Stack Memory Online Change Memory Reserve Settings Start Page Security Screen, if choosing Enforce encrypted communication in Security Level, Encrypted Communication will be ineffective.	
	Activate the Use of Certificates for Enhanced Security	
	• Change Communication Policy Opens the Change Communication Policy dialog for changing the device setting for the encryption of communication.	

Dialog Change Communication Policy

If a new communication policy is selected in this dialog, then the configuration on the controller is changed.

Communication

Current policy	Shows the currently selected policy for the encryption of communication	
New policy	 Drop-down list for the new policy for encryption. No encryption: The controller does not support encrypted communication. Optional encryption: The controller supports encrypted and unencrypted communication. Enforced encryption: The controller supports encrypted communication only. 	
Device User Management	<u></u>	
Current policy	Shows the currently selected policy for user management	
New policy	 Drop-down list for the new policy for user management. Optional user management: It is the responsibility of the user to enable user management on the device or leave the device unprotected. Enforced user management: The user management on the device is enabled and cannot be disabled by the user. 	

5.3.1 EtherCAT

Follow the procedures to do EtherCAT settings.

- 1. Create a project with AX-3 series.
- 2. Open Network Configuration Editor.

In the product list window on the right, select *EtherCAT > ASD > Delta ASDA-A2-E EtherCAT(CoE) Drive Rev4_SM*., add it to the network configuration window, as shown in the figure below.

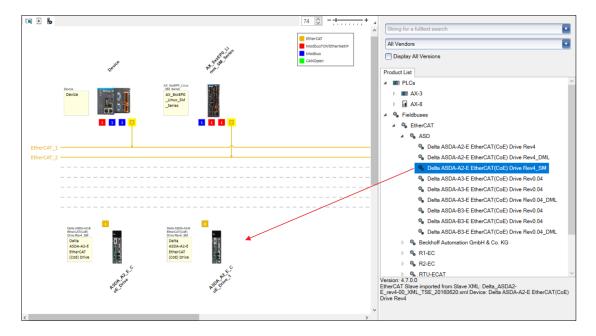


Figure 5 - 21: Adding device to network configuration

4. Connect the device to the network as shown in the following figure.

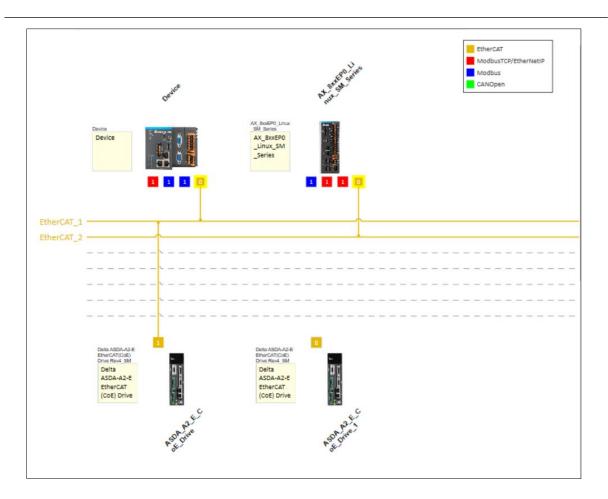


Figure 5 - 22: Connecting device to network configuration

5. Double-click on the master station node as shown in the following figure.

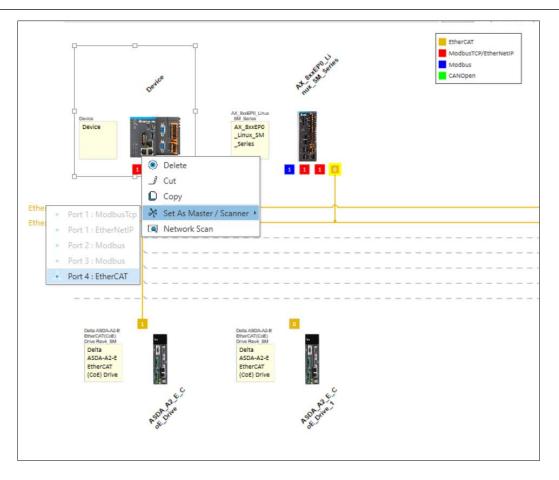


Figure 5 - 23: Clicking on Master station

Result: Displays the *EtherCAT* master station.

6. Set the EtherCAT synchronization time and other required settings as shown in the following figure.

General	Autoconfig Master/Slaves	Ether CAT.
Sync Unit Assignment	EtherCAT NIC Setting	
Log	Destination address(MAC) FF-FF-FF-FF-FF-FF	Broadcast Enable redundancy
EtherCAT I/O Mapping	Source address (MAC) 00-00-00-00-00 Network Name	Browse
EtherCAT IEC Objects	Select network by MAC Select network	vork by name
Status	✓ Distributed Clock	> Options
Information	Cycle time 4000 🖶 µs 🛶	
	Sync offset 20 🗘 %	
	Sync window monitoring	
	Sync window 1 🗘 μs	

Figure 5 - 24: Set EtherCAT synchronization time

7. Double-click on the slave device to set the EtherCAT settings as shown in the following figure.

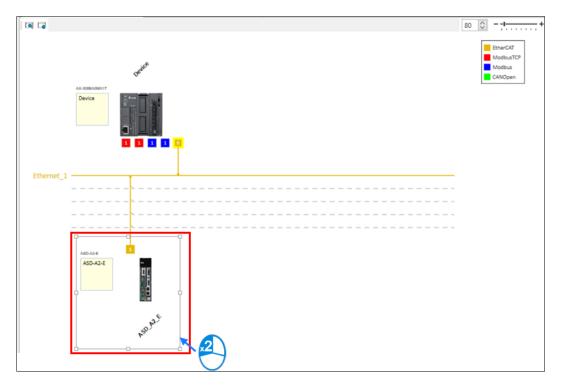


Figure 5 - 25: Click on slave device

8. Set the required EtherCAT settings as show in the following figure.

General Process Data Startup Parameters	Address AutoIncaddress EtherCAT address	0	4.9	_		opert settings	Ether CAT.
EtherCAT I/O Mapping	Distributed Clock Select DC	DC-Synch	ronous			~	
EtherCAT IEC Objects	🖉 Enable	4000	Sync ur	nit cycle (µs)			
Status	Sync0: Enable Sync 0						
Information	Sync unit cycle	× 1	~	4000	*	Cycle time (µs)	
	O User-defined			0	-	Shift time (µs)	
	Sync1:						
	Sync unit cycle	× 1	4	4000	*	Cycle time (µs)	
	O User-defined			0	-	Shift time (µs)	

Figure 5 - 26: EtherCAT Setting

NOTE: User can start programming later. It should be noted that place the created POU under EtherCAT_Task, and use the motion function block to write the program in the POU under EtherCAT_Task to avoid the motion function block from running normally.

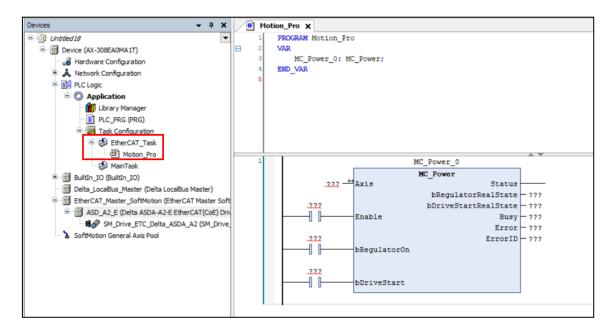


Figure 5 - 27: EtherCAT added to device

5.3.2 MODBUS COM

Follow the procedures to do MODBUS settings.

 In the network configuration window, select a MODBUS COM device. For example: *Modbus> Delta Modbus Slave COM Port*, then drag/double-click this device to add it to the network configuration window, as shown in the figure below.

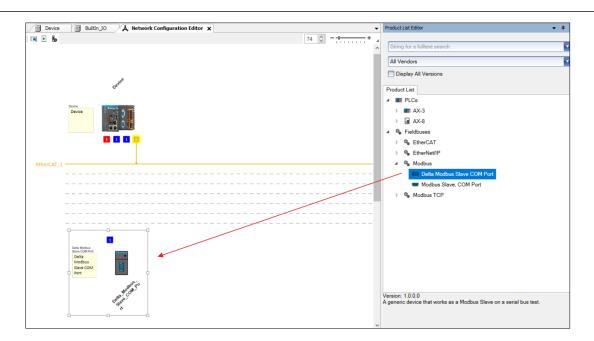
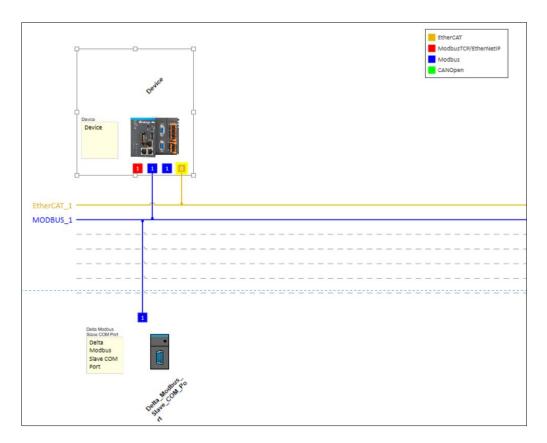


Figure 5 - 28: Adding MODBUS COM

2. Connect to the MODBUS line, Set controller as *MODBUS Master*, and doubleclick field device to open the parameter page.





A Network Configuration Editor	ASD_A2_M X	
General	General Configuration	
Modbus Slave Channel	Slave Address [1247]	1
Modbus Slave Init	Response Timeout [ms]	1000 🛓
Status		Sandard Hodbas Bernes
Information		

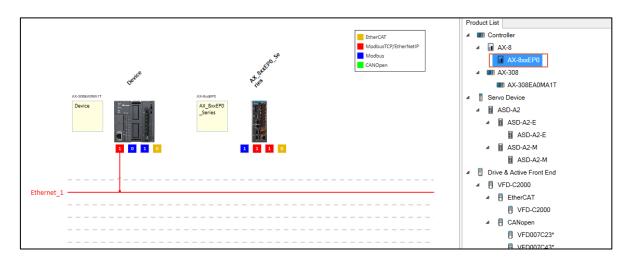
Figure 5 - 30: ASD_A2_M – General Configuration

For more information, please refer to <u>4.2.3 COM Port Setting</u> and <u>4.3.2 COM Port</u> <u>Setting</u> setting.

5.3.3 MODBUS TCP

Follow the procedures to do MODBUS settings.

 From the *Product List Editor* window, select one Ethernet device Example: Controller > AX-8 > AX-8xxEP0 and add it to the *Network* Configuration Editor window as shown in the following figure.





2. Connect to the Ethernet line and Set AX-3 controller as *MODBUS TCP* Master and double-click field device to open the parameter page.

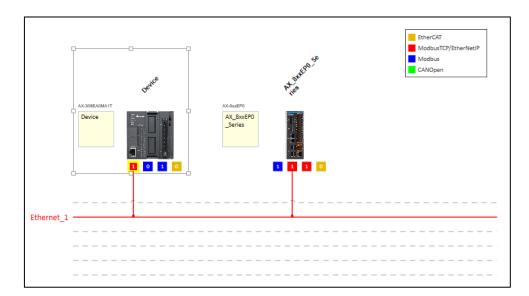


Figure 5 - 32: Setting AX- 3 Controller

User can go to project tree to open the MODBUS TCP slave parameter.

Devices 🗸 🕈 🗙	A Network Configuration Editor	Delta_Modbus_TCP_Slave 🗙
Cooling		
AX_8xxEP0_Series (AX-8xxEP0 Series)	General	
E- 🕤 Device (AX-308EA0MA1T)		General Configuration
Hardware Configuration	Modbus Slave Channel	
🗏 🎝 Network Configuration		Slave Address [0247] 0
A ModbusTCP Filter	Modbus Slave Init	Response Timeout [ms] 1000
PLC Logic	Status	
🖻 💮 Application		Port 502
Library Manager	Information	Device Type Standard Modbus Devices Y
PLC_PRG (PRG)		Standard Houses Standard Houses Standard
🖻 🎆 Task Configuration		IP Address 192 . 168 . 1 . 1
🖹 🍪 MainTask		C Auto Dessent
PLC_PRG		Auto-Reconnect
mdbsEtherTask		
BuiltIn_IO (BuiltIn_IO)		
Delta_LocalBus_Master (Delta LocalBus Master)		
Ethernet (Ethernet)		
🚊 🚮 Delta_Modbus_TCP_Master (Delta Modbus TCP Master)		
Delta_Modbus_TCP_Slave (Delta Modbus TCP Slave)		
SoftMotion General Axis Pool		

Figure 5 - 33: MODBUS TCP Slave parameter

For more information, please refer to <u>4.2.5 EtherNet Setting</u> for AX-3 TCP port setting and <u>4.3.4 EtherNet Setting</u> for AX-8 TCP port setting.

5.3.4 EtherNet/IP

Please follow the steps below to perform EtherNet/IP settings.

In the network configuration window, select an EtherNet/IP device.

Example: *AS CPU* > *AS218RX*, then drag/double-click this device to add it to the network configuration window, as shown below.

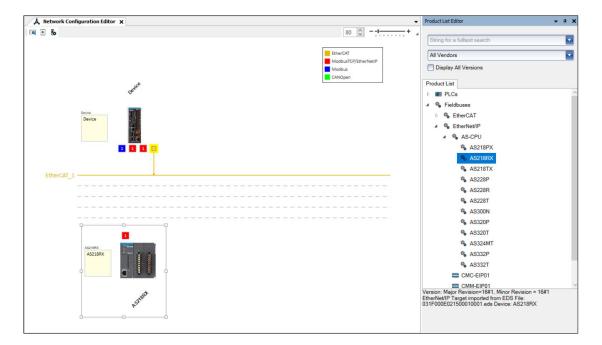


Figure 5 - 34: Add MODBUS COM device

Connect the Ethernet line. After the controller is set as the communication master by pressing the right button, double-click the field device to open the parameter tab.

Network Configuration Editor 🗙	 Product List Editor 	- 4 X
	80 🔘1+ 4	
	String for a fulltext sea	arch 💽
	EtherCAT All Vendors	
	ModbuaTCP/EtherNetIP Modbua Display All Versions CANOpen	1
Service.	Product List	
4	PLCs	
	🔺 💁 Fieldbuses	
Device Device	0 🗣 EtherCAT	
	▲ 🗣 EtherNet/IP	
	🔺 👒 AS-CPU	
13 🛱 🖬 🛄	% AS21	ISPX
	🐁 AS21	ISRX
	🗞 AS21	ISTX
EtherCAT_1	🗞 AS22	(8P
Ethernet_1	% AS22	28R
	• AS22	28T
	• AS30	ION
	• AS32	20P
	🗞 AS32	20T
ASCHRX	9 AS32	24MT
AS218RX	🗞 AS33	12P
	🧠 AS33	12T
	CMC-EIF	P01
1.5.10th	CMM-Ell Version: Major Revision= EtherNet/P Target import 031F000E02150001001	16#1 Minor Revision = 16#1

Figure 5 - 35: Connect the Ethernet line

General	Address Settings	
Connections	IP address 192 . 168 . 0 . 2	EtherNet/IP [*]
ssemblies		
Jser-Defined Parameters	Electronic Keying	
og	○ Compatibility check	
therNet/IP I/O Mapping	Strict identity check	
therNet/IP IEC Objects	 ✓ Check device type 14 ✓ Check vendor ID 799 	
itatus	Check product code 532	
nformation	Check major revision 1	

Figure 5 - 36: General tab

For more information on AX-308E EtherNet/IP settings, please refer to <u>4.2.6</u> <u>EtherNet/IP Settings</u>. For more information on AX-8 EtherNet/IP settings, please refer to <u>4.3.5 EtherNet/IP Settings</u>.

5.3.5 OPC UA

In the AX series controller, the OPC UA server is included, and this service is used through the client access to the control interface of the controller. The OPC UA server communicates with the OPC UA client through a TCP connection. Therefore, these connections must be checked separately for security to protect the client and OPC UA user management with encrypted communication, thereby protecting the OPC UA server.

OPC UA Server Support the following functions:

- Browse data types and variables
- Standard read/write
- Value change notification (for subscribed and monitored items)
- According to OPC UA standard, support Basic256SHA256 encrypted communication.

5.3.5.1 Create OPC UA Access Settings in the Project

To use the OPC UA Server function, user must first create the OPC UA access function in the project. The operation steps are as follows:

- 1. Create a new project in DIADesigner-AX.
- In the project *PLC_PRG* program, create some different types of variables, as shown below.

Device Application.PLC_PRG xpression Type Value Prepared value Address Comment]
	6
wval1 WORD 0	
	E
dwval2 DWORD 0	
bval3 BOOL FALSE	
aryval4 ARRAY [020] OF B	

Figure 5 - 37: PLC_PRG Create variables in

3. From Application adds a symbol configuration, *Application* > *Add Object* > *Symbol Configuration*.

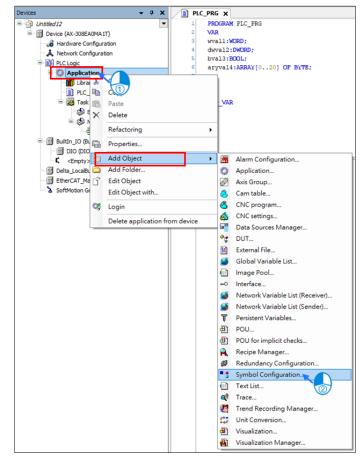


Figure 5 - 38: Add symbol configuration

4. In the *Add Symbol Configuration* dialog box, select, *Support OPC UA features* and click on *Add* button.

Include comments in XML	
Support OPC UA features Add library placeholder in Device Application (recommended, but may trigger download)	
Client Side Data Layout	
O Compatibility Layout	
Optimized Layout	
) Optimized Layout	

Figure 5 - 39: Add symbol configuration dialog

5. Open the symbol configuration setting interface and click compile: The created projects and variables are displayed in the tree structure table below.

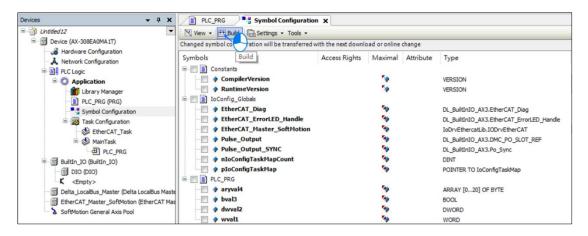


Figure 5 - 40: Symbol configuration setting interface

6. Check to allow the OPC UA client to set the monitored variables. Each variable can set its read/write permission in the access permission field. After changing the setting, it needs to be rebuilt and downloaded to the PLC host.

PLC_PRG	×				
🕅 View 👻 🔛 Build 🛛 🛱 Settings 🔹 Tools 👻					
• There are 6 configured variables which are not re	eferenced by the IE	C code. Read	ding and writi	ng to them may not have the desired effect(s).	Remove
Changed symbol configuration will be transferred w	ith the next downlo	ad or online	change		
Symbols	Access Rights	Maximal	Attribute	Туре	Members
- D Constants					
- 🔲 🕂 CompilerVersion		۰.		VERSION	
RuntimeVersion	5 0	*		VERSION	
🗐 🔲 IoConfig_Globals					
🖉 🐓 EtherCAT_Diag		*		DL_BuiltInIO_AX3.EtherCAT_Diag	
		*		DL_BuiltInIO_AX3.EtherCAT_ErrorLED_Handle	
- DtherCAT_Master_SoftMotion		*		IoDrvEthercatLib.IODrvEtherCAT	
🛛 📝 🖗 Pulse_Output	5	*		DL_BuiltInIO_AX3.DMC_PO_SLOT_REF	
		*		DL_BuiltInIO_AX3.Po_Sync	
- ConfigTaskMapCount	5	See		DINT	
→ pIoConfigTaskMap		-		POINTER TO IoConfigTaskMap	
PLC_PRG					
v aryval4	N	*		ARRAY [020] OF BYTE	
🐨 🔽 🕼 bval3	540	-		BOOL	
www.al2	5	-		DWORD	
🛛 🕼 🕸 wval1	50	-		WORD	

Figure 5 - 41: Change symbol configuration settings

7. Finally, download the project to the host.

5.3.5.2 Use UaExpert Client to Establish a General Connection

Use OPC UA Client to connect with AX series controller OPC UA server. Generally unencrypted connection.

The following is an explanation of how to set UaExpert client. Other OPC UA Clients are similarly set.

User can first go to UaExpert official website to register for free download.

Download URL : <u>https://www.unified-automation.com/downloads/opc-ua-clients.html</u>

- 1. Launch UaExpert
- 2. Right-click Servers > Add: open the Add Server dialog.

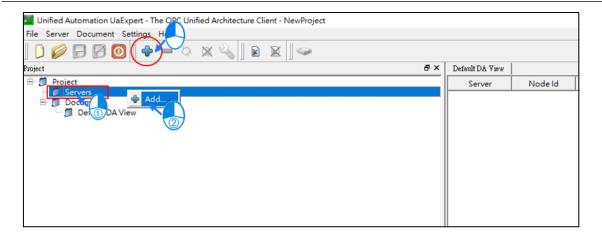


Figure 5 - 42: Add Server

3. Click *Custom Discovery* > *Double click to Add Server* > to pop up the *Enter Url* dialog box, enter opc.tcp://192.168.1.5.

Add Server	? ×
Configuration Name Unified Automation Dem	o Server
Discovery Advanced	
Cocal Cocal Cocal Network Microsoft Terminal Service Soft Wicrosoft Windows Network Soft Windows Soft Windows	ork
Enter Url Enter the Url of a computer with disc opc.tcp://192.168.1.5 OK	? × covery service running: Cancel
Authentication Settings • Anonymous	
C Password	Store
C Certificate Currently not supported	by UaExpert
✓ Connect Automatically	OK Cancel

Figure 5 - 43: Enter Url Dialog box

4. After completing the previous step, the following screen will appear and AX308E will be added under Project. If the encryption function is not used, the connection

method will only scan out [No encryption] None-None. (No need to enter account password and select encryption format).

figur	ation Name AX308E	
iscov	ery Advanced	
	Local	
T	Nocal Network	
	Microsoft Terminal Services	
	🚊 🔍 opc.tcp://tsclient	
ŀ	🤤 Microsoft Windows Network	
	⊕- 🚽 DELTA ∋- 😏 Web Client Network	
<u> </u> (Custom Discovery	
	🗣 < Double click to Add Server >	
E	- 🔍 opc.tcp://192.168.1.5	
	OPCUAServer@AX-308EA0MA1T None - None	
-) (î	Recently Used	
	Unified Automation Demo Server	
4 - A		
	entication Settings	
	entication Settings Anonymous	
Auth ©	entication Settings Anonymous Usemame	
•	entication Settings Anonymous	T Sto
•	entication Settings Anonymous Usemame Password	□ Sto
•	entication Settings Anonymous Usemame	┌ Sto
۰ د	entication Settings Anonymous Username Password Certificate Currently not supported by UaExpert	Γ Sto
ہ د	entication Settings Anonymous Usemame Password	□ Sto

Figure 5 - 44: Connection display

 Modify the connection content: *Project > AX308E* and click the right mouse button > *Properties*.

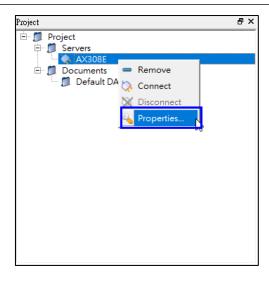


Figure 5 - 45: Modify connection content

6. Enter in *Endpoint Url* in the Server Settings dialog box *opc.tcp://192.168.1.5:4840*.

🔛 Se	rver Settings - OP	CUAServer@AX-308EA0MA1	? ×	
Serve	er Information ——		_	
Endy	point Url	opc.tcp://AX-308EA0MA1T:4840	← []]] 19	92.168.1.5
Secu	rity Settings			
Secu	urity Policy	None	•	
Mes	sage Security Mode	None	•	
Auth	entication Settings —			
œ	Anonymous			
-	Usemame			
10	Password		🗖 Store	
С	Certificate Curren	ntly not supported by UaExpert		
Sessi	on Settings			
Sessi	ion Name	m:TWTY3PC1346:UnifiedAutomatic	n:UaExpert	
		OK	Cancel	

Server Settings - OP	CUAServer@AX-308EA0MA1 ? X
Server Information	
Endpoint Url	opc.tcp://192.168.1.5:4840
Security Settings	
Security Policy	None
Message Security Mode	None
-Authentication Settings-	
Anonymous	
Username	
Password	☐ Store
C Certificate Curren	ntly not supported by UaExpert
Session Settings	
Session Name	m:TWTY3PC1346:UnifiedAutomation:UaExpert
	OK Cancel

Figure 5 - 46: change Endpoint Url

7. Click *Project* > *AX308E*, then, right-click > *Connect*.

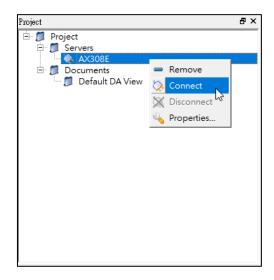


Figure 5 - 47: AX308E Connect

8. Change variable data status through OPC UA client.

Select the variable and drag it to the Default DA View, user can see the variable information and status; double-click the variable Value column to modify the value of the variable.

5.3.5.3 Establish an Encrypted Connection

In order to encrypt data and securely exchange data with the client, the server needs a certificate when establishing a connection for the first time, and the client must classify this certificate as a trusted certificate. After the certificate is trusted, the correct user account must be used to establish a connection. The following chapters are the setting and operation instructions required for authentication, please set and operate in order.

OPC UA Server Start certification

To set the encryption method of OPC UA Server, user need to use Matrikon ® FLEX[™] OPC UA Editor to configure the settings (DIADesigner-AX has been installed in advance).

 After the project is created, right-click *Device* > *Add Object* > *Matrikon FLEX* OPC UA Server. In Matrikon FLEX OPC UA Server dialog box, Add *Matrikon FLEX OPC UA Server* and click on *Add* button.

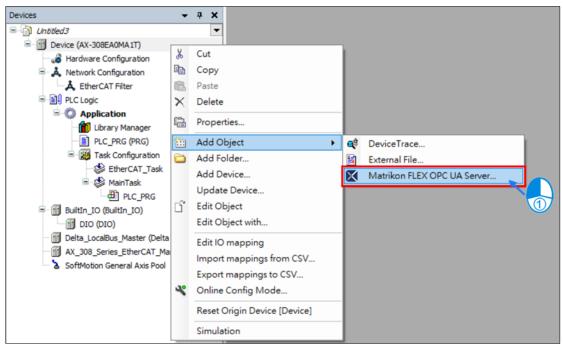


Figure 5 - 48: Add Object

Result: The Project tree displays Matrikon FLEX OPC UA Server in the project list.

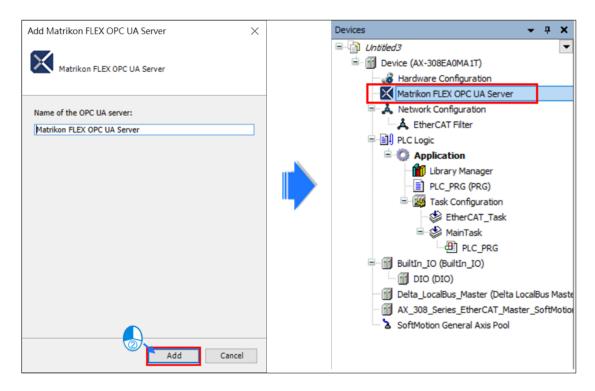


Figure 5 - 49: Project tree display Matrikon FLEX OPC UA Server

2. Matrikon FLEX OPC UA Server Setting interface.

Matrikon FLEX OPC UA Server					×
General	Communication	Settinas			
Data Setup		j_			
Status					
Information					🤒 Matrikon° FLEX™
	Hostname:		Get from device	Clear Number of sessions:	1
	Ethernet interface:	< Any >	Browse	Any Server cyclic rate, ms:	100 🗘
	IP address:			Security policy:	Basic256 Sha256 v
	Port number:	4840	\$	Authentication:	Anonymous
	OPC UA Endpoint:				
	Reverse connect				
- Total 0 error(s) 0 warning(s) 1 messa	٢				>

Figure 5 - 50: Matrikon FLEX OPC UA Server Setting interface

3. Set up the network communication interface.

	Communicatio	n Settings				
νp						
ton				1	Matrikon*	FLE?
	Hostname:		Get from device Clear	Number of sessions:	1	0 0
	Ethernet interface: IP address:	< Any >	Browse	Server cyclic rate, ms: Security policy:	100 Basic256 Sha256	Ĵ
	Port number:	4840	:	Authentication:	Anonymous	
	OPC UA Endpoint:				The second distance of	
	1203					
	Reverse connect					
INCOMENT TRADUCTION	C .					
HONOT TUDAHONN			_			
INCOME TO LIAMONIAN		•				
moret truestoorte		4	•			
		er	•	-	- ×	
1	1. T Description of	er	Description		D X	
	D Select network adapt	er	Description	IP at 192.16	idress 8.1.5	
	 Select network adapt Name 	er	Description	IP ac	idress 8.1.5	
	D Select network adapt Name cpsw0	er	Description	IP at 192.16	idress 8.1.5	
	D Select network adapt Name cpsw0	er	Description	IP at 192.16	idress 8.1.5	
	D Select network adapt Name cpsw0	er	Description	IP at 192.16	idress 8.1.5	
	D Select network adapt Name cpsw0	er	Description	IP at 192.16	idress 8.1.5	
	D Select network adapt Name cpsw0	er	Description	IP at 192.16	idress 8.1.5	
	D Select network adapt Name cpsw0	er	Description	IP at 192.16	idress 8.1.5	

Figure 5 - 51: Matrikon FLEX OPC UA Server Set up the network communication interface

4. Setting complete screen. (Other fields do not need to modify settings).

Matrikon FLEX OPC UA Server						×
General	Communication	Cottings				
Data Setup	Communication	setungs				
Status						
Information				~	🤊 Matrikon® F	LEX™
	Hostname:		Get from device Clear	Number of sessions:	1	•
	Ethernet interface:	cpsw0	Browse Any	Server cyclic rate, ms:	100	\$
	IP address:	192.168.1.5		Security policy:	Basic256 Sha256	×
	Port number:	4840 🗘		Authentication:	Anonymous	~
	OPC UA Endpoint:	opc.tcp://192.168.1.5:4840				
	Reverse connect					

Figure 5 - 52: Matrikon FLEX OPC UA Server Setup complete screen

- 5. After setting, please download to the PLC host.
 - Set user account password

The OPC UA Server account password used is the same as the account password of the host encryption.

Set up two accounts:

- 1. Default account : Administrator
- 2. New account : guest

Device		×
Communication Settings	🔕 🖙 🖬 Device user: Administrator	
Applications	Synchronized mode: All changes are immediately downloaded to the device.	
Backup and Restore		♦ Add
Synchronized Files	❀ 😫 guest	Import
Files		 Edit Delete
Log		Ψ Delete
PLC Settings		
PLC Shell		
Users and Groups		
Access Rights	Groups	
Symbol Rights	R= St Administrator	♦ Add
Runtime Clock Configuration	Sei derived from 'Developer' Shas user member 'Administrator'	Import
System Parameters	* 93 Developer	Edit
Task Deployment	 S has user member 'Administrator' S has user member 'guest' 	Delete
Status	se Service	
Information		

Figure 5 - 53: Set user account password screen

• Trust Certificate Settings

Install the CODESYS Security Agent add-on. DIADesigner-AX is already installed.

1. Click View > Security Screen.

Vie	w	Project	Build	Online	Debug	Tools			
2	D	evices			Alt+	0			
٦	P	OUs			Alt+	·1			
\$	Μ	Modules Alt+2							
	Μ	Messages Alt+3							
	El	ement pro	perties						
*	Т	oolBox							
	W	/atch				•			
	C	ross Refere	nce List						
ς5	C	all Tree							
5	Bo	ookmarks							
	Br	reakpoints							
Ъ.	C	all Stack							
٩	Ν	lemory							
	0	nline Chan	ge Men	nory Reser	ve Settings				
	St	tart Page							
Ø	Se	ecurity Scre	en 🖊						
',	St	tore		7					
	C	hoose pers	pective			•			
	Fu	ull Screen		Ctr	l+Shift+F1	2			
G.	Pr	roperties							

Figure 5 - 54: Trust certificate setting path

2. Select the *Devices* tab.

Jser	Φ.	Information	(<u>)</u>	Issued for	Issued by	Valid from	Valid u
Project	1	Click the 'Refresh' button to load the data.	\times				
-			×				
evices							

Figure 5 - 55: Safety fence Devices tab

3. Click , and select the controller *Device* in the left window: all services in the controller that require certificates will be displayed in the right window.

🛯 Security Screen	×					
User	\$	Information	E*	Information	Issued for	k
	187	E Device	\times	OPC UA Server (not available)		
Project		Own Certificates		Encrypted Application (not available)		
Davisas		Trusted Certificates	11	Encrypted Communication	AX-308EA0MA1T	A
Devices		Unstrusted Certificates		🙀 Web Server	AX-308EA0MA1T	A
		Quarantined Certificates				

Figure 5 - 56: Show all credentials

4. Click to create a new certificate for the controller: make settings in the following *Certificate Settings* dialog box.

Select OPC UA Server.

Security Screen X							-
User	Φ	Information		11	Information	Issued for	ls
Project	1	E Device		X	OPC UA Server (not available)		
Project		Own Certificates	\cup	403	Encrypted Application (not avail	able)	
Devices		Trusted Certificates		訇	Encrypted Communication	AX-308EA0MA1T	A:
benees		Unstrusted Certificates			🙀 Web Server	AX-308EA0MA1T	A:
		Quarantined Certificates					
		ate Settings ngth (bit)			×		
	Key lei	ligtil (bit)	3072		\sim		
	Validit	y period (days)	365)k	Cancel		

Figure 5 - 57: Create a new certificate for the controller

Select Encrypted Application

😻 Security Screen 🗙							
User	Φ	Information		1*	Information		Issued for
Project	1	Device Own Certificates		×	OPC UA Server	n (not available)	OPCUAServer@AX-3088
Devices		Trusted Certificates		曽	Encrypted Communic		AX-308EA0MA1T
		Quarantined Certificates			Web Server		AX-308EA0MA1T
	Certific	ate Settings			×		
		ngth (bit)	3072		~		
	Validit	y period (days)	365)k	Cancel		

Figure 5 - 58: Select Encrypted Application

5. Complete the OPC UA Server and Encrypted Application certificate.

Scority Screen x										
User	Φ	Information	1		Information	Issued for	Issued by	Valid from	Valid until	Thumbprint
	-84	B Device	>	×	💱 OPC UA Server	OPCUAServer@AX-308EA0MA1T	OPCUAServer@AX-308EA0MA1T	1970/1/2 上午 08:48:15	1971/1/2 上午 08:48:15	5C3F2C0888EC97E0286210688A738
Project	1000	Own Certificates			Encrypted Application	AX-308EA0MA1T	AX-308EA0MA 1T	1970/1/2 上午 08:48:55	1971/1/2 上午 08:48:55	B3B82A260B8664F44B4EDEA913B9A
Devices		Trusted Certificates		1	k Encrypted Communication	AX-308EA0MA1T	AX-308EA0MA1T	1970/1/1上午 08:00:13	1970/1/31 上午 08:00:13	508368D9FB1A7C5D89816707CE675
Devices		Unstrusted Certificates			💱 Web Server	AX-308EA0MA1T	AX-308EA0MA 1T	1970/1/1 上午 08:00:13	1970/1/31 上午 08:00:13	508368D9F81A7C5D89816707CE675
		Quarantined Certificates								

Figure 5 - 59: Complete OPC UA Server and Encrypted Application certificate

• Use Prosys OPC UA Client to establish an encrypted connection

Here with Prosys OPC UA Client C Operation connection. User can first go to the official website of Prosys OPC UA Client to register for free download: Download URL : <u>https://downloads.prosysopc.com/opc-ua-client-</u> <u>downloads.php</u>

- 1. Launch Prosys OPC UA Client
- 2. In the picture below ① *Disconnected*, Enter the OPC UA Server IP address: opc.tcp://192.168.1.5:4840

Prosys OPC UA Client		_		\times
Help				
New Tab +		2	3	4
Disconnected opc.tcp://192.168.1.5:484	ब ← 1	• >		
Search Att	ributes and References + 6			
	🔶 🔶 Filters 🔜 🚼 B	rowse Direction	Forward	Ŧ
6	ReferenceType	Target		
0				
Select server and connect				

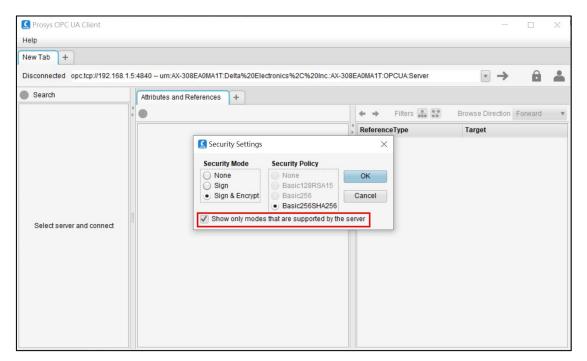
Figure 5 - 60: Enter the OPC UA Server IP address

3. Select the connection encryption method ③

rear, *Security Settings*

Window (only supports Basic256SHA256) check *Show only modes that are supported by the server.*

•





4. Click on (4) After, set the user account password > Apply, After setting, click (2) Connect.

S Prosys OPC UA Client			- 🗆 X
Help			
New Tab +			
Disconnected opc.tcp://192.168.1.	5:4840 urn:AX-308EA0MA1T:Delta%20Electronics%2C%20Inc.:AX-3	8EA0MA1T:OPCUA:Server	💌 🔶 🔒 🛋
Search	Attributes and References +		
	•	+ + Fitters 🔝 🔛	Browse Direction Forward •
		ReferenceType	Target
	S User Authentication	×	
	Anonymous Username and Password Certificate and	Private Key Apply Cancel	
	Username Administrator Password ****		
Select server and connect	Ŋ		
Select server and connect			

Figure 5 - 62: Set user account password

5. Pop up the prompt window: no Server Allowed App Certificate.



Figure 5 - 63: Application certificate not allowed by server

 Back to the Security Screen page, there is an untrusted certificate ProsysOpcUaClient in Quarantined Certificates, drag this certificate to Trusted Certificates.

User	•	Information		Info	Issued for	Issued by	Valid
Project	1	Device Own Certificates	1	×	ProsysOpcUaClient	ProsysOpcUaClier	nt 2020/
		Trusted Certificates		訇			
evices		Unstrusted Certificates					
		Quarantined Certificates					
			· .				
			_				
		1	➡ "				
		I	₹				
Security Screen >	κ		₹				
•	×	Information	•	1: Information	Issued for	ls	sued by
Jser	•	Information			Issued for Integration Objects' OP		
Jser						C UA Client In	tegration Ob
Jser Project	•	E Device		×	Integration Objects' OP	C UA Client In	tegration Ob
Security Screen Subser Project Devices	•	Device Own Certificates			Integration Objects' OP	C UA Client In	sued by tegration Ob osysOpcUaC

Figure 5 - 64: Drag untrusted certificates to Trusted Certificates

7. Client Reconnect to connect successfully. In the area (5), the tree structure organization of information connected to OPC UA Server for reading and writing is displayed. In the (6) area, the detailed description of the selected item is displayed. User can also add a paged Data View to pull the devices that user need to read and write to the page for monitoring.

S Prosys OPC UA Client				- 🗆 X
Help				
OPCUAServer@AX-308E/	AOMA1T +			
Running opc.tcp://192.168.1	1.5:4840 urn:AX-308EA0MA1T:Delf	ta%20Electronics%2C%20Inc.:A	-308EA0MA1T:OPCUA:Server	🖌 🖌 🔒 📥 Administrato
Search	Attributes and References	+		
Objects	O		← → Filters	Browse Direction Forward *
Types	Attribute	Value	ReferenceType	Target
	► Nodeld	i=85	Organizes	DeviceSet
	NodeClass	Object	Organizes	Server
	BrowseName	Objects	HasTypeDefinition	FolderType
	DisplayName	(en-Us) Objects		
	Description			
	WriteMask	NONE (0)		
	UserWriteMask	NONE (0)		
	EventNotifier	0		

User : Administrator

Figure 5 - 65: Administrator

 $\mathsf{User}:\mathsf{guest}\;(\,\mathsf{No}\;\mathsf{write}\;\mathsf{permission}\,)$

+							
+							
urn:AX-308EA0MA1T:D	elta%20Electron	ics%2C%2	0Inc.:AX-308EA0MA1T:C	PCUA:Server	• >	<	📥 guest
ttributes and Referenc	es Data View	× +					
ıbscription Enabled 🖉	Publishing	Interval (in I	milliseconds)	1,000	Subscriptio	on Settings	
Nodeld Displa	yName Value	DataType	SourceTimestam	ServerTimestam	StatusCode	MonitoringMo	Graph
ns=4;s= aaa	false	Boolean	29.05.2020 01:29:	29.05.2020 01:29:	GOOD (0x	Reporting	
ns=4;s= bbb	false	Boolean	29.05.2020 01:29:	29.05.2020 01:29:	GOOD (0x	Reporting	
ns=4:s=l ccc	false	Boolean	29.05.2020 01:29:	29.05.2020 01:29:	GOOD (0x	Reportina	
						>	×
ror=ServiceFault: Bad_ :	UserAccessDen	ied (0x801F	0000) "User does not h	ave permission to perf	form the reque	sted operation.	
	bscription Enabled Nodeld Displa ns=4;s= aaa ns=4;s= bbb ns=4;s= ccc or=ServiceFault Bad_	Nodeld DisplayName Value ns=4;s= aaa false ns=4;s= bbb false ns=4:s=l ccc false	bscription Enabled Veublishing Interval (in i Nodeld DisplayName Value DataType ns=4:s=1aaa false Boolean ns=4:s=1ccc false Boolean or=ServiceFault Bad_UserAccessDenied (0x801F	bscription Enabled Publishing Interval (in milliseconds) Nodeld DisplayName Value DataType SourceTimestam ns=4;s= aaa false Boolean 29.05.2020 01:29 ns=4;s= bbb false Boolean 29.05.2020 01:29 ns=4;s= ccc false Boolean 29.05.2020 01:29 or=ServiceFault: Bad_UserAccessDenied (0x801F0000) "User does not here	bscription Enabled Publishing Interval (in milliseconds) 1,000 Nodeld DisplayName Value DataType SourceTimestam ServerTimestam ns=4;s=1 bbb false Boolean 29.05.2020 01:29 29.05.2020 01:29 29.05.2020 01:29 ccc false Boolean 29.05.2020 01:29 29.05.2020 01:29 content c	bscription Enabled Publishing Interval (in milliseconds) 1,000 ★ Subscription Nodeld DisplayName Value DataType SourceTimestam ServerTimestam StatusCode ns=4;s= aaa false Boolean 29.05.2020 01:29: 29.05.2020 01:29: GOOD (0x ns=4;s= bb false Boolean 29.05.2020 01:29: 29.05.2020 01:29: GOOD (0x or=ServiceFault Bad_UserAccessDenied (0x801F0000) "User does not have permission to perform the reque	bscription Enabled ♥ Publishing Interval (in milliseconds) 1,000 ★ Subscription Settings Nodeld DisplayName Value DataType SourceTimestam ServerTimestam StatusCode MonitoringMo ns=4;s=1aaa false Boolean 29.05.2020 01:2929.05.2020 01:29GOOD (0x Reporting ns=4;s=1ccc false Boolean 29.05.2020 01:2929.05.2020 01:29GOOD (0x Reporting ns=4;s=1ccc false Boolean 29.05.2020 01:2929.05.2020 01:29GOOD (0x Reporting or=ServiceFault Bad_UserAccessDenied (0x801F0000) "User does not have permission to perform the requested operation."

Figure 5 - 66: Guest

Chapter 6: HMI Interactive

6.1 Overview

DIADesigner-AX supports export of variables to DIAScreen. User can define the variables in DIADesigner-AX and export the xml file of *Symbol configuration*. Import the xml to DIAScreen to communicate between controller and Delta HMI functions.

NOTE: HMI Tag sharing is supported only for DOP-100 series.

6.2 Export Variable

1. Open *DIADesigner-AX* > *File* > *New project*.

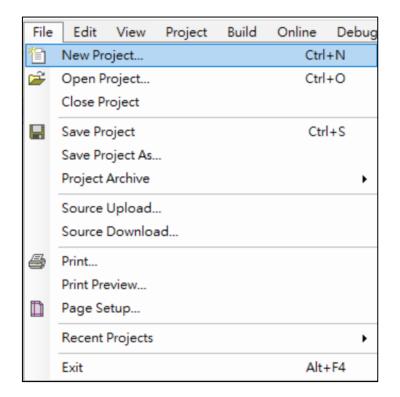


Figure 6 - 1: New project

2. Right-click on Application > Add device > Select Global variable list.

管 New Proj	ect				×
Categories		Templates			
	raries ojects	Project AX-308EA0	Project AX-8xxE	Standard project	
A project co	ntaining one device, one ap	plication, two emp	ty implementation	ons for PLC_PRO	G and Motion_P
Name	Untitled6				
Location	C:\Users\VIDA.CJ.LIU\Doc	uments			×
				OK	Cancel

Figure 6 - 2: Creating New Project

Children Untitled 1		-	1				
Device (AX-8xxEP0 Series)			BuiltIn_Pulse_Enco	der Pa	rameters	Parameter	
E I Plc Logic				der I/(😑 🧰 Pulse Encoder Parameters		
Application	X	Cut	Duntin_Puise_circon	ncoder I/O Mapping		 Pulse Encoder input typ 	
Library Manager		1913	e		C Objects	Pulse Encoder input dire	
PLC_PRG (PRG)		Copy Paste Delete				🔷 🛷 Pulse Encoder Z Inve	
E 🧱 Task Configuration	8			1			
EtherCAT_Task	×			⊢			
🖻 😻 MainTask 🕀 PLC_PRG		Refactoring	,				
EtherCAT_Master (AX-8xxEP0 Ser	G	Properties					
BuiltIn	-	Add Object	•		Alarm configuration		
BuiltIn_Pulse_Encoder (BuiltIn	0	Add Folder		0	The second se		
SoftMotion General Axis Pool	1°	Edit Object			Axis Grou	a con	
	-	Edit Object With			Cam table		
		can object min.	*				
	OŞ.	Login		8	CNC program		
		Delete application from device			CNC setti	-	
	_			4	Data Sou	rces Manager	
				4	DUT		
					External F	ile	
				1	Global Va	ariable List	
					Image Po	ol	

Figure 6 - 3: Adding Global Variable List

Result: Add Global Variable List displays.

Add Gl	obal Variable List	×
2	Create a new global variable list	
<u>N</u> ame		_
	Add Cancel	

Figure 6 - 4: Creating New Global Variable List

3. Enter the required name and click Add.

Result: *GVL* is added in *Application*.

Devices 👻 🕈 🗙	🥖 GV	L 🗙 🎁 Library Ma	anager			
- 🗿 Untitled 1	1	• ×				
Device (AX-8xxEP0 Series) Device (AX-8xxEP0 Series)		Scope	Name	Address	Data type	Initializa
Application	7	S VAR_GLOBAL	Axis_1_MC_Halt_Abborted		BOOL	
GVL	6	S VAR_GLOBAL	Axis_1_MC_Halt_Busy		BOOL	
Library Manager	3	S VAR_GLOBAL	Axis_1_MC_Halt_Deceleration		LREAL	
PLC_PRG (PRG)	5	S VAR_GLOBAL	Axis_1_MC_Halt_Done		BOOL	
🖃 🎆 Task Configuration	8	S VAR_GLOBAL	Axis_1_MC_Halt_Error		BOOL	
EtherCAT Task	9	S VAR_GLOBAL	Axis_1_MC_Halt_ErrorID		SMC_ERROR	
🖃 🍪 MainTask	2	S VAR_GLOBAL	Axis_1_MC_Halt_Excute		BOOL	
PLC_PRG	4	S VAR_GLOBAL	Axis_1_MC_Halt_Jerk		LREAL	
EtherCAT_Master (AX-8xxEP0 Series	15	S VAR_GLOBAL	Axis_1_MC_Power_Busy		BOOL	
BuiltIn	12	S VAR_GLOBAL	Axis_1_MC_Power_DriveStart		BOOL	
BuiltIn_DIO (BuiltIn_DIO)	13	S VAR_GLOBAL	Axis_1_MC_Power_DriveStartRealState		BOOL	
Builtin Pulse Encoder (Builtin Pu	1	S VAR_GLOBAL	Axis_1_MC_Power_Enable		BOOL	
SoftMotion General Axis Pool	14	S VAR_GLOBAL	Axis_1_MC_Power_Error		BOOL	
	17	S VAR_GLOBAL	Axis_1_MC_Power_ErrorID		SMC_ERROR	
	10	SVAR_GLOBAL	Axis_1_MC_Power_RegulatorOn		BOOL	
	11	S VAR_GLOBAL	Axis_1_MC_Power_RegulatorRealState		BOOL	
	16	S VAR_GLOBAL	Axis_1_MC_Power_Status		BOOL	



4. Right-click on *Application* and select *Add Object > Symbol Configuration*.

evices		* # X	Device 🗙 📷	Buittr	DIO_	BuiltIn_Pulse_Encoder	
Lhoted 1 Device (AX-8xxEP0 Series) Device (AX-8xxEP0 Series) Device (AX-8xxEP0 Series)			Communication Setting	15		Parameter Application Run Mode	
Library Manager PLC_PRG (PRG) Task Configuration EtherCAT_Task MainTask DLC_PRG	が で し、 、 の の 、	Cut Copy Paste Delete Refactoring Properties	•			Serial Communication Mode	
EtherCAT_Master (AX-8xxEF	111	Add Object Add Folder Edit Object Edit Object With		Ala:	Alarm	m configuration	
Bultin Bultin_DIO (Bultin_DIO Bultin_Pulse_Encoder (B SoftMotion General Axis Pool	C C			Axis		ication Group table	
	-	Login	Login		CNC	program	
		Delete application from device					
L	_		Parameters	0.0	Data DUT	Sources Manager	
			IEC Objects		External File Global Variable Li		
			Task deployment	Image Pool	Pool		
			Status	~	Interfa Netwo	ace ork Variable List (Receiver)	
			Information	7		ork Variable List (Sender) tent Variables	
				ð	POU.	*	
				创		for implicit checks	
				A	0.000	e Manager	
				Ø		ndancy Configuration ol configuration	
					Text	-	

Figure 6 - 6: Symbol Configuration Window

Result: The *Add Symbol Configuration* window displays.

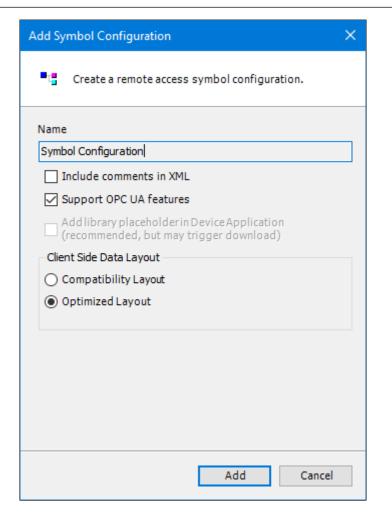


Figure 6 - 7: Adding Symbol Configuration

5. Select Include comments in XML and click Add.

Name Symbol Configuration	
Include comments i	n XML
Support OPC UA fea	atures
	derin Device Application may trigger download)
Client Side Data Layout	
O Compatibility Layou	t
Optimized Layout	

Figure 6 - 8: Adding XML

Result: A Symbol configuration is added to the application.

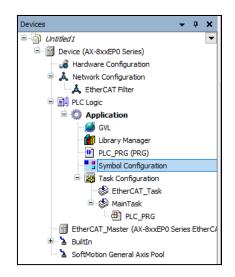


Figure 6 - 9: Adding Symbol Configuration to Application

6. Click *Build* in *Menu bar* or

Press *F11* and select the respective *GVL variable* in the symbol list.

RG 🚭 Trace 🗃 Device 🗃 ASD/	A_A2_E_CoE_Drive Uisualization	🧉 GVL 📲 Symbol Configuration 🗙 👻
🕅 View 👻 🛗 Build 🖺 Settings 🔹 Tools 🔹		
Changed symbol configuration will be transferred wit	h the next download or online change	
Symbols Access	s Rights Maximal Attribute Type	Members Comment
🗉 🔄 📄 Constants		
I I GVL		
B		
IoConfig_Globals_Mapping		
B-□ I PLC_PRG	Symbols	Acces
	🗉 🔲 📄 Constants	
	GVL	
	🗉 🔚 📄 IoConfig_Globals	
	🖲 📄 📄 IoConfig_Globals_Mapping	
	😟 🔄 📄 PLC_PRG	

Figure 6 - 10: Build

7. Click *Build* in Toolbar > *Generate code*.

Result: It generates xml file in the assigned folder.

File Edit View Project	Build Online Debug Tools W	índow Help
🛅 🚅 🔚 🕌 🗠 🖂 🖁	🛗 Build F11	🛱 🎦 🕇
	Rebuild	
Devices	Generate code	BuiltIn_DIC
Untitled 1	Generate runtime system files	
Device (AX-8xxEP0 Series	Clean	ettings
🖃 🗐 Plc Logic	Clean all	
Application		
- 🧭 GVL	Backup and Pr	astora

Figure 6 - 11: Generating Code

8. The XML file will be stored in the designated folder.

a Home Share View	w	
\rightarrow \checkmark \uparrow 🔠 \Rightarrow This PC \Rightarrow	Documents	
Quick access	Custom Office Templates	Date modified: 12/11/2019 12:04 PM
Documents Downloads	My Received Files	Date modified: 1/3/2020 3:14 PM
 Pictures OneDrive 	sample1.Device.Application.xml	Date modified: 1/24/2020 11:29 AM Size: 1.11 KB
This PC 3D Objects	sample1.project.~u Type: ~U File	Date modified: 1/24/2020 3:13 PM Size: 62 bytes
Desktop	sample1-AllUsers.opt Type: OPT File	Date modified: 1/24/2020 11:20 AM Size: 718 bytes
Downloads Music	sample 1-Vishnudevi.Govindasa-DELTA.opt Type: OPT File	Date modified: 1/24/2020 11:20 AM Size: 21.9 KB
Pictures Videos	D [★] sample1.project Type: DIADesignerPlus project	Date modified: 1/24/2020 11:18 AM Size: 154 KB

Figure 6 - 12: Sample Output

6.3 DIAScreen with PAC AX-8 Series

1. Launch DIAScreen.

Result: DIAScreen displays the home screen as shown in the following figure.

New file		Version: DIAScreen-0.3.105.6695
_+	-	HMI Model: PAC series, PAC_IPC_AX 65536 Colors
Open file		Description
Recent opened file		
	C:\Users\vishnudevi.govindasa\Docu	ments\Sample 1.dpa
W	I	Version: DIAScreen-0.3.105.6695
		HMI Model: DOP-100 series, DOP-107EG 65536 Colors
		Description
	C:\Users\vishnudevi.govindasa\Docu	ments\HMI1.dpa
		Version: DIAScreen-0.3,105,6695
	-	HMI Model: PAC series, PAC_IPC_AX 65536 Colors
		Description
	C:\Users\vishnudevi.govindasa\Docu	ments\PAC1.dpa
	-	
		Version: DIAScreen-0.3.105.6695
		HMI Model: PAC series, PAC_IPC_AX 65536 Colors

Figure 6 - 13: DIAScreen Window

2. Click New file.

Result: A *Project Wizard* window displays as shown in the following figure.

ries		HMI List			
AC series	~	Model Type	Resolution	Color	
		PAC_IPC_AX	1024 * 768	65536 Colors	
		PAC_IPC_IMP	1024 * 768	65536 Colors	
		Project Setup			
		Project Name:	NewHMI		
		Screen Name:	Screen_1		
		Screen No.	1		
		Printer:	ANULL		~
		System menu language:	English		~
		HMI Rotation:	0	✓ degree	
		Resolution:	Custom	~ <u>1024</u> *	768
		L			

Figure 6 - 14: Project Wizard

- 3. Select PAC series in Series and PAC_IPC_AX Model in Model Type.
- Enter Project Name, Screen Name, Screen No., Printer, System menu language, HMI Rotation and Resolution in the Project Setup box.Click Next.
 Result: A Project Wizard window displays as shown in the following figure.

GR DIAScreen ; File View Tools Options Hélp ∰ 11 ■ 11 ● 11 ● 11 ● 11 ● 11 ■ 11 ■ 11	<i>.</i>				
	Project Wizard	HX01iat ModelType PAC_IPC_XX PAC_IPC_IMP	Resolution 1024 * 768 1024 * 768	Color 65536 Colors 65536 Colors	
Recent opened file		Project Setup Project Name: Screen Name: Screen No.	NewHMI Screen_1 1		
		Printer: System menu language: HMI Rotation: Resolution:	Density of the second s	 degree 1024 • Next 	768 Cancel Finish

Figure 6 - 15: Creating New Project

5. Enter controller details and communication parameters and click *Finish*.

Result: A *Communication Settings* displays as shown in the following figure.

NOTE: Use New Network Link **I** to add Ethernet if required.

Communication Settings Pevice Localhost ind: Name 00-EtherLink! Controller IP :COM Port 192.168.0.1: 502 Main Ethernelt	Project Wizard	
Device Localhost Link Name 00-EtherLink1 Controller Controller IP Controller IP Main Extra PLC Station Plc Station Imeout(ms) Imeout(ms) Imeout(ms) Imeout(ms) Retry Count 2	▲ ▼	Communication Settings
	Ethernet1	Controller TCP/IP Communication Parameters HMI Station 0 Controller IP :COM Port 192 . 168 . 0 . 1 : 502 Main Extra PLC Station 1 Password 12345678 Comm. Delay Time(ms) 0 Timeout(ms) 1000 Retry Count 2
Back Next Cancel Finish		

Figure 6 - 16: Communication Setting

6. Click *New HMI* in the screen.

Result: User can view *CODESYS* in the project tree.

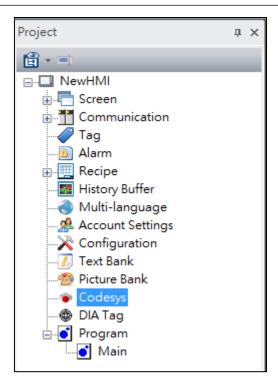


Figure 6 - 17: Project Tree

7. Click on CODESYS > Import icon > select the respective xml file > open.

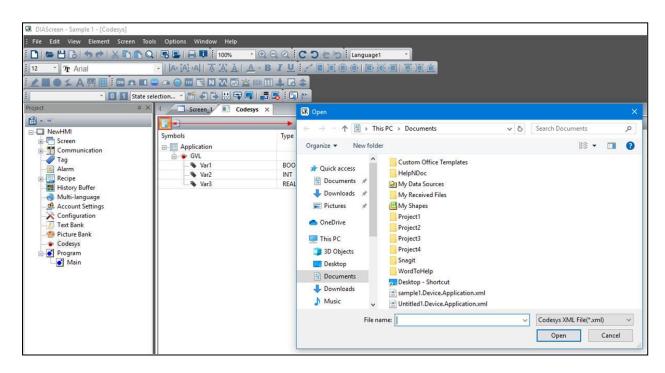


Figure 6 - 18: Importing XML file

Result: The Imported symbols appears on DIAScreen.

: File Edit View Element Screen To	ools Options Window Help											
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12 -												
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🔹 🚺 🚺 State se	lection. 🔻 📅 🞝 🔂 🖶 🖽 🗣 💷 👼 😼 😳 📖											
Project # ×	4 Screen_1 Codesys ×											
	Symbos Type											
🗄 🖳 Screen	Prication System											
Communication	i → GVL											
	aa ULINT											
Alarm	Axi1_MC_Halt_Aborted BOOL											
	Axi1_MC_Halt_Busy BOOL											
	Axi1_MC_Halt_Decelera LREAL											
	Axi1_MC_Halt_Done BOOL											
	Axi1_MC_Halt_Error BOOL											
Text Bank	Axi1_MC_Halt_ErrorID SMC_ERROR											
	Axi1_MC_Halt_Execute BOOL											
······································	Axi1_MC_Halt_Jerk LREAL											
DIA Tag	Axi1_MC_Power_Busy BOOL											
Program	Axi1_MC_Power_DriveSt BOOL											
Main	Axi1_MC_Power_DriveSt BOOL											
	Axi1_MC_Power_Enable BOOL											
	Axi1_MC_Power_Error BOOL											
	Axi1_MC_Power_ErrorID SMC_ERROR											
	AXi1_MC_Power_Regul BOOL											
	Aut MC Prove Preside ROOT											

Figure 6 - 19: GVL added to Application

8. Use any of the buttons on the element and double-click the element.

Example: Set to on button shown in the following figure.

NOTE: User can choose the CODESYS parameter to connect with the element.

	and a state of passion of the state	second product of the second	000		in the second								
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				Contraction of the local division of the loc	at to On								
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3-X						Write Address			yle:		She	ded	4
Mittadory Buffer	~					None		-					
-d Multi-language						dime			reground t	Color			
# Account Settings				1000		Pinput							
Configuration						Link	EtherLink1_1					0	
3 Text Bank			2 1	0	State		Internal Memor	ty .				3	
Picture Bank Build-in PLC					×	Dost.	EtherLink1_1					_	-
Pogam					Language	Obnie	(Word)	Device	Type Rh	1	_		
Main					Largonjal	Option	(286)			Port:	Ethernel iller : TC		
Alders .						Cherry	d Manney (Word)	Address	100.0	_		<u> </u>	
				r	Element description:		d Mamory (Bit)	Tag	1.1				-
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	Sciences Man	agerunt Window								1		1.0	Enter
	12					Status No.		0	1		24	1	
						1.1	Defeat				None		
Volt Search Results 1 Search R	Statement of Longe Line	a share of Window	Property Manual	And Markable					-	_	_	-	_

Figure 6 - 20: Creating Set to On Button

9. Select CODESYS in Link.

Result: CODESYS is linked with the element.

Input			×
Link:	Codes	ys	~
Туре	(Codesys Symbols	>
Device (Wor	d)	Symbos Type	
O Device (Bit)		□··· Application □··· GVL	^
🗌 Internal Mer	nory (aa ULINT	
		Axi1_MC_Halt_Aborted BOOL	
🗌 🗌 Internal Mer	nory (.	Axi1_MC_Halt_Busy BOOL	
Constant		Axi1_MC_Halt_Decelera LREAL	
	-	Axi1_MC_Halt_Done BOOL	
Constant Types		Axi1_MC_Halt_Error BOOL	
Constant Types		Axi1_MC_Halt_ErrorID SMC_ERROR	
Signed Decin	nal	Axi1_MC_Halt_Execute BOOL	
		Axi1_MC_Halt_Jerk LREAL	
O Unsigned De	ecimal	Axi1_MC_Power_Busy BOOL	
Hexadecimal		Axi1_MC_Power_DriveSt BOOL	
		Axi1_MC_Power_DriveSt BOOL	
		Axi1_MC_Power_Enable BOOL	
Station No.		Axi1_MC_Power_Error BOOL	
1	Def	Avi1 MC Dower ErrorID CMC EDDOD	>
	-	0	K Cancel

Figure 6 - 21: Linking CODESYS

10. After configuration screen, click *Download* and choose the model to download the screen.

🖪 DI	AScreen - NewProject - [Screen_1]						
: File	Edit View Element S	creen Tools Options	Window Help					
	🎽 🤝 🍋 🗳 💾 🗢	🗈 🖻 Q 🗟 🖳	 	• 🗨 🔾 🦉	2् । 🗊 📖	C 3 c 5	ⁱ Language1	Ψ.
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:	- 🚺 1 Sta	te selection 🝷 🚮 🍝	i 🕞 😸 🗣 📮 🛛	📅 🌄 🛛				

Figure 6 - 22: Download

PAC-AX, V1.0061.7					-	×
POWER S	ervo_ON / OFF	MoveRelative_Run	Halt_Run	Stop	Servo_ON	
MC_MoveRelative_Distance MC_MoveRelative_Velcity MC_MoveRelative_Accleration	0 0 0	MC_Halt_Dec		0		
MC_MoveRelative_Deceleral	tion 0					
Actual Position	0					

Figure 6 - 23: Downloading Application

6.4 DIAScreen with PLC AX-308E Series

1. Launch DIAScreen.

Result: DIAScreen displays the home screen as shown in the following figure.

New file		Version: DIAScreen-0.3.105.6695
L_+		HMI Model: PAC series, PAC_IPC_AX 65536 Colors
Open file		Description
Recent opened file		
	C:\Users\vishnudevi.govindasa\Doc	uments\Sample 1.dpa
example		
		Version: DIAScreen-0.3.105.6695
		HMI Model: DOP-100 series, DOP-107EG 65536 Colors
		Description
]
	C:\Users\vishnudevi.govindasa\Doc	uments\HMI1.dpa
		Version: DIAScreen-0.3.105.6695
		HMI Model: PAC series, PAC_IPC_AX 65536 Colors
		Description
	C:\Users\vishnudevi.govindasa\Doc	mente/DAC1 dos
	C. IS SCIENCE AND IN THE COMPANY STATES OF T	annas Ao Lupu
		Version: DIAScreen-0.3.105.6695
		HMI Model: PAC series, PAC_IPC_AX 65536 Colors

Figure 6 - 24: DIAScreen

2. Click *New file* in the screen.

Result: A *Project Wizard* window displays as shown in the following figure.

Series	HMI List			
DOP-100 series	Model Type	Resolution	Color	3
DOP-100 series	103BQ	480 * 272	65536 Colors	
- Loon-Handheld series	103WQ	480 * 272	65536 Colors	
HMC series PAC series	105CQ	320 * 234	65536 Colors	
TP series	107BV	800 * 480	65536 Colors	
- and a set of the set	107CV	800 * 480	65536 Colors	
	107DV	800 * 480	65536 Colors	
	107EG	800 * 600	65536 Colors	
	107EV	800 * 480	65536 Colors	_
	107IV	800 * 480	65536 Colors	
	107WV	800 * 480	65536 Colors	
	108IG	800 * 600	65536 Colors	
	110CG	800 * 600	65536 Colors	
	11005	1024 * 600	65536 Colors	1
	Project Setup Project Name:	NewHMI		
Ами	Screen Name:	Screen_1		
	Screen No.	1		
	Printer:	A NULL	*	
	System menu language:	English	~	
	HMI Rotation:	0	✓ degree	

Figure 6 - 25: Creating New file

3. Select *DOP-100 Series* and the Required Model type in HMI list. Click *Next.* **Result**: A *Project Wizard* window displays as shown in the following figure.

Project Wizard						x
		Communicatio	m Settings			
COM1 COM2	Device Localhost	Communicatio	n Settings			
			Back	Next	Cancel	Finish

Figure 6 - 26: Communication setting

4. Click *Ethernet1* > icon. Select *CODESYS* in controller. Click *Import*.

	2	Communication Settings		
	Device Localhost			
COM1	13.12			
-	Lok Nete	Detail		
	00.EtherLink1	Controller / Delta DV	PTCP	-3
COM2		Communication Parameters		
		HMI Station	0	
сомз	-	Costroller IP :COM Port	192 . 168 . 0 . 1	502
	1	Main		
thernet1		PLC Station	1	
		Password	12345678	
		Comm. Delay Time(ms)	0	
		Timeout(ms)	1000	
		Retry Count	1000 🗘 2 🗘	
		Optimize		
	N.			

Figure 6 - 27: Selecting CODESYS

5. Click Controller drop-down menu and click Open.

Device Localhos	 Copen Corganize ▼ New folder Quick access Quick access Quick access Quick access Quick access HelpNDoc My Data Sources My Data Sources My Project 1 Project 2 Project 3 Posktop Documents Posktop Documents WordToHelp Desktop > Shortcut Sangit WordToHelp Desktop > Shortcut Sangit Untitled 1.Device.Application.xml 	✓ Č	Search Documents B Codesys XML File(*.xx Open	
	Back Next	Cancel	Finish	

Figure 6 - 28: Importing CODESYS

6. Use any button to set the input.

Example: Set to On is used in the following figure. Enter the required details.

Click OK.

Set to On								
Preview	Main	Main-2	Text	Picture	Details	Macro	Coordinates	
State:	{Ether Read A None Write C	Address:		GVL_1.Va	Blink	round Color:	Standard No Gradient	 > → → → →
Language: Language1 v Element description: Set to On_001	None Read C None	ffset Addres	15:		Use 1	Fext Pic:	No	>
							OK	Canc

Figure 6 - 29: Set To On Button

Result: CODESYS is linked with the element.

File Edit View Element Screen T	ools Options Window Help				
┍╻╒┍╢╔╻┑┍╴╽╳┍╖┍	🖪 🖳 🖶 📭 100% 💿 🗨 🔾 📿 🌔	C C (C C) Languag	ge1		
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🛓 🔚 Screen			Write Address:		
Communication				Style: Standard	4 ~
			None	Foreground Color:	_
Alarm			Read Address:	Foreground Color:	•
History Buffer		•	Input		X
A Multi-language			mpar		~
Account Settings		State:	Link: EtherLink1		~ .
		0			
🕖 Text Bank			Symbols	Туре	
			□		~ -
DIA Tag		Language:	ia ⊕ GVL		
Program		Language1	✓ aa	ULINT	
			Axi1_MC_Halt_Aborted	BOOL	
Project Address		Element description:	Axi1_MC_Halt_Busy	BOOL	_
Nutput A X			Axi1_MC_Halt_Decelera Axi1 MC Halt Done	LREAL BOOL	_
		Set to On_001	Axi1_MC_Hait_Done	BOOL	
💭 Message 🔀 Error 💭 Warning 💌			Axi1_MC_Halt_Execute	BOOL	
dessage			Axi1_MC_Halt_Jerk	LREAL	
			Axi1_MC_Power_Busy	BOOL	
			Axi1_MC_Power_DriveSt	BOOL	
			Axi1_MC_Power_DriveSt		
			Axi1_MC_Power_Enable	BOOL	
			Axi1_MC_Power_Error	BOOL	_
	Screen Management Window		AXi1_MC_Power_Regul	BOOL	~
			K Avit Mr. Dowar Radula	RF W 11	>
			Station 🚺 🜩 Bit		
			Station Dit	~	
					Cancel

Figure 6 - 30: Linked CODESYS

7. After configuration screen, click *Download* and choose the model to download the screen.

₽R D	IAScreen - NewProject -	[Screen_1]							
: File	e Edit View Element	Screen Tools	Options Wi	ndow Help					
	1 🖛 💾 🖪 1 🦘 📌 1 💥		R 🖬 🔒	100%	- O, O,	0. 1	COCO	Language1	*
12	▼ Tr Arial		- A [A] 1	AAA	A B	IU /			i i
		🛯 🚓 🔳 🧲	🛆 🔵 🔛		🗟 🞽 📟 🖽	+ 6 +			
:	- 0 1 Sta	ate selection.	- 16 - 16 -	🔛 🗣 💷	5 😼				

Figure 6 - 31: Download

POWER Serve	D_ON/OFF Move	eRelative_Run	Halt_Run	Stop	Servo_ON	
MC_MoveRelative_Distance	0	MC_Halt_Decele	eration 0			
MC_MoveRelative_Velcity	0	MC_Halt_Jerk	0			
MC_MoveRelative_Accleration	0					
MC_MoveRelative_Deceleration	0					
MC_MoveRelative_Jerk	0					
Actual Position	0]				

Figure 6 - 32: Download Screen

6.5 Upload Download

The program files can be uploaded and downloaded in the PLC used by the HMI, various running projects can be changed for different program requirements. Upload and download the Application file in the AX series PLC used. After Clicking search, the currently connected PLC device is automatically searched. After the search is over, the searched files can be uploaded to the storage device.

To copy DVP and DIADesigenr-AX files from the storage device to the PLC, click Download.

The Upload Download fetaure, currently supports the following hardware series:

- DOP-100 series
- AX-8 HMIAP

6.5.1 Upload

Follow the procedure to upload the Application file.

1. Enter the system screen:

Press the blank area of the DOP-100 HMI or HMIAPP screen for more than 3 seconds, then click on the system setting icon to enter the system screen.



Figure 6 - 33: Enter the system screen

2. Click on Upload/Download.

PAC-AX, V1.0110.2			- 🗆 🗙
			0
			-
Sustem Setting	Up/Download	Sustam Info	HMI Doctor
System Setting	Oproownload	System Info	HWI DOCIOI

Figure 6 - 34: Upload and download

3. Click on *Transfer Mode*: This item is for the Application file in the PLC used. CODESYS Application file only supports *Transfer Mode*.

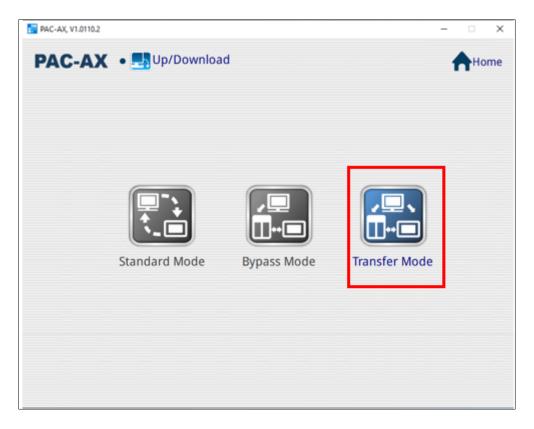


Figure 6 - 35: Transfer Mode

4. Click on the CODESYS tab.

PAC-AX, V1.0110.2			-	
PAC-AX • 🛃	Jp/Download		SBack	Home
CODESYS				
Boot APP (*.app)	۲	🍅 Gateway IP	192.168.1.120	8
▼ AX8 New		Device		

Figure 6 - 36: CODESYS tab

Project	Description			
Boot APP				
Path	DOP supports USB flash drives.			
	AX-8 supports D:\Delta Industrial Automation\PLC-APP.			
•	Refresh the Application file in the USB or D slot.			
Gateway IP				
IP Set up	Set the value of PLC IP.			
8	Search for PLC devices in the same network domain.			
Download				
	Download the App. file.			
	Upload the App. file.			

5. Upload the App. File.

The App file can be uploaded in two Methods:

Method 1:

Create .app file: Open the CODESYS project, click on *Online* > *Create Boot Application*.

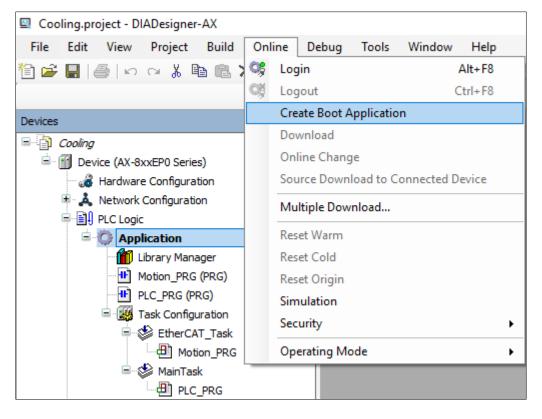


Figure 6 - 37: Create Boot Application path

Copy and save the .app and .crc files in the project directory to the following path:

- DOP-100 series: USB flash drive
- AX-8 HMIAP: Path D:\Delta Industrial Automation\PLC-APP

Application.app	
Application.crc	

Method 2:

Follow the steps to upload the .app file directly via PLC.

- 1. Click on search the PLC device to be uploaded. The PLC needs to be registered and activated in the CODESYS project.
- 2. After finding the device, select the PLC device to upload the app. file.
- 3. Select the folder path to upload.

4. Click on upload 🔟 icon.

PAC-AX, V1.0110.2		-	×
PAC-AX • 🛃 Up/Do	ownload	SBack 1	Home
CODESYS			
Boot APP (*.app)	②	Gateway IP 192.168.1.120	(1)
AX8 New 3		Vevice [0382.C00A] DESKTOP-8FF0	200
		•	

Figure 6 - 38: Upload

Result: Displays file upload success message.

PAC-AX, V1.0110.2			- 🗆 X
PAC-AX • 🛃	Up/Download		SBack Home
CODESYS			
Boot APP (*.app)	۲	🍗 Gateway IP	192.168.1.120
AX8 New	Hint CODESYS	file upload successfully OK	DESKTOP-8FFCUO

Figure 6 - 39: CODESYS file upload successfully

NOTE: After the upload is complete, there will be more .app files in the path.

PAC-	AX, V1.0110.2				-	□ ;	×
PA	C-AX • 🛃 Up	/Downl	oad		SBack	Home	e
	CODESYS						
	Boot APP (*.app)	•		🀞 Gateway IP	192.168.1.120	9	
	AX8 Application.a New	арр		Device	00A] DESKTOP-8FI	CUO	

Figure 6 - 40: After Successful Upload

6.5.2 Download

Follow the procedure to download the .app file.

- 1. Select the .app file to download.
- 2. Select the PLC device to be downloaded.
- 3. Click on download

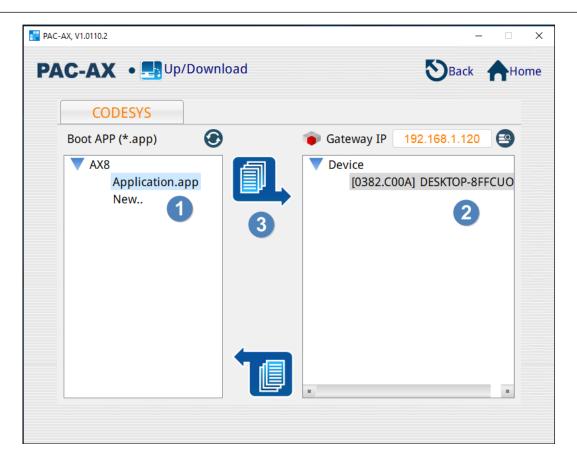


Figure 6 - 41: Download

4. A message after the download is successful, the newly downloaded Application program will run on the PLC.

PAC-AX, V1.0110.2		- 🗆 X
PAC-AX •	Up/Download	SBack AHome
CODESYS		
Boot APP (*.app)	📀 👘 Gateway	y IP 192.168.1.120 🗐
AX8 Applicat New	Hint CODESYS file download success	DESKTOP-8FFCUO sfully OK

Figure 6 - 42: CODESYS File downloaded successfully

Chapter 7: Library Manager

The library memory is the storage location of the upper programming system library and related metadata. Insert any installed library into the project through the library manager. When installing the library, there is a version manager to update the latest library.

In addition to the pre-installed system and motion control libraries, user can also create and edit more libraries.

7.1 Device Repository

Users can follow the steps below to install third-party device xml files.

1. Click on Tools> Device Repository.

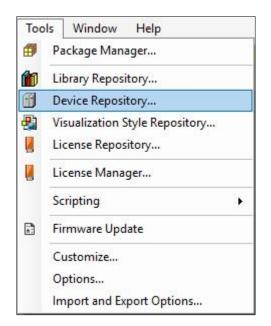


Figure 7 - 1: Device repository

Result: The device storage library window pops up.

cation	System Repositor	y			~	Edit Locations
	(C:\ProgramData	\Delta Indus	trial Automati	on\DIAStudio\DIADesign	er-AX\Devices)	
stalled d	e <u>v</u> ice descriptions					
String for	a fulltext search		Vendor:	<all vendors=""></all>	~	<u>I</u> nstall
Name		Vendor	Version	Description		
€ Î	liscellaneous ieldbuses LCs oftMotion drives					Export.
						Details

Figure 7 - 2: Device repository window

2. Click *Install* in the *device repository*.

Result: The installation device description window pops up.

🐮 Device R	lepository			×	Install Device Description
Location	System Repository			Edit Locations	← → ▼ ↑ 📮 → This PC → Local Disk (D:) → XML → 🗸 🗸 Search XML 🔎
		ta Industrial Automa	tion\DIAStudio\DIADesigner-AX\Device	A CONTRACTOR OF A CONTRACTOR O	Organize 🔻 New folder 🛛 🕮 🔻 🔟 🔮
					Type A Date modified Type
	evice descriptions a fulltext search	Vendo	r: <all vendors=""> ~</all>	Install	Desktop Beckhoff_EtherCAT_XML 12-02-2021 15:24 File folder Documents
B- 🗃 Fi B- 🗊 Pl	liscellaneous ieldbuses	endor Version	Description	Uninstell	Downloads Music Pictures Videos Local Disk (C:) Local Disk (D:) Network
				Details	K K
				Close	Open Cancel

Figure 7 - 3: Install device profile

3. Select the *xml file* of the third-party device to be installed> click *Open*.

Result: The selected xml file has been installed in the device repository.

ocation	System Repository			~	Edit Locations
	(C:\ProgramData\Delta	Industrial Automatic	n\DIAStudio\DIADesigne	r-AX\Devices)	
nstalled d	e <u>v</u> ice descriptions				
String for	a fulltext search	Vendor:	<all vendors=""></all>	~	<u>I</u> nstall
Name				^	<u>U</u> ninstall
	🖹 🛅 XPlanar				Export
	hadies -	03-5000 Feedback			
	and a second)3-7000 Drive	- Drive and Axis Terminals	(FL 7xxx)	
<		autori Ginbi i a co. Ko		(LL/AAA) V	
	Users\vishnudevi.govind: Device "APS 1003-7000 I			erCAT_X	
	Device "APS1003-70001				
					<u>D</u> etails
					10

Figure 7 - 4: The xml file has been installed in the device repository

7.2 Library Manager

The library manager is responsible for managing the libraries used in user projects. Display the library type and attributes according to the corresponding device. User can use more libraries from the library repository, delete them or edit their properties.

Devices 👻 🕈 🗙	Library Manager 🗙							
	🖬 Add Library 🗙 Delete Library 📑 Properties 🔞 Detai	ils 📑 Plac	cehold	ers 👔 Library	Repository 🕕 Ico	n legend		
E Device (AX-308EA0MA 1T)	Name				Name	space	Effective version	
Hardware Configuration	- C 3SLicense = 3SLicense, 3.5.14.0 (35 - Smart Software Soluti	ions GmhH)			35 LIG	FINSE	3.5.14.0	
A Network Configuration	BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (offware	Solutions GmbH)	BPLog	rhad Yatha	3.5.5.0	
EtherCAT Filter	Builtinio AX3 = DL Builtinio AX3, 0.50.0.0 (Delta Elect)			our of the other of		InIO_AX3	0.50.0.0	
O Application	DL_MotionControl = DL_MotionControl, 0.5.5.0 (Delta Electro					ionControl	0.5.5.0	
Library Manager	IODrvEtherCAT = IODrvEtherCAT, 3.5. 15.30 (35 - Smart So		ons Gmb	H)		hercatLib	3.5.15.30	
Motion_PRG (PRG)	IoStandard = IoStandard, 3.5.15.0 (System)			1.9e	IoStand		3.5.15.0	
PLC PRG (PRG)	SM3 Basic = SM3 Basic, 4.6.1.0 (35 - Smart Software Soluti	ions GmbH)			SM3 Ba	sic	4.6.1.0	
Task Configuration	. Sticense = 35License, 3.5.14.0 (35 - Smart Software Si		H)		35 LIO	ENSE	3.5.14.0	
SetterCAT_Task	Base Interfaces, * (System)				IBaseLit		3.5.2.0	
Motion PRG	CAA Callback = CAA Callback Extern, 3.5.11.0 (CAA Tec	thnical Works	roup)		CB		3.5.11.0	
Bultin_JO (Bultin_JO) Gildin_JO (Bultin_JO) Gildin JO (Dio) Gildin JO (Dio) Gildin Josebus Master (Delta Local Gildin Josebus Master (Delta Local Gilding Carl And Stranger (Carl And Stranger) SoftMotion General Axis Pool	DriveInterface DriveInterface Doba Globals Dota McCAbonal McCabonal	FUNCT This fun MC_Tou InOut:	ION_B	LOCK MC_Ab lock is designe <u>be).</u> Name Axis	Type		s that are connected to trigger events (e.g. Comment Reference to axis	
	Administrative/Configuration			TriggerInput	TRIGGER_REF		Reference to trigger signal source	
	CAM Diagnostics	In	nput	Execute	BOOL	FALSE	Rising edge: Starts the execution of the function block.	
	10 On	0	Output	Done	BOOL	FALSE		
>	c >			Ruese	ROOL	EALCE	save: Execution of function black has not been	- 1

Figure 7 - 5: Library manager

The library manager lists all libraries integrated in the project for creating applications. It provides information about the library type, its properties and content. User can expand or collapse the list of integrated libraries, and edit the library properties of non-dependent libraries.

The library manager contains three blocks :

- Upper block: List of integrated libraries.
- Lower left block: tree structure, all modules of the library are selected in the upper view.
- Lower right block: the document of the module selected in the tree structure.

User can insert the library manager into the POU view or the device view. In this way, a project can have an application and a library manager in each POUs view, or a cross-application library manager. Regardless of the application, user can call the library module of the library manager in the POUs view. The library module of the library manager in the POUs view. The library module of the library manager in the device view can only be called in the corresponding application code. In addition, due to different library locations, library placeholders behave differently during download.

The library manager can be inserted into the POUs view or the Devices view. In this way, a project can have one library manager per application and also one cross-application library manager in the POUs view. The library modules of the linked libraries in the POUs view can be called regardless of the application. The library modules of the linked libraries in the Devices view can be called in the respective application code only. Furthermore, placeholder libraries behave differently when downloading depending on their positions.

Libraries that are linked to a specific version in the project also have a placeholder for that version (placeholder library). User can define special placeholder resolutions. User can also use the placeholder resolution that is defined for a device in the device description or that is stored in the library repository for a library. The library manager notifies about the actual placeholder resolution and shows the version that is used when downloading an application (effective version).

If a library manager is linked cross-application in the POUs view, then user have global access to its contents. If placeholder libraries are linked, then only the placeholder resolutions in the device description or library repository are checked.

Normally, a library manager is linked in the Devices view. Then, only the application code below it calls the library modules. Moreover, the special placeholder resolutions are checked first for placeholder libraries. Only after that are the placeholder resolutions checked that are in the device description or that originate from the library repository.

Name Namespace Effectiv Image: Provide the system of the system	G
BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH) BPLog 3.5.5.0 CAA Memory, 3.5.12.0 (CAA Technical Workgroup) MEM 3.5.12.0 CAA Net Base Services, 3.5.15.0 (CAA Technical Workgroup) NBS 3.5.15.0 CAA Net Base Services, 3.5.15.0 (CAA Technical Workgroup) NBS 3.5.15.0 CAA Types Extern, 3.5.13.0 (CAA Technical Workgroup) CAA 3.5.10.0 CAA Types Extern, 3.5.13.0 (CAA Technical Workgroup) CAA 3.5.13.0 CAA Types Extern, 3.5.13.0 (CAA Technical Workgroup) CAA 3.5.13.0 CompAXBX00EDry = CompAXBX00EDry = Colleta Electronics Inc) CmpAXBX00EDry = 0.007vEtherCAT, 3.5.14.0 (3S - Smart Software Solutions GmbH) IoDryEthercatLib 3.5.14.0 CompAXBMEDry = CompAXBX00EDry = 0.007vEtherCAT, 3.5.13.0 (System) IoStandard = IoStandard, 3.5.13.0 (System) IoStandard 3.5.13.0	version
Image: Solution (Solger) = Dictation (Solger) (Solution (Solger) = Dictation (Solger) = Dic	
CAA Net Base Services, 3.5.15.0 (CAA Technical Workgroup) NBS 3.5.15.0 CAA Net Base Services, 3.5.15.0 (CAA Technical Workgroup) CAA 3.5.15.0 CAA Types Extern, 3.5.13.0 (CAA Technical Workgroup) CAA 3.5.13.0 CompAX8xxEDry = CmpAX8xxEDry, = (Delta Electronics Inc) CmpAX8xxEDry 1.0.10	
CAA Types Extern, 3.5.13.0 (CAA Technical Workgroup) CAA 3.5.13.0 CompAX8xxEDry = CompAX8xxEDry, * (Delta Electronics Inc) CmpAX8xxEDry 1.0.14 I DDryEtherCAT = IODryEtherCAT, 3.5.13.0 (System) IoDryEthercAT = IODryEtherCAT, 3.5.13.0 (System) 3.5.13.0	
CmpAX8xxEDryCmpAX8xxEDryC0eta_Electronics_Inc) CmpAX8xxEDry 1.10.1/1 CmpAX8xxEDryC0eta_Electronics_Inc) CmpAX8xxEDry 1.10.1/1 CmpAX8xxEDry_C0eta_Electronics_Inc) IoDryEtherCAT 1.00.1/1 IoDryEtherCAT = IODryEtherCAT, 3.5.14.0 (3S - Smart Software Solutions GmbH) IoDryEthercAtLib 3.5.14.0 IoStandard = IoStandard, 3.5.13.0 (System) IoStandard 3.5.13.0	
Improvement	
E loStandard = IoStandard, 3.5.13.0 (System) IoStandard 3.5.13.0	
GM3_Basic = SM3_Basic, 4.3.2.0 (3S - Smart Software Solutions GmbH) SM3_Basic 4.3.2.0	
#- I SM3_CNC = SM3_CNC, 4.3.2.0 (3S - Smart Software Solutions GmbH) SM3_CNC 4.3.2.0	

Figure 7 - 6: Library manager

Project	Description
Display in gray font	The library is automatically added to the project through a plug-in.
Display in black font	The library is automatically added to the project through the add library command.
Name	The name of the library definition
Namespaces	Namespace, used to uniquely access the contents of the library. The namespace is usually the same as the library name.
Effective version	A valid version of the library. This library version is used in the project.

Directory function

Project	Description
Add library	This command opens the Add Library dialog box. In this dialog box, user can add libraries to the Library Manager and then integrate them into userr application
Delete library	Remove the currently selected library from the project.
Properties	This command opens the properties dialog box for the library selected in the library manager.
Details	According to controller and fieldbus classification
Download Missing libraries	CODESYS browses the missing library on the download server of the specified project. Then user can download or install the library
Placeholders	This command will open a placeholder dialog box. This dialog box displays information about the currently selected placeholder library, convert the library version to another version.

Project	Description
Library Repository	To install or uninstall the library and define the address of the library.
Icon legend	 The meaning of icon legend information Library signed with a trusted certificate A library signed with a trusted certificate, but at least one unsigned library is referenced. Library signed with private key and token Unsigned libraries, or libraries signed with untrusted or expired certificates. For untrusted certificates, trusted certificate commands are provided in the context menu. Defined as optional and currently unavailable library Library being determined There is currently no license library for a valid license The library symbol of the library that cannot be loaded because the signature (encryption) cannot be verified.

7.2.1 Add Library

The following example shows how to add the Util library to userr application. User can add various libraries to use in the device in this way.

- 1. Select the *Library Repository*.
- 2. Select *Add Library* to open the dialog box for adding library.

🞁 Library Re	epository	×	
Location	System V (C:\ProgramData\DIADesigner-AX\Managed Libraries)	Edit Locations	
Installed lib	(All companies)	Install	
4) E	(Miscellaneous) (Ait companies)		
± € Do	Docs Docs Docs System		
• • • • • • • • • • • • • • • • • • •		Find	
		Details	
Group b	by category	Trust Certificate Dependencies	
Library Pro	ofiles	Close	
2.0rdiy m	Close		

Figure 7 - 7: Add library

Project	Description
String for a fulltext search	In the row above the library list, user can search for the library name or library module by entering the appropriate string.
Library	Appropriate library installed in the inventory repository. For example, the choice of library is in the device description or defined by the OEM. By default, the displayed libraries are divided into several categories.
Company	Creator of the library.
Library Repository	Open the Advanced Add Library dialog box
	The displayed libraries are divided into several categories.
The second se	The displayed libraries are listed in alphabetical order.
()	Show all available libraries.

• Function library

tring for a fu	illtext search		
ibrary Plac	ceholder		
Company	(All companies)		~
	cation	,	^
	eldbus CAN		
•			
•	CAN Ethernet/IP Modbus PROFIBUS CommFB 3.5.15.0 3S-Smart Software Solutions GmbH	_	
•	CAN Ethernet/IP Modbus PROFIBUS		~
	CAN Ethernet/IP Modbus PROFIBUS CommFB 3.5.15.0 3S-Smart Software Solutions GmbH	>	~

Figure 7 - 8: Function Library

Project	Description
Company	Filter the list by supplier
Group by category	Checked: Display the library in a tree structure. Unchecked: Display libraries in alphabetical order in the plane structure.
Display all versions	Checked: Show all versions of libraries. Version specification '*' means the latest version available in the repository. Unchecked: Only display the latest version of the library. Multiple libraries can be selected in this display. To do this, hold down the [Shift] key and select the entry.
Details	Details of library modules.
Library Repository	Inventory storage dialog box. More libraries can be installed to the local system.

• Placeholder

	ltext search			
ibrary Place	eholder			
Placeholder	name			~
Default libra	ary			
Company	(All companies)			~
 (Misc Appli Docs Inter Syste Use C 	n			
Group	by category 🗌 Display	all versions (for exp	perts only)	

Figure 7 - 9: Placeholder

Project	Description
Placeholder name The input field provides a drop-down list box for input field provides a drop-down list box for input field placeholder name read from the currently accessible device description.	
the company	Filter the list by supplier
	Checked: Display the library in a tree structure.
Group by category	Unchecked: Display libraries in alphabetical order in the plane structure.
Show all versions	Checked: Show all versions of libraries. Version specification '*' means the latest version available in the repository.
	Unchecked: Only display the latest version of the library. Multiple libraries can be selected in this display. To do this, hold down the [Shift] key and select the entry.
Details	Details of library modules.
Library	For any reason, when the device defined by the resolution is not available, CODESYS uses this library. In this way, the current project can be compiled correctly.

3. Enter the string *Util* in the search box to browse the library, select the Util library, and click *OK*.

Add Library		×
Util		
Match	Library	
Advanced	Of	Cancel

Figure 7 - 10: Util Library

4. The Util library has been added to the library manager and can be used in the library manager.

/ 🛍 Library Manager 🗙 🗄 Add Library 🗙 Delete Library 🖙 Properties 👼 Details 🖾 Placeholders 🎁 Library Repository 🕦 Icon legend		
Name	Namespace	Effective version
🖳 📃 DL_MotionControl = DL_MotionControl, 0.5.5.0 (Delta Electronics Inc)	DL_MotionControl	0.5.5.0
IODrvEtherCAT = IODrvEtherCAT, 3.5. 15.30 (3S - Smart Software Solutions GmbH)	IoDrvEthercatLib	3.5.15.30
🖩 🖳 IoStandard = IoStandard, 3.5.15.0 (System)	IoStandard	3.5.15.0
🗑 📙 SM3_Basic = SM3_Basic, 4.6.1.0 (3S - Smart Software Solutions GmbH)	SM3_Basic	4.6.1.0
🛱 📙 SM3_CNC = SM3_CNC, 4.6.1.0 (3S - Smart Software Solutions GmbH)	SM3_CNC	4.6.1.0
SM3_Robotics = SM3_Robotics, 4.6.1.0 (3S - Smart Software Solutions GmbH)	SM3_Robotics	4.6.1.0
🗑 🔚 SM3_Robotics_Visu = SM3_Robotics_Visu, 4.5.1.0 (3S - Smart Software Solutions GmbH)	SM3_Robotics_Visu	4.5.1.0
🕱 📙 SM3_Transformation = SM3_Transformation, 4.6.1.0 (3S - Smart Software Solutions GmbH)	TRAFO	4.6.1.0
Standard = Standard, 3.5.15.0 (System)	Standard	3.5.15.0
🗄 📃 Util = Util, 3.5.15.0 (System)	Util	3.5.15.0

Figure 7 - 11: Added the Util library to the library manager

7.2.2 Properties

Properties dialog box of the selected library is available in the library manager.

***NOTE**: It is recommended for people with professional knowledge related to library development to use.

Properties - #SM3_Basic	×
General: Namespace: SM3_Basic Default library: SM3_Basic, * (3S - Smart Softwa	Version: O Specific version:
Visibility: Only allow qualified access to all identifiers. If the current project is referenced as a library by another p Publish all IEC symbols to that project as if this referen Hide this reference in the dependency tree.	
Optional (if the library is missing, no error will be report	ted). OK Cancel

Figure 7 - 12: Library Properties

Project	Description
	General
Namespace	Display the current namespace. By default, this is the same library name, unless user explicitly define different standard namespaces when creating library information in the project. User can change the namespace of the local project in the <i>Properties</i> dialog box.
Default library	If user have just selected the library placeholder in the library manager, when no other resolution can be defined, then this field contains the name of the library to replace the placeholder
Version	
Specific version	To use this version is to select the desired version from the list.
Newest version always	Always use the latest version of the library found in the library's database. If a new version of the library is available, the library module can actually be changed.
	Visibility
Only allow qualified access to all identifiers	Library modules (and variables) can only be called in the project using the pre-name space path.
If the project is referenced as a library by another project	It makes sense to change the following settings only when a library is created using the project and therefore another library project is opened. In this way, the selected library will be referenced in the new library.
Publish all IEC symbols to that project as if this reference would have been included there directly	As a container library, the selected library makes the contents of the referenced library visible at the top level (a higher level in the project). Requirements : Use the library project to create a container project. The container library does not implement its own modules, but specifically references other libraries. It is bundled with libraries. User can use container libraries wisely to bundle multiple libraries in a project (in the reference). This option must be enabled for each library reference.
Hide this reference in the dependency tree	The selected library is not displayed as a library reference in the library manager (appears later in the project). The library is a hidden reference. Warning : If there are compilation errors caused by hidden library errors, it may be difficult to detect these errors.
Optional	The selected library is considered an optional library. When downloading a project that references the library, even if

Project	Description
	the library is not available in the library repository, no errors will be reported.

7.2.3 Placeholder

The placeholder describes the configuration and the target device of the library, or has not been defined (*free Placeholder*). The user can transfer each placeholder version to another version of the library.

laceholders		
Name	Library	Info
3SLicense	3SLicense, 3.5.14.0 (3S - Smart Software Solutions GmbH)	Resolved by licensing r
BreakpointLogging	Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	Resolved by library pro
CAA Behaviour Model	CAA Behaviour Model, 3.5.11.0 (CAA Technical Workgroup)	Resolved by device
CAA Callback	CAA Callback Extern, 3.5.11.0 (CAA Technical Workgroup)	Resolved by device
CAA Device Diagnosis	CAA Device Diagnosis, 3.5.15.0 (CAA Technical Workgroup)	Resolved by device
CAA FB Factory	CAA FB Factory, 3.5.13.0 (CAA Technical Workgroup)	Resolved by device
CAA MemBlockMan	CAA Memory Block Manager Extern, 3.5.13.0 (CAA Technical Workgroup)	Resolved by device
CAA ResMan	CAA Ressource Manager Extern, 3.5.11.0 (CAA Technical Workgroup)	Resolved by device
CAA Tick	CAA Tick Extern, 3.5.7.0 (CAA Technical Workgroup)	Resolved by device
CAA TickUtil	CAA TickUtil Extern, 3.5.7.0 (CAA Technical Workgroup)	Resolved by device
CAA Types	CAA Types Extern, 3.5.13.0 (CAA Technical Workgroup)	Resolved by device
CBML	Common Behaviour Model, 3.5.15.0 (35 - Smart Software Solutions GmbH)	Unbound placeholder
CmpApp	CmpApp, 3.5.15.0 (System)	Resolved by device
CmpAsyncMgr	CmpAsyncMgr, 3.5.15.0 (System)	Resolved by device
CmpBinTagUtilIec	CmpBinTagUtilIec, 3.5.5.0 (System)	Resolved by device
CmpChannelClientIec	CmpChannelClientIec, 3.5.11.0 (System)	Resolved by device
CmpCodeMeter		
CmpEventMgr	CmpEventMgr, 3.5.14.0 (System)	Resolved by device
<		>

Figure 7 - 13: Placeholder

Project	Description
Name	Placeholder name
Library	The library version currently valid for the project. Double- click the item to display a selection list with available library versions, user can select the version that needs to be used in the project.

Project	Description		
	CmpApp, 3.5.15.0 (System)		
	Other versions of CmpApp		
	3.5.14.0		
	3.5.13.0		
	Other library		
	Placeholder device type:		
	Device analysis: Solve by device description		
Info	 Library configuration file analysis: resolved by the database configuration file. 		
	 Solved by XXX configuration file: Solved by <specific library></specific 		

The placeholder function can mainly convert the currently used library version to the required version. The main functions are as follows:

- 1. If a specific version is assigned to the placeholder library through the placeholder dialog, the project will apply this version.
- 2. If a specific version is not defined, it will check whether the version is specified in the device description of the app.
- 3. The library configuration file will be checked for version definitions.
- 4. Shown in the library manager below the active version.

7.2.4 Resource Library

Resource library defines which libraries have been installed on the local system and can be used in the application, and new libraries can be installed and used in the application through the interface.

dd Library	X Delete Library Properties 🛅 Details 🔄 Placeholders 🎁 Libra	ry Repository 🕕
🛚 Library R	epository	
Location	System	Edit Locations.
	(C: \ProgramData \DIADesigner-AX \Managed Libraries)	
Installed lib	raries:	Install
Company	(All companies) ~	Uninstall
	ntern	Export
		Find
		Details
		Trust Certificat
Group	by category	Dependencies.

Figure 7 - 14: Resource Library

Project	Description
Location	Display the directory on the local system where the library file is located. The libraries in this location are listed in the installed libraries area.
Edit Locations	Open the Edit Repository Location dialog box
Company	List of companies supported by the library.
Install	 Open the Select the library to install dialog box. Possible screening procedures: Compile CODESYS library file (* .compiled-library). Compile CODESYS library file (* .compiled-library-v3) ab V3 SP15 Library files (*.library) are used for library projects that have not yet been compiled All files (*.*)
Uninstall	Uninstall selected library

Project	Description
Export	Opens the default dialog box for saving library projects to the local file system. The file type isLibrary files (*.library), Compiled library files (*.compiled-library), or Compiled library files (*.compiled-library-v3).
Find	Search libraries and function blocks. Open the Find Library dialog box. When entering a string in the input box, CODESYS will display the library found with the corresponding string.
Details	 Open the detailed information dialog box, which contains detailed information about the selected library version in the library's project information. User can find the following information by clicking More in the details dialog: Size: in bytes Created: Date of creation Change: Last change date Last Visited: Date Attributes Attributes
Dependiencies	For the selected library, the dependency dialog box will open, showing dependencies on other libraries. Display the title, version and company referenced by each library. References that function through placeholders will be displayed according to the following syntax: # <placeholder name>.</placeholder
Group by category	 Startup: group by library category Not activated: sorted alphabetically The category is defined by the external description file "*.libcat.xml".

The following describes how to install the library in the *Library Repository*.

- 1. Select *Libaray Repository* and open it in the editor.
- 2. Select *Install*, select the library to be installed. User can choose the file format here.

🗂 Library R	epository	×
Location	System ~ (C:\ProgramData\CODESYS\Managed Libraries)	Edit Locations
Installed lib		Install
Company	(All companies) V	Uninstall
	itern /stem	Export
		Find
Group	by category	Trust Certificate
Library Pr		Dependencies Close

Figure 7 - 15: Install library

After the installation is complete, the new installation library will appear in the resource library.

ocation	System (C: \ProgramData \DIADesigner-AX \Managed Libraries)	~	Edit Locations
Installed lib	raries:		Install
Company	(All companies)	~	Uninstall
	DL_LogDmp Delta Electronics Inc DL_LRC Delta Electronics Inc DL_MemRW Delta Electronics Inc DL_ModbusComMaster Delta Electronics Inc DL_ModbusTCPMaster Delta Electronics Inc DL_MotionControl Delta Electronics Inc 0.5.5.0	^	Export
			Find
	DL_MotionControlLight Delta Electronics Inc DL_MotionControl_Error Delta Electronics Inc DL_Mov_Delta Electronics Inc	~	Details Trust Certificate
Group b	by category		Dependencies

Figure 7 - 16: New installation library

User can export the library from the resource library and save it as a file to the hard drive.

- 1. Open the application library manager in the project.
- 2. Select a library in the library manager and click *Export*. The Export Library dialog box will open.

ocation	System (C:\ProgramData\DIADesigner-AX\Managed Libraries)	~	Edit Locations
installed libr			
Company	(All companies)	~	Install
,	0.5.5.0		Uninstall
		^	Export
.	DL_MotionControlLight Delta Electronics Inc		
	DL_MotionControl_Error Delta Electronics Inc		
		1	
±	DL_Mov Delta Electronics Inc		
	pplication		Find
E Do	ocs		Details
🖲 🔋 In	tern		
<u></u>		*	Trust Certificate
Group b	oy category		Dependencies

Figure 7 - 17: Library selection

- 3. If the selected library is not only linked to the project in the form of a compiled library, but also linked to the project in the original format, both file types are in the file type drop-down list. Otherwise, the filter will automatically display the available types: "*.library or *.compiled-library.
- 4. Select the file type and storage location, and then click *Save* to export.

A	ec F	Runtime Work:	shop > Motion	~ Ö	Search Motion		p
Organize 👻 No	ew fol						0
 3D Objects Desktop Documents Downloads Music Pictures Videos Local Disk (C 	•	Name	No	items match y	Date modified	Туре	
🔔 Local Disk (D 🥩 Network	:)	<					
	DL	MotionContro	l_Error.compiled-lib	rary-ge33.com	piled-library		
File name:	DL				11		-

Figure 7 - 18: Export Library

7.3 Package Manager

DIADesigner-AX provides a package manager whose functionality extends the standard installation through DIADesigner-AX additional functions and configuration settings. The package manager is located in *Tools > Package Management*. The concept is similar to the typical Windows installation mechanism. The package is a ZIP file with a *.*package* file extension.

Refresh		Sort by	Name 🗸	Install
Name CODESYS SoftMotion	allation date 0/10/5	Update info Free version 4.8.0.0 available!	License info Searching	Uninstall Details Updates Search Updates Download CODESYS Store Rating <u>CODESYS Store</u>

Figure 7 - 19: Package manager

The possible package components include the following items that can be installed:

- Plug-in
- Library
- Description of the device
- Supplier's description
- Configuration
- Configuration information
- Configuration changes
- File
- Function table, toolbar, keyboard shortcuts and view configuration extension
- Description module
- Complete menu configuration of special profile
- Complete toolbar configuration for special profile
- Complete keyboard configuration for special profile

- Options
- Library configuration

Currently Installed Packages					
Refresh			Sort by Name	\sim	Install
Name AX-8xxEP0 Linux Series AX-8xxEP0 Series CODESYS SoftMotion Delta_AX-308EA0MA1T_Package Delta_MotionControlLight_Package HMI Example MotionControl_ReleaseV0.5.3.0_20200703	Version 1.0.00 1.0.00 4.6.3.0 0.40.3.0 0.5.5.0 1.0.0.0 0.5.3.0	Installation date 2020/9/1 2020/7/16 2020/7/15 2020/7/16 2020/9/30 2020/8/18 2020/7/17	Update info Free version 4.8.0.0 ava	iable	Uninstall Details Updates Search Updates Download CODESYS Store Rating CODESYS Store
< ☐ Display versions				>	Close

Figure 7 - 20: Package manager

Project	Description
Currently installed Packages	The list of installed packages includes: name, version, installed data, update information, authorization information. If the package comes from the CODESYS Store, it will be marked with a red package symbol instead of a yellow symbol.
Refresh	Update list
Install	Browse the packages in the file system and select the package to install. The standard file types are *.package. After selecting the package, the installation steps are shown as follows:
	Installation-License Agreement

Project	Description
	 Show package checksum in installation protocol dialog. Only displayed if the package contains a license agreement. Choose installation type Full installation: install all components Typical installation: install the standard set from the components defined in the package Installation-target system version: select which existing target system version to update through package installation. User must select at least one version profile
Uninstall	 Uninstall selected package If the display version is not started, CODESYS uninstalls all versions of the selected package If the display version is activated and user select the highest level package node, CODESYS will uninstall all versions of the selected package If the display version is activated and user select a package version, CODESYS will uninstall that version exactly.
Details	Use the following options to open the details dialog of the selected package: • Package details • Name: The name of the package • Version • Checksum: packaged SHA-1 CRC • Supplier • Copyright • Description • Installation date • License Agreement
	Updates
Search Updates	Every time the programming system is started, CODESYS automatically searches for updates every hour.
Download	Install the update package with the help of the dialog download package. To do this, click the download and install button in the dialog download package.
CODESYS Store	Link to the homepage of the CODESYS store
Display versions	Show all versions of installed packages.

Project	Description
Search updates in background	Search for updates of the selected package on the system and in the CODESYS Store. CODESYS displays the list of found update packages in the update information bar.

The steps to install a package are as follows:

1. Tools > Package Manager.

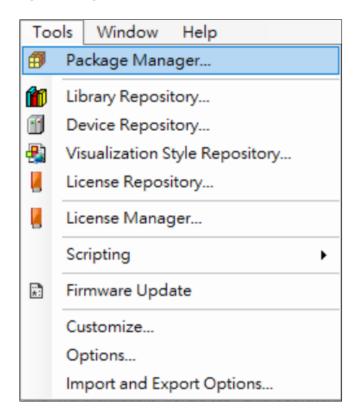


Figure 7 - 21: Install a package path

2. Click *Install*, select the package user want to install and open it to install.

Refresh		Sort by	Name ~	/ Install
Name CODESYS SoftMotion	Installation date 2020/10/5	Update info Free version 4.8.0.0 available!	License info Searching	Uninstall Details Updates Search Updates Download CODESYS Store Rating CODESYS Store

Figure 7 - 22: Installation Package

 In the open dialog box, select a package from the file directory, and then click *Open*, the installation step will start, and the installation is complete, select *Finish*.

🗊 Open	×
← → × ↑ 🦲 « Runtime Workshop > Motion	✓ ♂ Search Motion
Organize 👻 New folder	10 • 🗖 📀
This PC Name	Date modified Type
3D Objects No item	ns match your search.
Documents	
👃 Downloads	
1 Music	
Fictures	
📓 Videos	
🏪 Local Disk (C:)	
Local Disk (D:)	
👉 Network	
v c	,
File name:	V Package (*.package) V
	Open Cancel

Figure 7 - 23: Open Window

Installation - Choose Setup Type	×						
MotionControl_ReleaseV1.0.0.0_20201008 [1.0.0.0] Please select the type of setup you would like to perform.							
 Complete setup All package components will be installed. Typical setup The most commonly used package components will be installed. 							
Cancel < Back Next >	Finish						

Figure 7 - 24: Software package successfully installed

Uninstall a package:

- 1. After selecting the package to be uninstalled, click Uninstall.
- 2. User will be guided through the process of uninstalling the package.

Currently installed packages Refresh Name Version Installation date Update Install OccessYS SoftMotion 4.6.1.0 2020/10/5 Free version 4.8.0.0 available! MotionControl_ReleaseV1.0.0.0_20201008 1.0.0.0 1.0.0.0 2020/10/12 Updates Search Updates Download CODESYS Store Rating CODESYS Store Rating CODESYS Store CoDESYS Store CoDESYS Store	🗊 Package Manager						×
Name Version Installation date Update info CODESYS SoftMotion 4.6.1.0 2020/10/5 Free version 4.8.0.0 available! Details MotionControl_ReleaseV1.0.0.0_20201008 1.0.0.0 2020/10/12 Updates Search Updates Download CODESYS Store Rating CODESYS Store Rating CODESYS Store Nation Store Store Store	Currently installed packages						
CODESYS SoftMotion 4.6.1.0 2020/10/5 Free version 4.8.0.0 available! MotionControl_ReleaseV1.0.0.0_20201008 1.0.0.0 2020/10/12 Updates Search Updates Download CODESYS Store Rating CODESYS Store Rating CODESYS Store	Refresh			Sort by	Name	\sim	Install
MotionControl_ReleaseV1.0.0.0_20201008 1.0.0.0 2020/10/12 Updates Search Updates Download CODESYS Store Rating CODESYS Store	Name Version Installation date		Update info			Uninstall	
CODESYS Store Rating CODESYS Store		-		Free vers	ion 4.8.0.0 available!		Details
Display versions 🔽 Search updates in background		1.0.0.0	2020/10/12			>	Search Updates Download CODESYS Store Rating
	□ Display versions 🔽 Search updates in background						Close

Figure 7 - 25: Remove a package



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