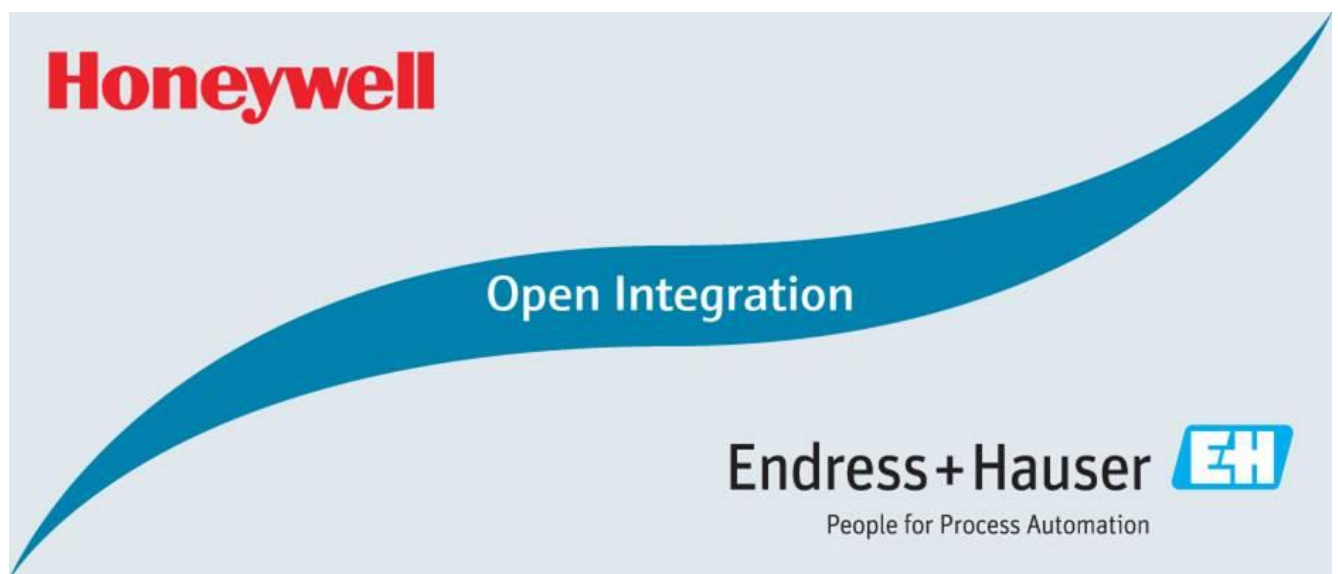


Integration Tutorial HON03

Honeywell ControlEdge™ Unit Operations Controller and
EtherNet/IP plus HART for Life Science



Supported by:

FESTO

TURCK

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1 Document Information

1.1 Purpose and Scope

This document provides a step by step description on how to integrate EtherNet/IP and HART devices with a Honeywell ControlEdge™ UOC System. All content of this document is jointly developed, reviewed and approved by Honeywell and Endress+Hauser as a common deliverable of Open Integration.

1.2 Document History

This is version 1.00.00 of this document. Version history:

Version	Released	Description
1.00.00	2020-11	Initial version

1.3 Related Documents

Please refer to related documents as listed below:

Document	Description
SD02648S/04/EN/1.20	Reference Topology HON03
SD02650S/04/EN/1.20	Integration Test Summary HON03
SD02651S/04/EN/1.20	List of Tested Devices and Versions HON03

2 Pre-Requisites

Readers of this document should be familiar with related documents as listed in chapter 1.3 and basics on how to work with the Honeywell ControlEdge™ UOC System as well as EtherNet/IP and HART in general. Please refer to recommended literature as listed in chapter 2.1.

2.1 Recommended Literature

2.1.1 Honeywell

Please refer to online help of the Honeywell Configuration Studio for latest information about the Honeywell control system.

2.1.2 Endress+Hauser

Document	Description
BA00065S/04/EN/11.20	FieldCare SFE500 Operating Instructions

2.1.3 Other

2.1.3.1 Rockwell Automation

Document	Description
1783-UM007G-EN-P	Stratix Managed Switches
1783-PC011B-EN-P	Ethernet Tap

2.1.3.2 Festo

Document	Description
8024075-CPX-FB36-EN	Bus node - EtherNet/IP

2.2 Operable Control System

This document assumes an operable Honeywell ControlEdge™ UOC as defined by Reference Topology HON03. Please refer to manuals listed in chapter 2.1.1 for explanation on how to use hard- and software provided by Honeywell.

2.3 Operable Asset Management System

This document assumes an operable Endress+Hauser FieldCare environment as defined by Reference Topology HON03.

2.4 Operable Field Network Infrastructure

This document assumes an operable selection of Endress+Hauser EtherNet/IP and HART devices, as defined by Reference Topology HON03. Please refer to manuals listed in chapter 2.1.3 for installing of hardware and software provided by other parties.

2.5 Operable Field Devices

This document assumes an operable selection of Endress+Hauser EtherNet/IP and HART devices, as defined by Reference Topology HON03. Each field device is powered if needed and adequately connected to the Honeywell ControlEdge™ UOC System. If required, please refer to individual device manuals for further advice.

3 Basic Integration

This chapter describes the main workflow for integrating EtherNet/IP devices into a Honeywell ControlEdge™ UOC and HART devices into a Turck Excom Remote/IO. As a result, the EtherNet/IP cyclic communication as well as the 4-20 mA/HART communication are running. Process values and status information are available within the control strategy of the system for further processing.

3.1 IP Network Address Configuration

All devices in the EtherNet/IP network need a valid IP address. This chapter explains how this can be set for the different device types used in this topology.

3.1.1 IP Address Overview

The table below lists all IP addresses to configure with the used method:

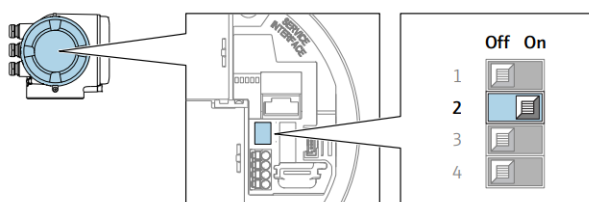
Network	Component		Configured IP Address	Subnet Mask	IP Configuration Method
IO Network	Switches	Stratix 5400	10.126.93.20	255.255.255.0	Web server
		ETAP 1783	10.126.93.21	255.255.255.0	DIP Switch and BOOTP server
	Remote IO EtherNet/IP Field Devices	Excom	10.126.93.46	255.255.255.0	Turck Service Tool
		CPX_FB36	10.126.93.111	255.255.255.0	Festo Field Device Tool
		Promag500	10.126.93.112	255.255.255.0	DIP Switch and Web server
		Promass300	10.126.93.113	255.255.255.0	DIP Switch and Web server

3.1.2 Proline 300/500

IP addresses of Endress+Hauser EtherNet/IP devices may be configured directly on the display if available or by using the web server.

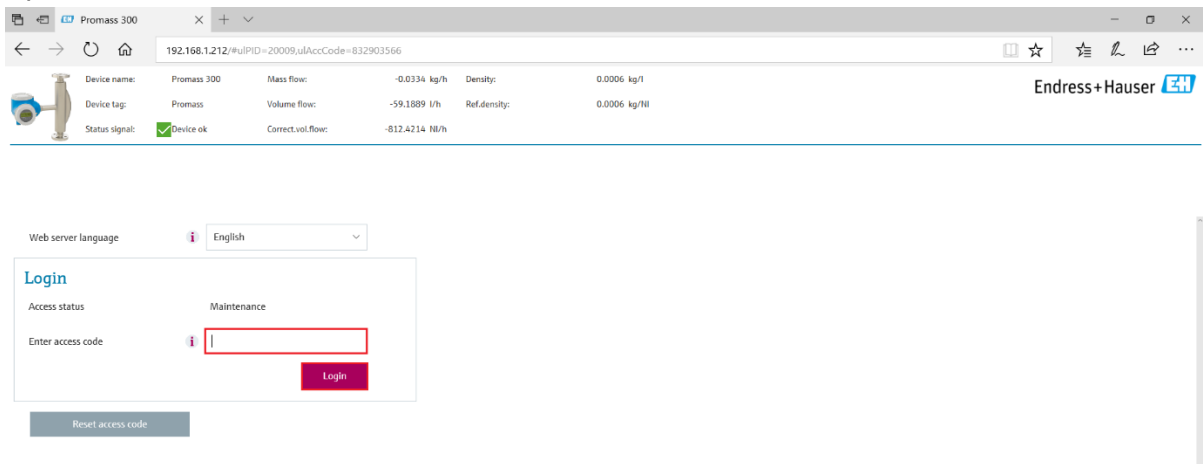
This example describes the main steps for configuring the IP address for the Promass 300 by using the Web server. Please refer to the device manual for further details.

- Power off the device.
- Set the device DIP switch 2 to ON in order to select the default IP address 192.168.1.212:



- Reboot the device.

- Connect a laptop with private network settings (192.168.1.1/24) to the Promass300 with an Ethernet cable.
- Open a browser and enter the IP address 192.168.1.212:



Web server language: English

Login

Access status: Maintenance

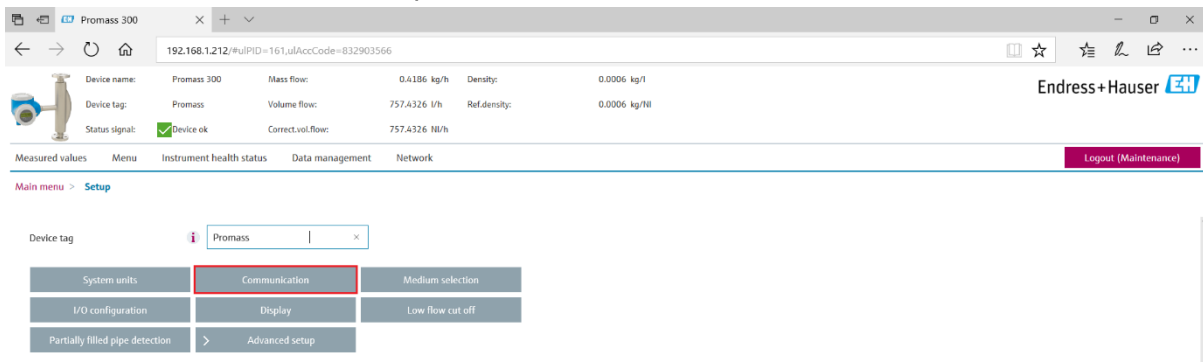
Enter access code:

Login

Reset access code

Enter the default access code "0000" and click on the button Login.

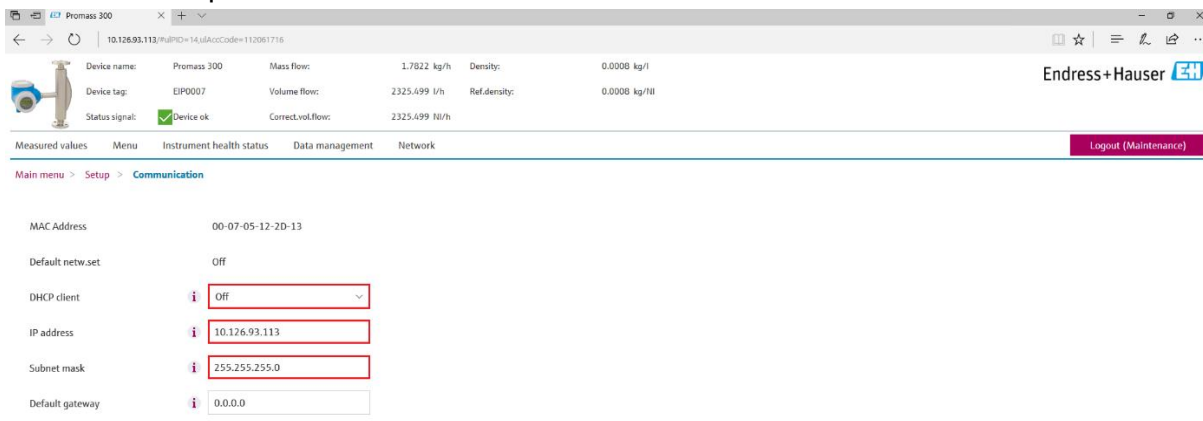
- Click on the button "Menu→Setup→Communication":



Device tag: Promass

System units	Communication	Medium selection
I/O configuration	Display	Low flow cut off
Partially filled pipe detection	Advanced setup	

- Deactivate the option "DHCP client" and set the new IP address and subnet mask:



MAC Address: 00-07-05-12-2D-13

Default netw.set: Off

DHCP client: Off

IP address: 10.126.93.113

Subnet mask: 255.255.255.0

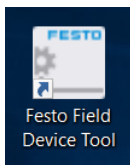
Default gateway: 0.0.0.0

Remarks

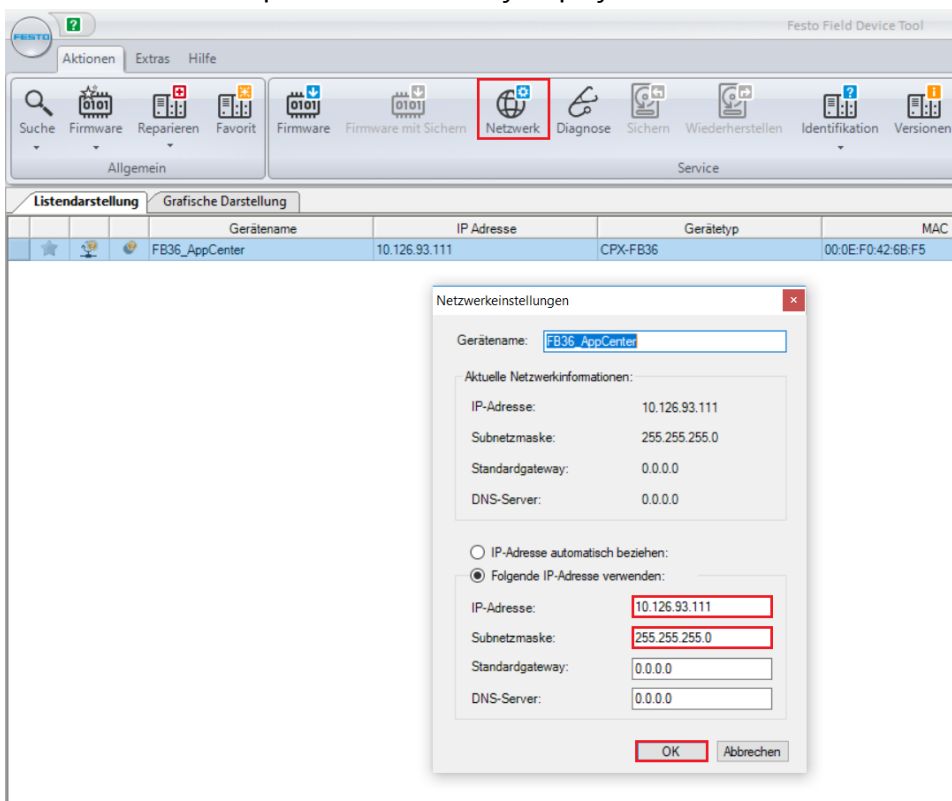
- Once done, the connection to the Web server is lost. The connection can be reestablished by entering the assigned IP address.
- Reconfigure the DIP switch 2 to OFF.

3.1.3 CPX FB36

- Connect a laptop to the Festo CPX network via Network cable and start the Festo software “Field Device Tool”:



- Connected FB36 adapter is automatically displayed:



Click on the menu “Network” to configure the IP settings and click on the button “OK” to save.

- Verify as well that the DIL switch 1.1 is configured to OFF (Factory setting operating mode) and that the DIL switch 1.2 is OFF for EtherNet/IP network protocol:



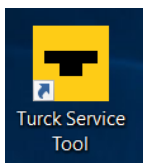
- In this example, the DIL switch 2 is configured with I/O diagnostics interface, that means switch 2.1 is on ON and switch 2.2 on OFF:



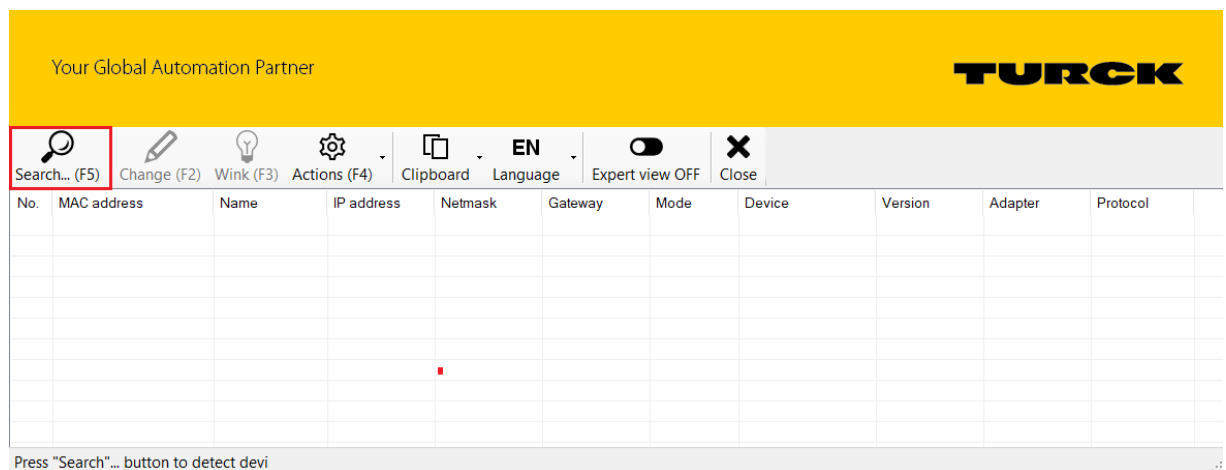
Please refer to the user manual for further details.

3.1.4 Excom Gateway

- Connect a laptop to the Excom Remote I/O via network cable and start the Turck software "Turck Service Tool":



- Click on the button "Search":



- This displays the found devices:

Your Global Automation Partner

No	MAC address	Name	IP ad...	Netm...	Gatew...	Mode	Device	Version	Adapter	Turck, DCP
1	00:07:46:84:12:C3		0.0.0.0	0.0.0.0	0.0.0.0	PGM_DHCP	GEN-N	1.2.32.5	10.126.93.111	DCP, Turck

- Select the device and click on the button "Change(F2)":

Your Global Automation Partner

No	MAC address	Name	IP ad...	Netm...	Gatew...	Mode	Device	Version	Adapter	Turck, DCP
1	00:07:46:84:12:C3		0.0.0.0	0.0.0.0	0.0.0.0	PGM_DHCP	GEN-N	1.2.32.5	10.126.93.111	DCP, Turck

- This displays the "Change device configuration" window. Set a Device name and the device network settings:

Change device config...

Device name:
excom-01

IP configuration

MAC address: 00:07:46:FF:A5:6B

IP address: 10.126.93.46

Netmask: 255.255.255.0

Gateway: 0.0.0.0

☐ Set IP configuration temporarily

Status messages:

Set in device Cancel

In this example, the IP address is 10.126.93.46 and the subnet mask 255.255.255.0.

- Click on the button "Set in device".

- Changes have been updated:

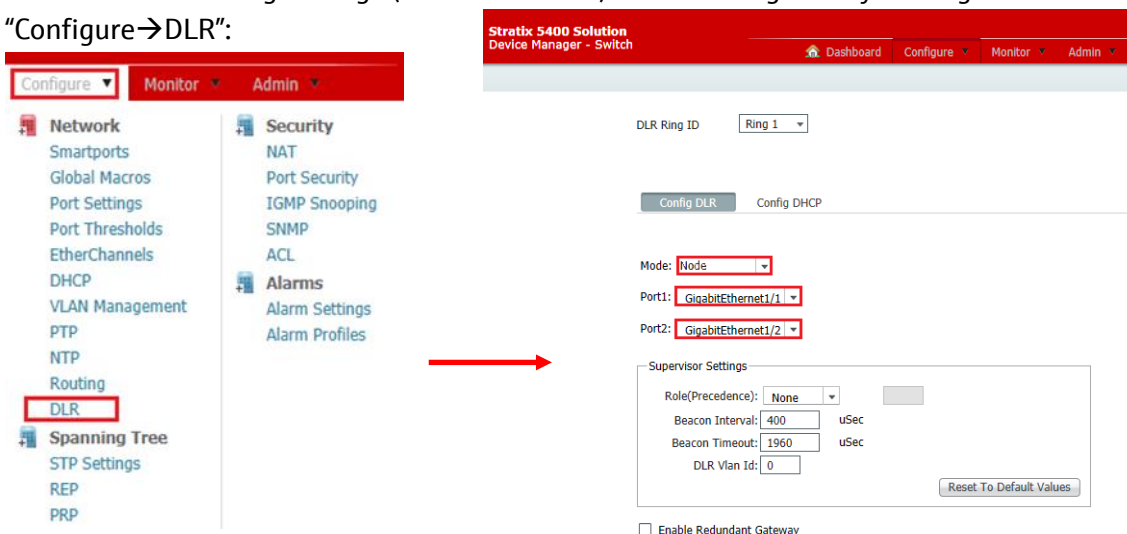
Your Global Automation Partner										
No	MAC address	Name	IP address	Netmask	Gateway	Mode	Device	Version	Adapter	Turck, DCP
1	00:07:46:84:12:C3	excom-oi	10.126.93.46	255.255.255.0	0.0.0.0	PGM_DHCP	GEN-N	1.2.32.5	10.126.93.111	DCP, Turck

3.1.5 Stratix 5400

In this example, the Stratix5400 IP address has been configured by using the "Express Setup". Please refer to the user manual "Stratix Managed Switches" for further details.

The EtherNet/IP ring is connected between port1 and port2.

- The Device Level Ring settings (Ports and mode) can be configured by clicking on the menu "Configure→DLR":



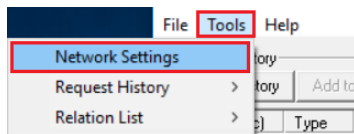
Remark

- In this example, the mode is "Node" because the "Supervisor" mode is set in the UOC system.

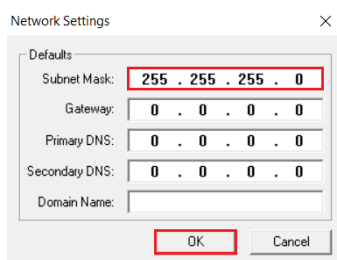
3.1.6 ETAP Modul

The ETAP module IP settings have been configured by using the Rockwell Automation tool BOOTP server.

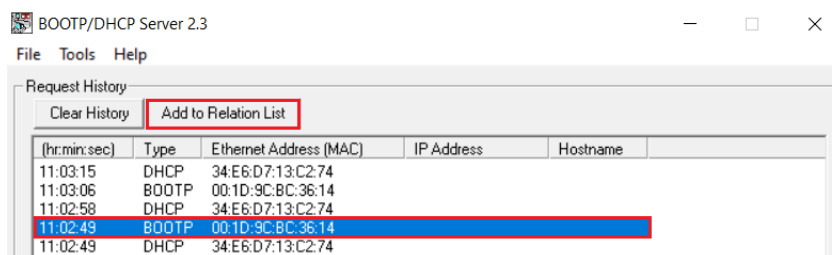
- This requires first to configure the ETAP module DIP switches to following states:
 - DIP Switch 1 configured to OFF, to get the IP address from BOOTP server.
 - DIP Switch 2 configured to ON, to get the IP address from BOOTP server.
 - DIP Switch 3 configured to OFF, to disable the Ring Supervisor mode.
- Connect a Laptop to the Ethernet module 1756-EN2TR with an Ethernet cable and start the tool "BOOTP".
- Click on the menu "Tools→Network Settings":



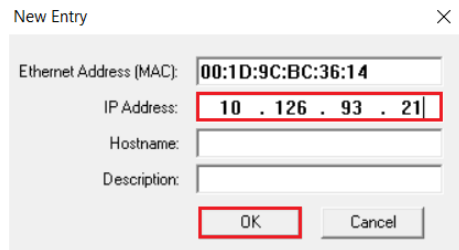
- Set the subnet mask according to the network, in this example 255.255.255.0 and click on the button "OK":



- Select the ETAP MAC address and click on the button "Add to Relation List":



- These opens the window "New Entry". Enter the MAC address and the requested IP address, then click on the button "OK":



New Entry

Ethernet Address (MAC): 00:1D:9C:BC:36:14

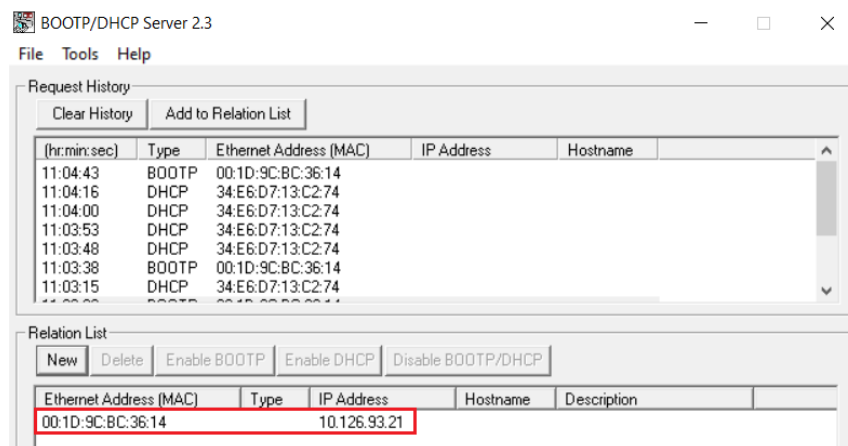
IP Address: 10 . 126 . 93 . 21

Hostname:

Description:

OK Cancel

- This assigns the IP address:



BOOTP/DHCP Server 2.3

File Tools Help

Request History

Clear History Add to Relation List

(hr:min:sec)	Type	Ethernet Address (MAC)	IP Address	Hostname
11:04:43	BOOTP	00:1D:9C:BC:36:14		
11:04:16	DHCP	34:E6:D7:13:C2:74		
11:04:00	DHCP	34:E6:D7:13:C2:74		
11:03:53	DHCP	34:E6:D7:13:C2:74		
11:03:48	DHCP	34:E6:D7:13:C2:74		
11:03:38	BOOTP	00:1D:9C:BC:36:14		
11:03:15	DHCP	34:E6:D7:13:C2:74		

Relation List

New Delete Enable BOOTP Enable DHCP Disable BOOTP/DHCP

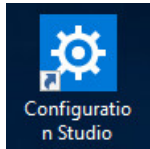
Ethernet Address (MAC)	Type	IP Address	Hostname	Description
00:1D:9C:BC:36:14		10.126.93.21		

Please refer to Rockwell Automation Datasheet for further details.

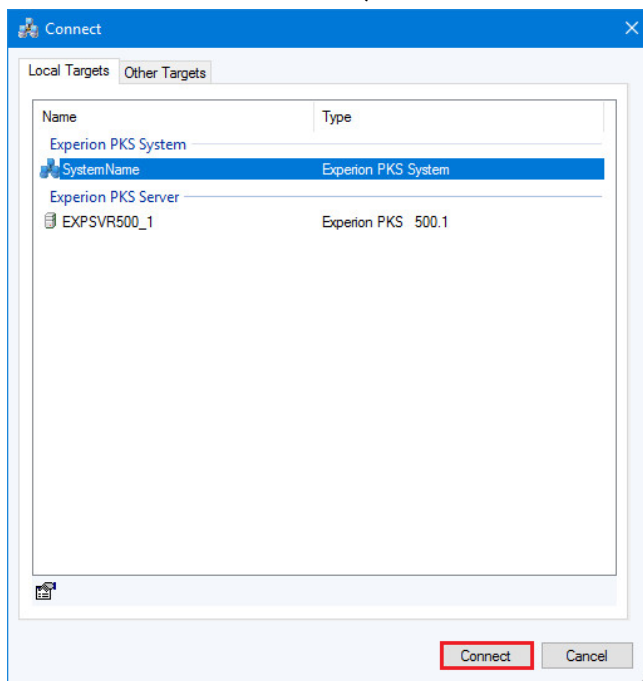
3.2 System Configuration

3.2.1 New Project

- Start the software Configuration Studio:



- Select the menu "SystemName" and click on the button "Connect" (Honeywell EPKS System must be connected to the network):

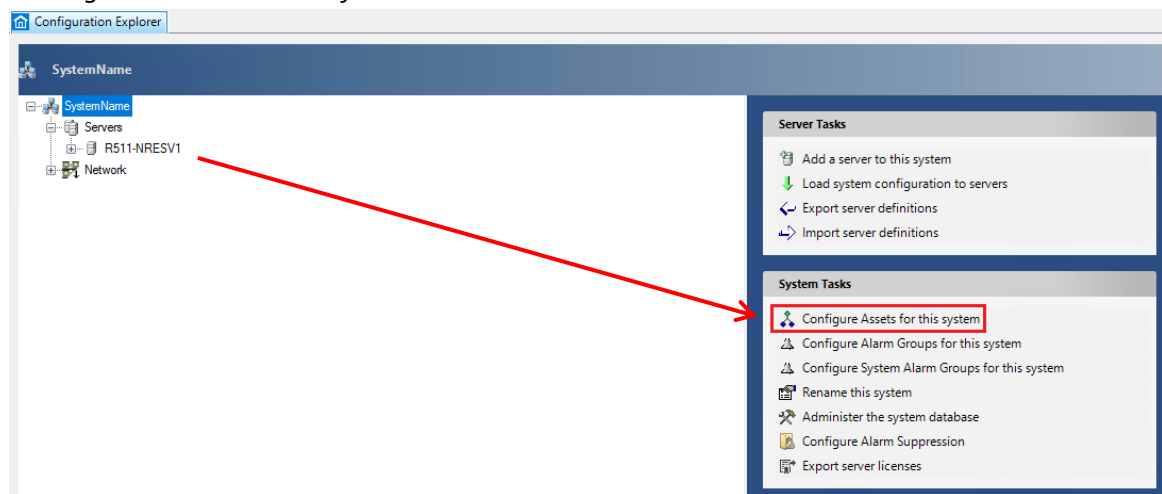


3.2.2 System Offline Configuration

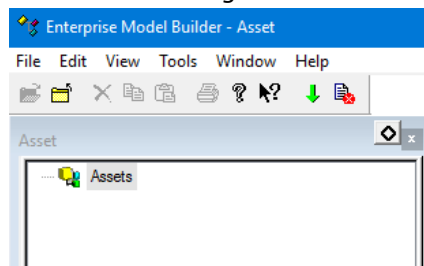
3.2.2.1 Enterprise Model Configuration (Asset Configuration)

Assets are used to fix the scope of responsibilities in a project. These items are mandatory for Control Strategy. This chapter explains how creating Assets.

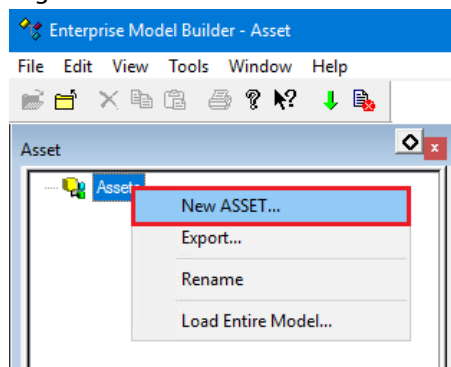
- In Configuration Studio, select "SystemName" in the Configuration Explorer and click on the menu "Configure Assets for this system":



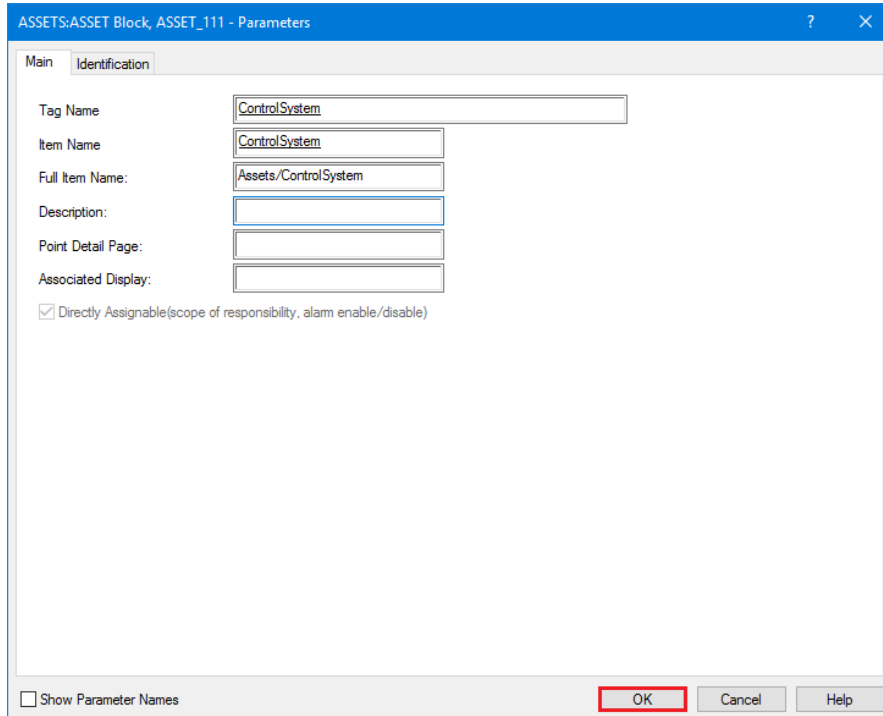
- The Assets management tool is opened and displays configured assets:



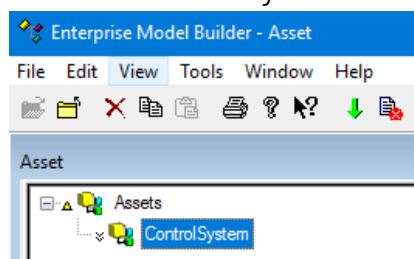
- Right-click on "Assets" and select the menu "New ASSET":



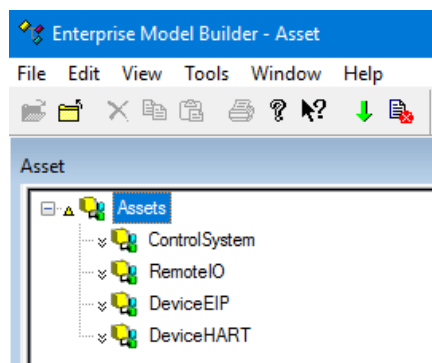
- Configure the Asset "Tag Name" and "Item Name". The parameter "Full Item Name" is refreshed automatically. Click on the button "OK".



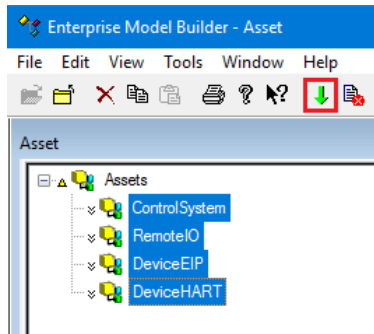
- New Asset "ControlSystem" has been inserted:



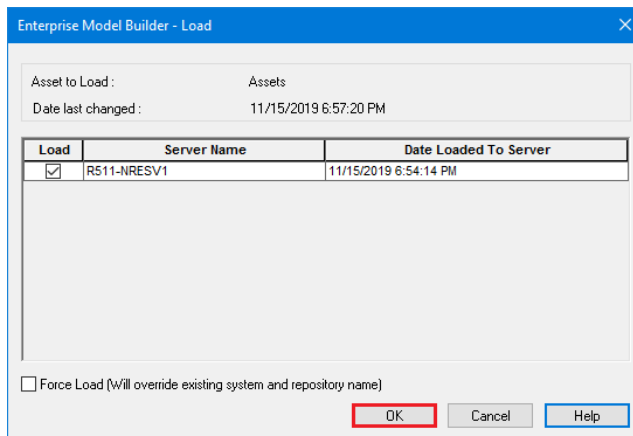
- Further relevant assets have been added as well:



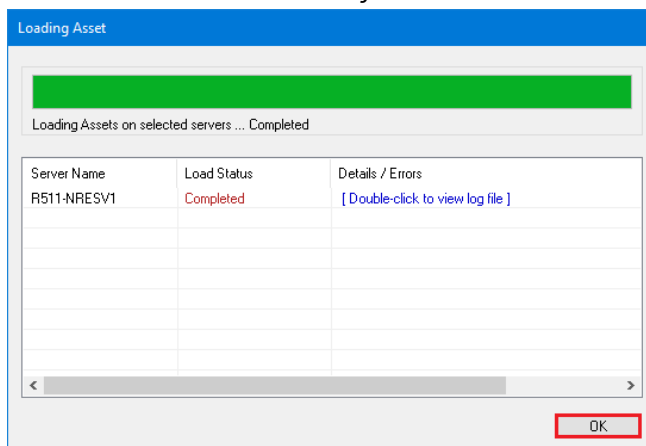
- Select all created assets and click on the shortcut button "Load Entire Model":



- Click on the button "OK":



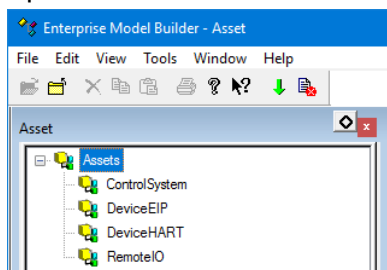
- Assets have been successfully loaded. Click on the button "OK":



Remark:

- The asset model can be created as a hierarchy 10 levels deep, with 5 levels of alarm history.
- There are direct assignable assets and non-direct assignable assets. Direct assignable assets can be directly included or excluded from a Scope of Responsibility (SOR) while non-direct assignable assets are always following the SOR assignment of its parent.

- Updated Assets:



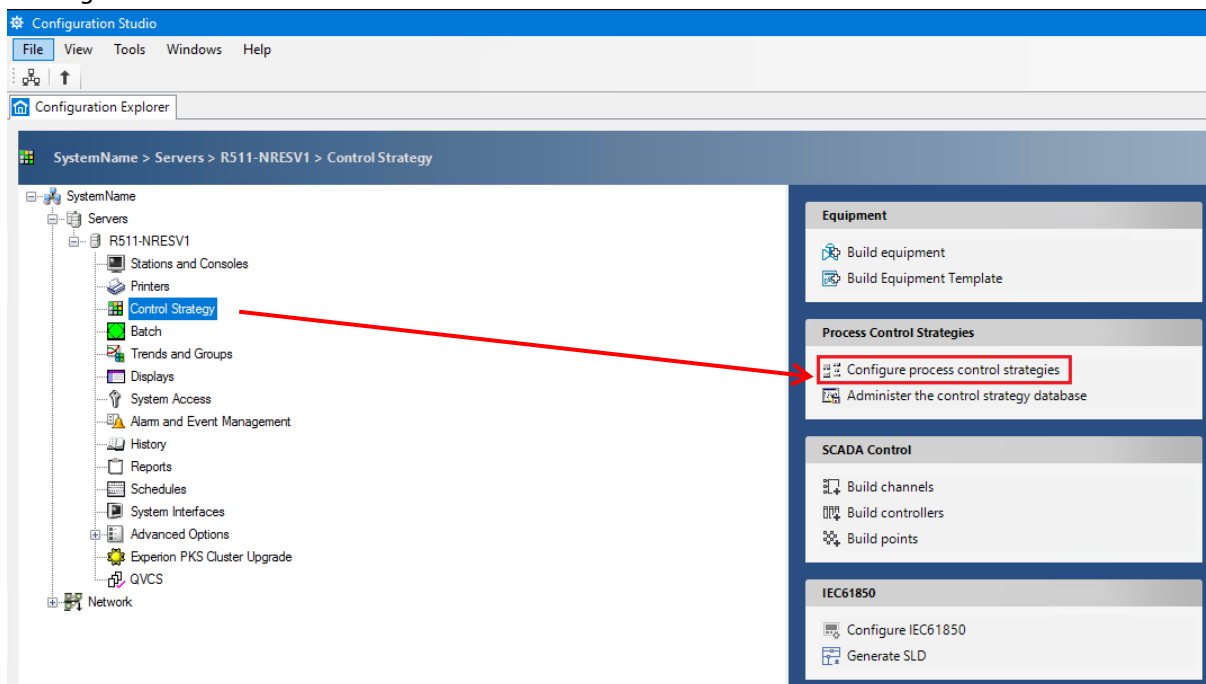
3.2.2.2 IP Network Settings

The table below lists all IP addresses to configure with the used method:

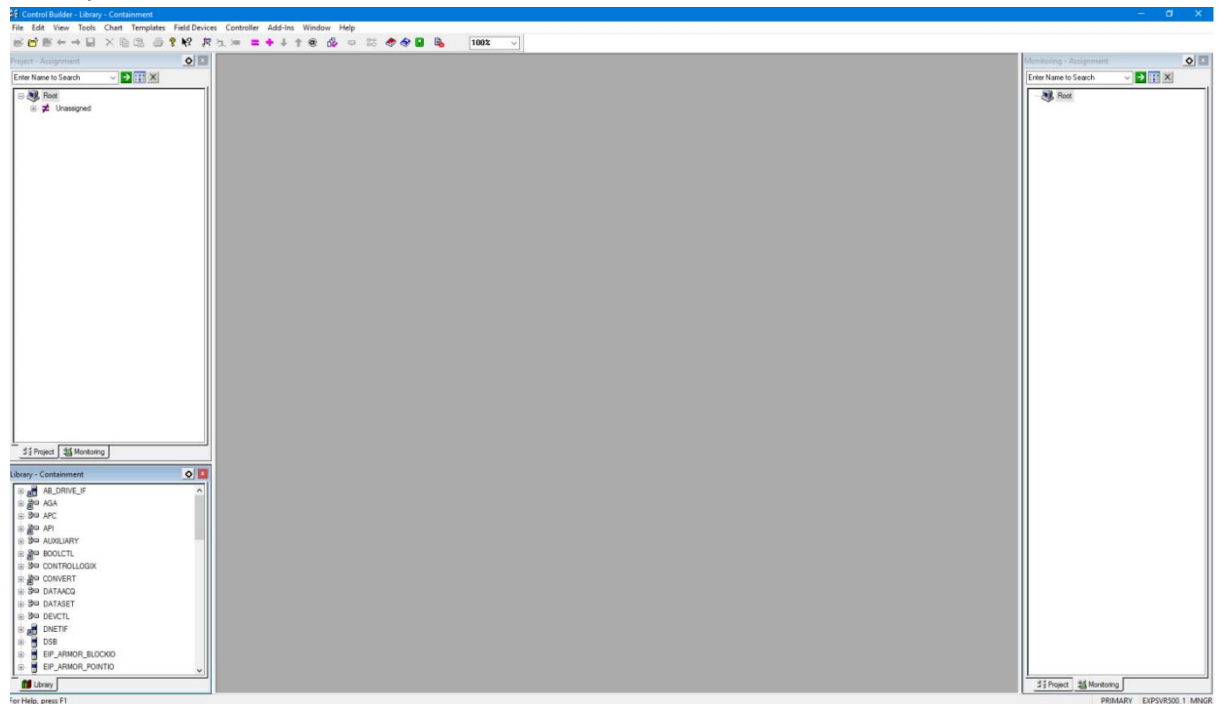
Network	Component		Configured IP Address	Subnet Mask	IP Configuration Method
FTE Network	Experion PKS Server	Server	192.168.12.86	255.255.255.0	ControlBuilder
	Control System	UOC	192.168.12.21	255.255.255.0	Rotary DIP switch and ControlBuilder
IO Network	Control System	UOC	10.126.93.65	255.255.255.0	ControlBuilder
	Switches	Stratix 5400	10.126.93.20	255.255.255.0	Web server
		ETAP 1783	10.126.93.21	255.255.255.0	DIP Switch and BOOTP server
	Remote IO	Excom	10.126.93.46	255.255.255.0	Turck Service Tool
	Ethernet/IP Field Devices	CPX_FB36	10.126.93.111	255.255.255.0	Festo Field Device Tool
		Promag500	10.126.93.112	255.255.255.0	DIP Switch and Web server
		Promass300	10.126.93.113	255.255.255.0	DIP Switch and Web server

3.2.2.2.1 Experion PKS Server

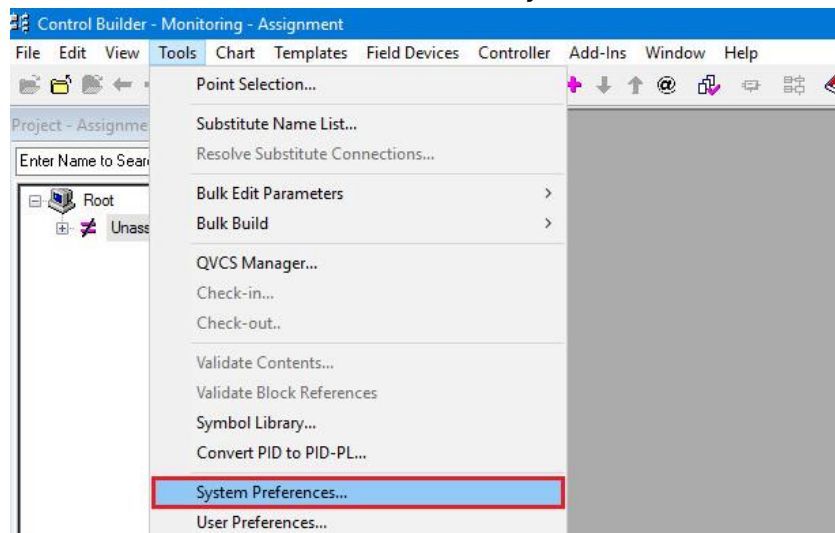
- Select the menu "Control Strategy" and then click on the menu "Configure process control strategies":



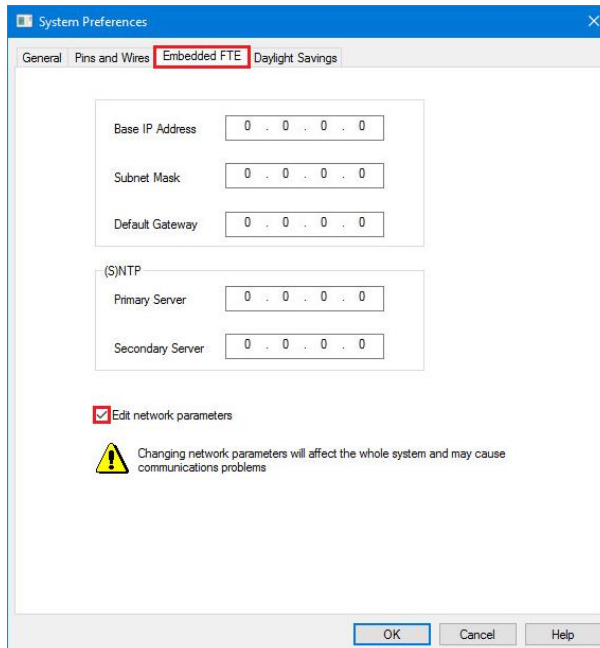
- This opens the Control Builder environment:



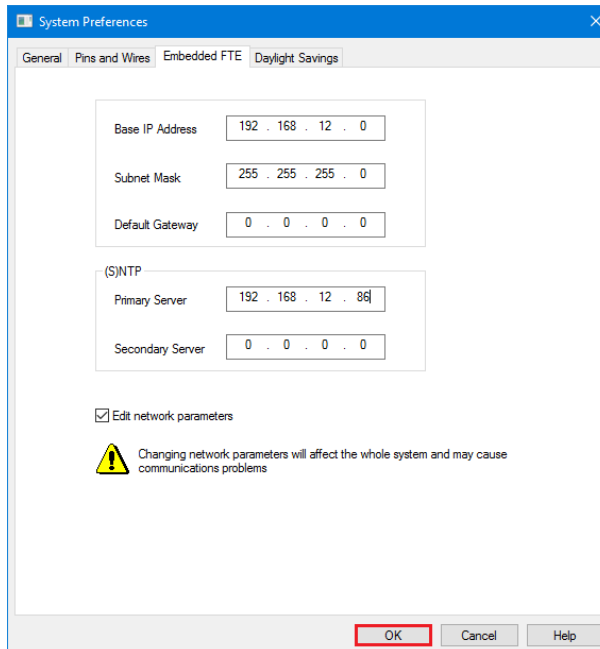
- In the toolbar, select the menu "Tools→ System Preferences":



- Select the tab “Embedded FTE” and enable the “Edit network parameters” checkbox:



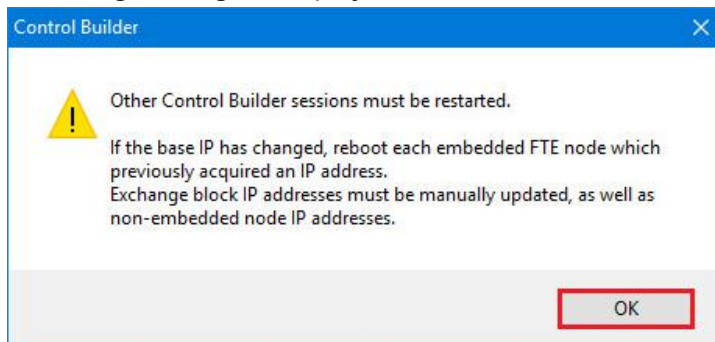
- Edit the network settings according to the corresponding network.
In this example, following configuration has been set:



The IP address of the Primary Server (EPKS Server) is 192.168.12.86.

Click on the button “OK” to continue.

- Following message is displayed:



Click on the button "OK" and restart other Control Builder running at the system, if required.

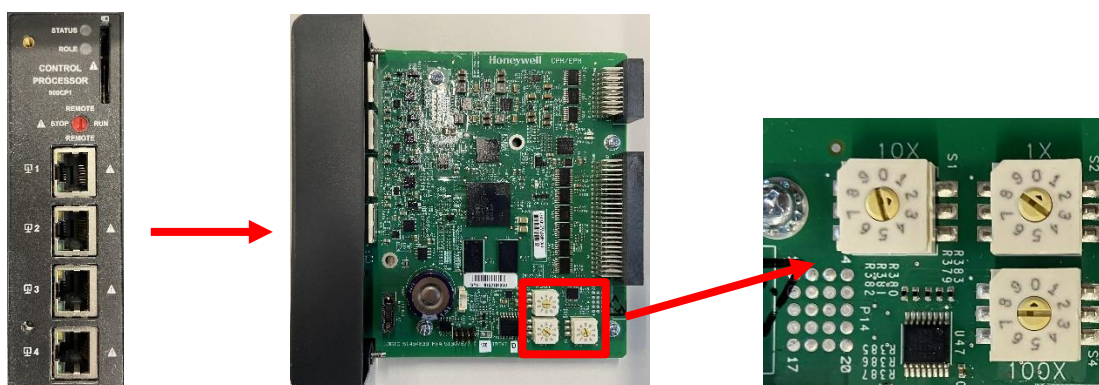
3.2.2.2.2 Control System

Honeywell ControlEdge™ Unit Operations Controller has two IP addresses, one related to the FTE network another one related to the Downlink network. FTE network must be configured via hardware (rotary DIP switch) and software (Control Builder) whereas Downlink network only via software (Control Builder).

In this example, the FTE network IP address is 192.168.12.021 and the Downlink IP address is 10.126.93.65.

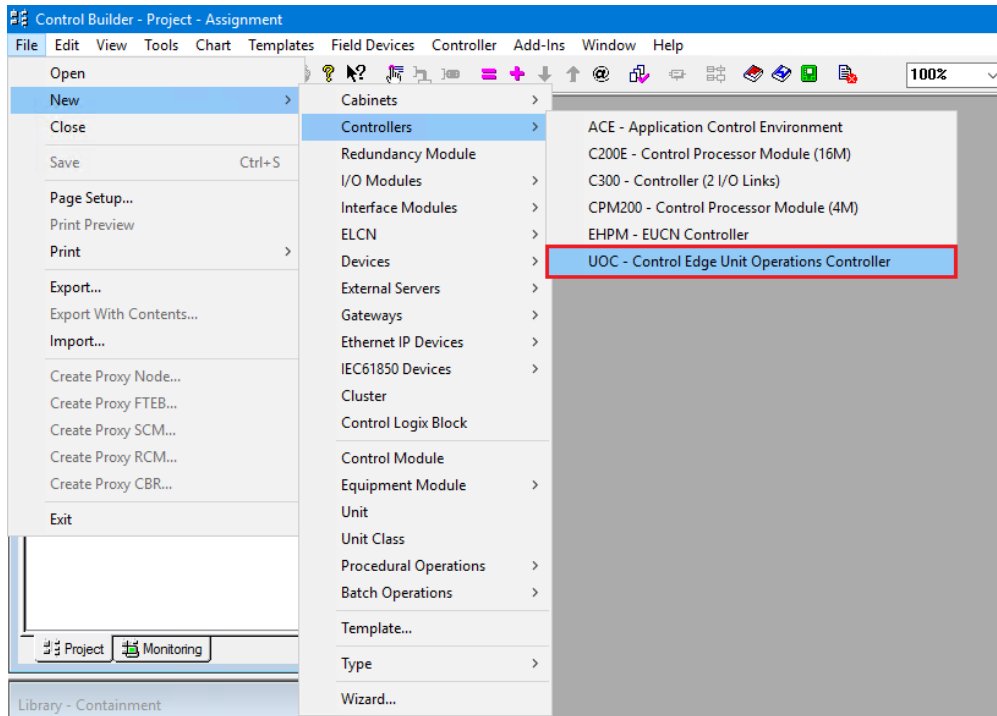
Hardware Configuration

- The last byte of the FTE IP address 192.168.12.021 (which corresponds the FTE device index) must be configured with a screwdriver on the rotary switches of the UOC system card. The first switch is set to "0", the second one to "2" and the last one to "1":

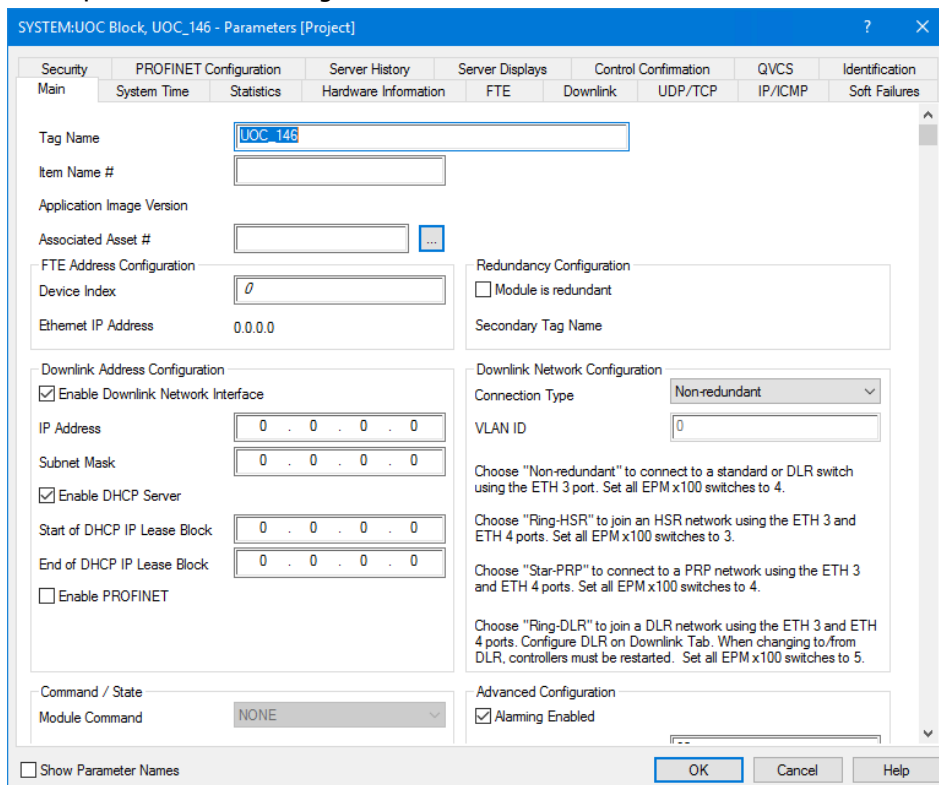


Software Configuration

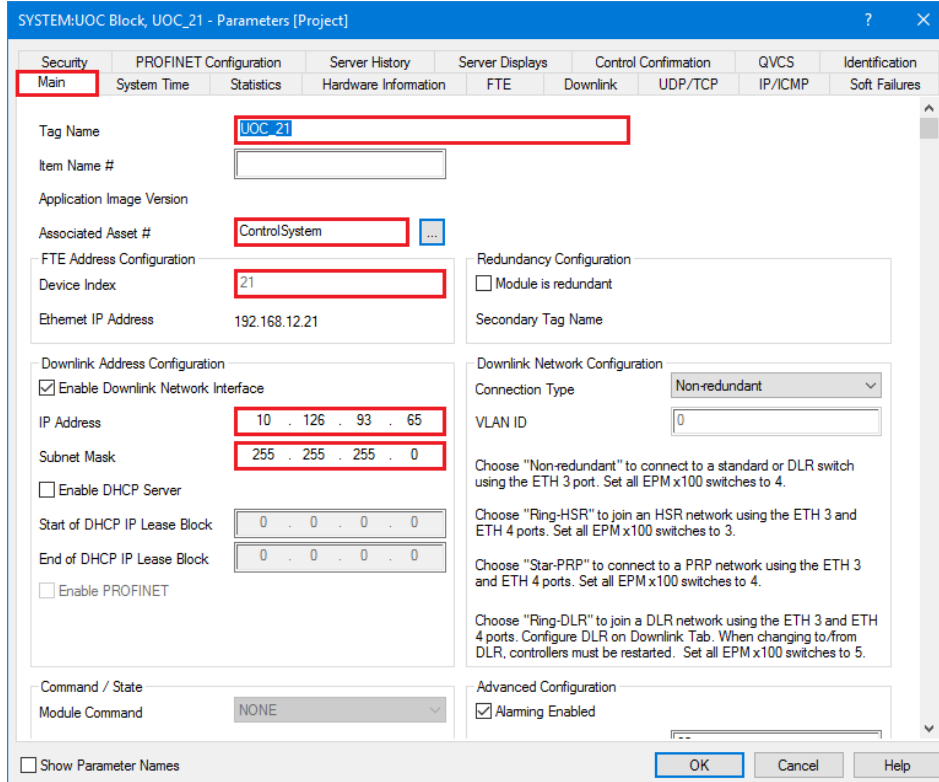
- In the Project-Assignment view, right-click on "Root" and select the option "New→Controllers→UOC – Control Edge Unit Operations Controller":



- This opens the UOC configuration window:



- UOC system Tag name, Associated Asset, FTE and Downlink IP addresses have to be configured in the tab "Main":



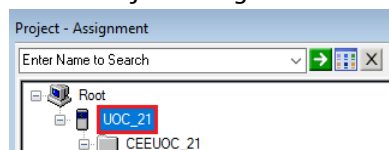
In this example,

- The TAG Name is "UOC_21" (name referring to the FTE device index).
 - The selected Associated Asset is "ControlSystem" (Associated Asset is an optional setting).
 - The entered Device Index is 21 (index referring to the last byte of the FTE IP address). The subnet mask has been defined in chapter 3.2.2.2.1.
 - The configured Downlinked IP address is 10.126.93.65/24.
- Click on the button "ok" to save and close the window.

3.2.2.3 Device Level Ring Supervisor

There must be one Ring Supervisor in a Device Level Ring (DLR) network. In this example, the Ring Supervisor is the UOC system.

- In the Project Assignment view, double-click on the UOC_21 controller.



- In the tab "Main", configure the connection Type to "Ring-DLR":

SYSTEM:UOC Block, UOC_21 - Parameters [Project]

Security | PROFINET Configuration | Server History | Server Displays | Control Confirmation | QVCS | Identification

Main | System Time | Statistics | Hardware Information | FTE | Downlink | UDP/TCP | IP/ICMP | Soft Failures

Tag Name: UOC_21

Item Name #:

Application Image Version:

Associated Asset #: ControlSystem

FTE Address Configuration

Device Index: 21

Ethernet IP Address: 192.168.12.21

Redundancy Configuration

☐ Module is redundant

Secondary Tag Name:

Downlink Address Configuration

☒ Enable Downlink Network Interface

IP Address: 10 . 126 . 93 . 65

Subnet Mask: 255 . 255 . 255 . 0

☐ Enable DHCP Server

Start of DHCP IP Lease Block: 0 . 0 . 0 . 0

End of DHCP IP Lease Block: 0 . 0 . 0 . 0

☐ Enable PROFINET

Downlink Network Configuration

Connection Type: Ring-DLR

VLAN ID: 0

Choose "Non-redundant" to connect to a standard or DLR switch using the ETH 3 port. Set all EPM x100 switches to 4.

Choose "Ring-HSR" to join an HSR network using the ETH 3 and ETH 4 ports. Set all EPM x100 switches to 3.

Choose "Star-PRP" to connect to a PRP network using the ETH 3 and ETH 4 ports. Set all EPM x100 switches to 4.

Choose "Ring-DLR" to join a DLR network using the ETH 3 and ETH 4 ports. Configure DLR on Downlink Tab. When changing to/from DLR, controllers must be restarted. Set all EPM x100 switches to 5.

Advanced Configuration

☒ Alarming Enabled

Command / State

Module Command: NONE

☐ Show Parameter Names

OK Cancel Help

Remark:

The Connection Type mode can only be modified if the UOC system is stopped. A connection type change requires a system Restart as well, which has to be performed in Online Monitoring by selecting the Module Command option "RESTART":

SYSTEM:UOC Block, UOC_21 - Parameters [Project]

Security | PROFINET Configuration | Server History | Server Displays | Control Confirmation | QVCS | Identification

Main | System Time | Statistics | Hardware Information | FTE | Downlink | UDP/TCP | IP/ICMP | Soft Failures

Tag Name: UOC_21

Item Name #:

Application Image Version:

Associated Asset #: ControlSystem

FTE Address Configuration

Device Index: 21

Ethernet IP Address: 192.168.12.21

Redundancy Configuration

☐ Module is redundant

Secondary Tag Name:

Downlink Address Configuration

☒ Enable Downlink Network Interface

IP Address: 10 . 126 . 93 . 65

Subnet Mask: 255 . 255 . 255 . 0

☐ Enable DHCP Server

Start of DHCP IP Lease Block: 0 . 0 . 0 . 0

End of DHCP IP Lease Block: 0 . 0 . 0 . 0

☐ Enable PROFINET

Downlink Network Configuration

Connection Type: Ring-DLR

VLAN ID: 0

Choose "Non-redundant" to connect to a standard or DLR switch using the ETH 3 port. Set all EPM x100 switches to 4.

Choose "Ring-HSR" to join an HSR network using the ETH 3 and ETH 4 ports. Set all EPM x100 switches to 3.

Choose "Star-PRP" to connect to a PRP network using the ETH 3 and ETH 4 ports. Set all EPM x100 switches to 4.

Choose "Ring-DLR" to join a DLR network using the ETH 3 and ETH 4 ports. Configure DLR on Downlink Tab. When changing to/from DLR, controllers must be restarted. Set all EPM x100 switches to 5.

Advanced Configuration

☒ Alarming Enabled

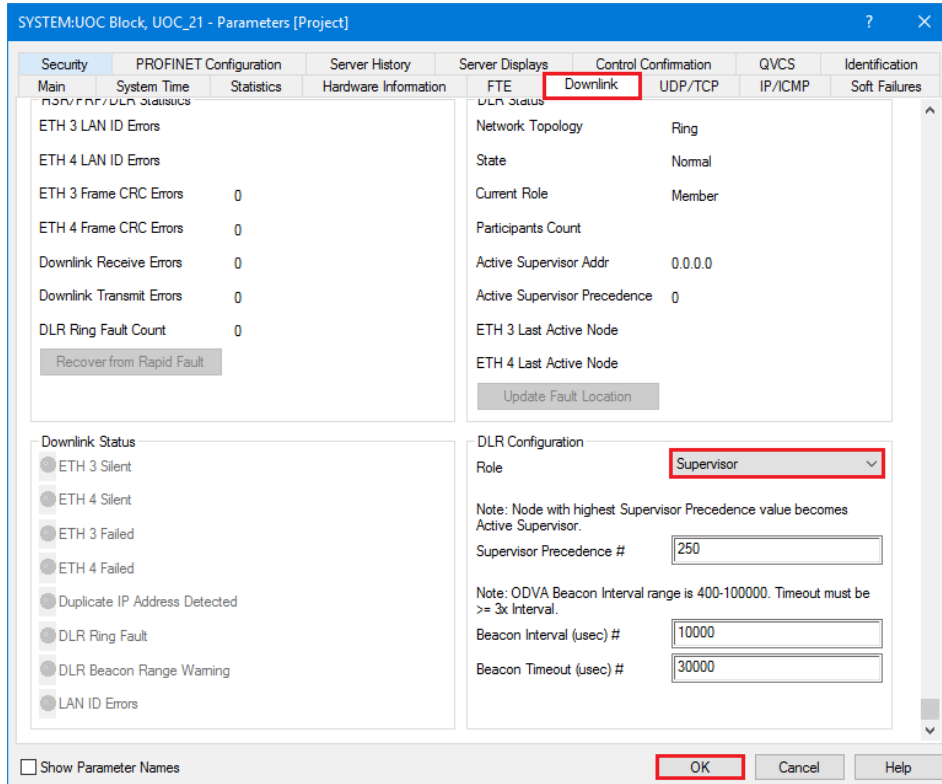
Command / State

Module Command: RESTART

☐ Show Parameter Names

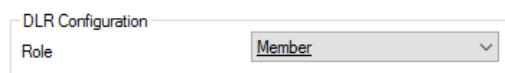
OK Cancel Help

- Click on the tab "Downlink", scroll down and check the DLR configuration. In this example, the DLR ring role is configured as "Supervisor":

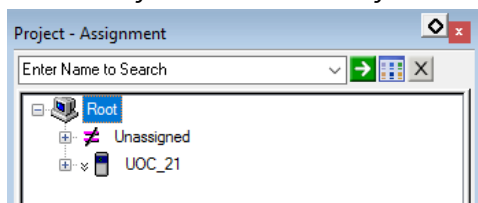


Remark:

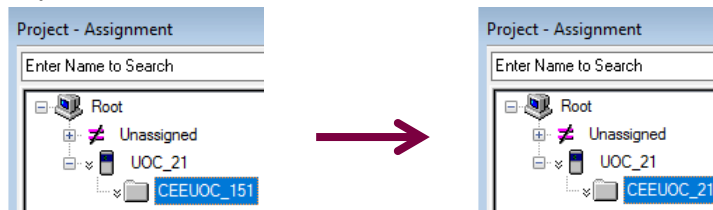
If the UOC system would not be the DLR Supervisor, then the Role would have to be configured to "Member":



- Click on the button "OK" to set the configuration.
- The UOC system is successfully inserted in the project:



- Expand the "UOC_21" menu and rename all modules for a better overview:



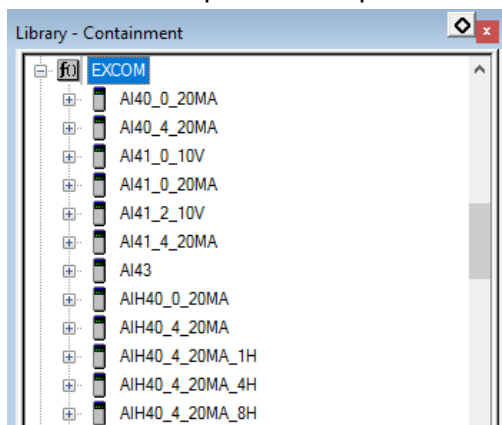
- Download the configuration in the system. Please refer to chapter 3.6.1.1 to proceed.

3.3 Excom Remote I/O Integration

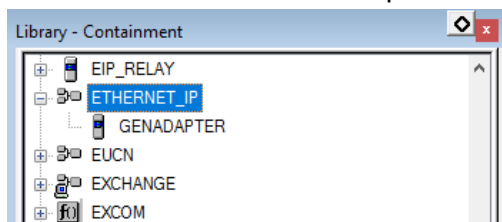
This part describes the configuration of the Turck Remote I/O (Gateway and IO modules) in Control Builder.

3.3.1 Control Builder Field Device Library

- The Excom components are part of the Honeywell library:



- An additional EtherNet/IP adapter must be used as well:

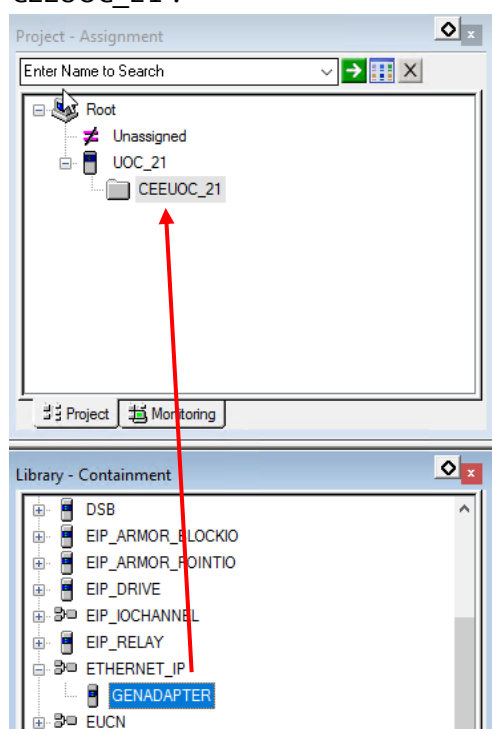


3.3.2 Excom Remote I/O Configuration

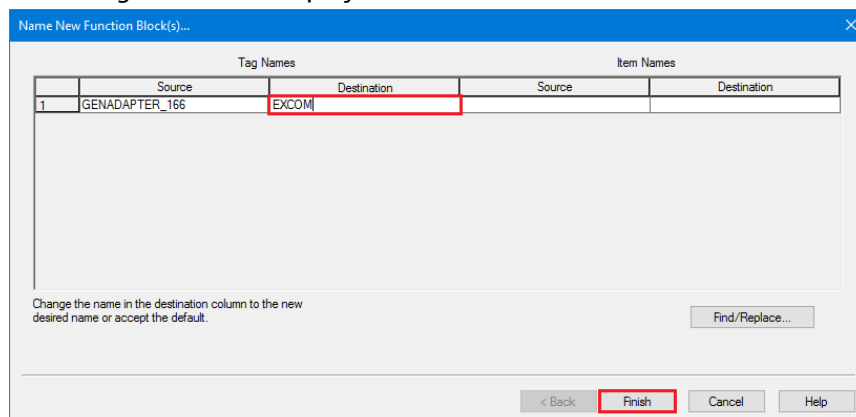
This chapter describes the steps to configure the gateway and IO modules of the Turck Remote I/O. There are two methods to configure the Excom Remote IO, either via Web or via ControlBuilder. The configuration via ControlBuilder is recommended and described in this chapter.

3.3.2.1 Ethernet Gateway GEN Adapter

- The generic adapter "GENADAPTER" from the library "ETHERNET_IP" is used to configure the GEN-N gateway. Drag and drop the module "GENADAPTER" from the library "ETHERNET_IP" on "CEEUOC_21":

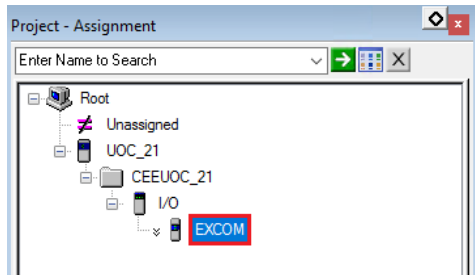


- Following window is displayed:

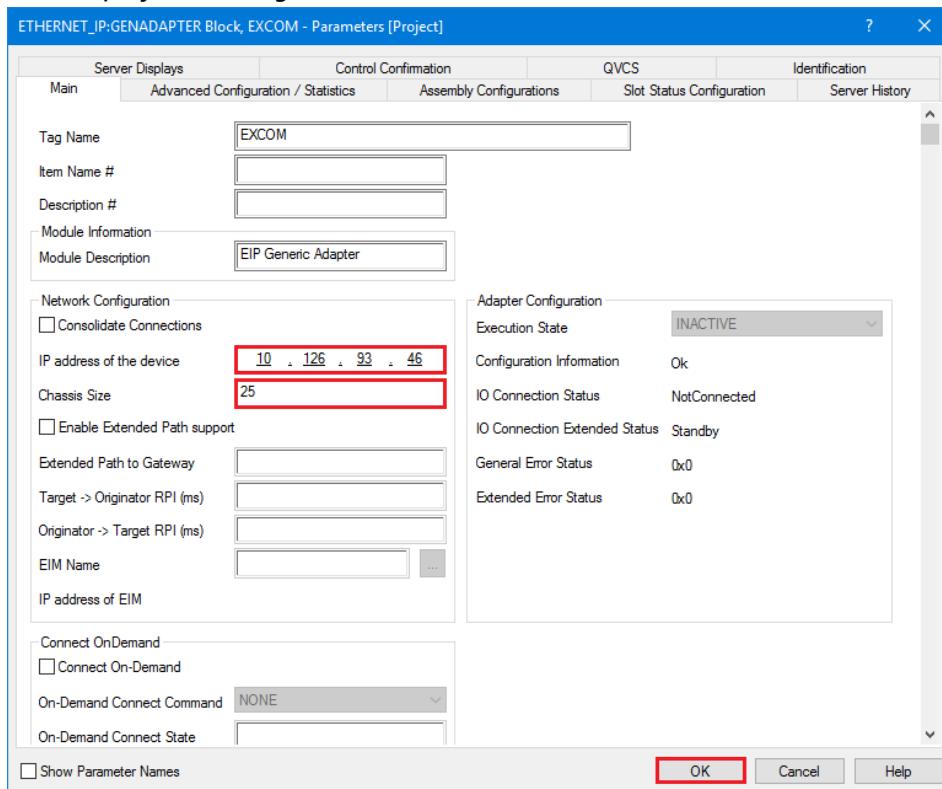


Change the Destination name, for example "EXCOM" and click on the button "Finish".

- Adapter is inserted in the project:

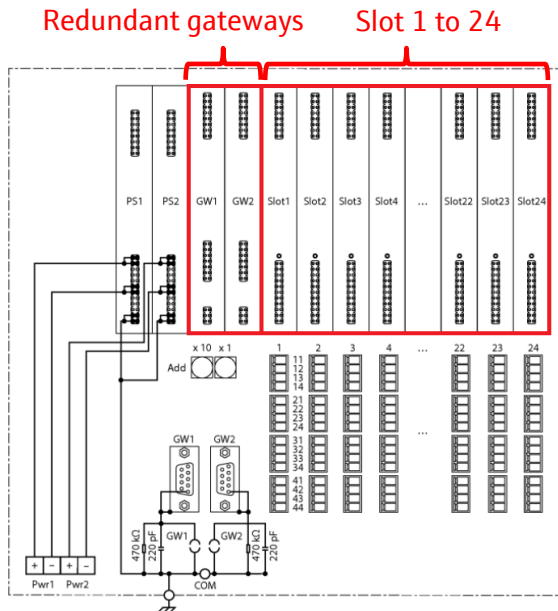


- Double-click on the adapter.
- This displays following window:



Configure the IP address of the bus controller as well as the backplane Chassis size. In this example, the IP address is 10.126.93.46 and the chassis size is 25. Please note that chassis size equals No. of IO modules plus 1:

The used backplane is a MT24-N, which can connect until 24 IO modules as described on following picture:

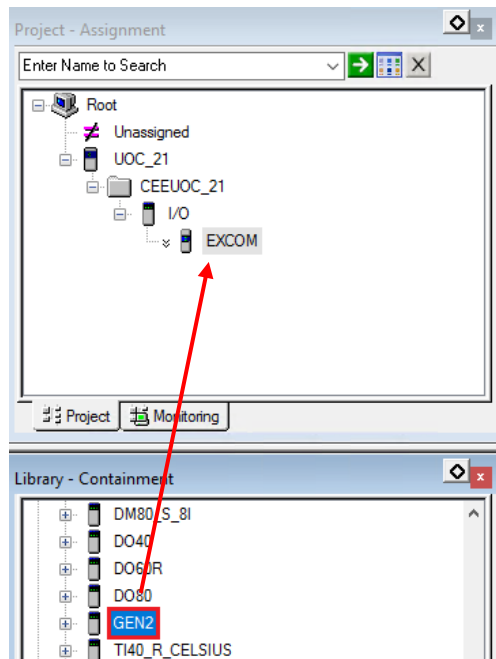


The chassis size corresponds to the number of available slots in the backplane plus the gateway, that means $24+1=25$.

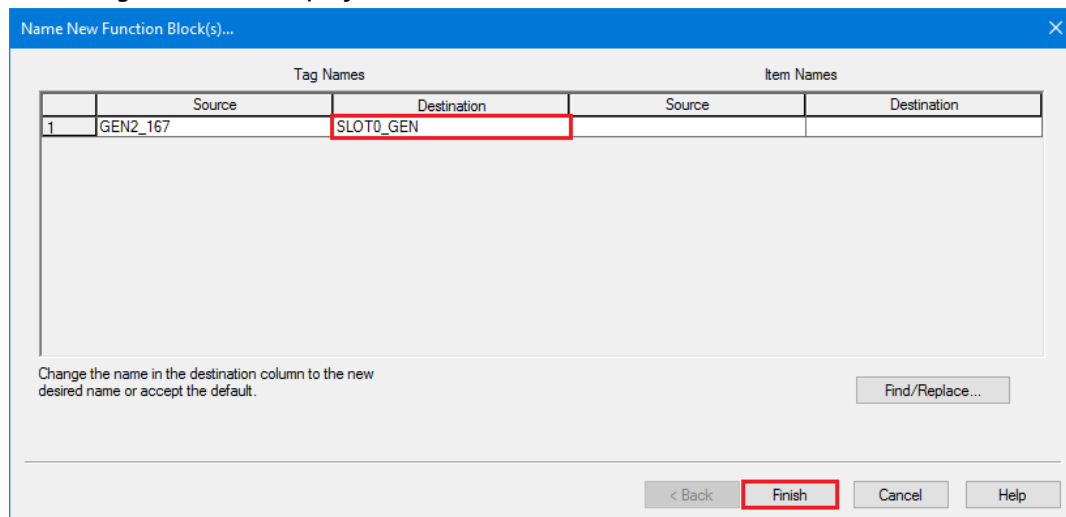
- Click on the button "OK".

3.3.2.2 Ethernet Gateway GEN

- Drag and drop the gateway module "GEN2" from the library "EXCOM" on the gateway adapter "EXCOM":

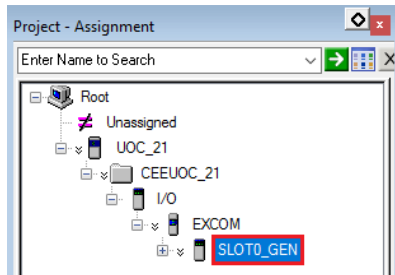


- Following window is displayed:

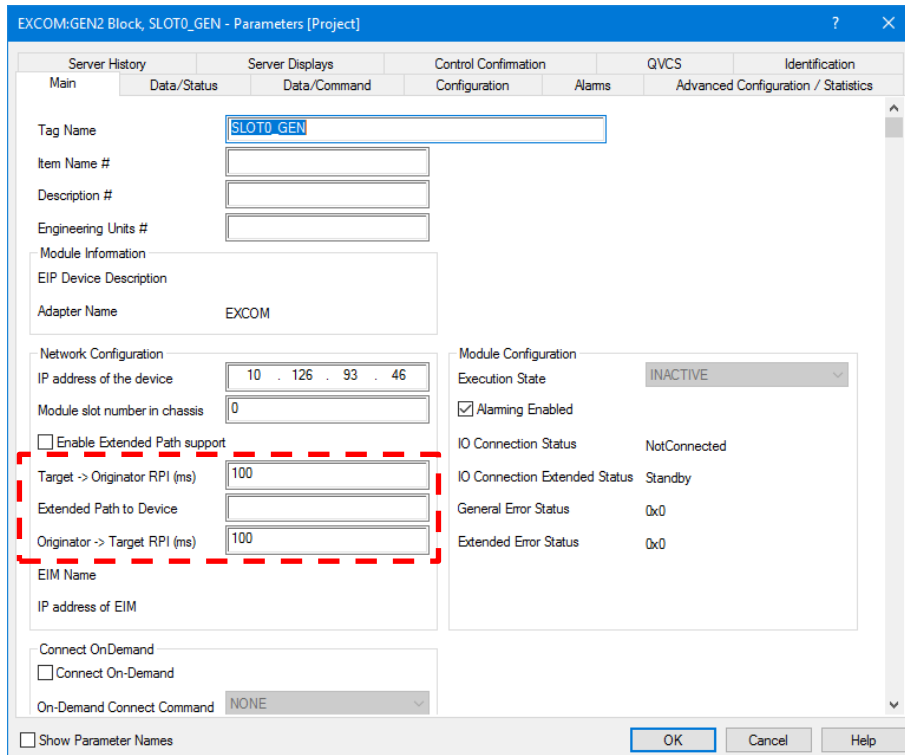


- Change the Destination name, for example "SLOT0_GEN" and click on the button "Finish".

- Gateway is inserted in the project:

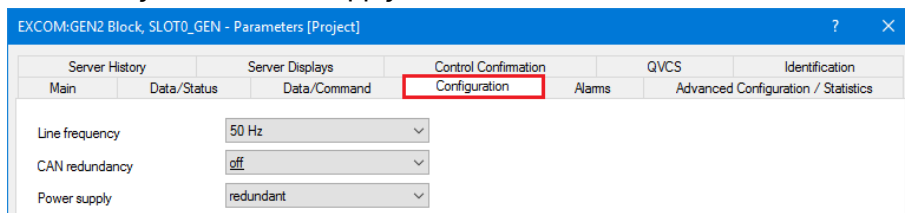


- Double-click on the adapter.
- This displays following window:

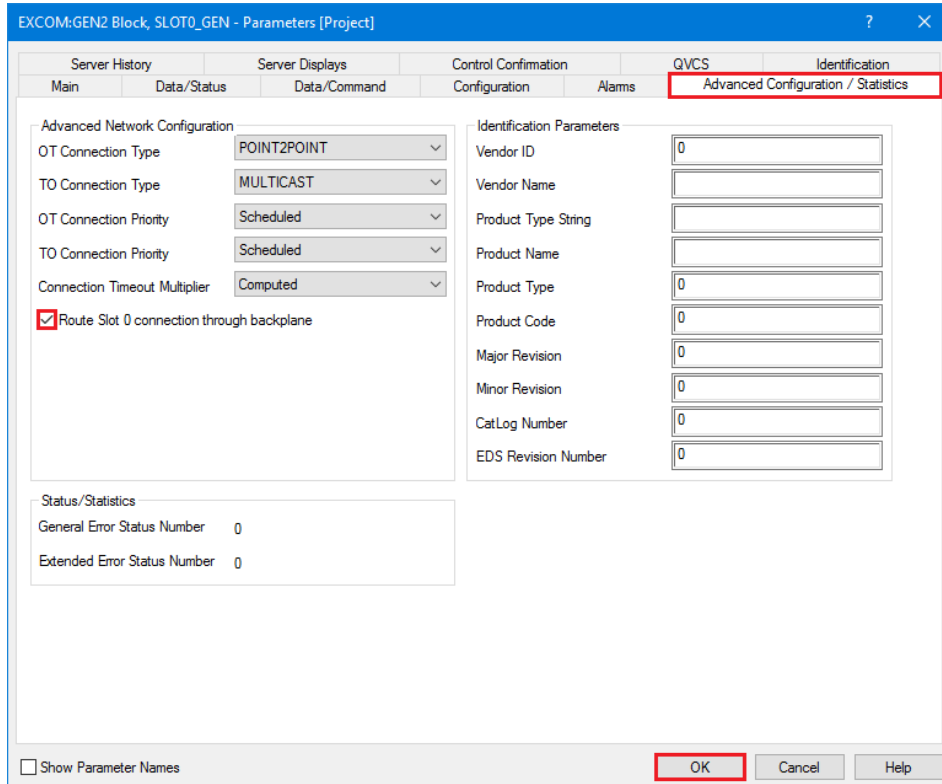


EtherNet/IP communication RPI time can be updated here if needed. Default time is 100ms.

- Click on the tab "Configuration" to configure the gateway options "Line frequency", "CAN redundancy" and "Power supply":



- Click on the tab "Advanced Configuration / Statistics" and select the option "Route Slot 0 connection through backplane":



EXCOM:GEN2 Block, SLOT0_GEN - Parameters [Project]

Server History Server Displays Control Confirmation QVCS Identification

Main Data/Status Data/Command Configuration Alarms **Advanced Configuration / Statistics**

Advanced Network Configuration

OT Connection Type: POINT2POINT

TO Connection Type: MULTICAST

OT Connection Priority: Scheduled

TO Connection Priority: Scheduled

Connection Timeout Multiplier: Computed

☒ Route Slot 0 connection through backplane

Identification Parameters

Vendor ID: 0

Vendor Name:

Product Type String:

Product Name:

Product Type: 0

Product Code: 0

Major Revision: 0

Minor Revision: 0

CatLog Number: 0

EDS Revision Number: 0

Status/Statistics

General Error Status Number: 0

Extended Error Status Number: 0

☐ Show Parameter Names

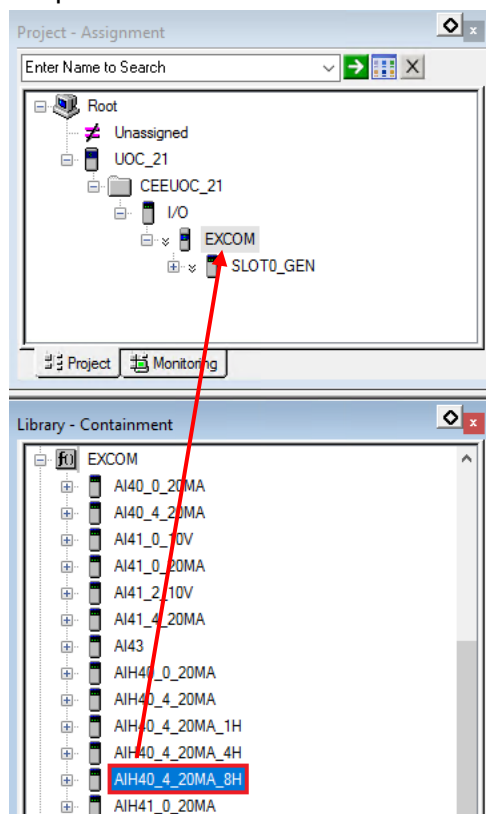
OK Cancel Help

- Click on the button OK.

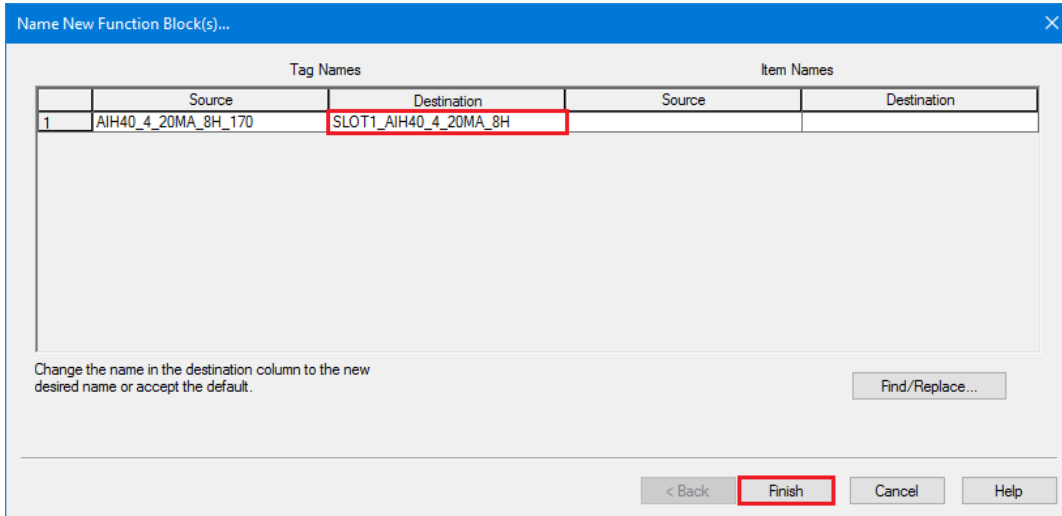
3.3.2.3 Analog Input Module HART AIH40

Different AIH40 templates are available depending on the needed configuration (with or without HART variables). In this example, we have chosen the template "AIH40_4_20MA_8H", which allows the user to configure until 8 HART variables for the 4 channels.

- Drag and drop the module "AIH40_4_20MA_8H" from the library "EXCOM" on the Ethernet adapter "EXCOM":



- Following window is displayed:



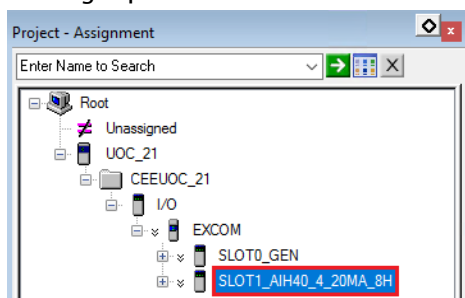
Tag Names		Item Names	
	Source	Destination	
1	AIH40_4_20MA_8H_170	SLOT1_AIH40_4_20MA_8H	

Change the name in the destination column to the new desired name or accept the default.

Find/Replace...

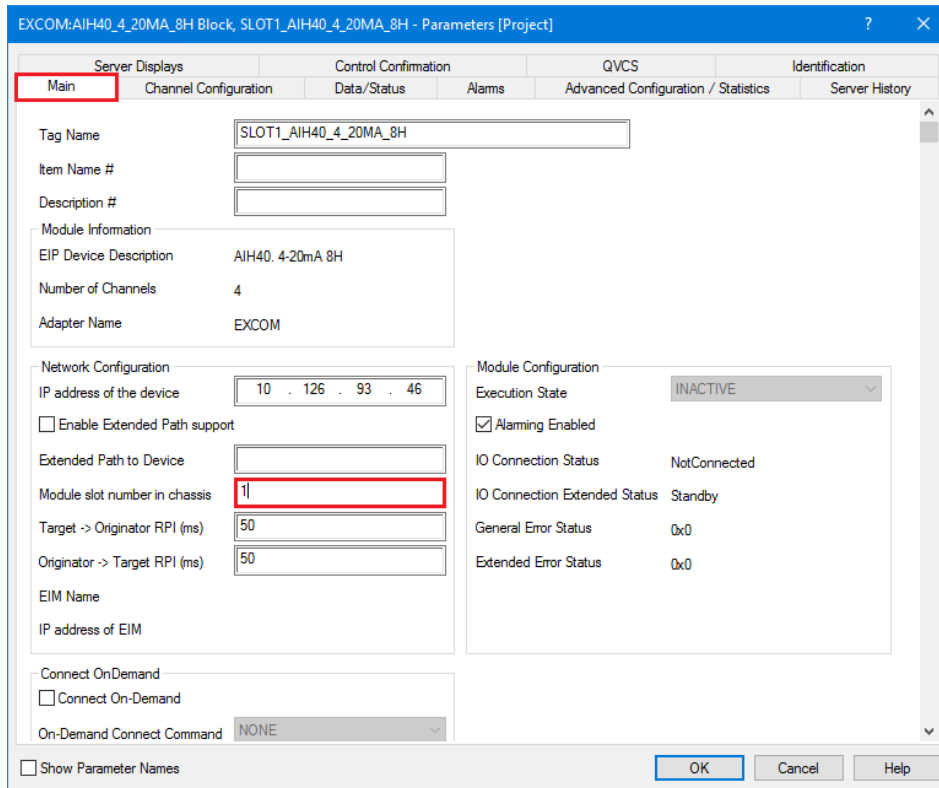
< Back Finish Cancel Help

- Change the Destination name, for example "SLOT1_AIH40_4_20MA_8H" and click on the button "Finish".
- Analog Input Module is inserted in the project:



Double-click on the analog input card.

- This displays following window:



EXCOM:AIH40_4_20MA_8H Block, SLOT1_AIH40_4_20MA_8H - Parameters [Project]

Server Displays: Main (selected), Channel Configuration, Control Confirmation, Data/Status, Alarms, QVCS, Identification, Advanced Configuration / Statistics, Server History

Tag Name: SLOT1_AIH40_4_20MA_8H

Item Name #:

Description #:

Module Information

EIP Device Description: AIH40_4-20mA 8H

Number of Channels: 4

Adapter Name: EXCOM

Network Configuration

IP address of the device: 10 . 126 . 93 . 46

☐ Enable Extended Path support

Extended Path to Device:

Module slot number in chassis: 1 (highlighted)

Target -> Originator RPI (ms): 50

Originator -> Target RPI (ms): 50

EIM Name:

IP address of EIM:

Connect OnDemand

☐ Connect On-Demand

On-Demand Connect Command: NONE

☐ Show Parameter Names

Module Configuration

Execution State: INACTIVE

☒ Alarming Enabled

IO Connection Status: NotConnected

IO Connection Extended Status: Standby

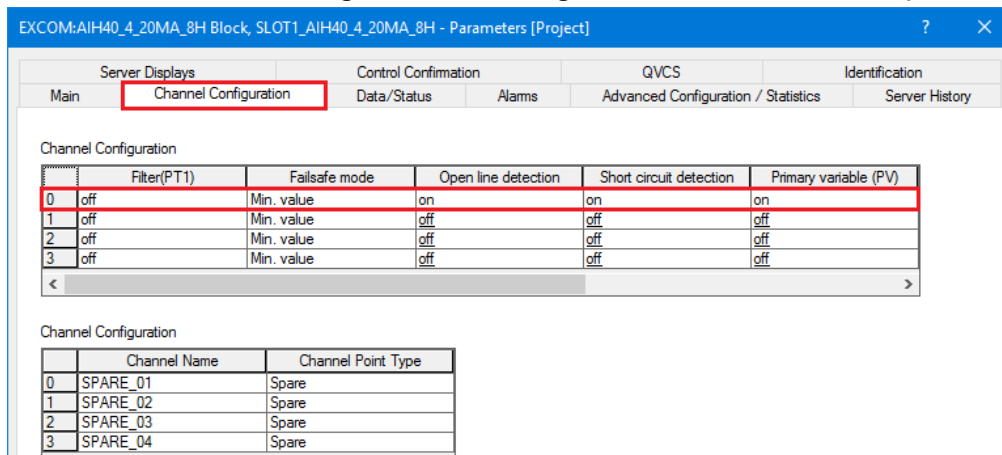
General Error Status: 0x0

Extended Error Status: 0x0

OK Cancel Help

In the tab "Main", configure the parameter "Module slot number in chassis". In this example, the card is this one plugged in Slot1.

- Click on the "Channel Configuration" to configure the different channel options:



EXCOM:AIH40_4_20MA_8H Block, SLOT1_AIH40_4_20MA_8H - Parameters [Project]

Server Displays: Main, Channel Configuration (selected), Control Confirmation, Data/Status, Alarms, QVCS, Identification, Advanced Configuration / Statistics, Server History

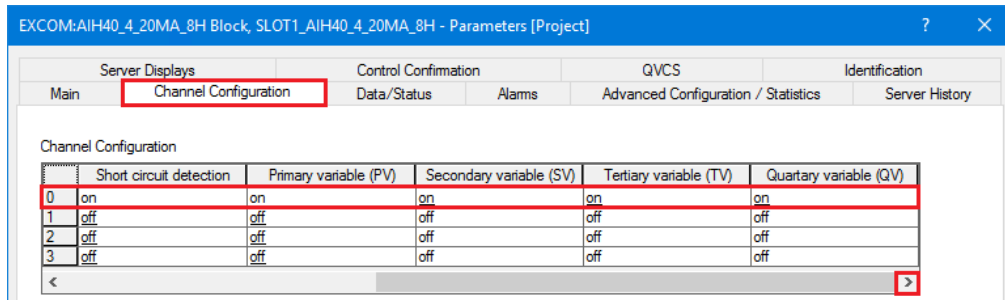
Channel Configuration

	Filter(PT1)	Failsafe mode	Open line detection	Short circuit detection	Primary variable (PV)
0	off	Min. value	on	on	on
1	off	Min. value	off	off	off
2	off	Min. value	off	off	off
3	off	Min. value	off	off	off

Channel Configuration

	Channel Name	Channel Point Type
0	SPARE_01	Spare
1	SPARE_02	Spare
2	SPARE_03	Spare
3	SPARE_04	Spare

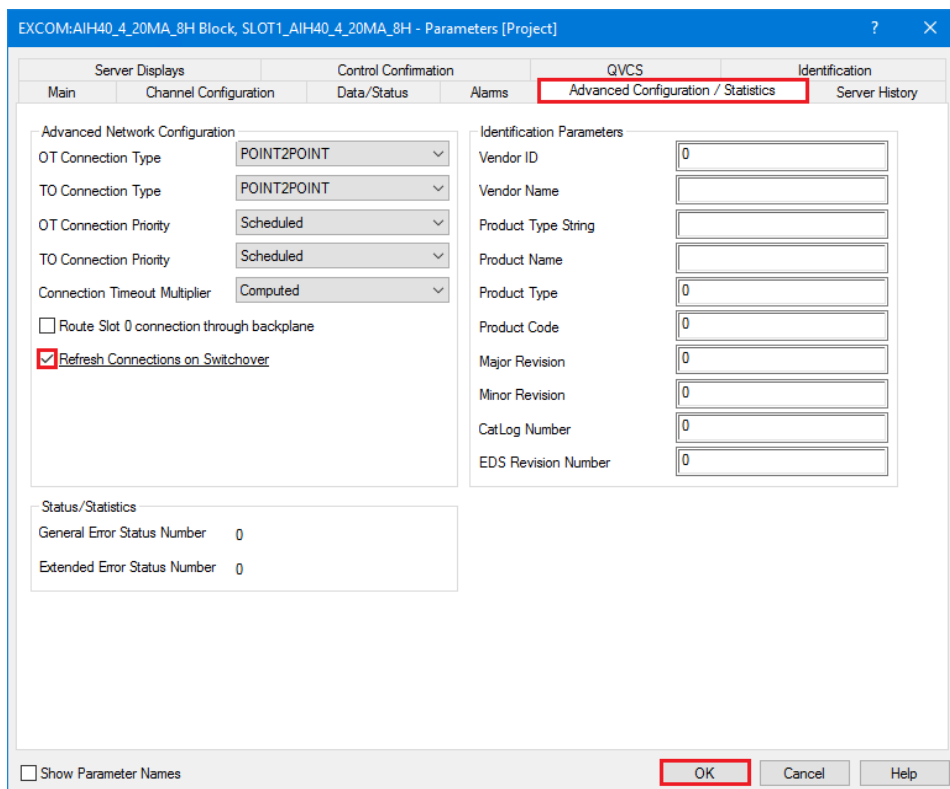
- Scroll to the right to see the HART data SV, TV and QV:



	Short circuit detection	Primary variable (PV)	Secondary variable (SV)	Tertiary variable (TV)	Quaternary variable (QV)
0	on	on	on	on	on
1	off	off	off	off	off
2	off	off	off	off	off
3	off	off	off	off	off

In this example, channel 1 has been configured with the four HART data. The card "AIH40_4_20MA_8H" allows the configuration of maximal eight HART data. In consequence, all four channels cannot be configured with their four HART data.

- Select the tab "Advanced Configuration / Statistics" and choose the option "Refresh Connections on Switchover":



Advanced Network Configuration

OT Connection Type: POINT2POINT

TO Connection Type: POINT2POINT

OT Connection Priority: Scheduled

TO Connection Priority: Scheduled

Connection Timeout Multiplier: Computed

☐ Route Slot 0 connection through backplane

☒ Refresh Connections on Switchover

Status/Statistics

General Error Status Number: 0

Extended Error Status Number: 0

Identification Parameters

Vendor ID: 0

Vendor Name:

Product Type String:

Product Name:

Product Type: 0

Product Code: 0

Major Revision: 0

Minor Revision: 0

CatLog Number: 0

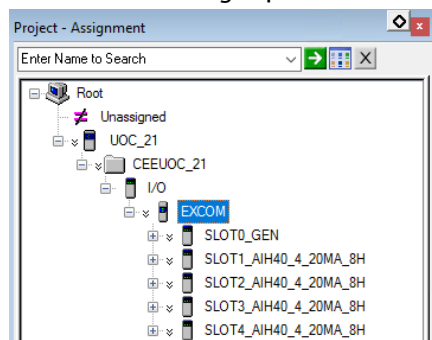
EDS Revision Number: 0

☐ Show Parameter Names

OK Cancel Help

Click on the button "OK".

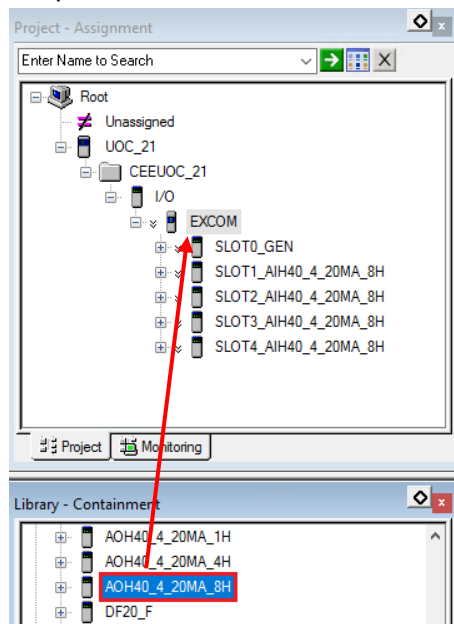
- Additional Analog Input cards have been added in our application:



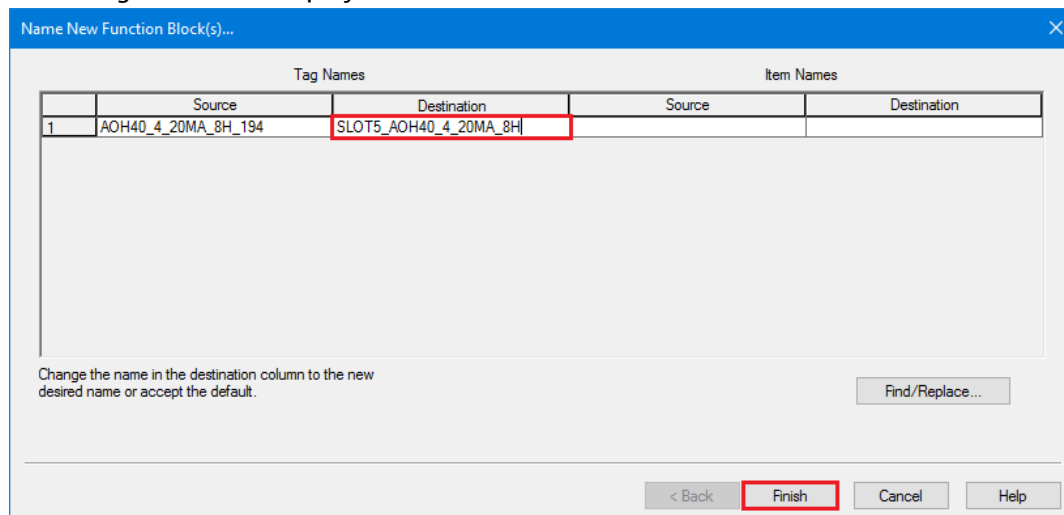
3.3.2.4 Analog Output Module HART AOH40

As for the analog input cards, there are as well different AOH40 templates depending on the needed configuration (with or without HART variables). In this example, we have chosen the template "AOH40_4_20MA_8H", which allows the user to configure until 8 HART variables for the 4 channels.

- Drag and drop the module "AOH40_4_20MA_8H" from the library "EXCOM" on the Ethernet adapter "EXCOM":

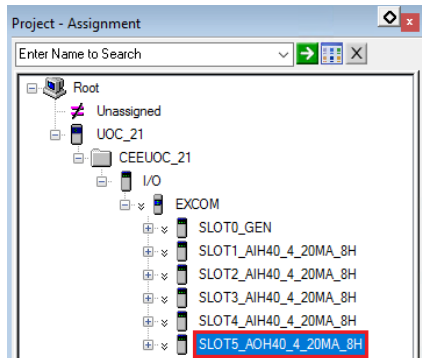


- Following window is displayed:



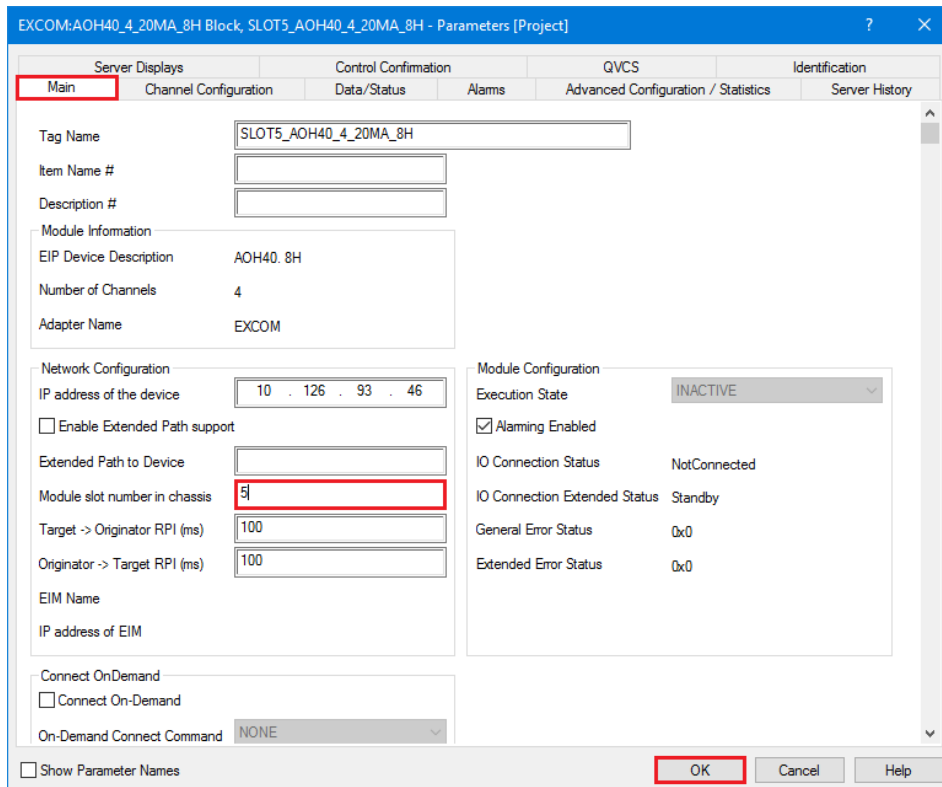
- Change the Destination name, for example "SLOT5_AOH40_4_20MA_8H" and click on the button "Finish".

- Analog Output Module is inserted in the project:



Double-click on the adapter.

- This displays following window:



In the tab "Main", configure the parameter "Module slot number in chassis". In this example, the card is this one plugged in Slot5.

- Download the configuration in the system. Please refer to chapter 3.6.1.2 to proceed.

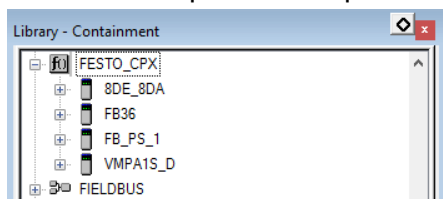
3.4 EtherNet/IP Field Device Integration

3.4.1 CPX MPA Valve Island

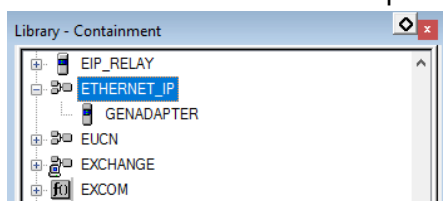
This part describes the configuration of the Festo Valve island (Gateway and pneumatic modules).

3.4.1.1 Control Builder Field Device Library

- The Festo components are part of the Honeywell library:



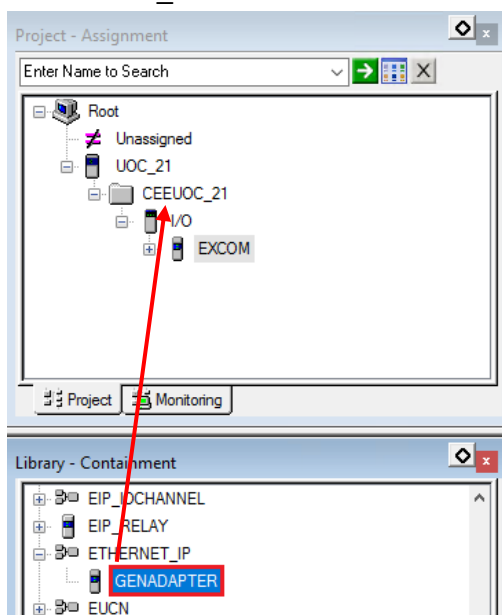
- An additional EtherNet/IP adapter must be used as well:



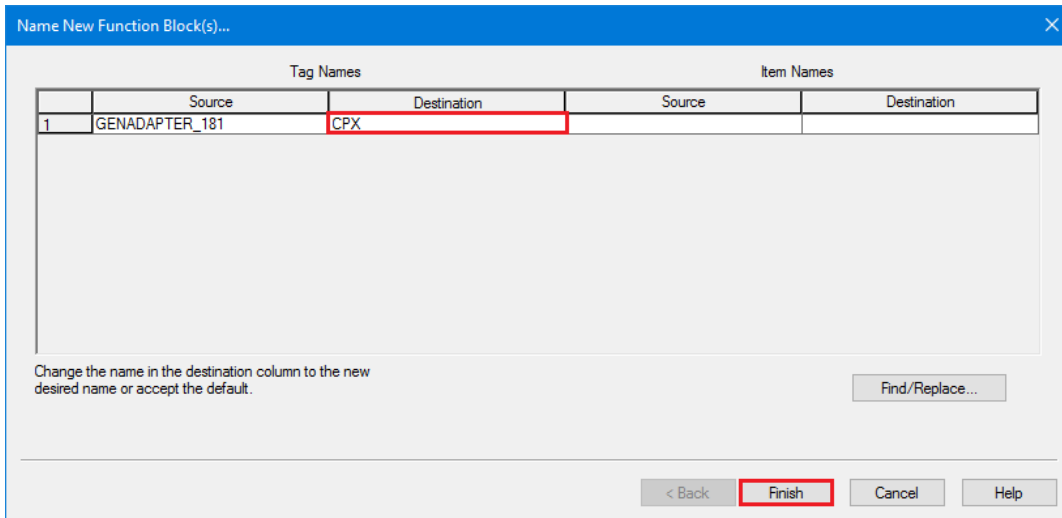
3.4.1.2 CPX MPA Valve Island Configuration

3.4.1.2.1 Gateway GEN Adapter

- The generic adapter "GENADADAPTER" from the library "ETHERNET_IP" is used to configure part of the FB36 gateway. Drag and drop the module "GENADAPTER" from the library "ETHERNET_IP" on "CEEUOC_21":



- Following window is displayed:



Tag Names		Item Names	
	Source	Destination	
1	GENADAPTER_181	CPX	

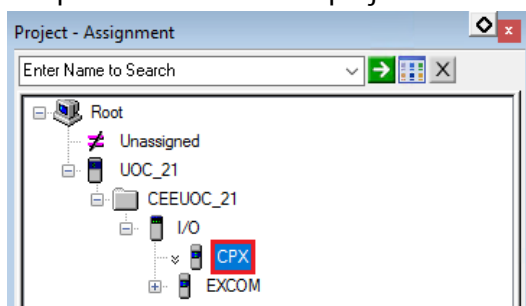
Change the name in the destination column to the new desired name or accept the default.

Find/Replace...

< Back Finish Cancel Help

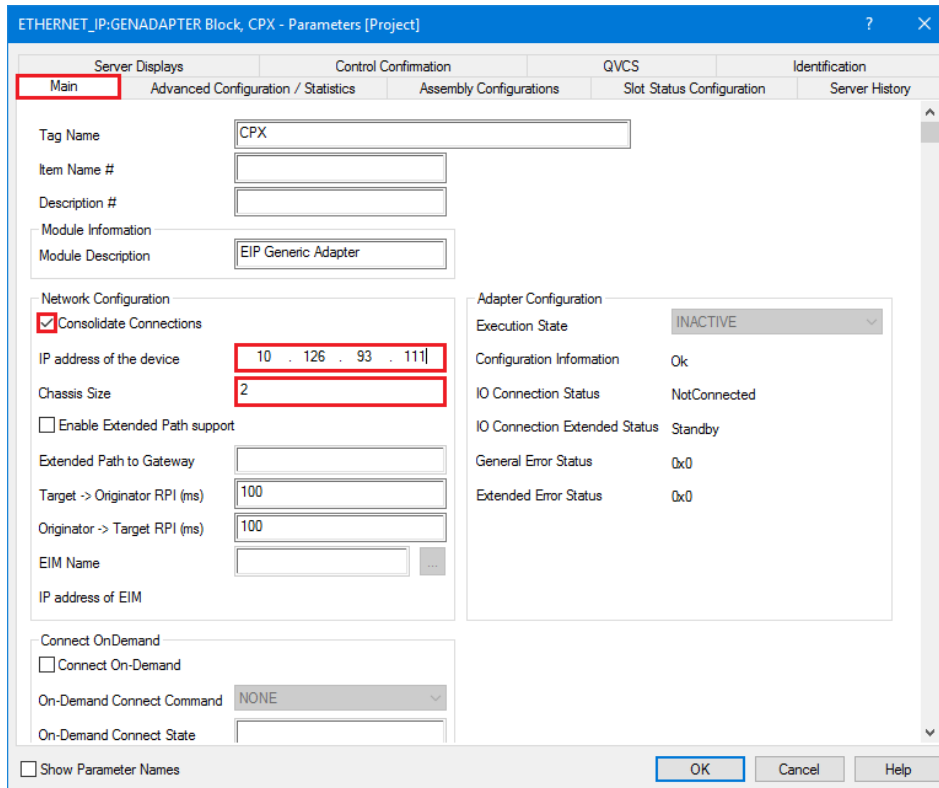
Change the Destination name, for example "CPX" and click on the button "Finish".

- Adapter is inserted in the project:



Double-click on the adapter.

- This displays following window:



ETHERNET_IP:GENADAPTER Block, CPX - Parameters [Project]

Server Displays | Control Confirmation | QVCS | Identification

Main | Advanced Configuration / Statistics | Assembly Configurations | Slot Status Configuration | Server History

Tag Name: CPX

Item Name #:

Description #:

Module Information: EIP Generic Adapter

Network Configuration

☒ Consolidate Connections

IP address of the device: 10 . 126 . 93 . 111

Chassis Size: 2

☐ Enable Extended Path support

Extended Path to Gateway:

Target -> Originator RPI (ms): 100

Originator -> Target RPI (ms): 100

EIM Name:

IP address of EIM:

Adapter Configuration

Execution State: INACTIVE

Configuration Information: Ok

IO Connection Status: NotConnected

IO Connection Extended Status: Standby

General Error Status: 0x0

Extended Error Status: 0x0

Connect OnDemand

☐ Connect On-Demand

On-Demand Connect Command: NONE

On-Demand Connect State:

☐ Show Parameter Names

OK Cancel Help

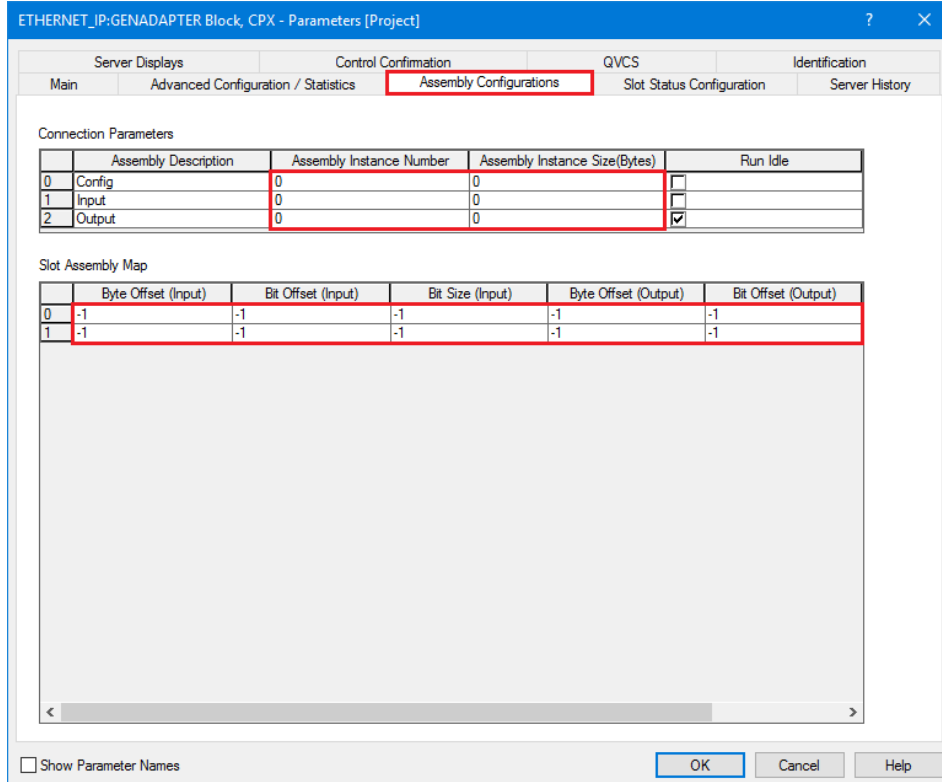
In the tab "Main", enable the parameter "Consolidate Connections" and configure the IP address of the bus controller as well the backplane Chassis size. In this example, the IP address is 10.126.93.111 and the chassis size is 2.

In this example, the chassis is composed of two slots: the FB36 and MPA1S-D modules:

Modules

Slot	Module
0	FB36
1	MPA1S-D

- Select the tab "Assembly Configurations", "Connection Parameters" and "Slot Assembly Map" must be defined:



ETHERNET_IP:GENADAPTER Block, CPX - Parameters [Project]

Server Displays | Control Confirmation | QVCS | Identification

Main | Advanced Configuration / Statistics | **Assembly Configurations** | Slot Status Configuration | Server History

Connection Parameters

	Assembly Description	Assembly Instance Number	Assembly Instance Size(Bytes)	Run Idle
0	Config	0	0	<input type="checkbox"/>
1	Input	0	0	<input type="checkbox"/>
2	Output	0	0	<input checked="" type="checkbox"/>

Slot Assembly Map

	Byte Offset (Input)	Bit Offset (Input)	Bit Size (Input)	Byte Offset (Output)	Bit Offset (Output)
0	-1	-1	-1	-1	-1
1	-1	-1	-1	-1	-1

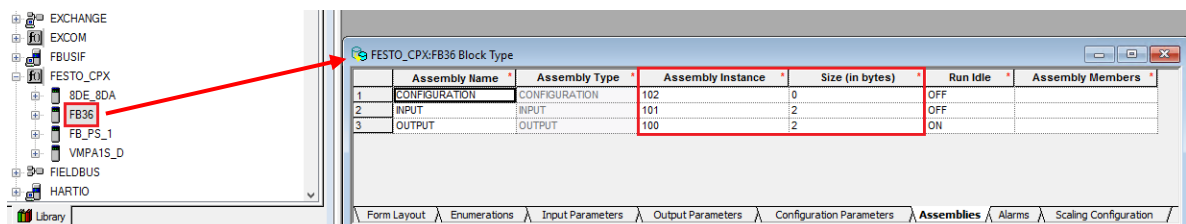
☐ Show Parameter Names

OK Cancel Help

These parameters can be found in the library "FESTO_CPX" as described below.

Connection Parameters

- In the library "FESTO_CPX", double-click on "FB36" and select the tab "Assemblies" to display the "FB36" assemblies:

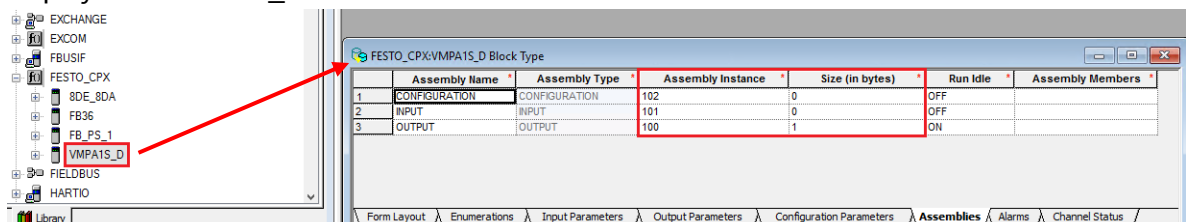


FESTO_CPX:FB36 Block Type

	Assembly Name	Assembly Type	Assembly Instance	Size (in bytes)	Run Idle	Assembly Members
1	CONFIGURATION	CONFIGURATION	102	0	OFF	
2	INPUT	INPUT	101	2	OFF	
3	OUTPUT	OUTPUT	100	2	ON	

Form Layout | Enumerations | Input Parameters | Output Parameters | Configuration Parameters | **Assemblies** | Alarms | Scaling Configuration

- In the library "FESTO_CPX", double-click on "VMPA1S_D" and select the tab "Assemblies" to display the "VMPA1S_D" assemblies:



FESTO_CPX:VMPA1S_D Block Type

	Assembly Name	Assembly Type	Assembly Instance	Size (in bytes)	Run Idle	Assembly Members
1	CONFIGURATION	CONFIGURATION	102	0	OFF	
2	INPUT	INPUT	101	0	OFF	
3	OUTPUT	OUTPUT	100	1	ON	

Form Layout | Enumerations | Input Parameters | Output Parameters | Configuration Parameters | **Assemblies** | Alarms | Channel Status

- The "Assembly Instance" parameters are the same for both modules (Config: 102, Input:101, Output:100). The "Assembly Instance Size (Bytes)" parameters are the sum result of "FB36" and "VMPA1S_D" (Config: 0+0=0, Input: 2+0=2, Output: 2+1=3):

ETHERNET_IP:GENADAPTER Block, CPX - Parameters [Project]

Server Displays Control Confirmation QVCS Identification

Main Advanced Configuration / Statistics **Assembly Configurations** Slot Status Configuration Server History

Connection Parameters

	Assembly Description	Assembly Instance Number	Assembly Instance Size(Bytes)	Run Idle
0	Config	102	0	<input type="checkbox"/>
1	Input	101	2	<input type="checkbox"/>
2	Output	100	3	<input checked="" type="checkbox"/>

Slot Assembly Map

- The "Slot Assembly Map" corresponds to the Input/Output data size Offset and Size. The "Slot Assembly Map" is depending on the Hardware configuration. In this example, the chassis size is two, one slot the FB36 module and another one for the VMPA1S_D module.
- In the library "FESTO_CPX", double -click on "FB36". Select the tab "Assemblies" and click on the button of the Input "Assembly Members":

Library

EXCHANGE

EXCOM

FBUSIF

FESTO_CPX

8DE_8DA

FB36

FB_PS_1

VMPA1S_D

FESTO_CPX:FB36 Block Type

Assembly Name	Assembly Type	Assembly Instance	Size (in bytes)	Run Idle	Assembly Members
1 CONFIGURATION	CONFIGURATION	102	0	OFF	
2 INPUT	INPUT	101	2	OFF	
3 OUTPUT	OUTPUT	100	2	ON	

Form Layout Enumerations Input Parameters Output Parameters Configuration Parameters **Assemblies** Alarms Scaling Configuration

- This displays the Inputs settings of the FB36 module, 16 bits for that example:

Assembly Members - INPUT, Size: 2 bytes

	Parameter name	Parameter Index	Byte Offset	Bit Offset	Size (in bits)
1	STATUSWORD	0	0	0	16
2					
3					
4					
5					

- Click on the button of the Input "Assembly Members":

Library

EXCHANGE

EXCOM

FBUSIF

FESTO_CPX

8DE_8DA

FB36

FB_PS_1

VMPA1S_D

FESTO_CPX:FB36 Block Type

Assembly Name	Assembly Type	Assembly Instance	Size (in bytes)	Run Idle	Assembly Members
1 CONFIGURATION	CONFIGURATION	102	0	OFF	
2 INPUT	INPUT	101	2	OFF	
3 OUTPUT	OUTPUT	100	2	ON	

Form Layout Enumerations Input Parameters Output Parameters Configuration Parameters **Assemblies** Alarms Scaling Configuration

- This displays the Outputs settings of the "FB36" module, 16 bits for that example:

	Parameter name	Parameter Index	Byte Offset	Bit Offset	Size (in bits)
1	COMMAND_WORD	0	0	0	16
2					
3					
4					

- In the library "FESTO_CPX", double-click on "VMPA1S_D" and select the tab "Assemblies" to display the "VMPA1S_D" assemblies. Then click on the button in the "Assembly Members":

	Assembly Name	Assembly Type	Assembly Instance	Size (in bytes)	Run Idle	Assembly Members
1	CONFIGURATION	CONFIGURATION	102	0	OFF	
2	INPUT	INPUT	101	0	OFF	
3	OUTPUT	OUTPUT	100	1	ON	

- This displays the Outputs settings of the "VMPA1S_D" module, 8 bits for that example:

	Parameter name	Parameter Index	Byte Offset	Bit Offset	Size (in bits)
1	OPFL	0	0	0	1
2	OPFL	1	0	1	1
3	OPFL	2	0	2	1
4	OPFL	3	0	3	1
5	OPFL	4	0	4	1
6	OPFL	5	0	5	1
7	OPFL	6	0	6	1
8	OPFL	7	0	7	1
9					

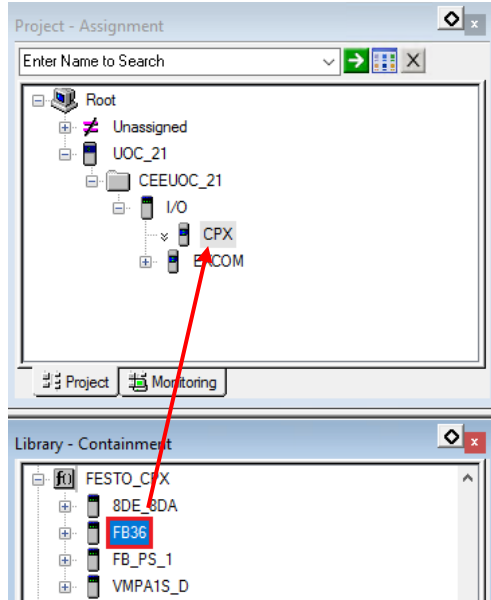
- Report the previous values in the Slot Assembly Map:

	Byte Offset (Input)	Bit Offset (Input)	Bit Size (Input)	Byte Offset (Output)	Bit Offset (Output)
0	0	0	16	0	0
1	0	0	0	2	0

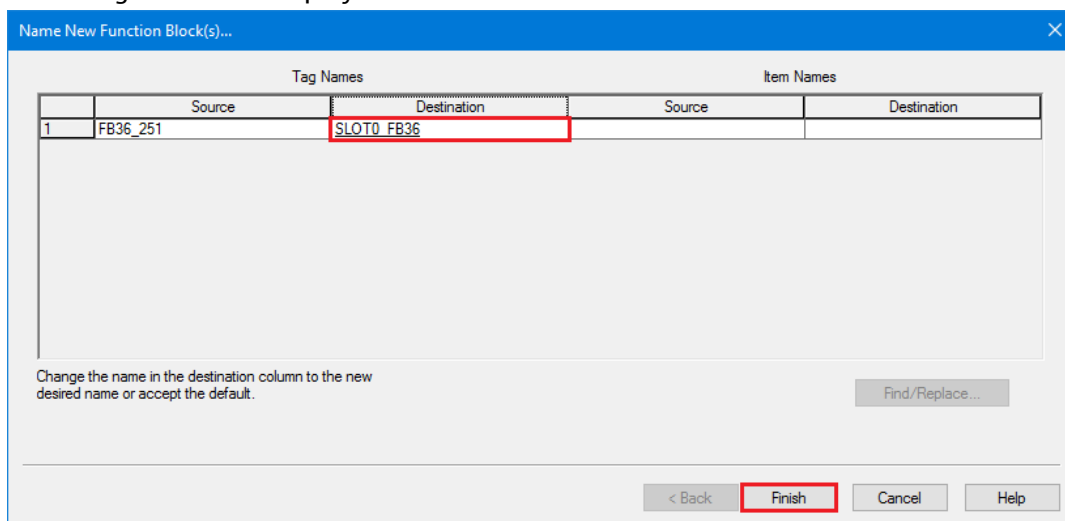
	Byte Offset (Input)	Bit Size (Input)	Byte Offset (Output)	Bit Offset (Output)	Bit Size (Output)
0	0	16	0	0	16
1	0	0	2	0	8

3.4.1.2.2 Bus node FB36

- Drag and drop the module "FB36" from the library "FESTO_CPX" on the Ethernet adapter "CPX":

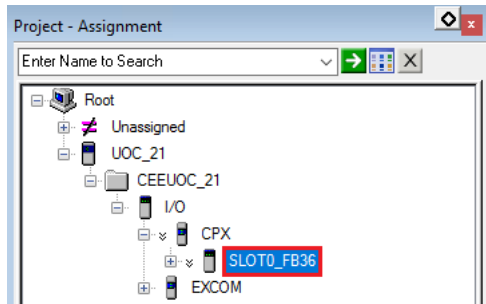


- Following window is displayed:

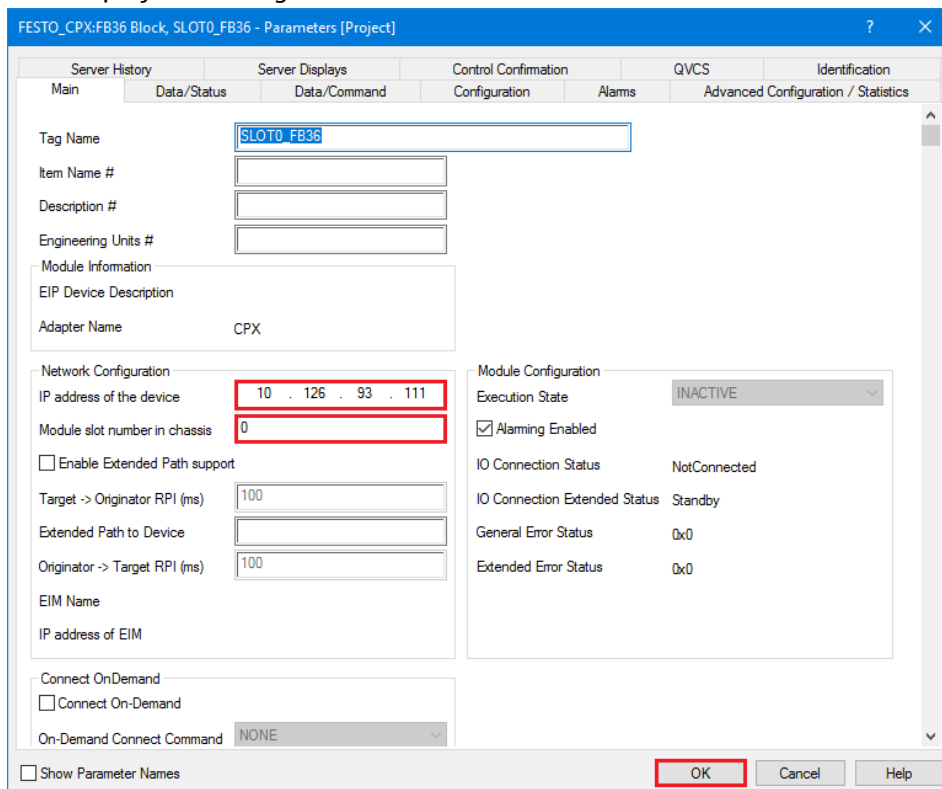


Change the Destination name, for example "SLOT_0_FB36" and click on the button "Finish".

- Adapter is inserted in the project:



- Double-click on the Bus node.
- This displays following window:

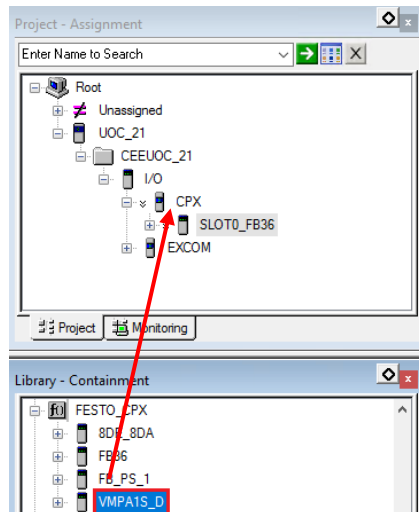


Verify the parameters "IP address of the device" and "Module slot number in chassis". Then click on the button "OK".

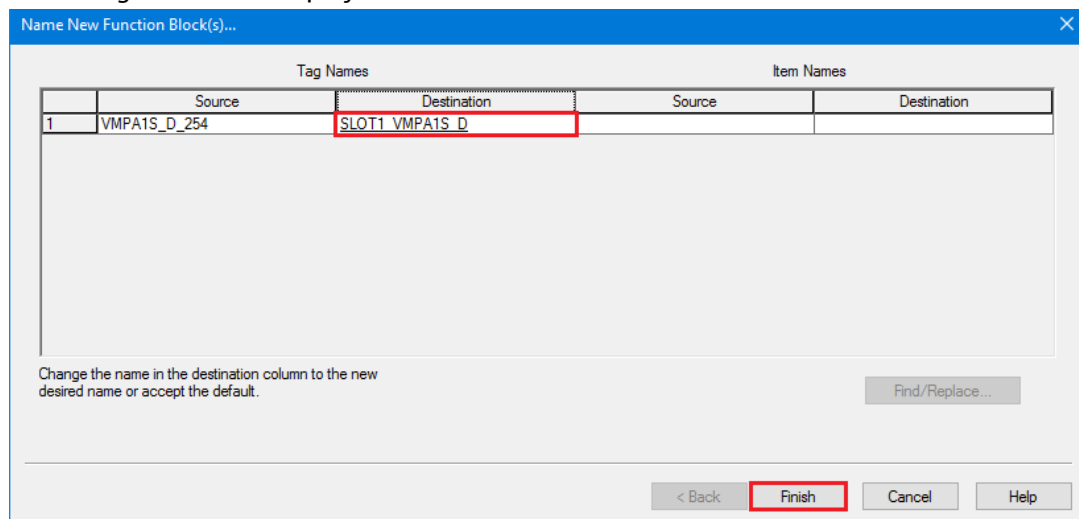
3.4.1.2.3 Pneumatic Module MPA1S

This part describes the configuration of the MPA1S pneumatic module, which can control up to 8 digital output channels.

- Drag and drop the module "VMPA1S" from the library "FESTO_CPX" on the Ethernet adapter "CPX":

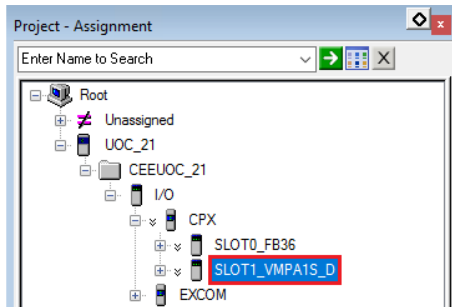


- Following window is displayed:

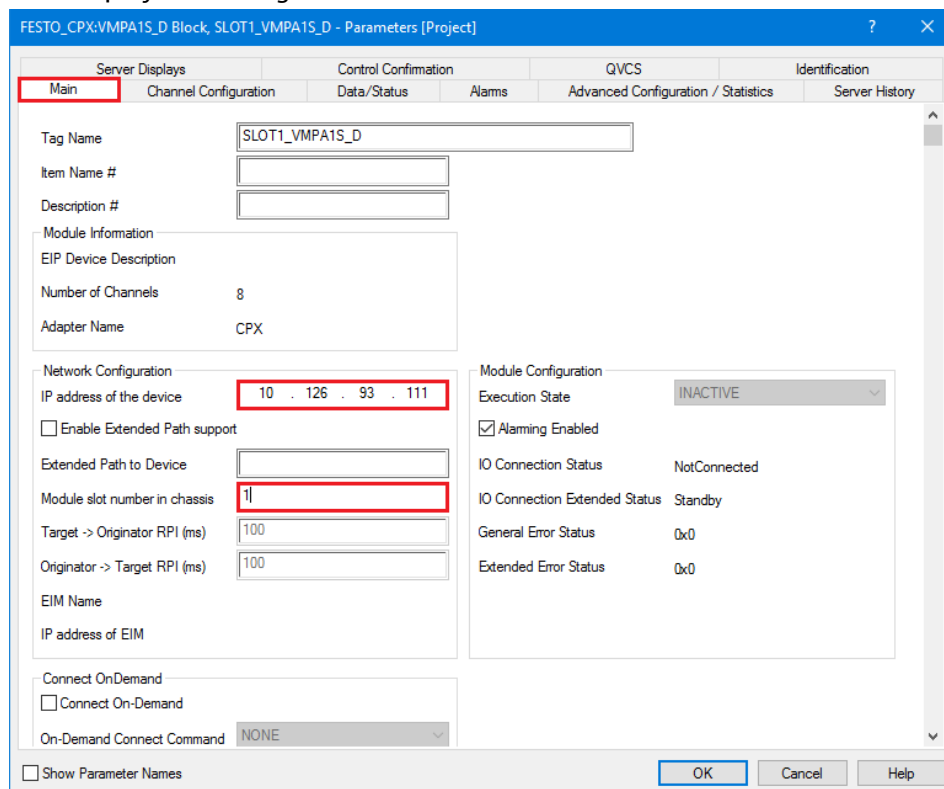


Change the Destination name, for example "Slot_1_VMPA1S_D" and click on the button "Finish".

- Module is inserted in the project:

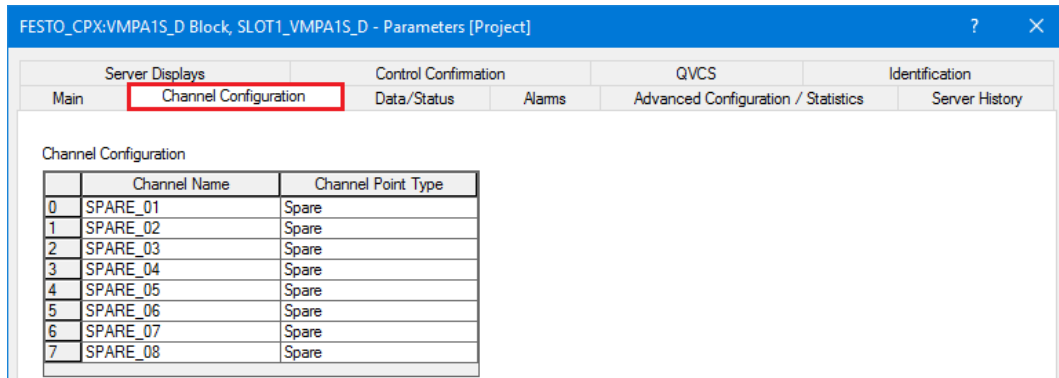


- Double-click on the Bus node.
- This displays following window:



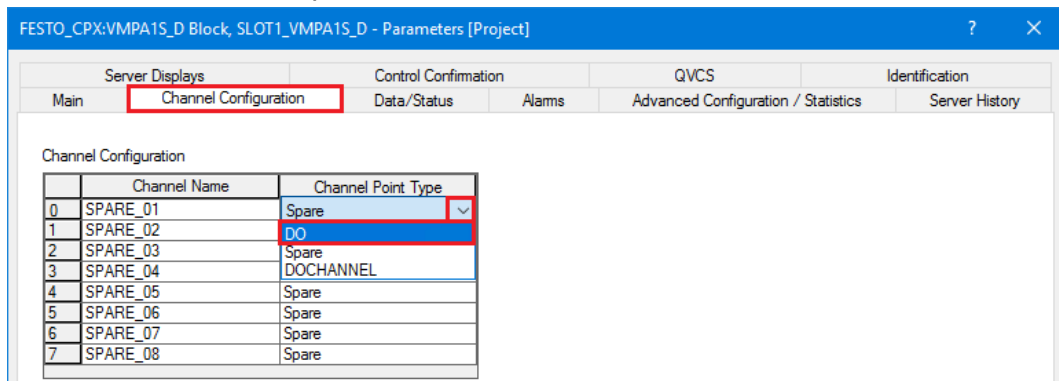
In the tab "Main", verify the parameter "IP address of the device" then configure the parameter "Module slot number in chassis". In this example, the IP address is 10.126.93.111 and the slot number is 1.

- Click on the tab "Channel Configuration" to configure the solenoid channels:



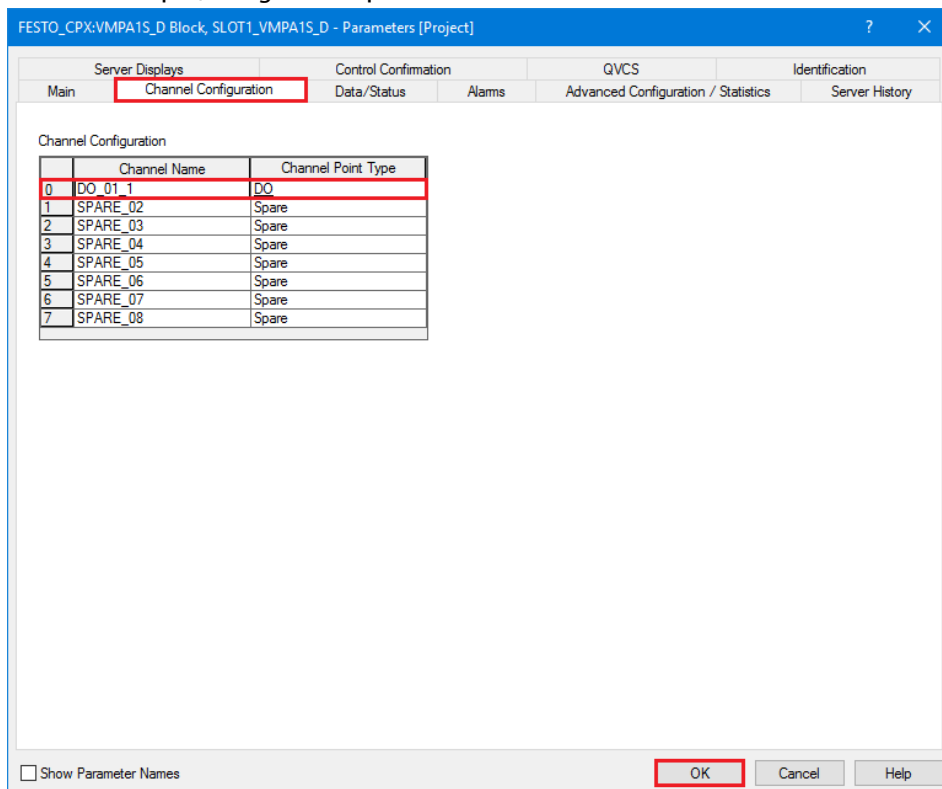
	Channel Name	Channel Point Type
0	SPARE_01	Spare
1	SPARE_02	Spare
2	SPARE_03	Spare
3	SPARE_04	Spare
4	SPARE_05	Spare
5	SPARE_06	Spare
6	SPARE_07	Spare
7	SPARE_08	Spare

- Click on the list box of "Spare01" and select the item "DO":



	Channel Name	Channel Point Type
0	SPARE_01	Spare
1	SPARE_02	DO
2	SPARE_03	Spare
3	SPARE_04	DOCHANNEL
4	SPARE_05	Spare
5	SPARE_06	Spare
6	SPARE_07	Spare
7	SPARE_08	Spare

- In this example, a digital Output "DO" is now defined for the solenoid 0:



	Channel Name	Channel Point Type
0	DO_01_1	DO
1	SPARE_02	Spare
2	SPARE_03	Spare
3	SPARE_04	Spare
4	SPARE_05	Spare
5	SPARE_06	Spare
6	SPARE_07	Spare
7	SPARE_08	Spare

☐ Show Parameter Names

OK Cancel Help

Click on the button "OK".

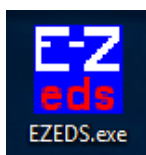
- Download the configuration in the system. Please refer to chapter 3.6.1.3 to proceed.

3.4.2 Promass 300 Flowmeter

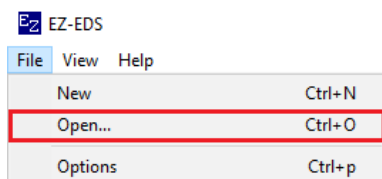
3.4.2.1 ODVA Tool for EDS File Reading

The EDS file contains the list of relevant device parameters. This file can be opened either with a standard Text editor or much more convenient by using the ODVA tool EZ-EDS. This tool can be downloaded on <https://www.odva.org/> The following example is done with EZ-EDS.

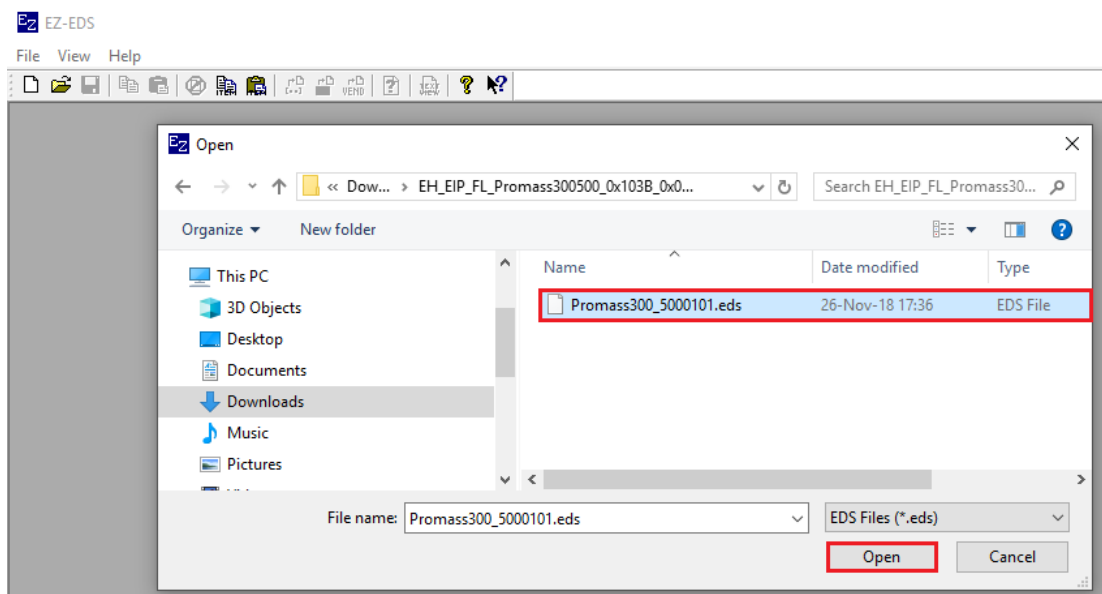
- Start the software EZEDS.exe:



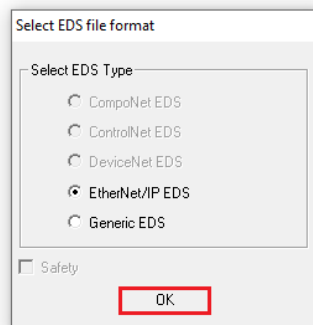
- Select the menu "File→Open...":



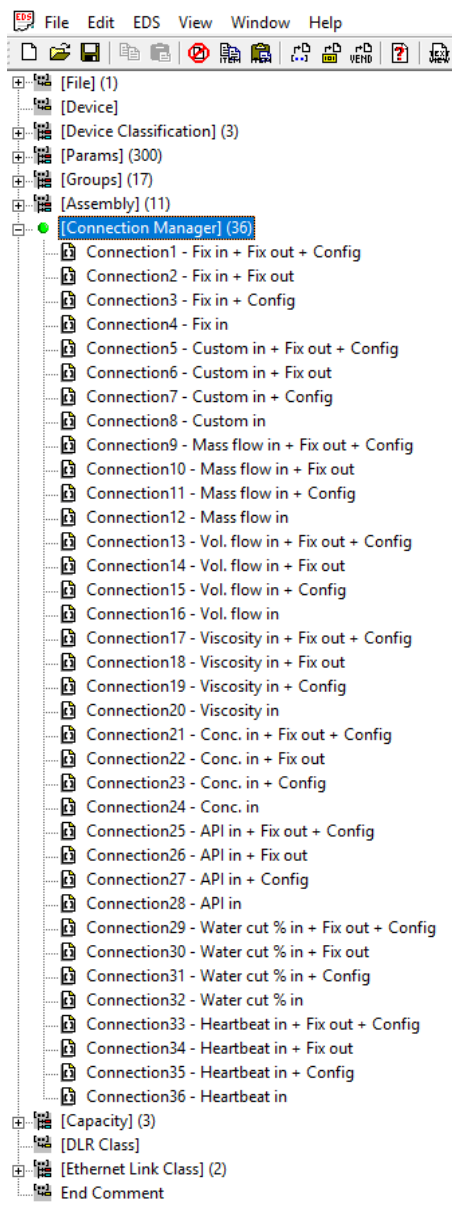
- Select the EDS file, for example "Promass300_5000101.eds" and click on the button "Open":



- Select the format “EtherNet/IP EDS” and click on the button “OK”:



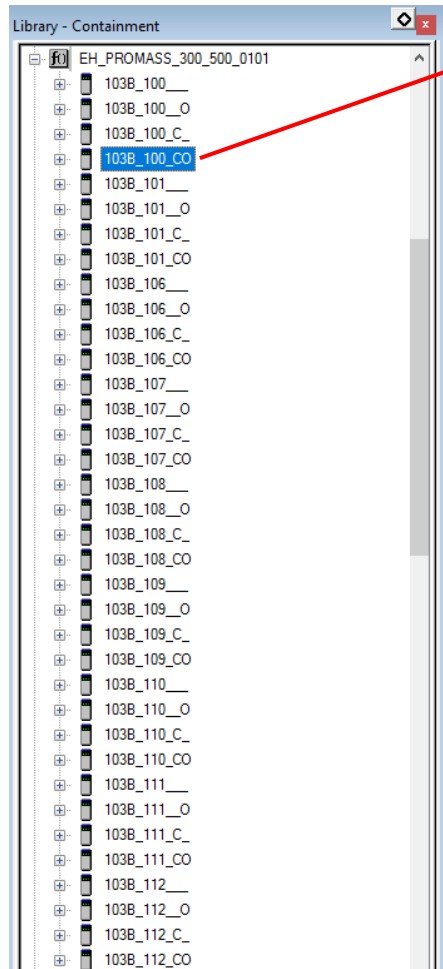
- Main Parts are listed on the left side:



For example, the available Promass300 connections types are part of “Connection Manager”

3.4.2.2 Control Builder Field Device Library

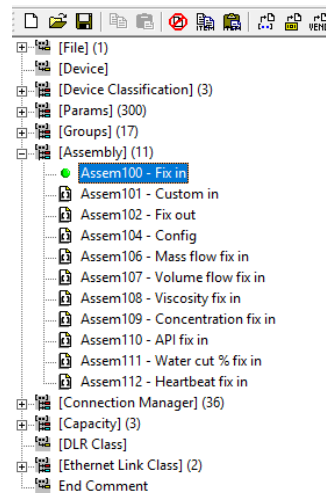
- The following window displays the Promass300 device in the Honeywell Library. All possible device connections are available:



Connection "103B_100_CO":

- "103B" corresponds to the Promass300 device type.

- "100" corresponds to the Assembly FixIn:

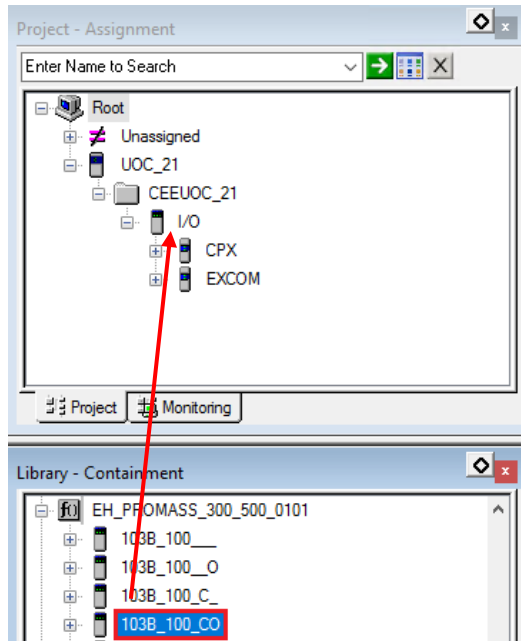


- "_CO"
 - "C" is for "Configuration"
 - "O" is for "Output"

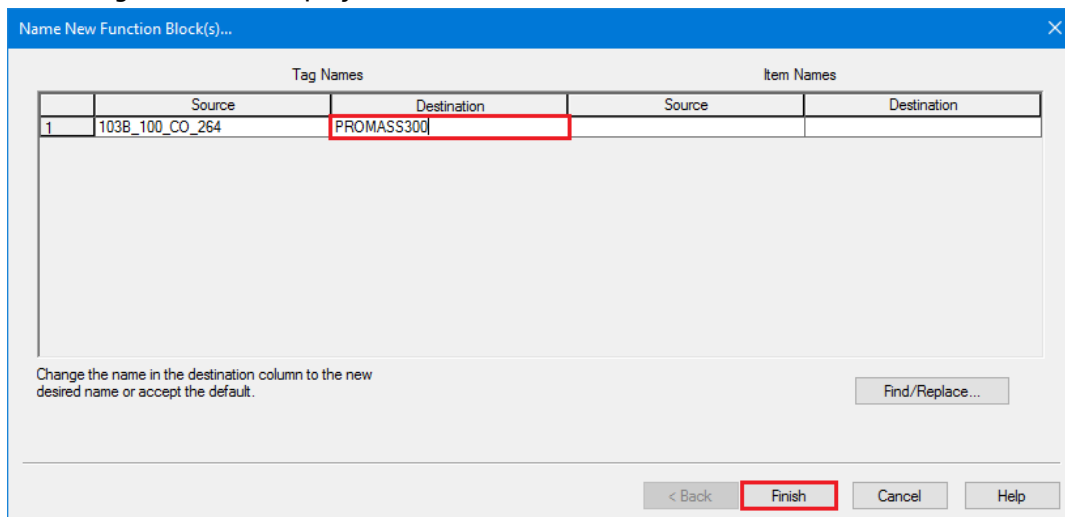
The connection "103B_100_CO" corresponds to "FixIn+Output+Configuration Assembly".

3.4.2.3 Device Configuration with Connection FixIn + FixOut + Config

- Drag and drop the Promass300 FixIn+Output+Config "103B_100_CO" from the library "EH_PROMASS_300_500_0101" on "CEEUOC_21":

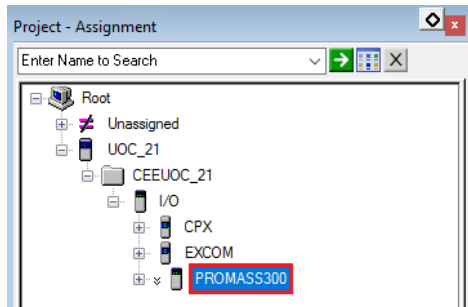


- Following window is displayed:

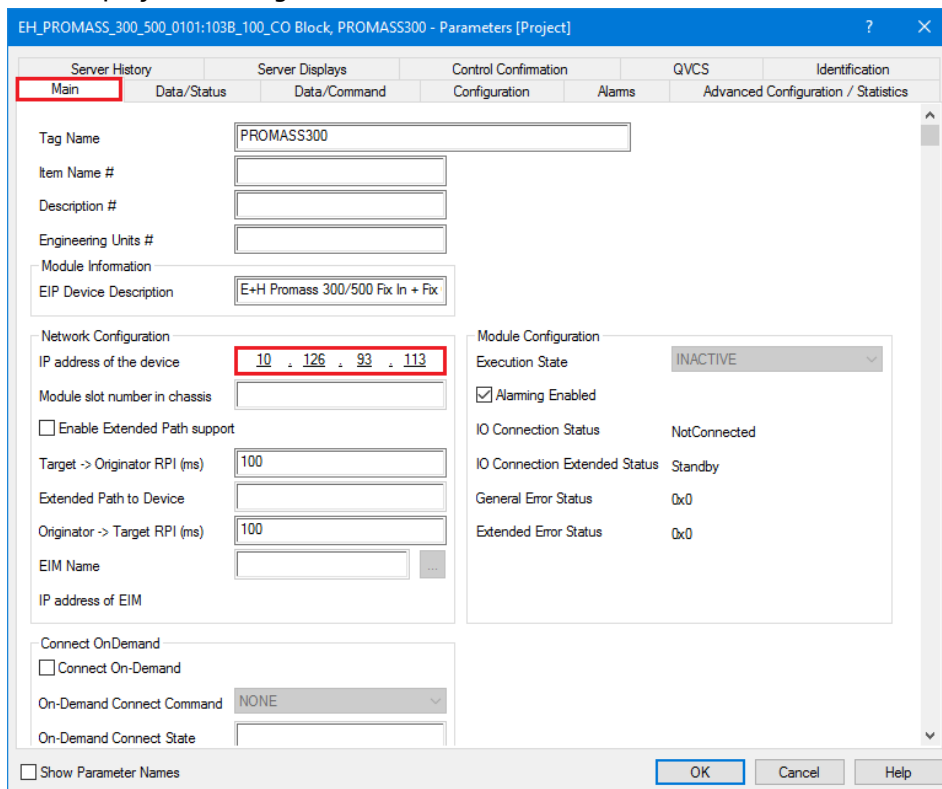


Change the Destination name, for example "PROMASS300" and click on the button "Finish".

- Device is inserted in the project:

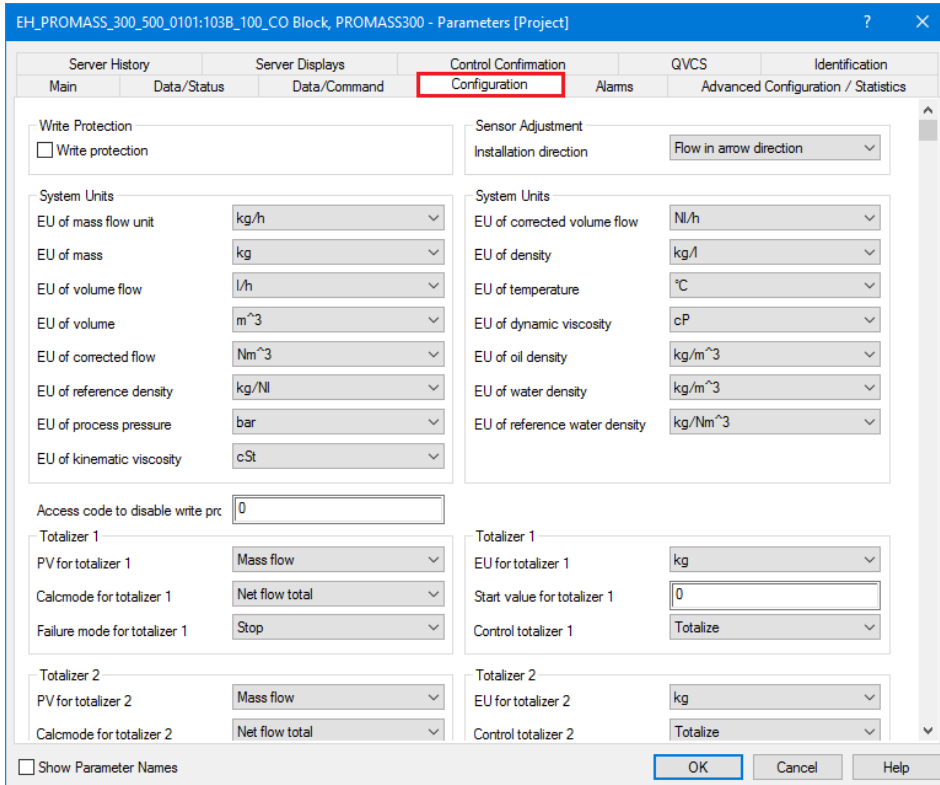


- Double-click on the device.
- This displays following window:



In the tab "Main", configure the IP address of the device. In this example, the IP address is 10.126.93.113.

- Connection types with "Config" as for example "FixIn+Output+Config" contains some configurable parameters. Click on the tab "Configuration":



The screenshot shows the 'Configuration' tab of the 'EH_PROMASS_300_500_0101:103B_100_CO Block, PROMASS300 - Parameters [Project]' window. The window is divided into several sections:

- Write Protection:** Includes a checkbox for 'Write protection'.
- Sensor Adjustment:** Includes a dropdown for 'Installation direction' set to 'Flow in arrow direction'.
- System Units:** Two columns of dropdown menus for various units:
 - Left column: EU of mass flow unit (kg/h), EU of mass (kg), EU of volume flow (l/h), EU of volume (m³), EU of corrected flow (Nm³), EU of reference density (kg/Nl), EU of process pressure (bar), EU of kinematic viscosity (cSt).
 - Right column: EU of corrected volume flow (Nl/h), EU of density (kg/l), EU of temperature (°C), EU of dynamic viscosity (cP), EU of oil density (kg/m³), EU of water density (kg/m³), EU of reference water density (kg/Nm³).
- Access code to disable write pr:** A text input field with the value '0'.
- Totalizer 1:** Includes dropdowns for 'PV for totalizer 1' (Mass flow), 'Calcmode for totalizer 1' (Net flow total), 'Failure mode for totalizer 1' (Stop), 'EU for totalizer 1' (kg), 'Start value for totalizer 1' (0), and 'Control totalizer 1' (Totalize).
- Totalizer 2:** Includes dropdowns for 'PV for totalizer 2' (Mass flow), 'Calcmode for totalizer 2' (Net flow total), 'EU for totalizer 2' (kg), and 'Control totalizer 2' (Totalize).

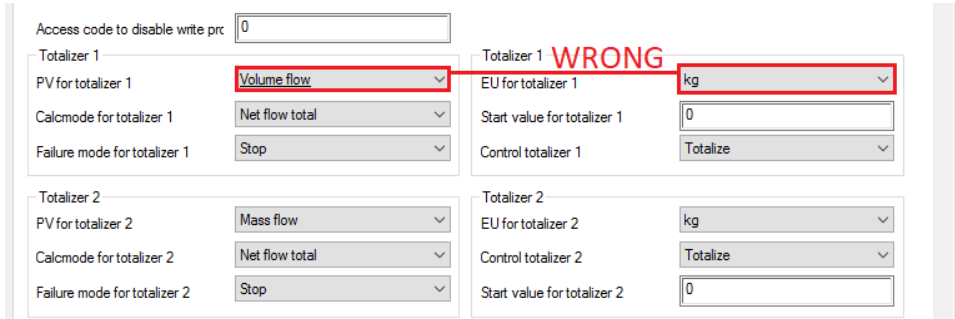
At the bottom, there is a checkbox for 'Show Parameter Names' and three buttons: 'OK', 'Cancel', and 'Help'.

The main Promass300 configurable parameters in this section are:

- Write Protection
- Sensor Adjustment
- System Units
- Totalizers
- Configurable Input Assembly
- Low Flow Cut Off
- Process Parameters
- Diagnostics Behavior
- Partially Filled Pipe Detection
- Compensations
- Concentration
- Petroleum Mode

These parameters will be downloaded into the device during the Download.

- Be careful by the configuration of the Totalizer PV. Don't forget to update the corresponding Unit as well. Otherwise the communication with the device will not be successful after the download:



Access code to disable write prc: 0

Totalizer 1

PV for totalizer 1: Volume flow

Calcmode for totalizer 1: Net flow total

Failure mode for totalizer 1: Stop

Totalizer 2

PV for totalizer 2: Mass flow

Calcmode for totalizer 2: Net flow total

Failure mode for totalizer 2: Stop

Totalizer 1 EU for totalizer 1: kg

Start value for totalizer 1: 0

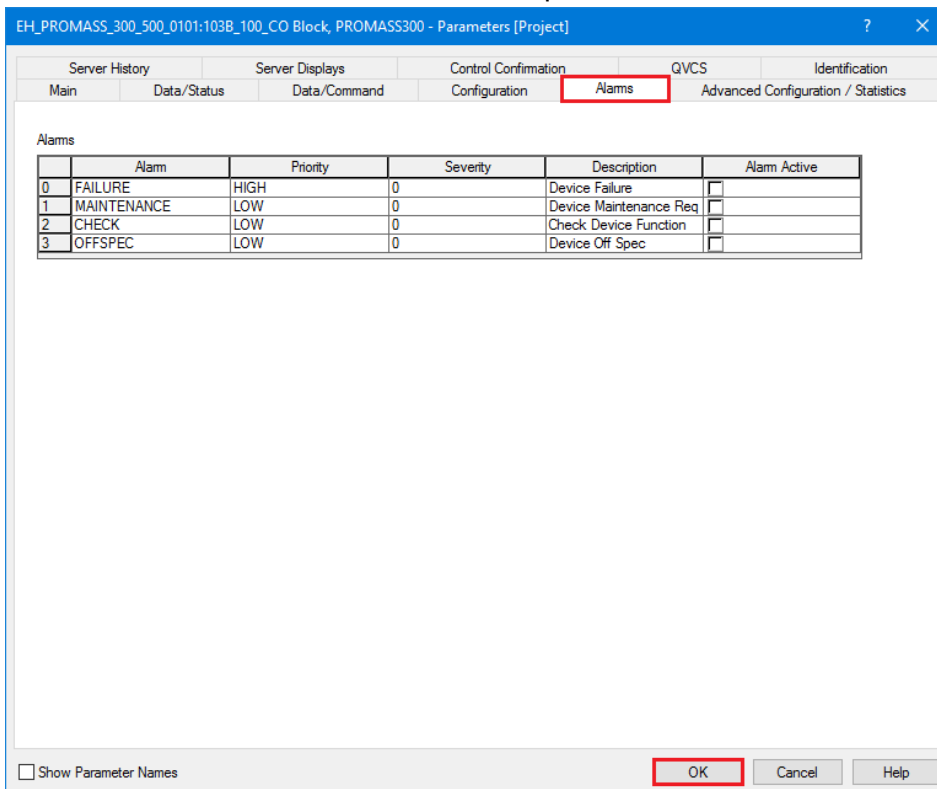
Control totalizer 1: Totalize

Totalizer 2 EU for totalizer 2: kg

Start value for totalizer 2: 0

Control totalizer 2: Totalize

- Click on the tab "Alarm" to see the Alarm configuration. These alarms have been defined with their default values in the device connection template:



EH_PROMASS_300_500_0101:103B_100_CO Block, PROMASS300 - Parameters [Project]

Server History | Server Displays | Control Confirmation | QVCS | Identification

Main | Data/Status | Data/Command | Configuration | **Alarms** | Advanced Configuration / Statistics

Alarms

Alarm	Priority	Severity	Description	Alarm Active
0 FAILURE	HIGH	0	Device Failure	<input type="checkbox"/>
1 MAINTENANCE	LOW	0	Device Maintenance Req	<input type="checkbox"/>
2 CHECK	LOW	0	Check Device Function	<input type="checkbox"/>
3 OFFSPEC	LOW	0	Device Off Spec	<input type="checkbox"/>

☐ Show Parameter Names

OK Cancel Help

The alarm list for Endress+Hauser Ethernet/IP field devices contains the Namur NE107 status signal diagnostics. Settings as "Priority" or "Severity" can be configured.

- Download the configuration in the system. Please refer to chapter 0 to proceed.

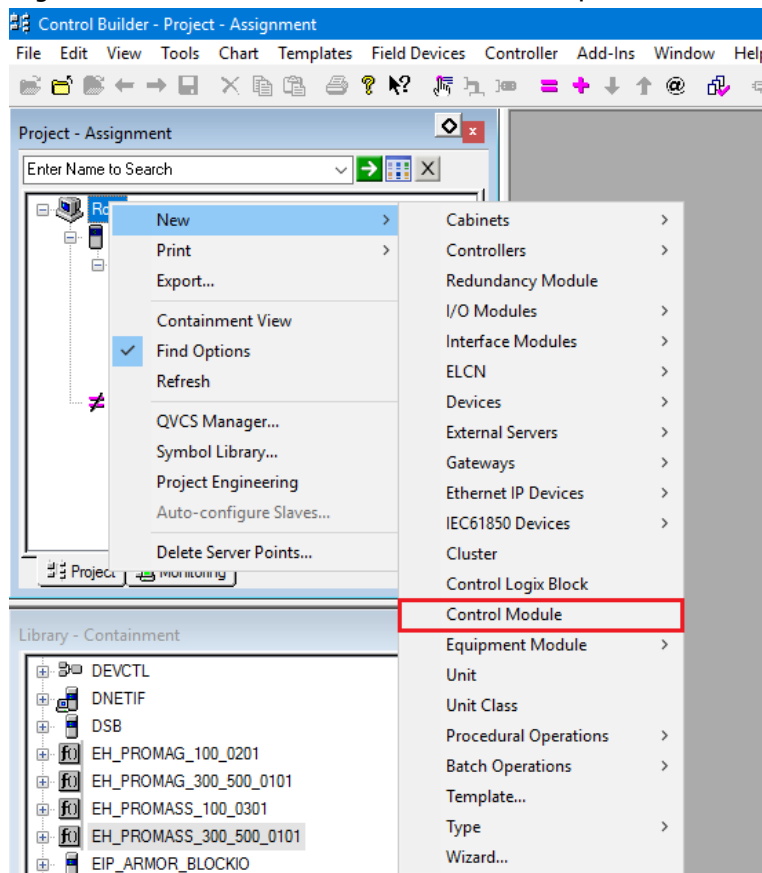
3.5 Control Strategy

3.5.1 Analog Input Function Block Configuration

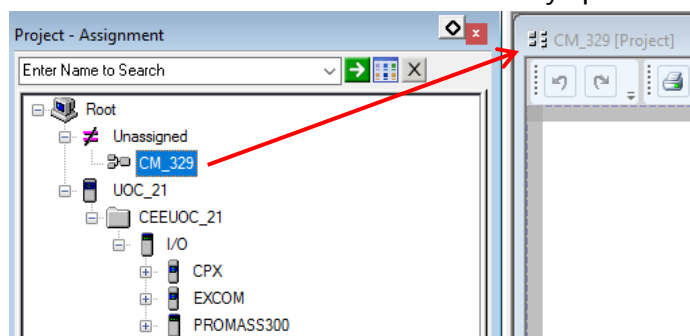
This chapter explains how assign analog input function blocks. The method is the same for mapping analog inputs from HART or EtherNet/IP field devices.

3.5.1.1 New Control Module

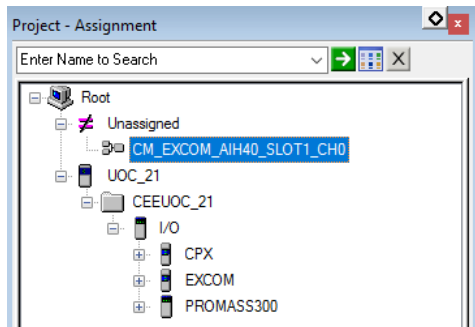
- Right-click on the field "Root" and select the option "New→Control Module":



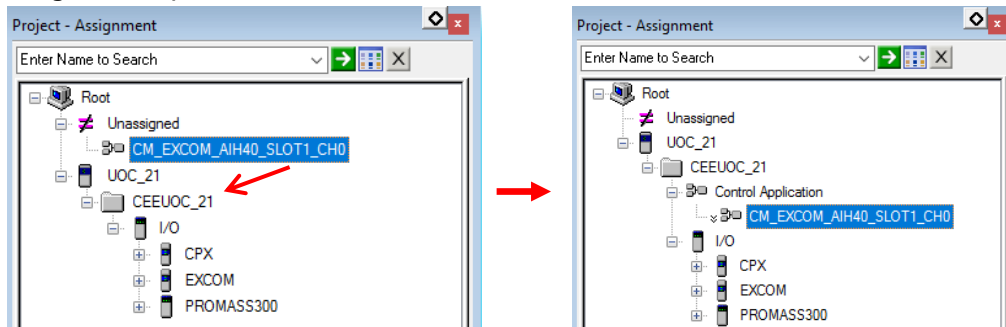
- The created Control Module is automatically opened and saved under "Unassigned":



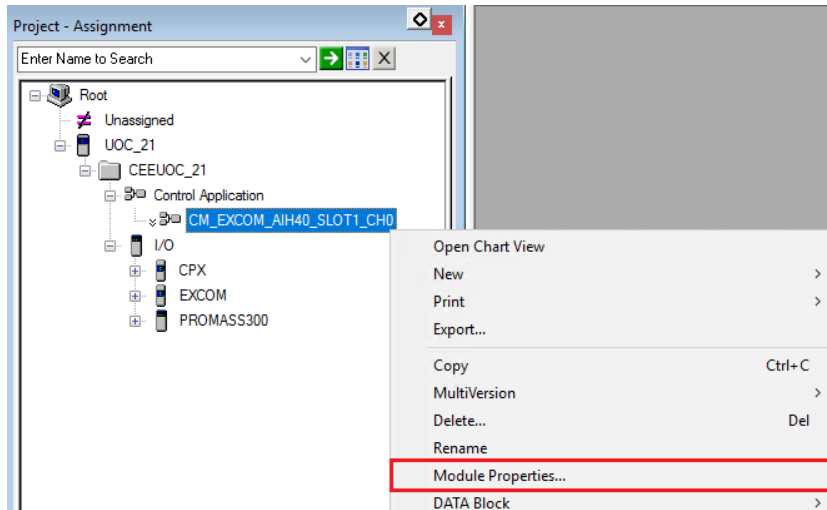
- Close the Control Module.
- Rename the Control Module, for example "CM_EXCOM_AI40_SLOT1_Ch0":



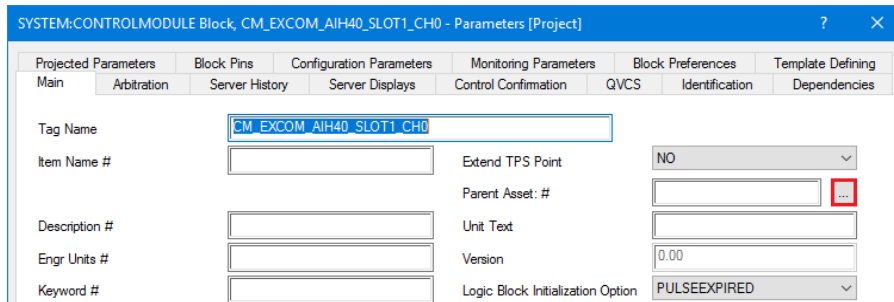
- Drag and drop the Control Module in "CEEUOC_21":



- Right-click on the Control Module and select the menu "Module Properties...":



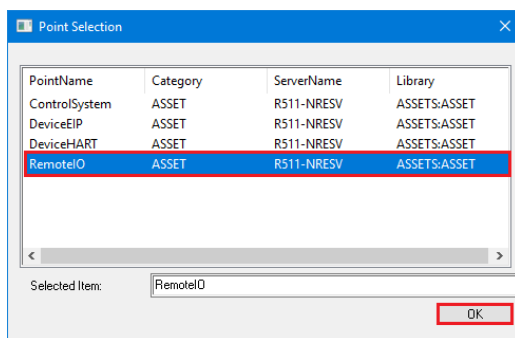
- Click on the shortcut button "Parent Asset#":



SYSTEM:CONTROLMODULE Block, CM_EXCOM_AIH40_SLOT1_CH0 - Parameters [Project]

Projected Parameters	Block Pins	Configuration Parameters	Monitoring Parameters	Block Preferences	Template Defining
Main	Arbitration	Server History	Server Displays	Control Confirmation	QVCS
Tag Name	CM_EXCOM_AIH40_SLOT1_CH0				
Item Name #		Extend TPS Point	NO		
Description #		Parent Asset: #	<div>Parent Asset #</div>		
Engr Units #		Unit Text			
Keyword #		Version	0.00		
		Logic Block Initialization Option	PULSEEXPIRED		

- Select a "Parent Asset" and click on the button "OK":



Point Selection

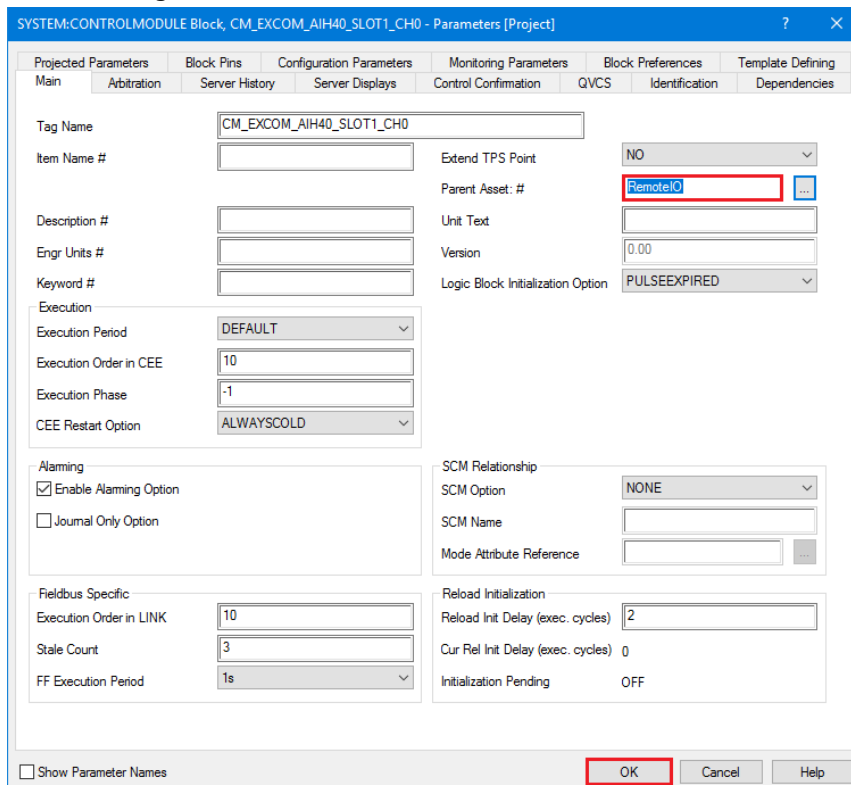
PointName	Category	ServerName	Library
ControlSystem	ASSET	R511-NRESV	ASSETS:ASSET
DeviceEIP	ASSET	R511-NRESV	ASSETS:ASSET
DeviceHART	ASSET	R511-NRESV	ASSETS:ASSET
RemoteIO	ASSET	R511-NRESV	ASSETS:ASSET

Selected Item: RemoteIO

OK

In this example, the Parent Asset is "RemoteIO".

- Asset is assigned. Click on the button "OK" to close the window:



SYSTEM:CONTROLMODULE Block, CM_EXCOM_AIH40_SLOT1_CH0 - Parameters [Project]

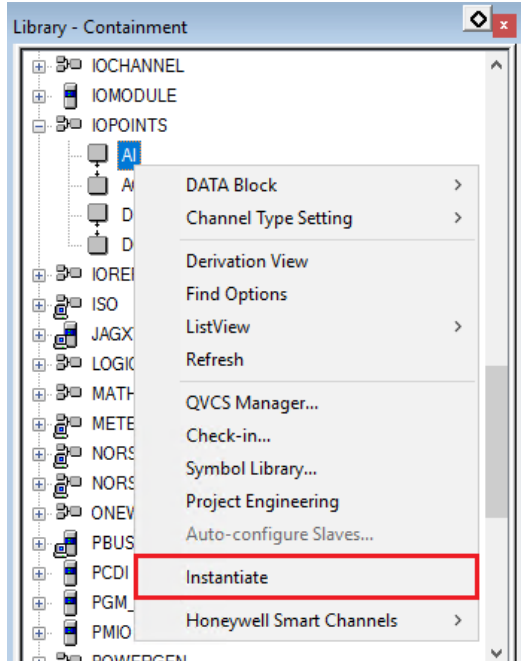
Projected Parameters	Block Pins	Configuration Parameters	Monitoring Parameters	Block Preferences	Template Defining
Main	Arbitration	Server History	Server Displays	Control Confirmation	QVCS
Tag Name	CM_EXCOM_AIH40_SLOT1_CH0				
Item Name #		Extend TPS Point	NO		
Description #		Parent Asset: #	RemoteIO		
Engr Units #		Unit Text			
Keyword #		Version	0.00		
		Logic Block Initialization Option	PULSEEXPIRED		
Execution	DEFAULT				
Execution Period	10				
Execution Order in CEE	-1				
Execution Phase	ALWAYS COLD				
CEE Restart Option					
Alarming	<input checked="" type="checkbox"/> Enable Alarming Option <input type="checkbox"/> Journal Only Option				
Fieldbus Specific	Execution Order in LINK: 10 Stale Count: 3 FF Execution Period: 1s				
SCM Relationship	SCM Option: NONE SCM Name: Mode Attribute Reference:				
Reload Initialization	Reload Init Delay (exec. cycles): 2 Cur Rel Init Delay (exec. cycles): 0 Initialization Pending: OFF				

☐ Show Parameter Names

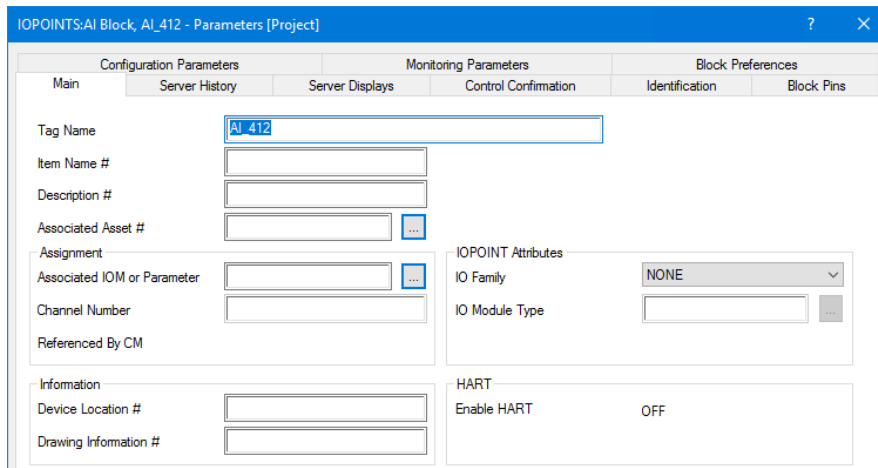
OK Cancel Help

3.5.1.2 New IO Point

- Right-click on "AI" in the "IOPOINTS" project library and select the menu "Instantiate":

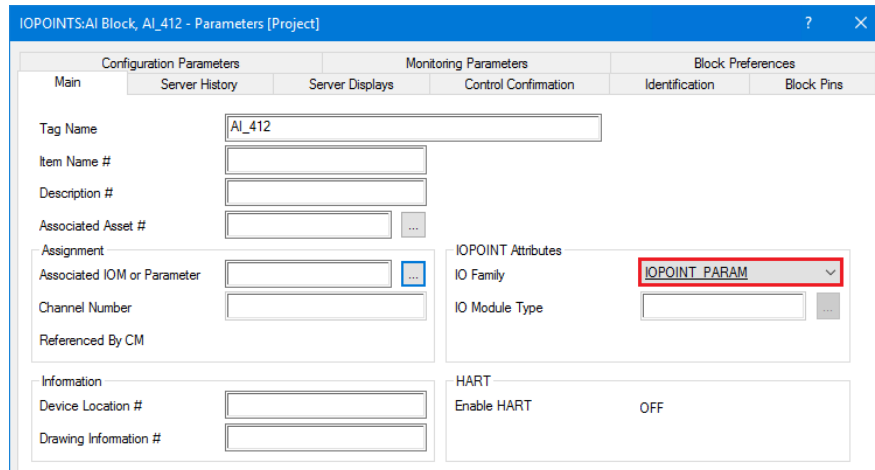


- This displays following window:



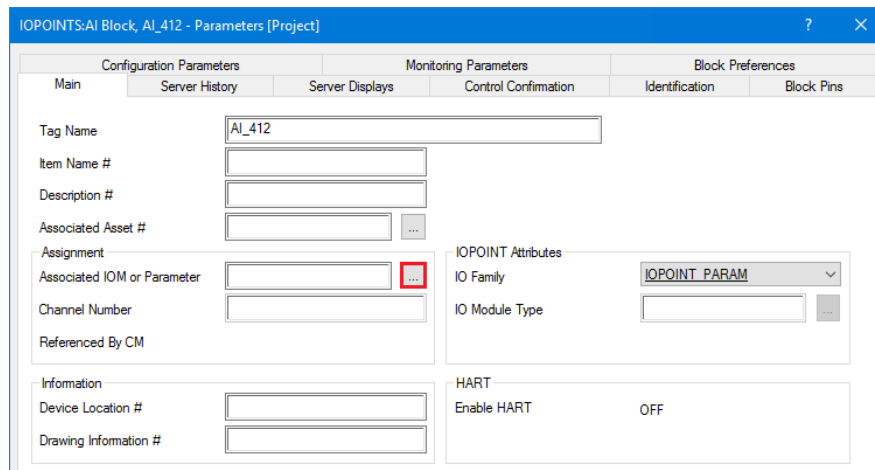
The screenshot shows the 'IOPOINTS:AI Block, AI_412 - Parameters [Project]' window. The window has tabs for 'Configuration Parameters', 'Monitoring Parameters', and 'Block Preferences'. The 'Configuration Parameters' tab is active, showing fields for 'Tag Name' (AI_412), 'Item Name #', 'Description #', 'Associated Asset #', 'Assignment', 'Associated IOM or Parameter', 'Channel Number', 'Referenced By CM', 'Information', 'Device Location #', and 'Drawing Information #'. The 'IOPOINT Attributes' section shows 'IO Family' set to 'NONE' and 'IO Module Type' set to an empty field. The 'HART' section shows 'Enable HART' set to 'OFF'.

- Select the IOPOINT Attributes “IOPOINT_PARAM”:



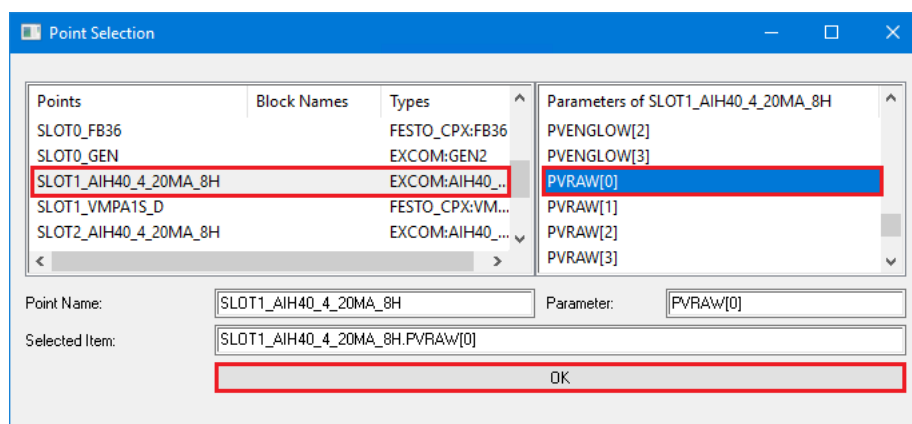
The screenshot shows the 'IOPOINTS:AI Block, AI_412 - Parameters [Project]' window. The 'IOPOINT Attributes' section is highlighted with a red box, showing 'IO Family' set to 'IOPOINT_PARAM'.

- Click on the shortcut button “Associated IOM or Parameter”:



The screenshot shows the 'IOPOINTS:AI Block, AI_412 - Parameters [Project]' window. The 'Associated IOM or Parameter' button is highlighted with a red box.

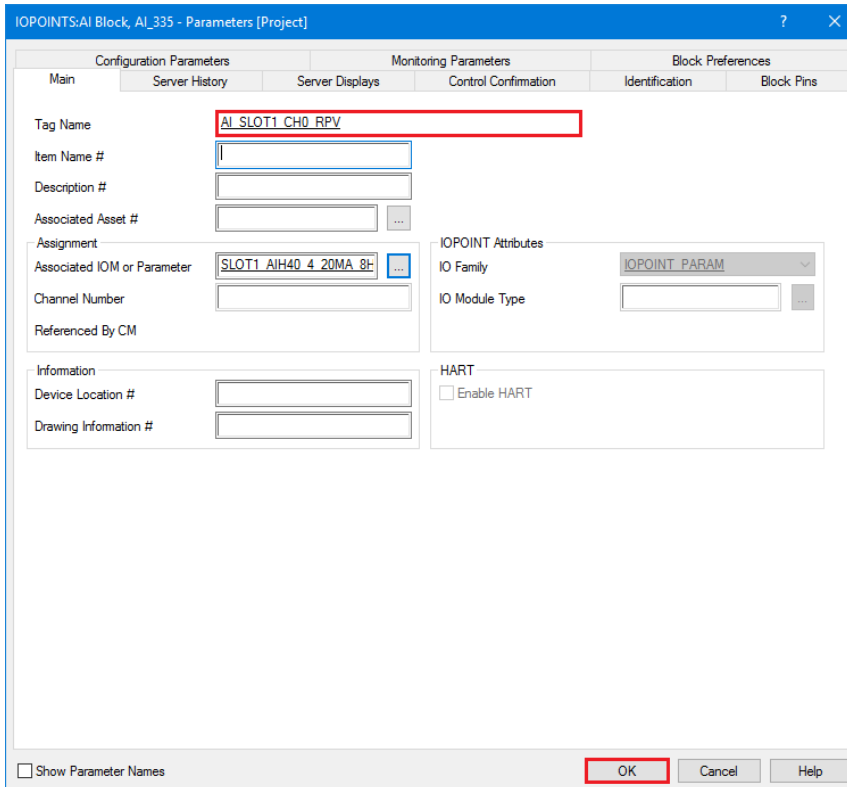
- Select the Point Name and then the Parameter.



The screenshot shows the 'Point Selection' dialog box. The 'Points' list shows 'SLOT1_AIH40_4_20MA_8H' selected. The 'Parameters of SLOT1_AIH40_4_20MA_8H' list shows 'PVRW[0]' selected. The 'Point Name' field is 'SLOT1_AIH40_4_20MA_8H' and the 'Parameter' field is 'PVRW[0]'. The 'Selected Item' field is 'SLOT1_AIH40_4_20MA_8H.PVRW[0]'. The 'OK' button is highlighted with a red box.

In this example, the selected parameter is the Ch0 Raw Process value (“PVRW[0]”) of the first Excom Analog Input value.

- Click on the button "OK".
- Rename the Tag Name as well and click on the button "OK":



IOPOINTS:AI Block, AI_335 - Parameters [Project]

Configuration Parameters | Monitoring Parameters | Block Preferences

Main | Server History | Server Displays | Control Confirmation | Identification | Block Pins

Tag Name: **AI_SLOT1_CH0_RPV**

Item Name #:

Description #:

Associated Asset #:

Assignment

Associated IOM or Parameter: **SLOT1 AIH40_4_20MA_8H**

Channel Number:

Referenced By CM:

IOPOINT Attributes

IO Family: **IOPOINT_PARAM**

IO Module Type:

Information

Device Location #:

Drawing Information #:

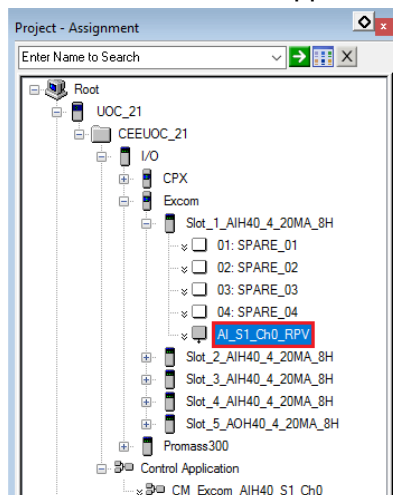
HART

☐ Enable HART

☐ Show Parameter Names

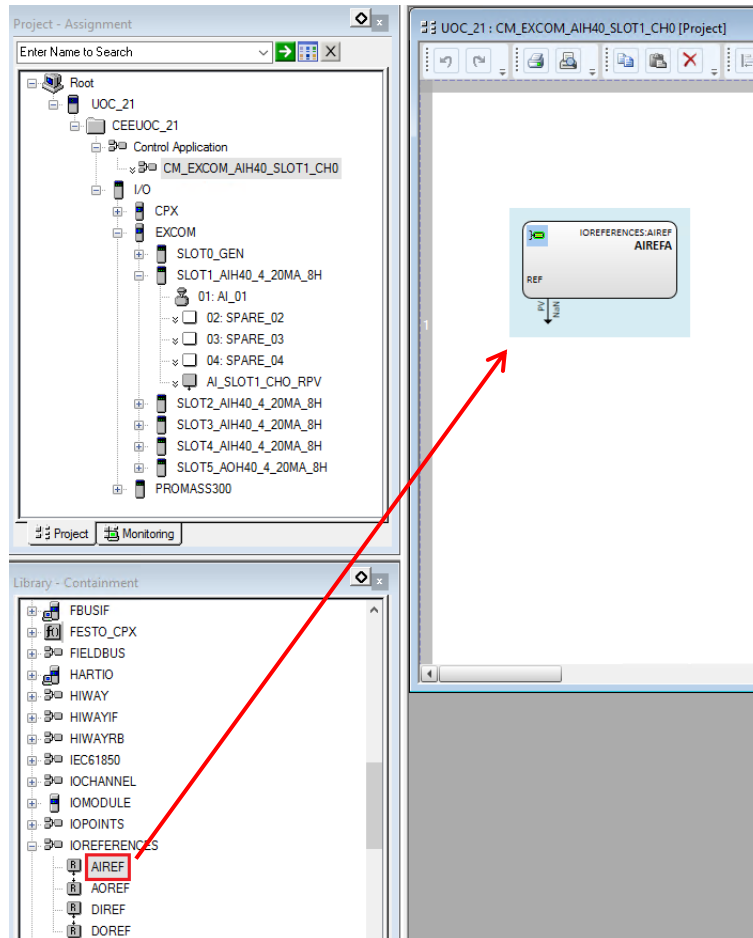
OK Cancel Help

- The created IOPOINT appears under the defined allocation:

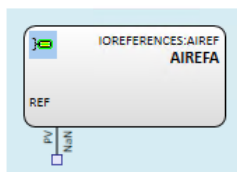


3.5.1.3 IO Point Assignment

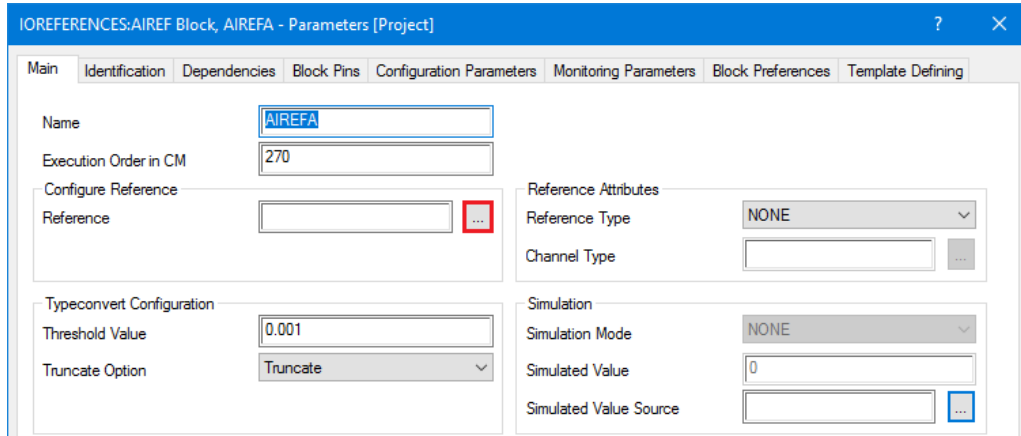
- Open the Control Module "CM_Excom_AIH40_SLOT1_Ch0", then Drag and drop the AIREF component from the IOREFERENCES library:



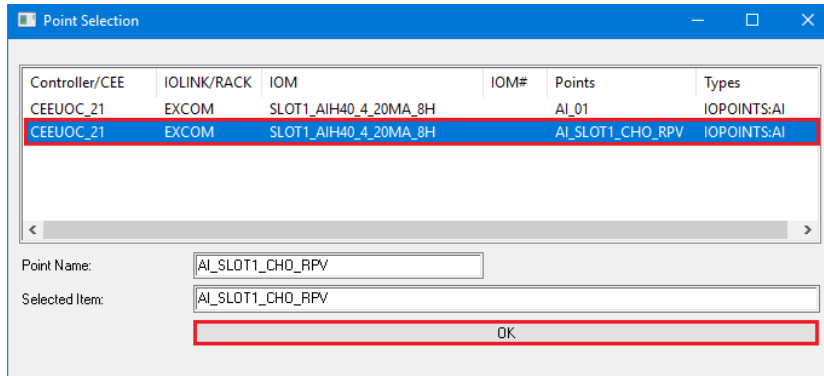
- Double-click on the AIREFA function block:



- Click on the shortcut button "Reference":



- Select the IOPOINT created previously and click on the button "OK":



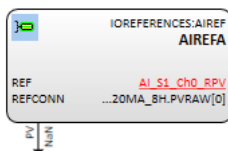
Controller/CEE	IOLINK/RACK	IOM	IOM#	Points	Types
CEEUOC_21	EXCOM	SLOT1_AIH40_4_20MA_8H		AI_01	IOPOINTS:AI
CEEUOC_21	EXCOM	SLOT1_AIH40_4_20MA_8H		AI_SLOT1_CHO_RPV	IOPOINTS:AI

Point Name:

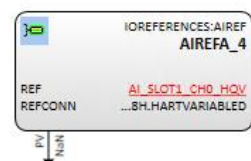
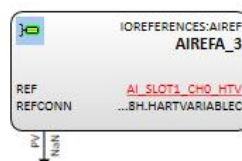
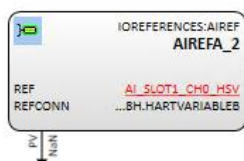
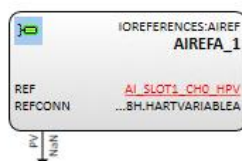
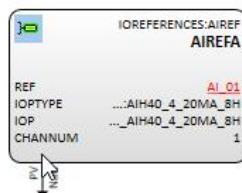
Selected Item:

- Reference is assigned. Click on the button "OK":

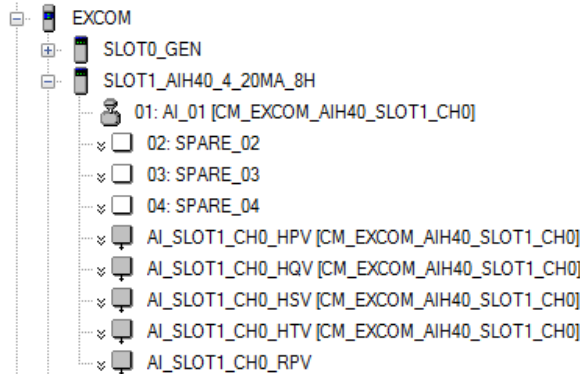
- The analog input function block is now configured for the current value of EXCOM SLOT1 CHO card:



- Proceed as well for other relevant device data:



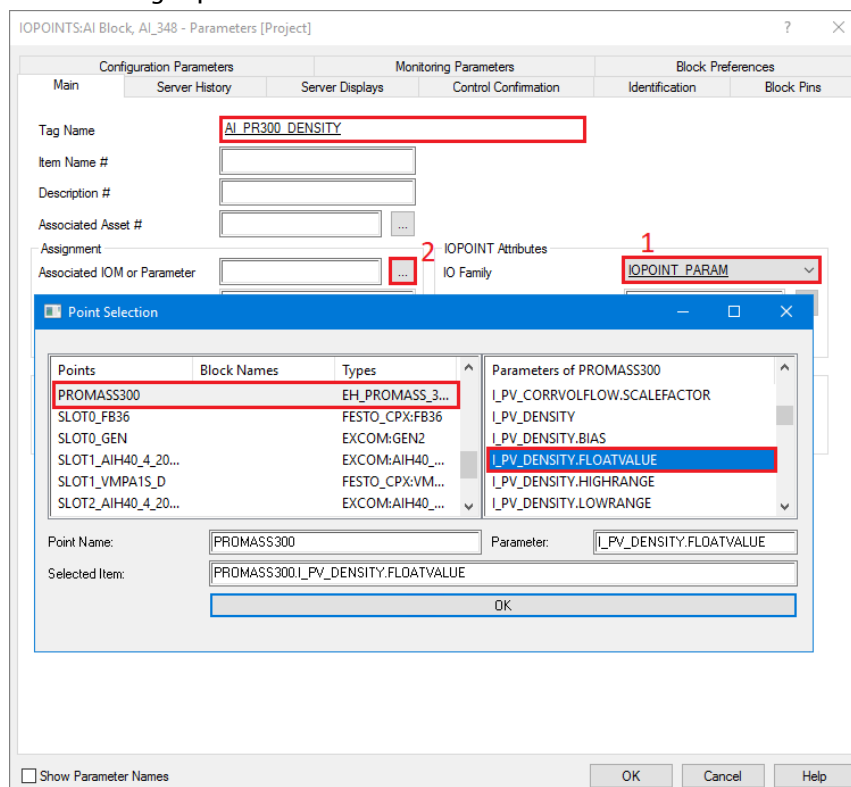
- In this example, four additional AI IOPOINTS have been created for the EXCOM SLOT1 Channel0 card and mapped to an AIREF IOREFERENCE block:



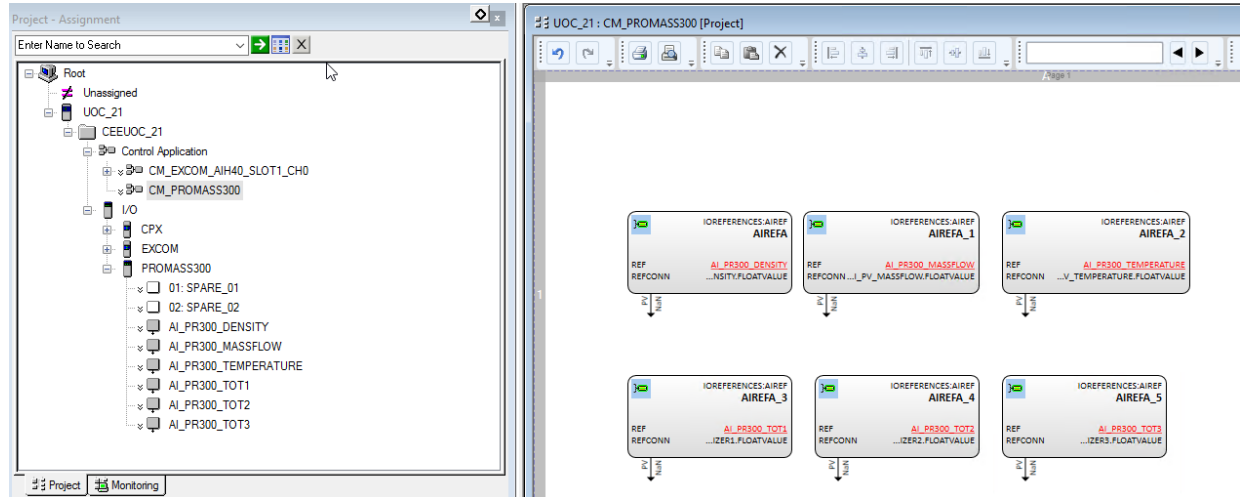
- Control module must be closed to create the AI IOPOINTS.

Remark

- The method is the same to map analog inputs values from other devices as for example the Promass300 EtherNet/IP, ie create an Instance of an "AI", assign the IO point parameter and link it to an analog input reference:



- In following example, a new Control Module for the Promass300 (CM_PROMASS300) has been created, in which are mapped Density, Mass flow, Temperature and totalizers process values:

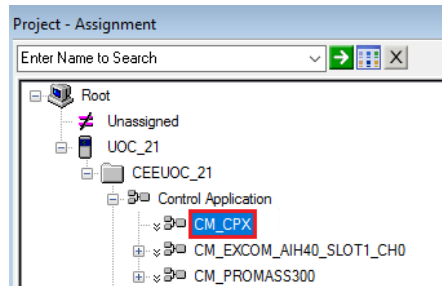


3.5.2 Digital Output Function Block Configuration

This chapter explains how assign digital output function blocks.

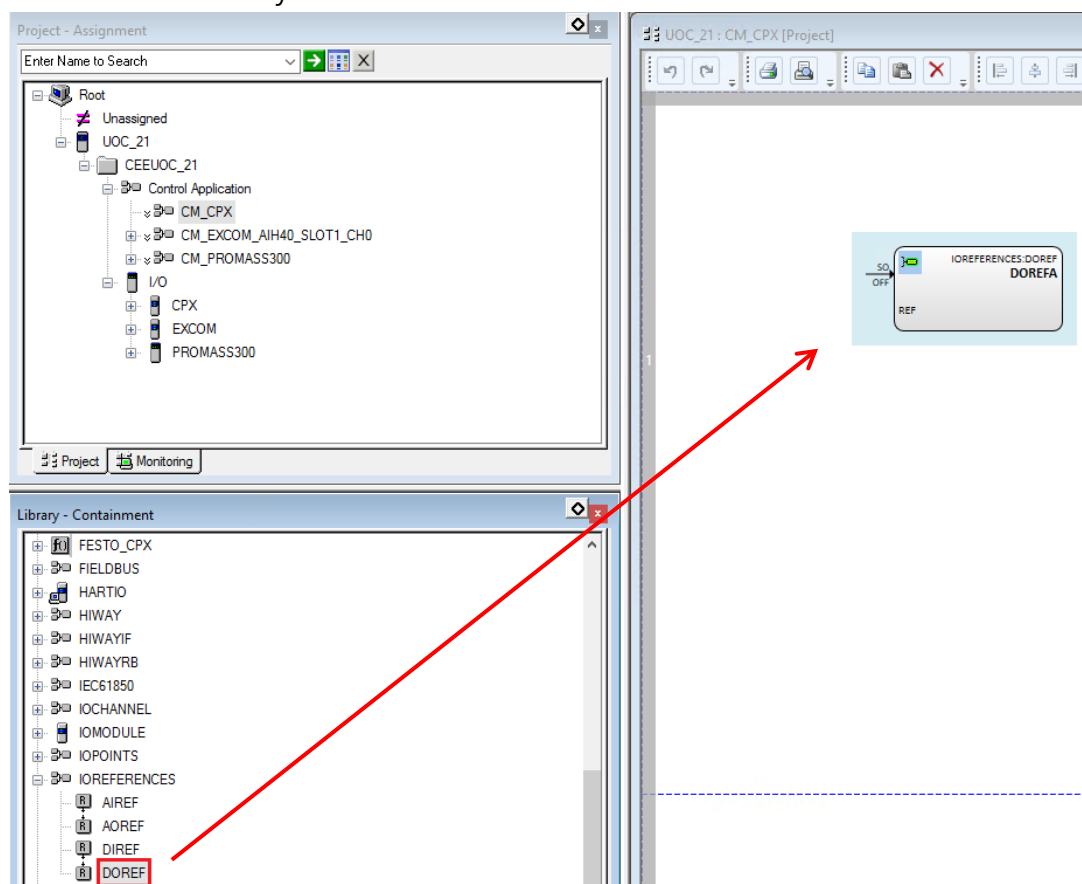
3.5.2.1 New Control Module

- Create a new Control Module for the CPX Valve Island as done in chapter 3.5.1.1:



3.5.2.2 IO Point Assignment

- Open the Control Module "CM_CPX", then Drag and drop the DOREF component from the IOREFERENCES library:



- Double-click on the DO function block:



- Select the Reference Type "IOPOINT_PARAM":

IOREFERENCES:DOREF Block, DOREFA - Parameters [Project]

Main Identification Dependencies Block Pins Configuration Parameters Monitoring Parameters Block Preferences Template Defining

Name: DOREFA

Execution Order in CM: 40

Configure Reference

Reference: [] ...

Reference Attributes

Reference Type: **IOPOINT_PARAM** ▼

Channel Type: [] ...

Push Configuration

Threshold Value: 0.001

Truncate Option: Truncate ▼

☒ Output Store Enable

Input change deadband: 0.001

☐ Store on change Enable

Simulation

Simulation Mode: NONE ▼

- Click on the Reference parameter shortcut:

IOREFERENCES:DOREF Block, DOREFA - Parameters [Project]

Main Identification Dependencies Block Pins Configuration Parameters Monitoring Parameters Block Preferences Template Defining

Name: DOREFA

Execution Order in CM: 40

Configure Reference

Reference: [] ...

Reference Attributes

Reference Type: IOPOINT_PARAM ▼

Channel Type: [] ...

Push Configuration

Threshold Value: 0.001

Truncate Option: Truncate ▼

☒ Output Store Enable

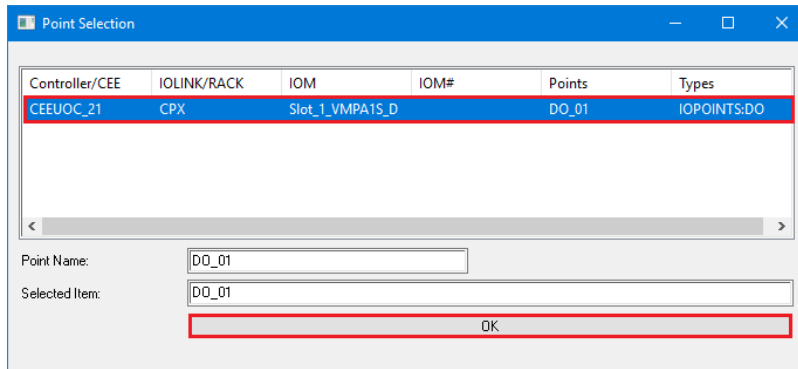
Input change deadband: 0.001

☐ Store on change Enable

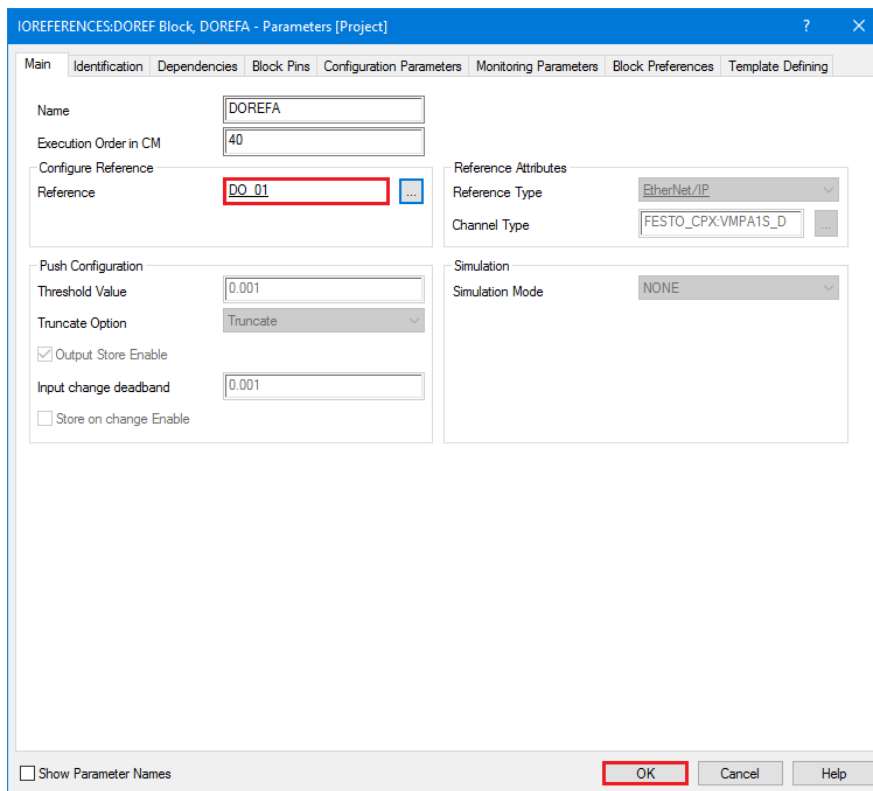
Simulation

Simulation Mode: NONE ▼

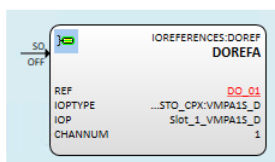
- Select the Digital Output DO_01:



- Reference is set. Click on the button "OK":

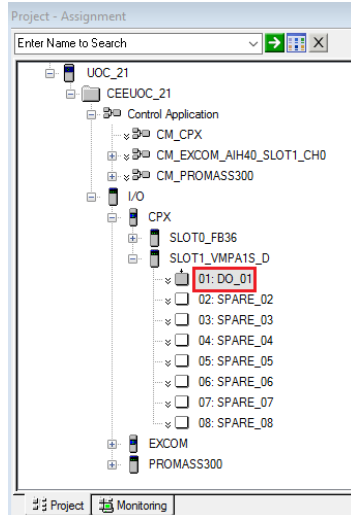


- DO reference block is configured:

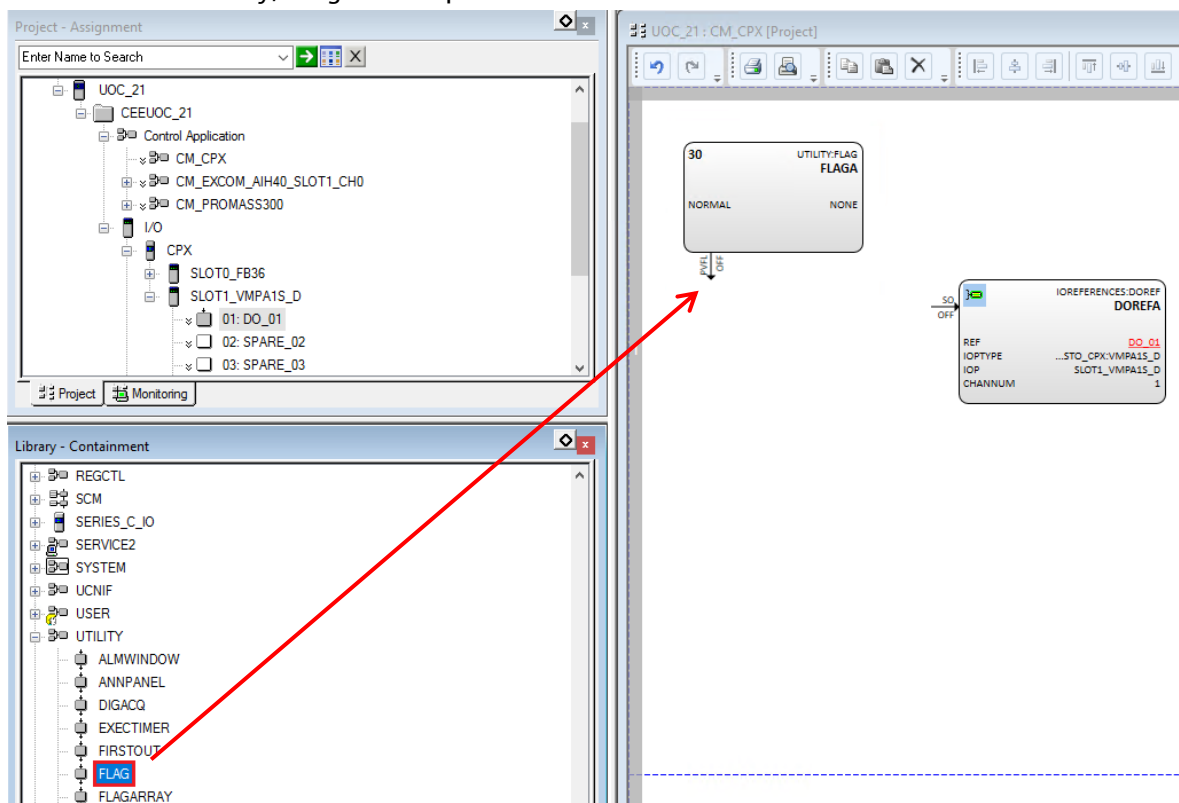


Remark:

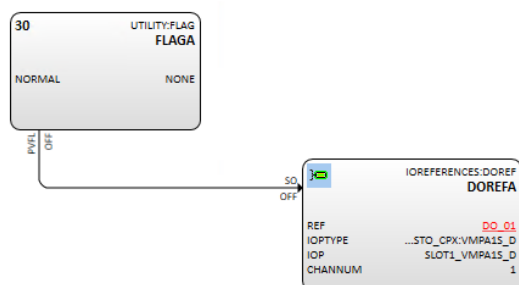
- The Reference "DO_01" has been configured in chapter 3.4.1.2.3:



- In the UTILITY library, drag and drop the function block "FLAG":



- Connect both function blocks:



3.5.3 Control Strategy Download

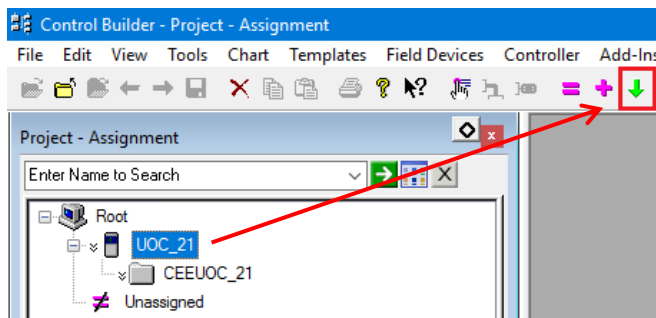
- Please refer to chapter 3.6.2 for the Control Module Download.

3.6 Commissioning of the Control Project

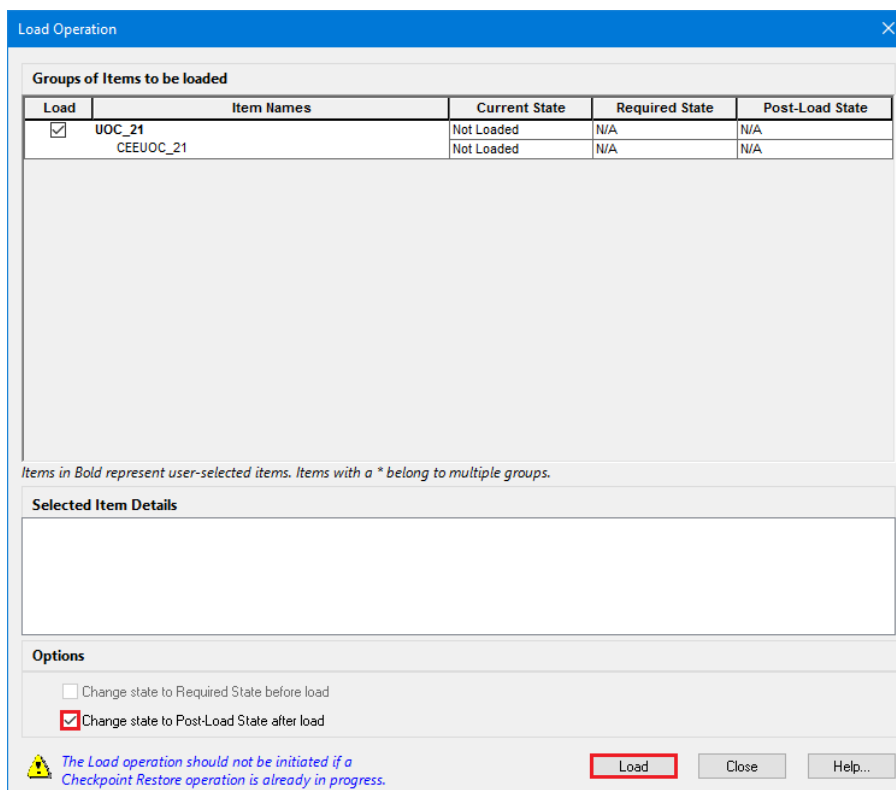
3.6.1 Configuration Download

3.6.1.1 UOC system

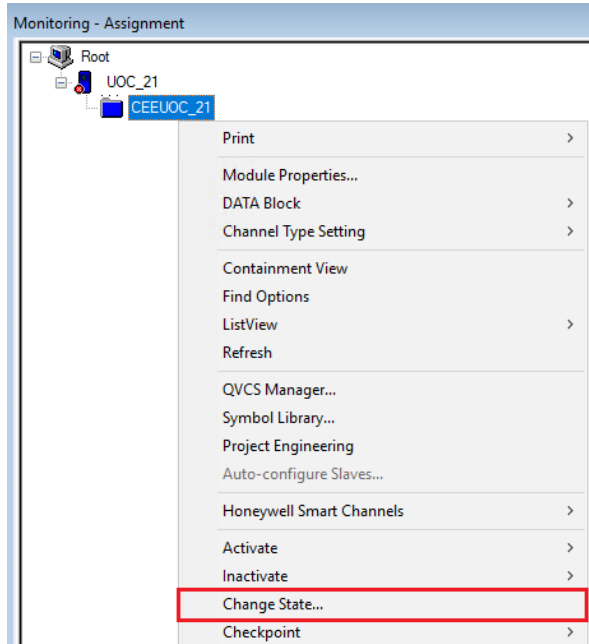
- In the project assignment view, select the UOC system and click on the shortcut button "Load" in the tool bar menu:



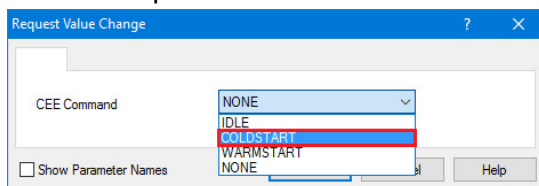
- This opens the "Load Operation" window. Select the option "Change state to Post-Load State after load" and click on the button "Load":



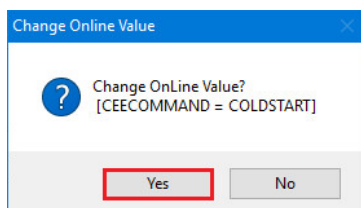
- Download is successful. Right-click on "CEEUOC_21" and click on "Change State...":



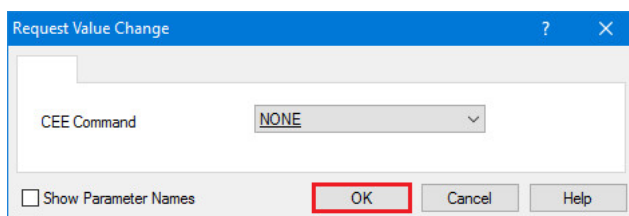
- Select the option "COLD START":



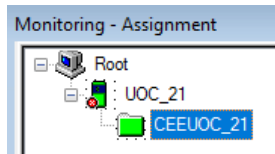
- Click on the button "Yes":



- Click on the button "OK" to close the window:

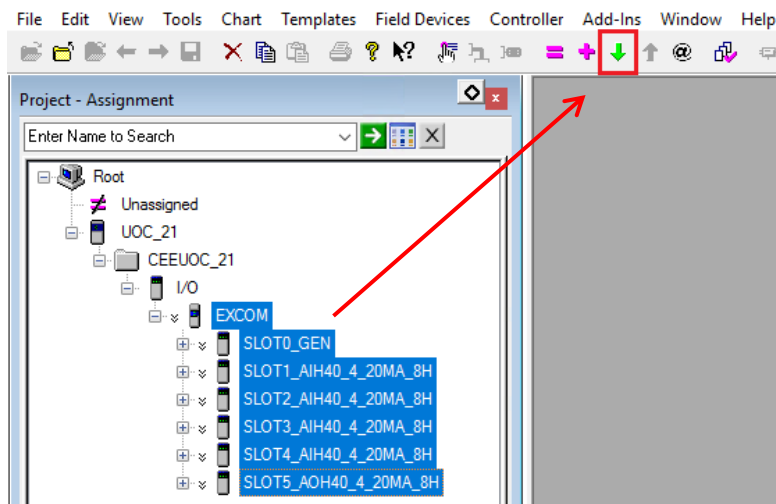


- UOC system is now activated:

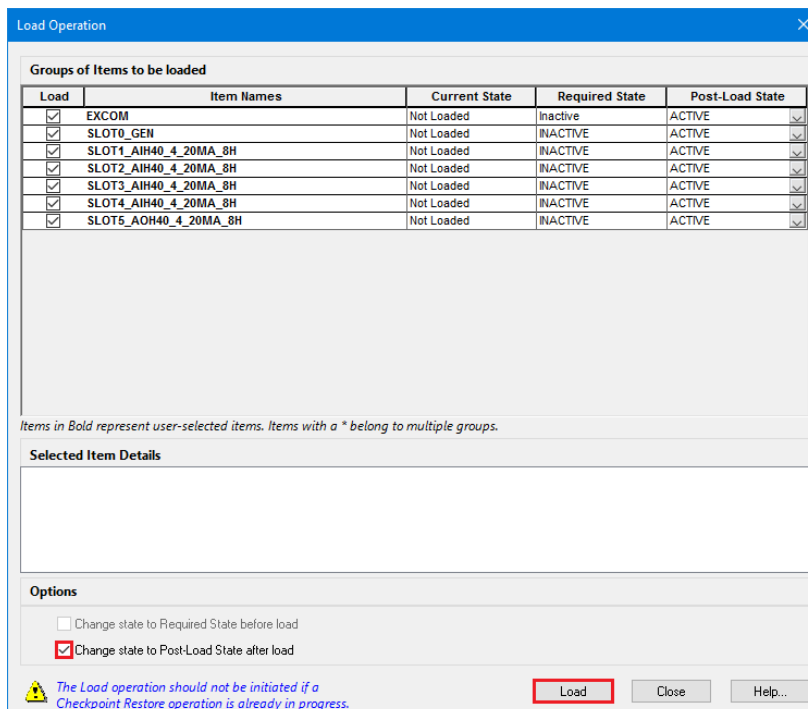


3.6.1.2 Excom Remote I/O

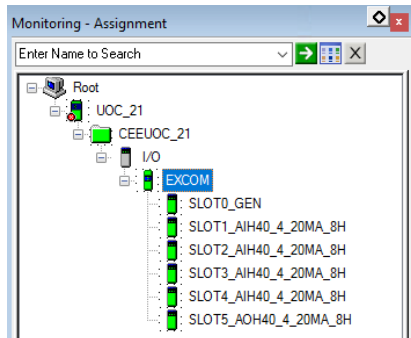
- In the project assignment view, select the Excom RemoteI/O and click on the shortcut button "Load" in the tool bar menu:



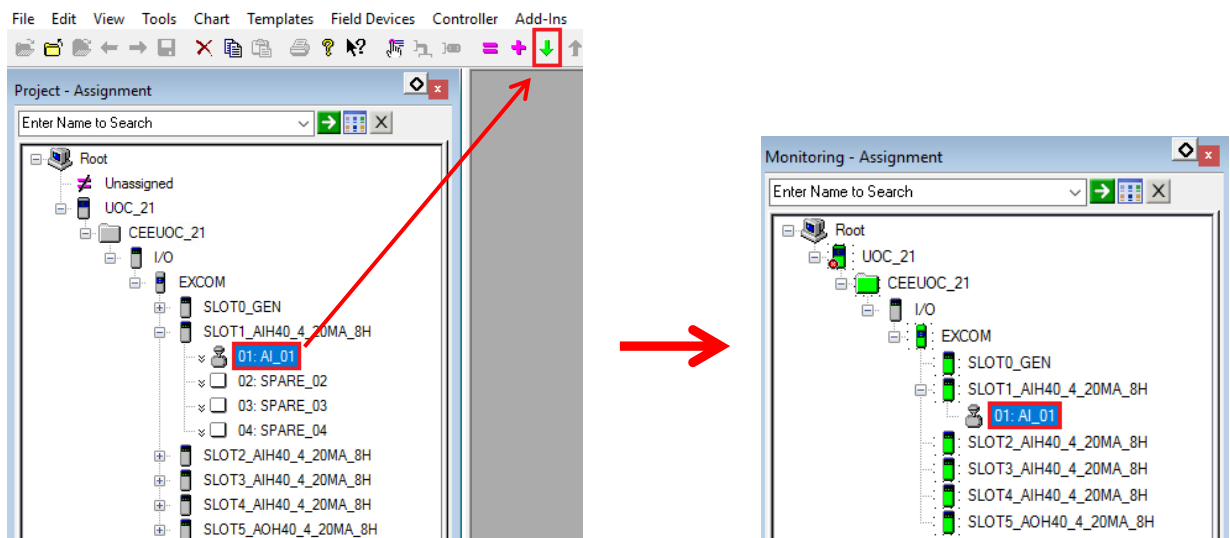
- This opens the "Load Operation" window. Select the option "Change state to Post-Load State after load" and click on the button "Load":



- Excom Remote I/O is now activated:

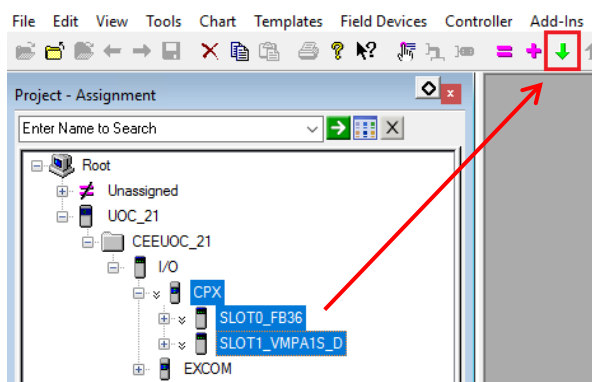


- The defined channel has still not been downloaded. Select the channel and download it:



3.6.1.3 CPX Valve Island

- In the project assignment view, select the CPX valve island and click on the shortcut button "Load" in the tool bar menu:



- This opens the "Load Operation" window. Select the option "Change state to Post-Load State after load" and click on the button "Load":

Load Operation

Groups of Items to be loaded

Load	Item Names	Current State	Required State	Post-Load State
<input checked="" type="checkbox"/>	CPX	Not Loaded	Inactive	ACTIVE
<input checked="" type="checkbox"/>	SLOT0_FB36	Not Loaded	INACTIVE	ACTIVE
<input checked="" type="checkbox"/>	SLOT1_VMPA1S_D	Not Loaded	INACTIVE	ACTIVE

Items in Bold represent user-selected items. Items with a * belong to multiple groups.

Selected Item Details

Options

☐ Change state to Required State before load
☒ Change state to Post-Load State after load

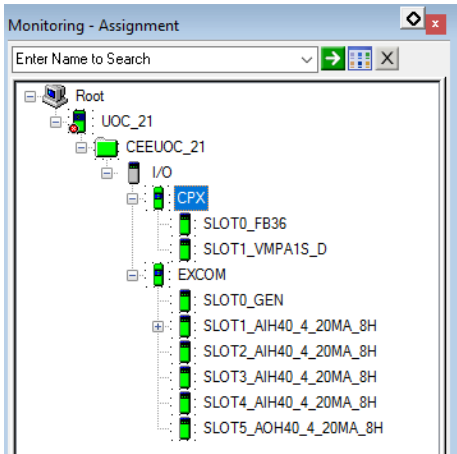
The Load operation should not be initiated if a Checkpoint Restore operation is already in progress.

Load

Close

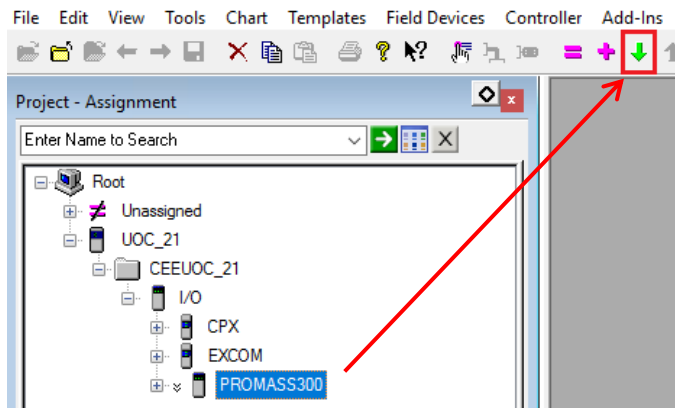
Help...

- Festo CPX is now activated:

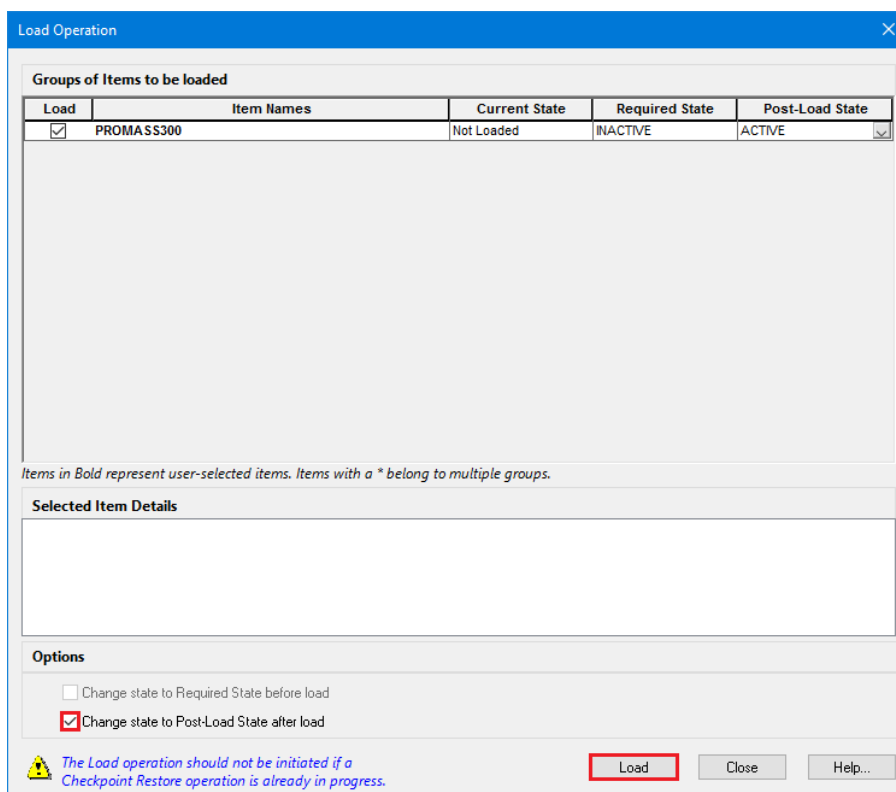


3.6.1.4 Promass300 Flowmeter

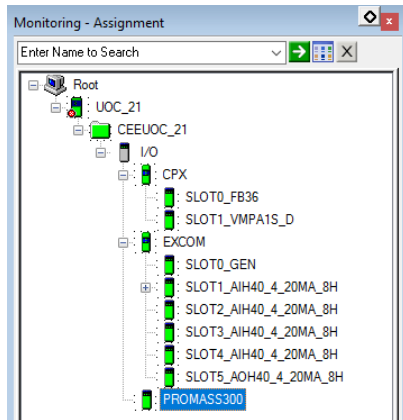
- In the project assignment view, select the UOC system and click on the shortcut button "Load" in the tool bar menu:



- This opens the "Load Operation" window. Select the option "Change state to Post-Load State after load" and click on the button "Load":

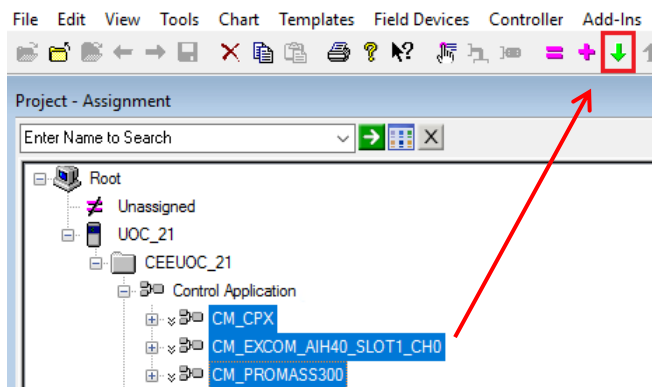


- Promass300 Flowmeter is now activated:

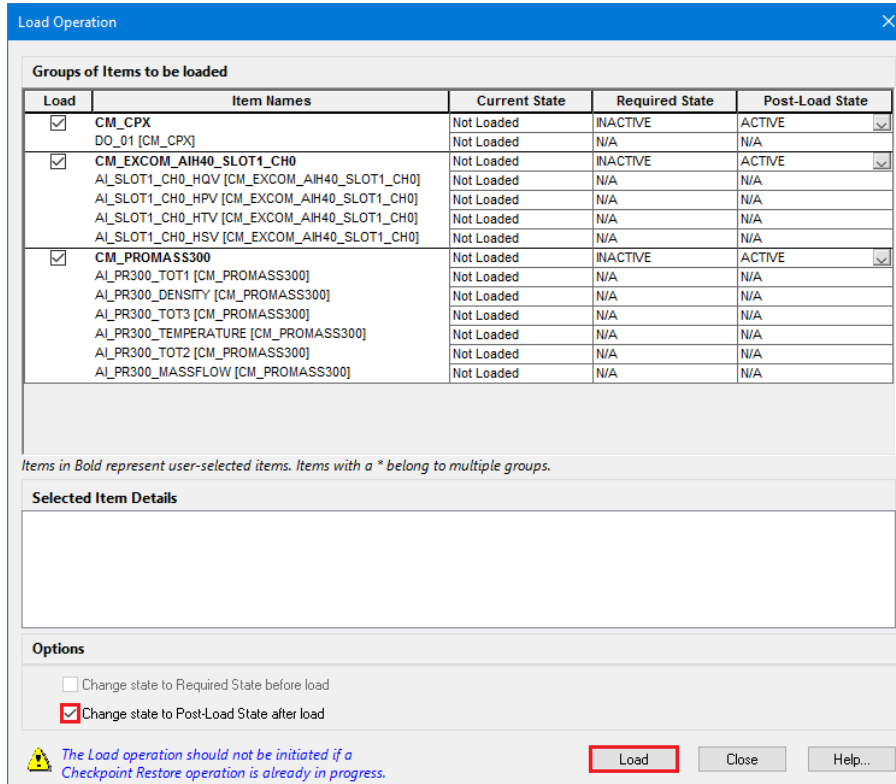


3.6.2 Control Module Download

- Select all created Control modules and click on the button "Download":



- This opens the "Load Operation" window. Select the option "Change state to Post-Load State after load" and click on the button "Load":



The "Load Operation" window displays a table of items to be loaded. The table has five columns: Load, Item Names, Current State, Required State, and Post-Load State. The items are grouped into three categories: CM_CPX, CM_EXCOM_AIH40_SLOT1_CH0, and CM_PROMASS300. The "Load" column has checkboxes for each group. The "Current State" column shows "Not Loaded" for all items. The "Required State" column shows "INACTIVE" for the first group and "N/A" for the others. The "Post-Load State" column shows "ACTIVE" for the first group and "N/A" for the others. Below the table, there is a section for "Selected Item Details" and an "Options" section with two checkboxes: "Change state to Required State before load" (unchecked) and "Change state to Post-Load State after load" (checked). At the bottom, there is a warning message and three buttons: "Load", "Close", and "Help...".

Load	Item Names	Current State	Required State	Post-Load State
<input checked="" type="checkbox"/>	CM_CPX DO_01 [CM_CPX]	Not Loaded	INACTIVE	ACTIVE
<input checked="" type="checkbox"/>	CM_EXCOM_AIH40_SLOT1_CH0 AI_SLOT1_CH0_HQV [CM_EXCOM_AIH40_SLOT1_CH0] AI_SLOT1_CH0_HPQ [CM_EXCOM_AIH40_SLOT1_CH0] AI_SLOT1_CH0_HTV [CM_EXCOM_AIH40_SLOT1_CH0] AI_SLOT1_CH0_HSV [CM_EXCOM_AIH40_SLOT1_CH0]	Not Loaded	INACTIVE	ACTIVE
<input checked="" type="checkbox"/>	CM_PROMASS300 AI_PR300_TOT1 [CM_PROMASS300] AI_PR300_DENSITY [CM_PROMASS300] AI_PR300_TOT3 [CM_PROMASS300] AI_PR300_TEMPERATURE [CM_PROMASS300] AI_PR300_TOT2 [CM_PROMASS300] AI_PR300_MASSFLOW [CM_PROMASS300]	Not Loaded	INACTIVE	ACTIVE


Items in Bold represent user-selected items. Items with a * belong to multiple groups.

Selected Item Details

Options

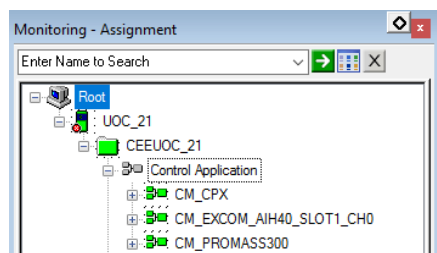
☐ Change state to Required State before load

☒ Change state to Post-Load State after load

 The Load operation should not be initiated if a Checkpoint Restore operation is already in progress.

Load **Close** **Help...**

- Control Modules have been successfully loaded:

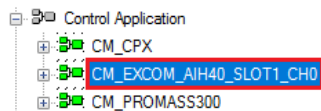


3.7 Monitoring of Process Values and Status Information

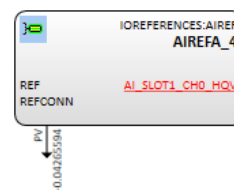
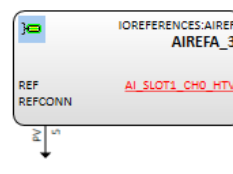
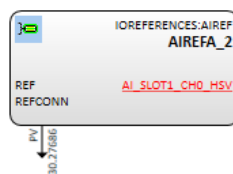
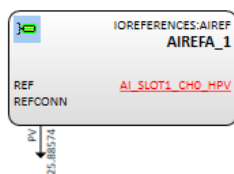
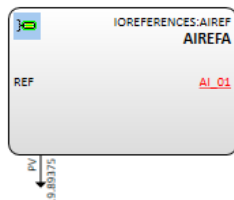
3.7.1 Control Strategy Online Values

3.7.1.1 Remote I/O Analog Input Module HART AIH40

- Double-click on the Control Module "CM_EXCOM_AIH40_SLOT1_CH0":

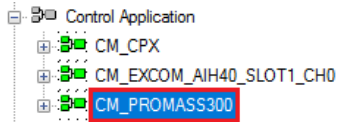


- Configured analog input process values of the AIH40 card are displayed:

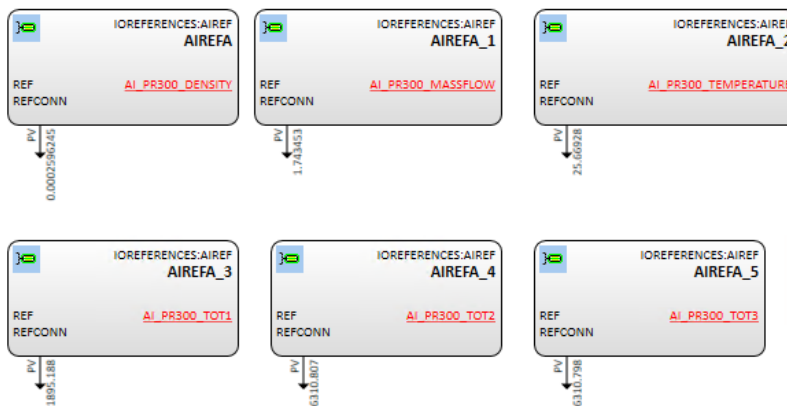


3.7.1.2 Promass300 Flowmeter

- Double-click on the Control Module "CM_Promass300":

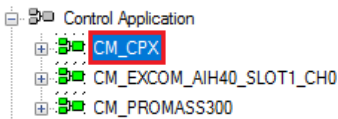


- Configured analog input process values of the AIH40 card are displayed:

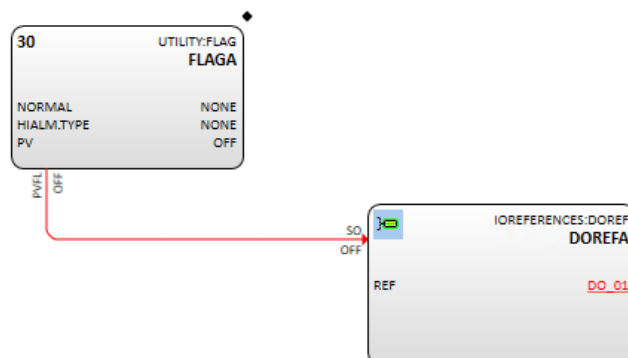


3.7.1.3 CPX Valve Island

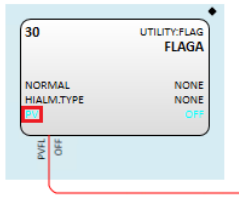
- Double-click on the Control Module "CM_EXCOM_AI40_SLOT1_CH0":



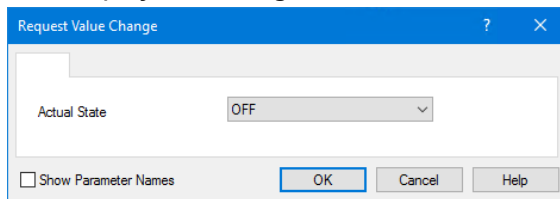
- Configured digital output process values of the valve island card are displayed:



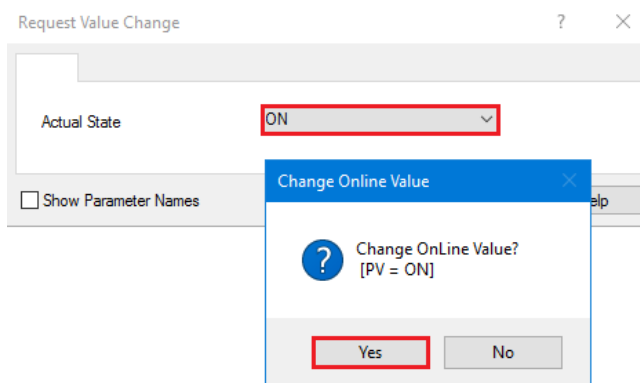
- Double-click on the parameter PV:



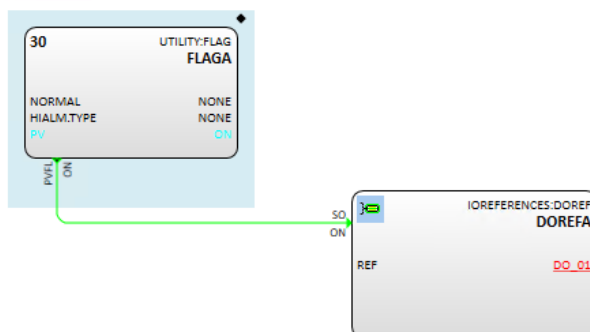
- This displays following window:



- Select the Actual State "ON" and click on the button "Yes":



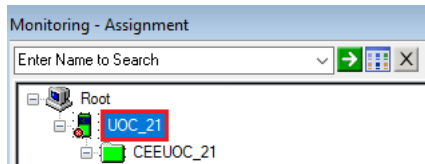
- Digital Output is now active:



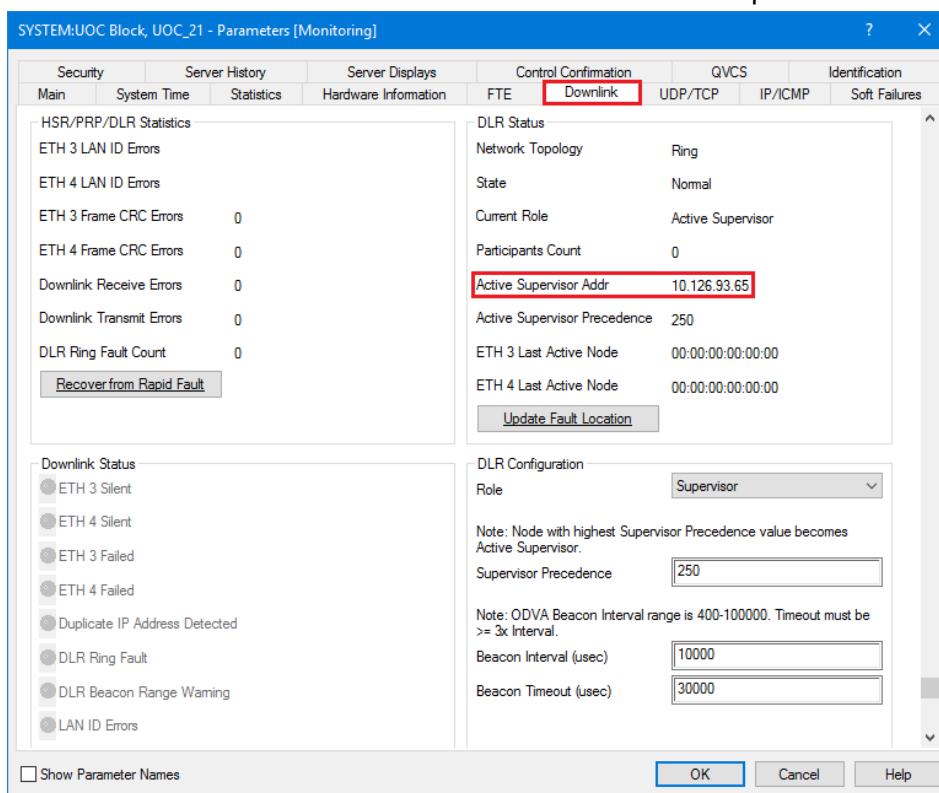
3.7.2 Online Monitoring Values

3.7.2.1 Supervisor Mode

- In the Project Assignment monitoring view, double-click on the UOC system "UOC_21":



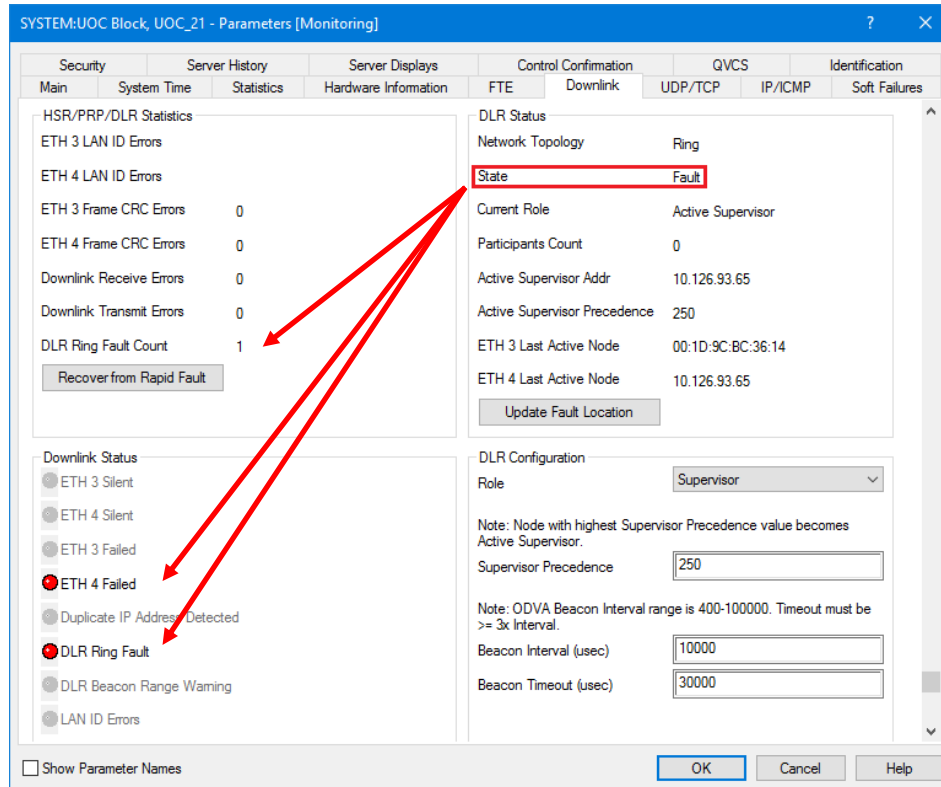
- Select the tab "Downlink" and scroll down to the DLR status part:



In this example, we can see that the active supervisor has the IP address 10.26.93.65, which corresponds to the UOC system Downlink IP address.

Remark

- DLR and Downlink Status are displayed in case of any issues

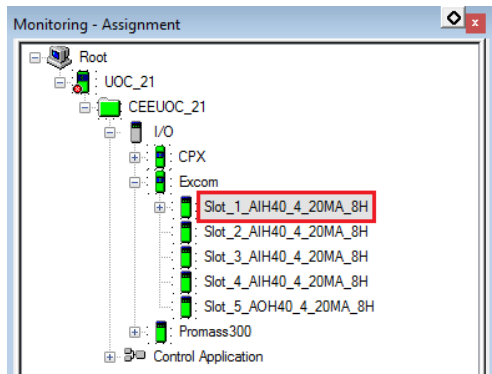


In this example, the ETH4 port has been disconnected from the UOC system, which simulates a failure. As a consequence:

- The counter "DLR Ring Fault Count" is incremented.
- The Downlink Status "ETH4 Failed" is enabled.
- The Downlink Status "DLR Ring Fault" is enabled.

3.7.2.2 TrustSens HART TM371

- Double-click on "Slot1_AI40_4_20MA_8H":



- AIH40 Slot 1 analog input card are displayed in the tab Data/Status":

EXCOM:AIH40_4_20MA_8H Block, SLOT1_AI40_4_20MA_8H - Parameters [Monitoring]

Server Displays		Control Confirmation		QVCS		Identification	
Main	Channel Configuration	Data/Status	Alarms	Advanced Configuration / Statistics	Server History		
Data/Status							
	PV Raw Value	Process Value	Err. field processor	Wire break	Short circuit		
0	14398	19.99375	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
1	8028	0.0875	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
2	23342	47.94375	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
3	35278	85.24375	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

HART Variables	
HART variable 1	25.85431
HART variable 2	30.25732
HART variable 3	5
HART variable 4	-0.04265594
HART variable 5	NaN
HART variable 6	NaN
HART variable 7	NaN
HART variable 8	NaN

Configured HART variables on AIH40 Slot 1

☐ Show Parameter Names

OK Cancel Help

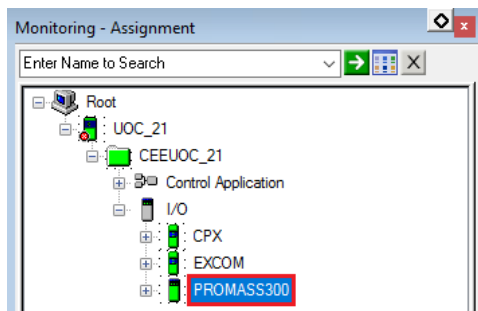
- In this example, Channel PV Raw value 14398 is the TrustSens PV raw value (4mA→0 and 20mA→40000), which corresponds to 19.99%(4mA→0% and 20mA→100%).
- HART variable 1 corresponds to the TrustSens Temperature measurement
- HART variable 2 corresponds to the TrustSens Device temperature
- HART variable 3 corresponds to the TrustSens number of self-calibrations
- HART variable 4 corresponds to the TrustSens deviation value

Remark

- Slot1 AIH40 card channel 0 HART data PV, SV, TV and QV have been previously configured in chapter 3.3.2.3.

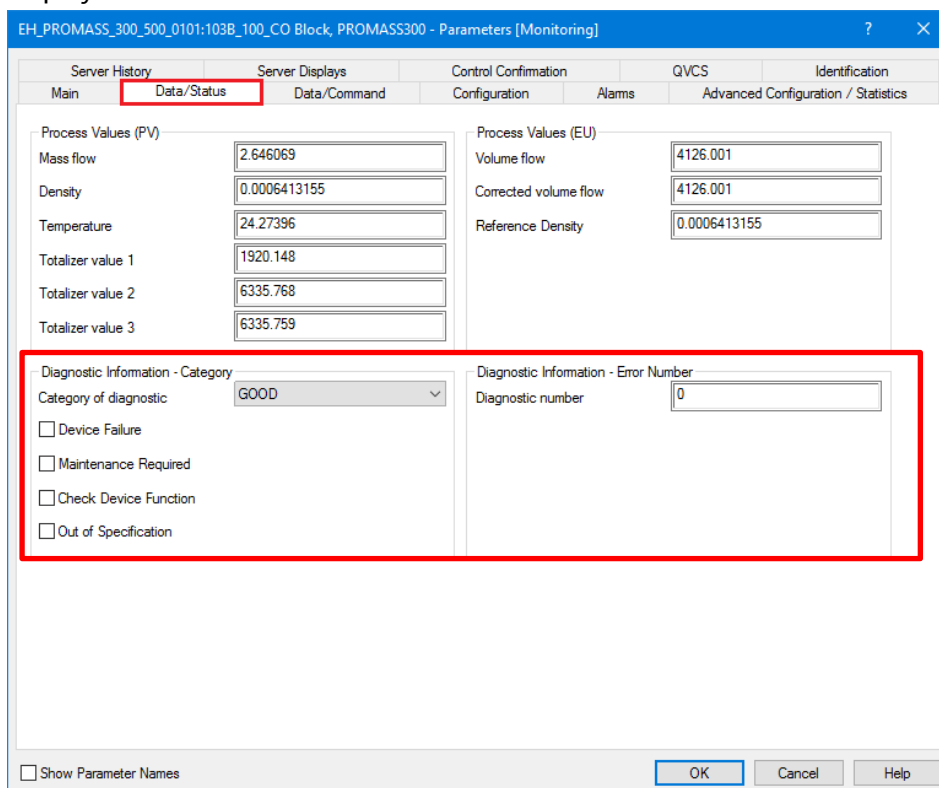
3.7.2.3 Promass300 Flowmeter

- Double-click on the Control Module "CM_Promass300":



3.7.2.3.1 Data/Status

- Click on the tab "Data/Status", online values of the connection "FixIn+Output+Config" are displayed:



NAMUR NE107 status and device Diagnostic number are displayed as well.

3.7.2.3.2 Data/Command

- Click on the tab "Data/Command", online values of the connection "FixIn+Output+Config" are displayed:

- The Data/Command window contains default values. These values correspond to parameters enumeration attributes. Please refer to the EDS file for further details. For example, the parameter "EU of external process pressure" has the value "4871":

EU of external process pressure

- In the EDS file (opened with EZ-Tool), select the parameter "Param21092" and click on the button "Enumerate". This displays the different values that can be configured for this parameter.

In this example, "4871" corresponds to the unit "bar".

3.7.2.3.3 Heartbeat Verification

- If the option is enabled in the field device, a Heartbeat verification can be performed from the Data/Command window with this connection type. Two parameters are required to start the verification: "Start Verification Activation" and "Start Verification (encoded)":

☒ Start verification Activation

☐ Liquid type Activation

☐ External pressure Activation

☐ SW correction value Activation

☐ Water cut Activation

☐ Flow override Activation

☐ Zero point adjustment control Activation

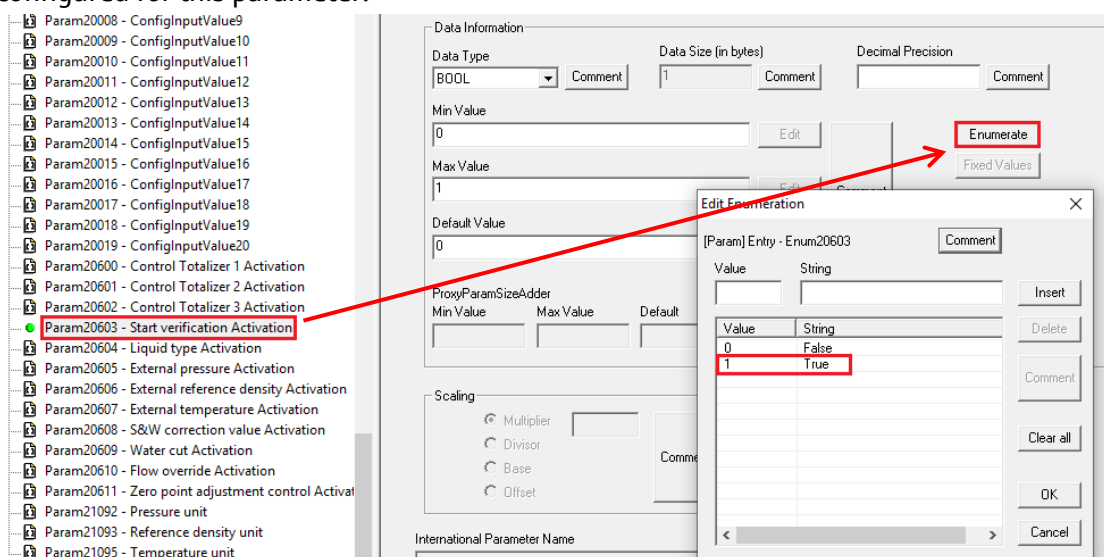
Start verification (encoded) -32713

Both parameters can be found in the EDS file.

- The parameter "Start Verification" is Param43 according to the EDS file:

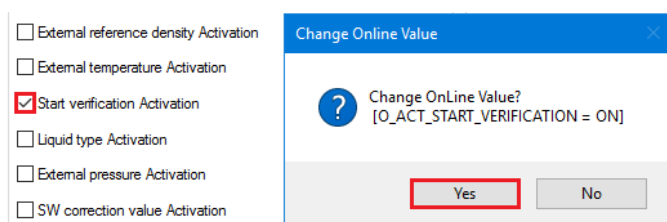
The screenshot displays the NI MAX software interface for configuring a parameter. On the left, a tree view lists various parameters, with 'Param43 - Perform.verific. - Start verific.' highlighted. The main window shows the 'Data Information' tab for this parameter. Key settings include 'Data Type' set to 'INT', 'Data Size' set to '2', and 'Decimal Precision' set to '0'. The 'Min Value' is '-32768' and the 'Max Value' is '32767'. The 'Default Value' is '32713'. The 'Enumerate' button is highlighted with a red box, and a red arrow points from the selected parameter in the left pane to this button. The 'Edit Enumeration' dialog box is open, showing a list of values and strings. The value '-32738' is selected, and the string 'Start' is entered in the 'String' column.

- Select the parameter "Param43" and click on the button "Enumerate". This displays the different values that can be configured for this parameter. The "Param43" value must set to "-32378".
- The trigger bit "Start verification activation" is the parameter "Param20603. Select the parameter "Param20603" and click on the button "Enumerate". This displays the different values that can be configured for this parameter:

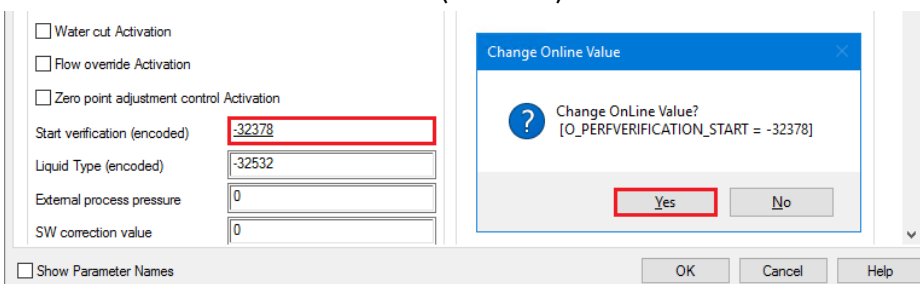


Steps to perform a Heartbeat verification from the Data/Command window

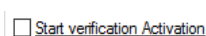
1. Set the bit "Start verification Activation" and click on the button "Yes":



2. Edit the variable "Start verification (encoded)" to the value "-32378" and click on "Yes":



3. Reset the bit "Start verification Activation":



- NAMUR status and diagnostic number are indicated in the Data/Status tab during the Heartbeat verification:

EH_PROMASS_300_500_0101:103B_100_CO Block, Promass300 - Parameters [Monitoring]

Server History	Server Displays	Control Confirmation	QVCS	Identification
Main	Data/Status	Configuration	Alarms	Advanced Configuration / Statistics

Process Values (PV)

Mass flow	0.4164821
Density	0.0008388062
Temperature	23.4173
Totalizer value 1	89.73127
Totalizer value 2	62.57828
Totalizer value 3	89.56999

Process Values (EU)

Volume flow	1782.263
Corrected volume flow	1782.263
Reference Density	0.0008388062

Diagnostic Information - Category

Category of diagnostic: MAINTENANCE

☐ Device Failure

☐ Maintenance Required

☒ Check Device Function

☐ Out of Specification

Diagnostic Information - Error Number

Diagnostic number: 302

The event 302 means "Device Verification active".

3.7.2.3.4 Totalizer Handling

- Totalizers can be controlled as well from the Data/Command window with the parameters "Control Totalizer X Activation" and "Control totalizer value X":

EH_PROMASS_300_500_0101:103B_100_CO Block, PROMASS300 - Parameters [Monitoring]

Server History	Server Displays	Control Confirmation	QVCS	Identification
Main	Data/Status	Data/Command	Alarms	Advanced Configuration / Statistics

Output Parameters and Commands

☐ Control Totalizer 1 Activation

☐ Control Totalizer 2 Activation

☐ Control Totalizer 3 Activation

Output Parameters and Commands

Control totalizer value 1 (encode): 0

Control totalizer value 2 (encode): 0

Control totalizer value 3 (encode): 0

Both parameters can be found in the EDS file.

- The parameter "Control Totalizer 1 Activation" is Param20600 according to the EDS file:

Param20014 - ConfigInputValue15

Param20015 - ConfigInputValue16

Param20016 - ConfigInputValue17

Param20017 - ConfigInputValue18

Param20018 - ConfigInputValue19

Param20019 - ConfigInputValue20

Param20600 - Control Totalizer 1 Activation

Param20601 - Control Totalizer 2 Activation

Param20602 - Control Totalizer 3 Activation

Param20603 - Start verification Activation

Param20604 - Liquid type Activation

Param20605 - External pressure Activation

Param20606 - External reference density Activation

Param20607 - External temperature Activation

Param20608 - S&W correction value Activation

Param20609 - Water cut Activation

Param20610 - Flow override Activation

Param20611 - Zero point adjustment control Activation

Param21092 - Pressure unit

Param21093 - Reference density unit

Param21095 - Temperature unit

Min Value: 0

Max Value: 1

Default Value: 0

ProxyParamSizeAdder

Min Value: Max Value: Default:

Scaling

☒ Multiplier

☐ Divisor

☐ Base

☐ Offset

Comment:

Edit Enumeration

[Param] Entry - Enum20600

Value String

0 False

1 True

Insert

Delete

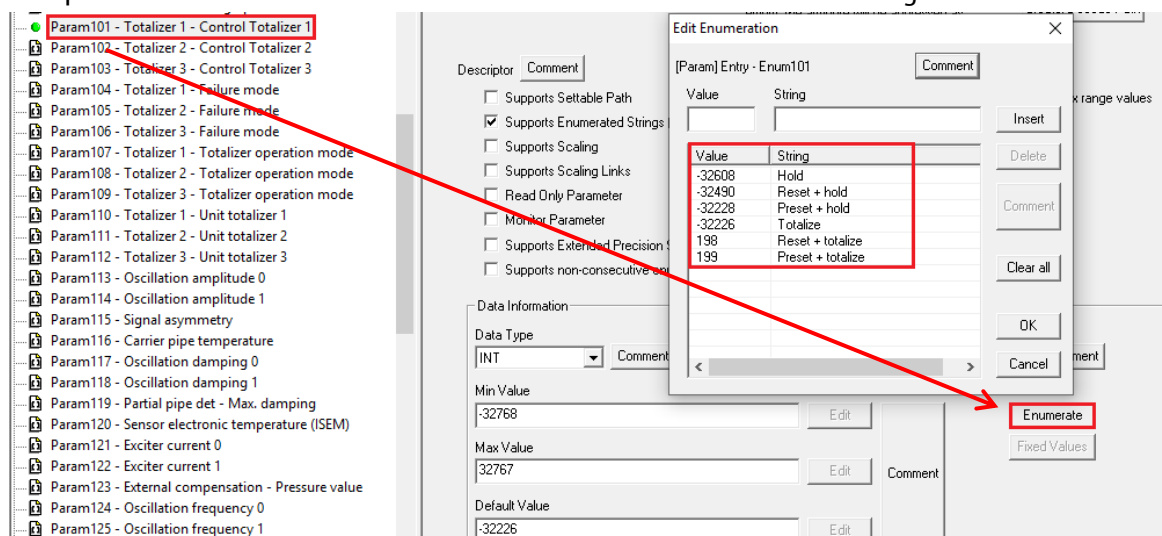
Comment

Clear all

OK

Cancel

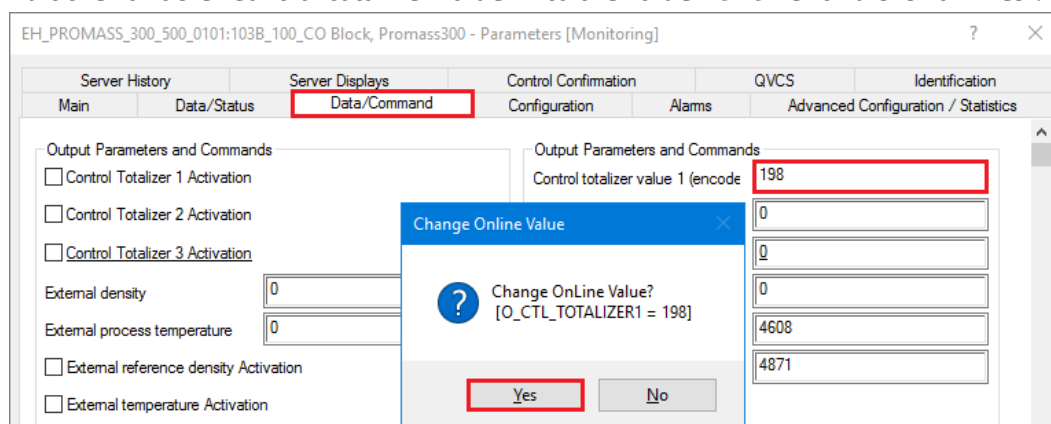
- The parameter "Control Totalizer 1 Activation" is Param20600 according to the EDS file:



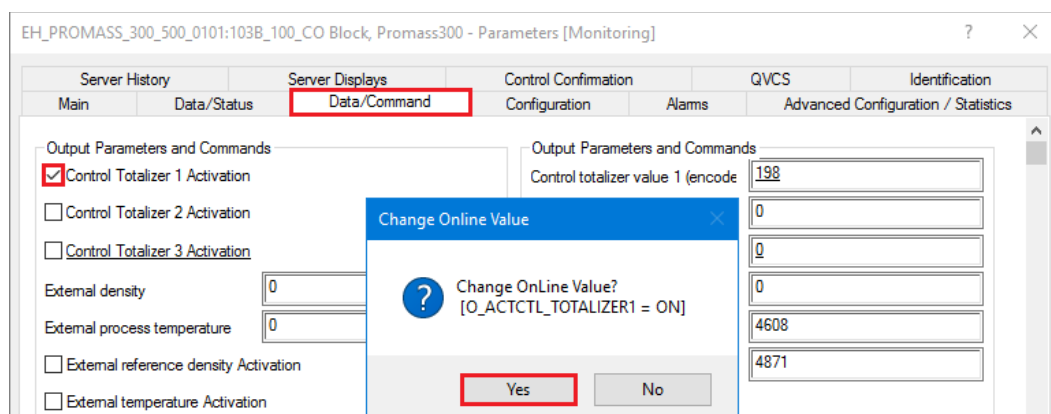
This parameter can be configured with six different values.

Steps to perform a totalizer "Reset+totalize" from the Data/Command window

- Edit the variable "Control totalizer value 1" to the value "-32378" and click on "Yes":



- Set the bit "Control Totalizer 1 Activation" and click on the button "Yes":



- Reset the bit "Start verification Activation":

☐ Control Totalizer 1 Activation

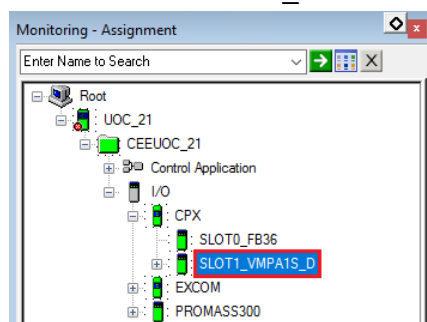
- Totalizer value has been reset and starts again to count:

EH_PROMASS_300_500_0101:103B_100_CO Block, Promass300 - Parameters [Monitoring] ?

Server History		Server Displays		Control Confirmation		QVCS		Identification	
Main	Data/Status	Data/Command	Configuration	Alarms	Advanced Configuration / Statistics				
Process Values (PV)									
Mass flow	11.001426								
Density	0.0008940811								
Temperature	23.43927								
Totalizer value 1	0.0007425206								
Totalizer value 2	67.50729								
Totalizer value 3	93.9698								
Process Values (EU)									
Volume flow	723.3735								
Corrected volume flow	723.3735								
Reference Density	0.0008940811								

3.7.2.4 CPX Valve Island

- Double-click on "Slot1_VMPA1S":



- Click on the tab Data/Status to display the current status of the solenoid module:

FESTO_CPX:VMPA1S_D Block, Slot_1_VMPA1S_D - Parameters [Monitoring] ? X

Server Displays		Control Confirmation		QVCS		Identification	
Main	Channel Configuration	Data/Status	Alarms	Advanced Configuration / Statistics	Server History		
Data/Status							
	Final Output	Echo Back value					
0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					
1	<input type="checkbox"/>	<input type="checkbox"/>					
2	<input type="checkbox"/>	<input type="checkbox"/>					
3	<input type="checkbox"/>	<input type="checkbox"/>					
4	<input type="checkbox"/>	<input type="checkbox"/>					
5	<input type="checkbox"/>	<input type="checkbox"/>					
6	<input type="checkbox"/>	<input type="checkbox"/>					
7	<input type="checkbox"/>	<input type="checkbox"/>					

In this example, Ch0 is active.

4 Advanced Integration

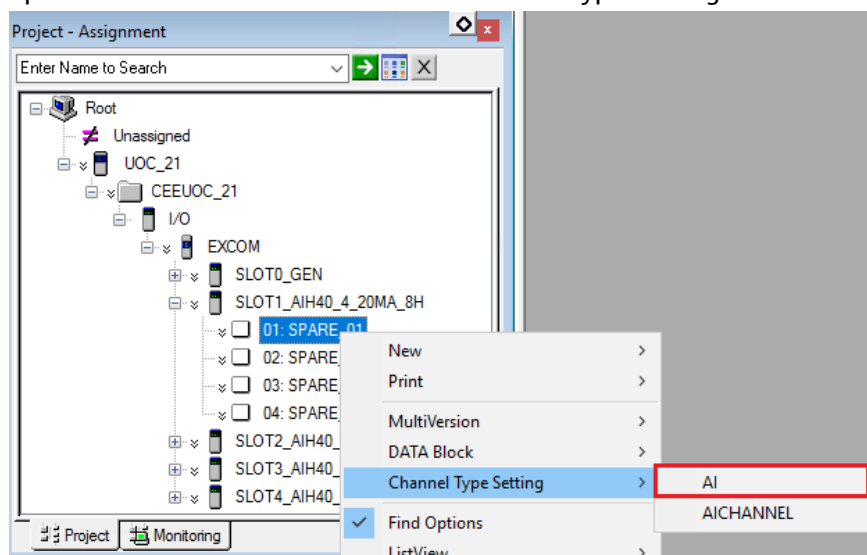
This chapter describes another method to access the field devices HART data, based on HART over CIP protocol.

Pay attention that the use of this feature does not allow parallel access with a Plant Asset Management tool like FieldCare.

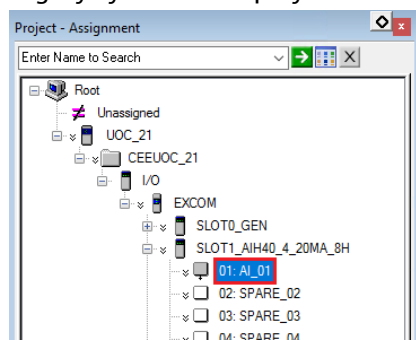
4.1 Offline Configuration

4.1.1 Channel Assignment

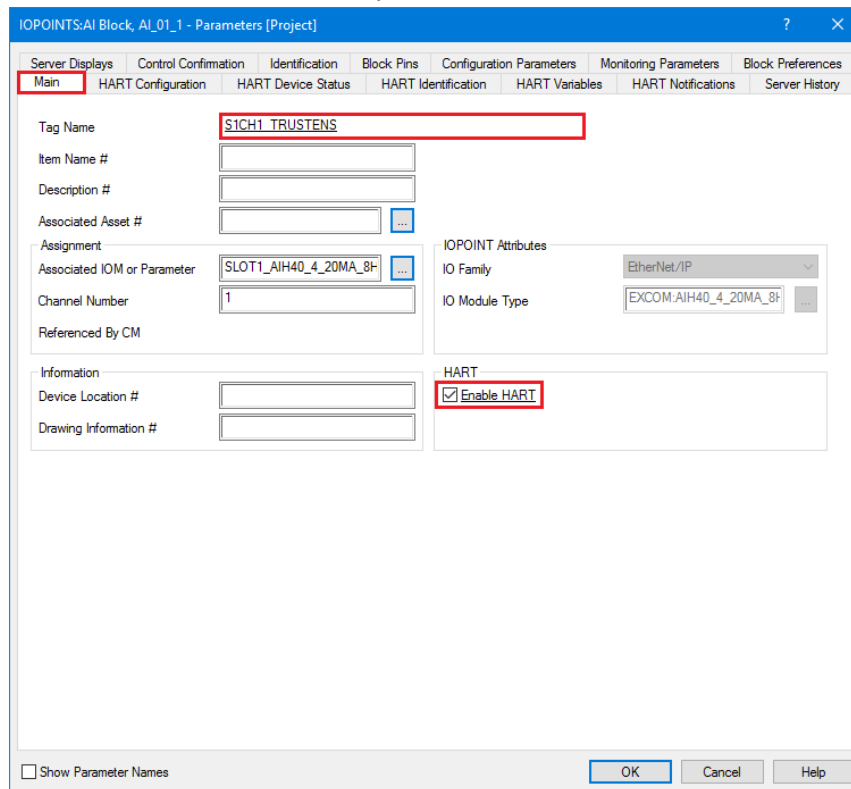
- In the project view, expand the analog input module, right-click for example on the Channel 1 Spare module and select the menu "Channel Type Setting→AI":



- A gray symbol is displayed on Channel 1, this indicates that an "AI" is instanced:

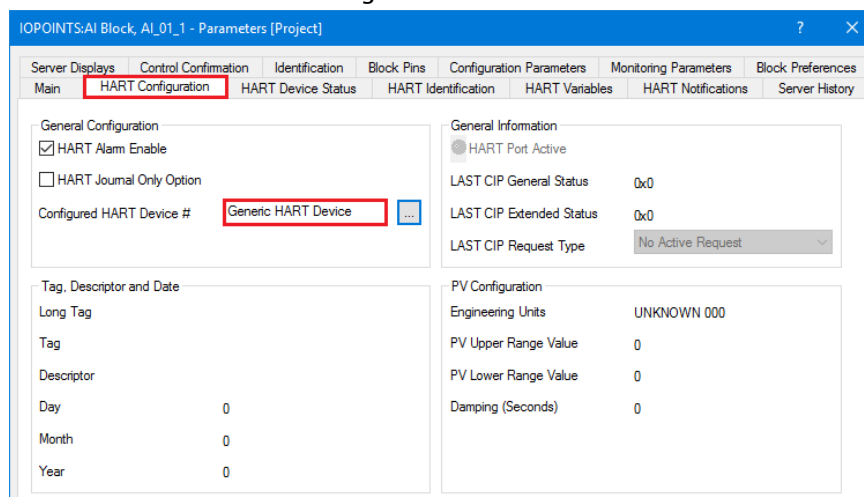


- In the tab "main", select the option "Enable HART" and click on the button "OK":



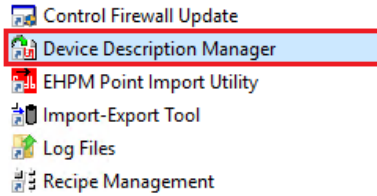
4.1.2 Field Device Configuration

- Click on the tab "HART Configuration":

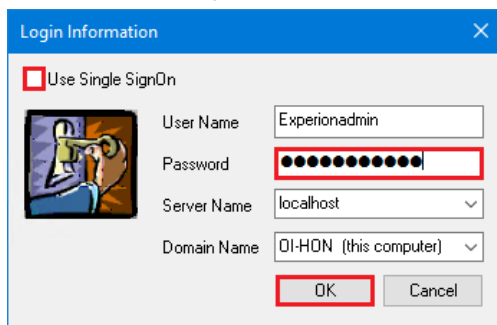


Per default, the Generic HART Device Template is selected. If the device DD is installed, then the corresponding template can be selected. This will provide the user a better overview of the field device status (HART CMD48).

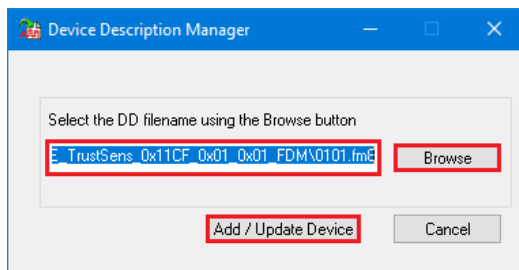
- On the Experion station, start with Administration rights the application “Device Description Manager” (located in All Honeywell tools→Engineering Tools)



- Uncheck the box, write the Password and click on the button “OK”:

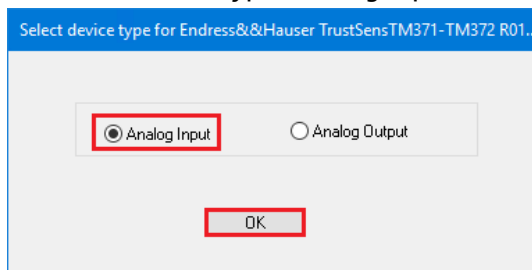


- Click on the button “Browse”, select the DD file to import and click on the button “Add/Update Device”:



In this example, the TrustSens DD file has been selected.

- Select the device type “Analog Input” for the TrustSens and click on the button “OK”



- This display following menu:

Command 48 string for Endress+Hauser TrustSensTM371-TM372 R01 DD01 de...

Filter: Device Status Defined in DD

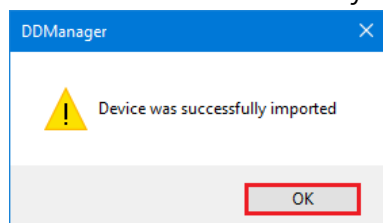
Assign as:

Search:

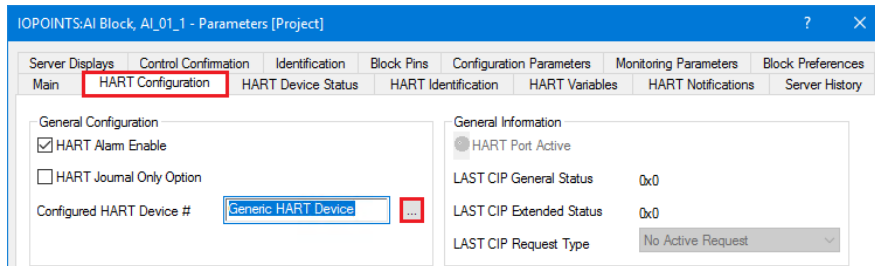
<input type="checkbox"/>	Bit Pos	Command 48 Strings	Notification Type
Byte 0			
<input type="checkbox"/>	1	401-Factory reset active	Event
<input type="checkbox"/>	2	221-Reference sensor defective	Event
<input type="checkbox"/>	3	144-Sensordrift warning limit exceeded	Event
<input type="checkbox"/>	4	143-Sensordrift alarm limit exceeded	Event
<input type="checkbox"/>	5	105-Manual calibration interval expired	Event
<input type="checkbox"/>	6	047-Sensor limit reached	Event
<input type="checkbox"/>	7	004-Sensor defective	Event
<input type="checkbox"/>	8	001-Device failure	Event
Byte 1			
<input type="checkbox"/>	9	491-Output simulation-Current output	Event
<input type="checkbox"/>	10	485-Process variable simulation active-Sensor	Event
<input type="checkbox"/>	11	438-Dataset different	Event
<input type="checkbox"/>	12	437-Configuration incompatible	Event
<input type="checkbox"/>	13	435-Linearization faulty	Event
<input type="checkbox"/>	14	411-Up-/download active	Event
<input type="checkbox"/>	15	410-Data transfer failed	Event
<input type="checkbox"/>	16	402-Initialization active	Event
Byte 2			
<input type="checkbox"/>	17	537-Configuration-Reference sensor	Event
<input type="checkbox"/>	18	537-Configuration-Sensor	Event
<input type="checkbox"/>	19	537-Configuration	Event
<input type="checkbox"/>	20	531-Factory adjustment missing-Current output	Event
<input type="checkbox"/>	21	531-Factory adjustment missing-Reference se...	Event
<input type="checkbox"/>	22	531-Factory adjustment missing-Sensor	Event
<input type="checkbox"/>	23	531-Factory adjustment missing	Event

Each CMD48 bit position can be configured as "View Only", "Event" or "Alarm". Per default, all notifications are set to "Event".

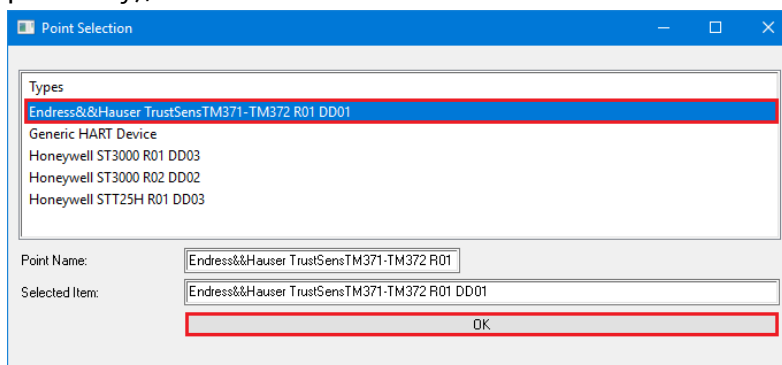
- Click on the button "OK" to continue.
- DD file has been successfully imported



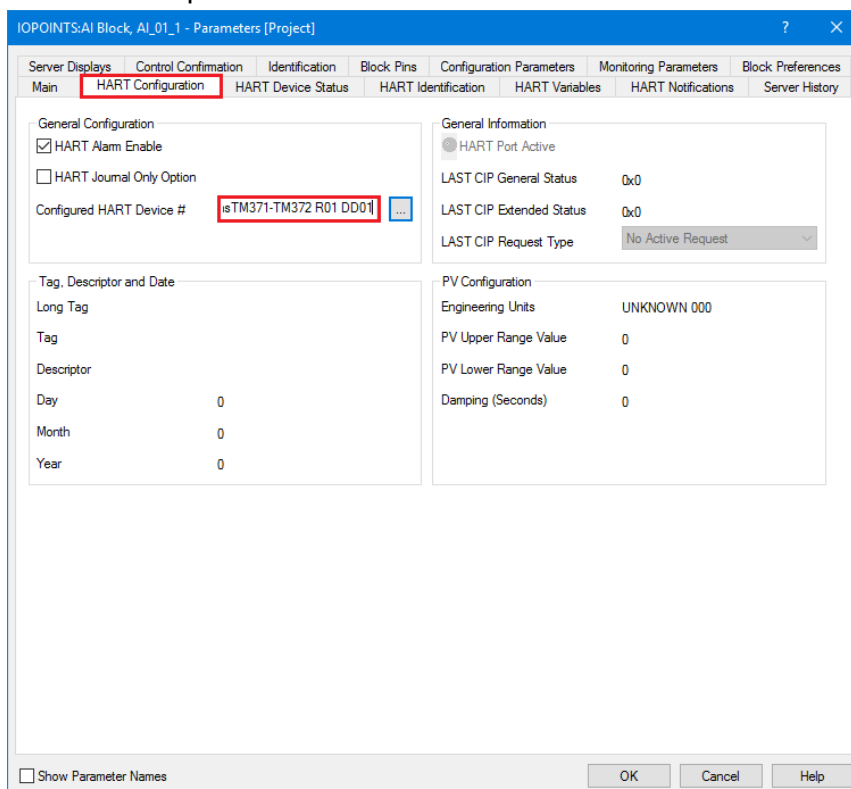
- Go back in ControlBuilder and click on the shortcut button to select another field device template:



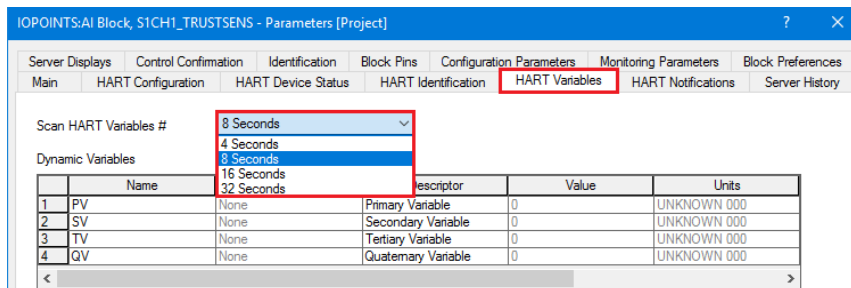
- Select the needed field device DD template, in our example the TrustSens one (installed previously), and click on the button "OK":



- TrustSens template is selected:

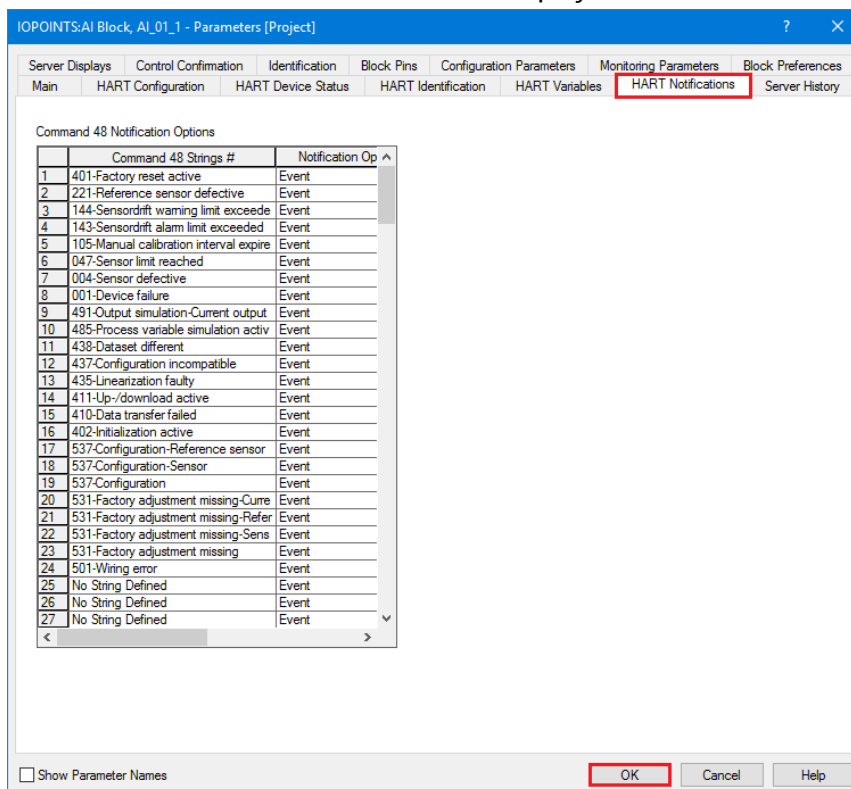


- Click on the tab "HART Variables" :



Click on the list box to select the channel timing parameter of the "Scan HART Variables".

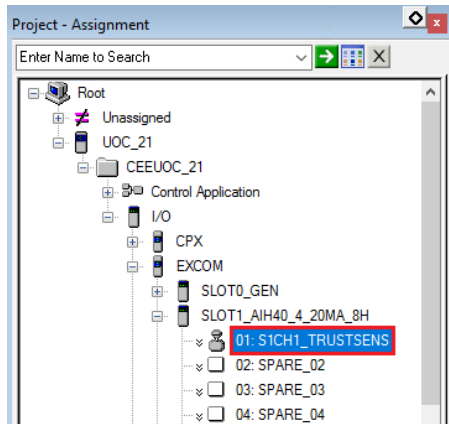
- Click on the tab "HART Notifications" to display the field device CMD48 text messages:



The configured notification "Event" can be updated to "View Only" or "Alarm" according to the project requirements.

- Click on the button "OK" to save the configuration.

- This updates the project view:

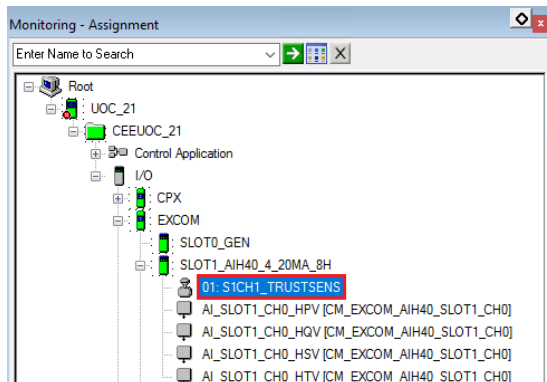


4.1.3 Configuration Download

- Download the configuration in the system. Please refer to chapter 3.6.1.2 to proceed.

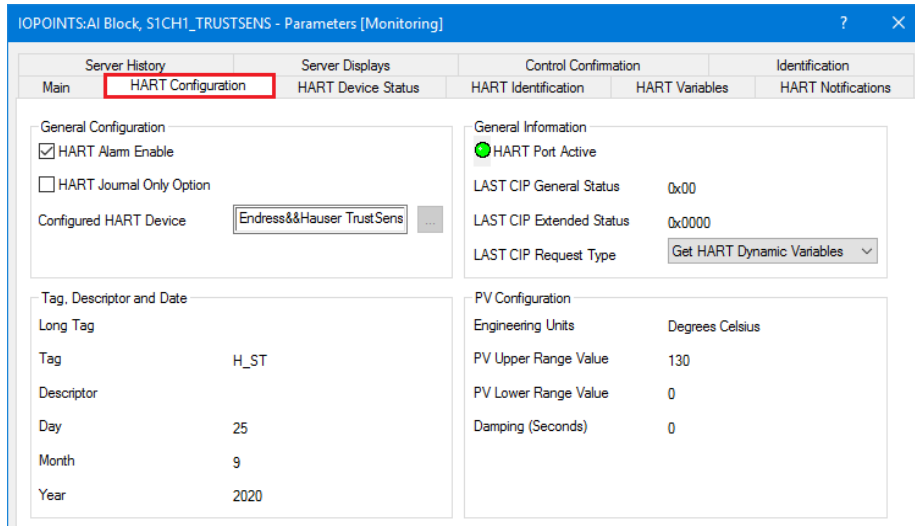
4.2 Online Monitoring

- Double-click on the channel "S1CH1_TRUSTSENS":



4.2.1 HART Configuration

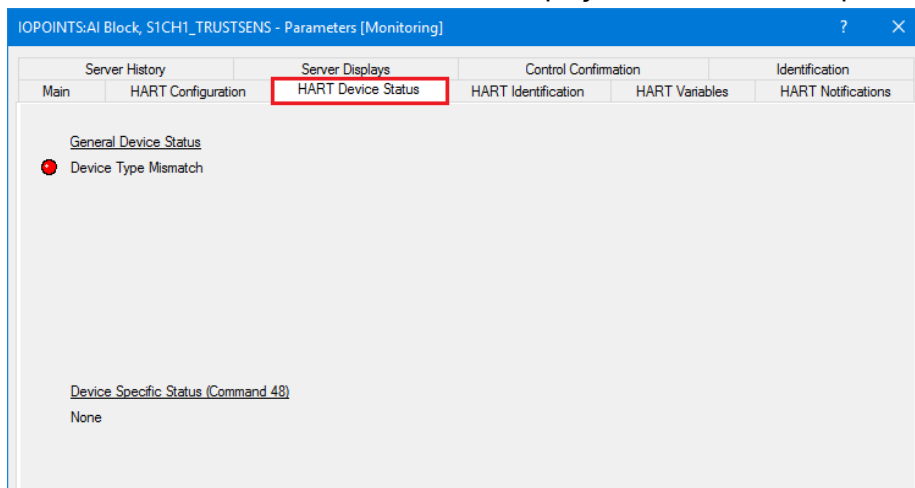
- Select the tab "HART Configuration" to get information about the field device tags and ranges:



In this example, the parameter "Tag" corresponds to the TrustSens Short Tag ("H_ST").

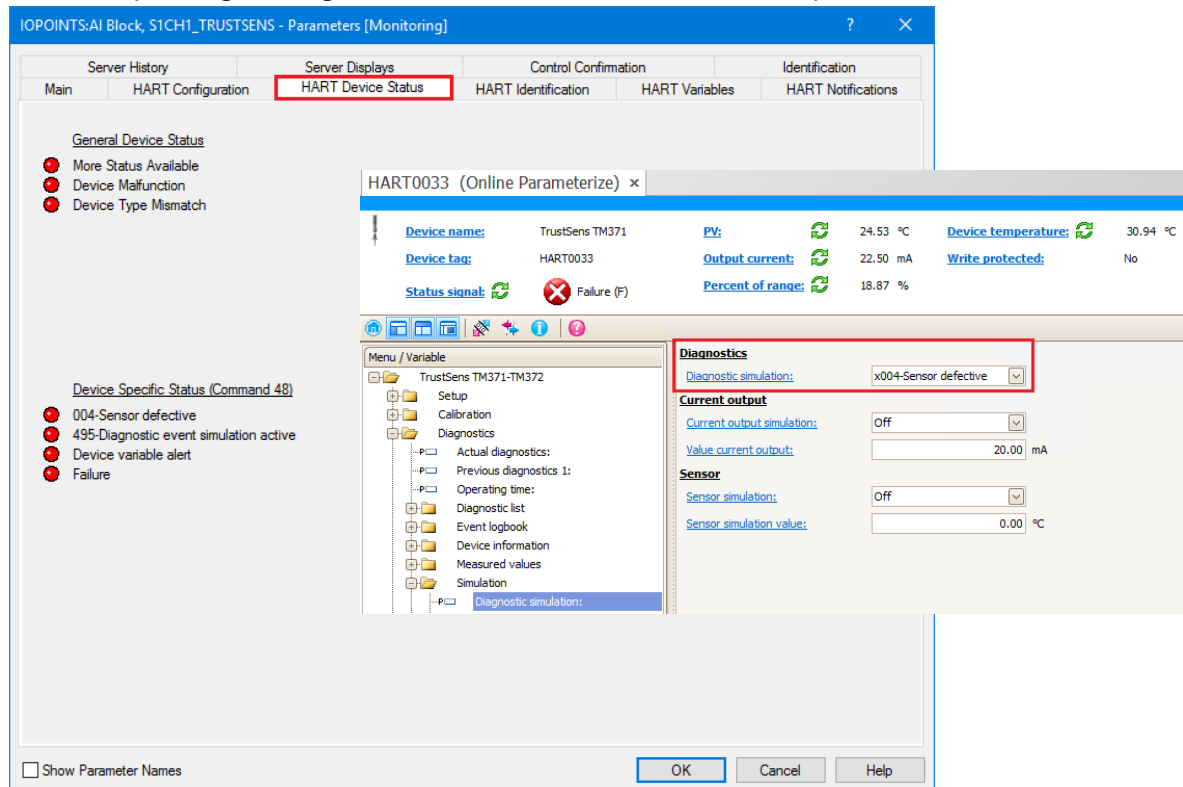
4.2.2 HART Device Status

- Click on the tab "HART Device Status" to display device and device specific status:

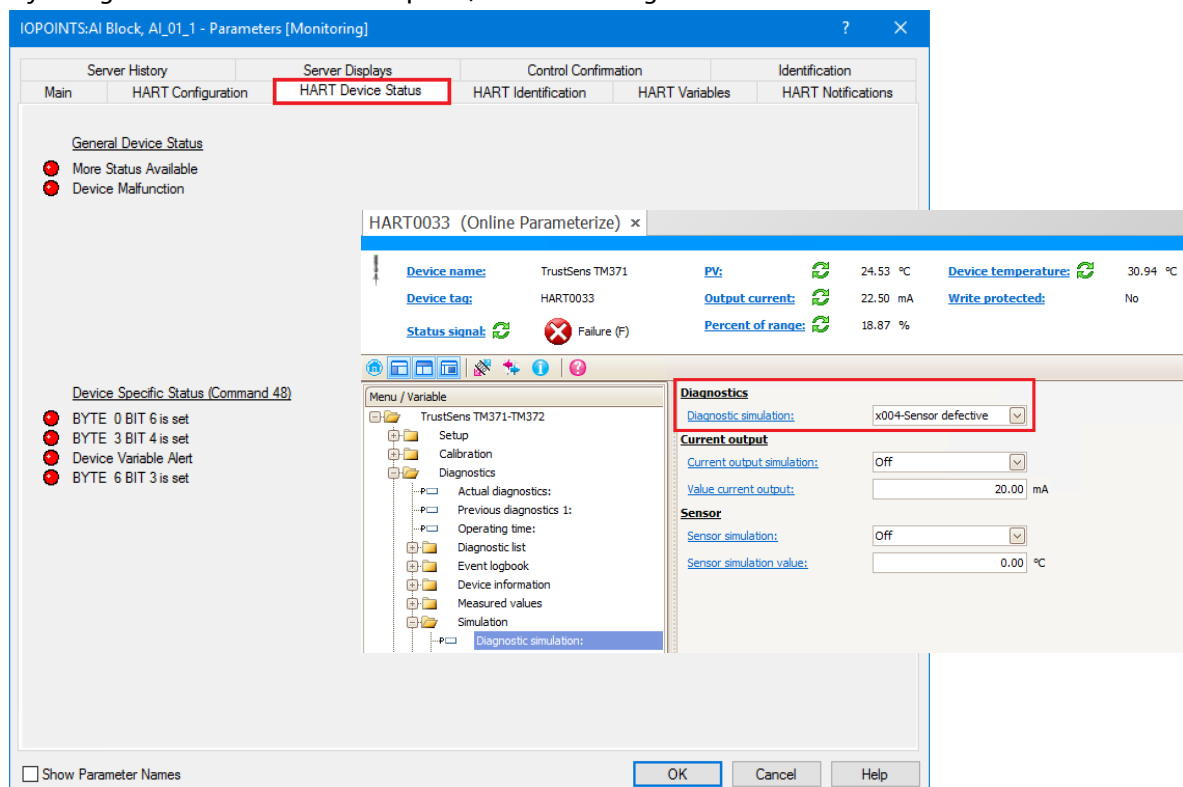


In this example, there is one message displayed regarding the wrong Device Type. This is a bug in ControlBuilder, only for HART7 field devices. This error does not occur with HART5, HART6 field devices or by using the Generic HART template. Refer to the tab "HART Identification" for more details.

- By Simulating an error on the TrustSens, for example "Sensor defective", status are updated with the corresponding message thanks to the field device HART Template:



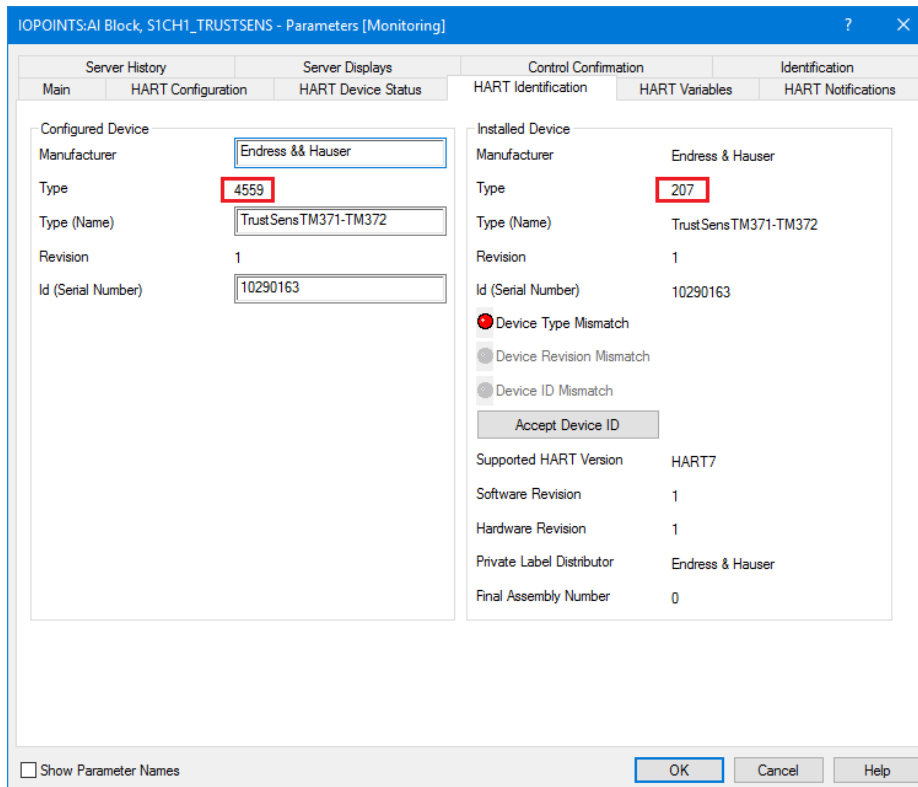
- By using the Generic HART Template, status messages would look like as below:



- As the generic HART template is a standard template for all kind of HART field devices, the corresponding field device specific status are not decoded with text.

4.2.3 HART Identification

- Click on the tab "HART Identification":



Configured Device		Installed Device	
Manufacturer	Endress & Hauser	Manufacturer	Endress & Hauser
Type	4559	Type	207
Type (Name)	TrustSensTM371-TM372	Type (Name)	TrustSensTM371-TM372
Revision	1	Revision	1
Id (Serial Number)	10290163	Id (Serial Number)	10290163
		<input checked="" type="radio"/> Device Type Mismatch <input type="radio"/> Device Revision Mismatch <input type="radio"/> Device ID Mismatch <input type="button" value="Accept Device ID"/>	
		Supported HART Version: HART7	
		Software Revision: 1	
		Hardware Revision: 1	
		Private Label Distributor: Endress & Hauser	
		Final Assembly Number: 0	

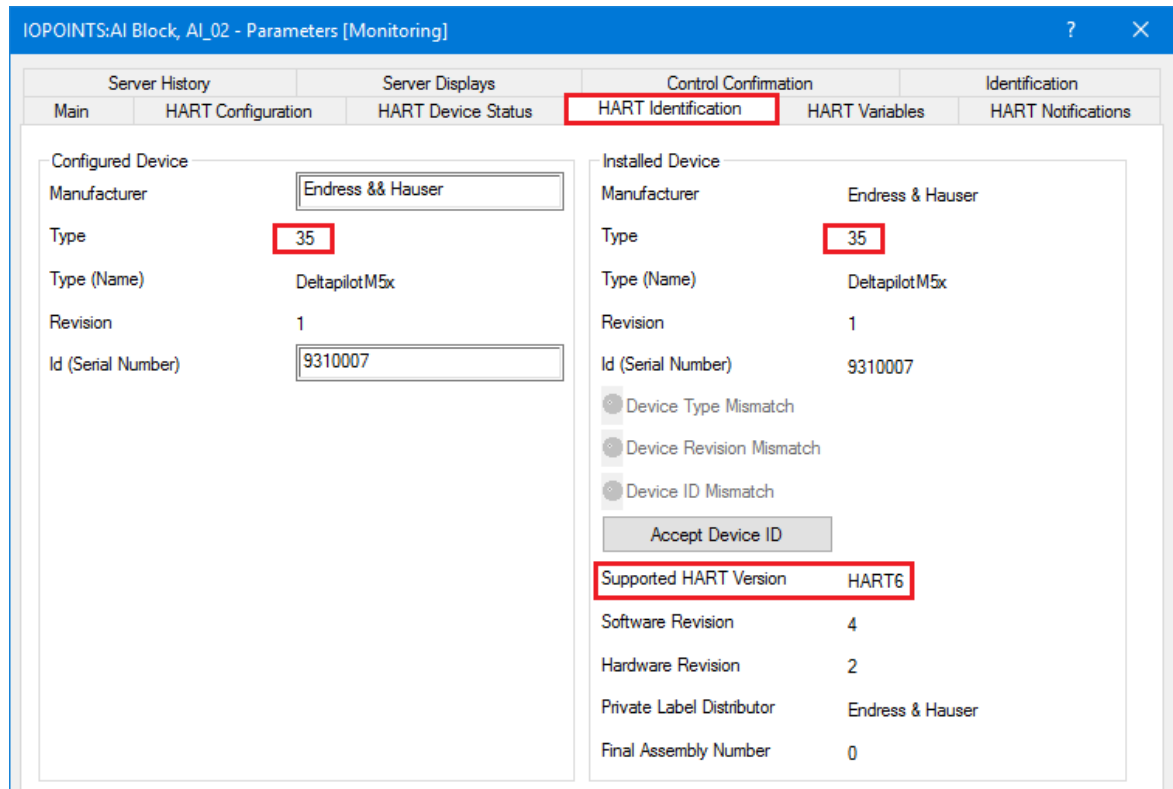
☐ Show Parameter Names

This tab displays information about the configured and the connected HART field device.

- As explained before, HART7 field device type are not displayed as it should be, and this activates unfortunately the bit "Device Type Mismatch".
In this example, the offline device type $(4559)_{10} = (0x11CF)_{16}$ is the correct device type and it does not match with the online device type $(207)_{10} = (0x00CF)_{16}$. (which is the HART5 and HART6 format)

This issue has been sent to Honeywell development and will be fixed soon.

- As just explained, HART5 and HART6 field devices are not concerned. For example, following picture displays the Deltapilot M (HART6 field device) HART Identification tab, in which the offline device Type is matching with Online one:



IOPOINTS:AI Block, AI_02 - Parameters [Monitoring]

Server History | Server Displays | Control Confirmation | Identification

Main | HART Configuration | HART Device Status | **HART Identification** | HART Variables | HART Notifications

Configured Device

Manufacturer: Endress & Hauser

Type: **35**

Type (Name): DeltapilotM5x

Revision: 1

Id (Serial Number): 9310007

Installed Device

Manufacturer: Endress & Hauser

Type: **35**

Type (Name): DeltapilotM5x

Revision: 1

Id (Serial Number): 9310007

☐ Device Type Mismatch

☐ Device Revision Mismatch

☐ Device ID Mismatch

Accept Device ID

Supported HART Version: HART6

Software Revision: 4

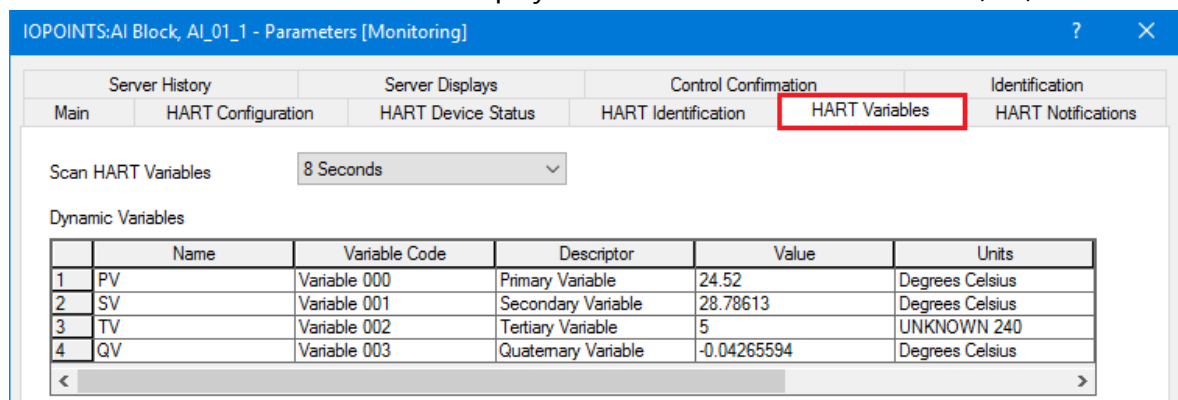
Hardware Revision: 2

Private Label Distributor: Endress & Hauser

Final Assembly Number: 0

4.2.4 HART Variables

- Click on the tab "HART Variables" to display the field device HART variables PV, SV, TV and QV:



IOPOINTS:AI Block, AI_01_1 - Parameters [Monitoring]

Server History | Server Displays | Control Confirmation | Identification

Main | HART Configuration | HART Device Status | HART Identification | **HART Variables** | HART Notifications

Scan HART Variables: 8 Seconds

Dynamic Variables

	Name	Variable Code	Descriptor	Value	Units
1	PV	Variable 000	Primary Variable	24.52	Degrees Celsius
2	SV	Variable 001	Secondary Variable	28.78613	Degrees Celsius
3	TV	Variable 002	Tertiary Variable	5	UNKNOWN 240
4	QV	Variable 003	Quaternary Variable	-0.04265594	Degrees Celsius

- The PV variable corresponds to the TrustSens Temperature measurement
- The SV variable corresponds to the TrustSens Device temperature
- The TV variable corresponds to the TrustSens number of self-calibrations
- The QV variable corresponds to the TrustSens deviation value

5 Specific Integration

The Honeywell system provides some features to access to field device specific data. This chapter resumes some of them, whose links refers to the previous Basic and Advanced Integration chapters.

5.1 TrustSens Integration

Method 1

This method is based on utilizing the channel HART Data PV, SV, TV and QV of the HART analog input module, on which the TrustSens is connected. The TrustSens calibration counter and the deviation value are transferred as TV and QV and monitored by the controller.

Please refer to following chapters for more details:

- Offline configuration: Chapter 3.3.2.3
- Offline control strategy configuration: Chapter 3.5.1.
- Online Monitoring: Chapter 3.7.2.2

Method 2

This method uses the HART over CIP protocol to access the TrustSens HART data. Again, the TrustSens calibration counter and the deviation value are transferred as TV and QV and monitored by the controller. In addition, this method allows to read further information about the HART field device like Tag, descriptor, Range and units, CMD48 status, HART identification parameters. The backdrop of this method is that the Plant Asset Management tools cannot be used in parallel.

Please refer to Chapter 4 for more details.

5.2 Field Device Status

Please refer to Chapter 3.7.2.3.1 for EtherNet/IP field devices.

Please refer to Chapter 4 for HART field devices.

5.3 Heartbeat Verification

In this tutorial, the described example concerns the Promass300 E/IP. Please refer to chapter 3.7.2.3.3.

5.4 Totalizer Handling

In this tutorial, the described example concerns the Promass300 E/IP. Please refer to chapter 3.7.2.3.4.

6 Bypassed Tool Integration

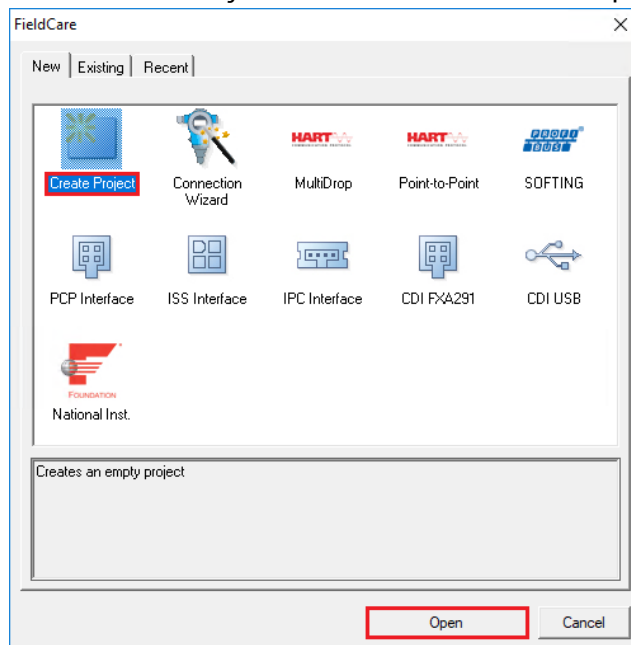
This chapter describes the main workflow for integration of EtherNet/IP and HART devices to the Endress+Hauser Plant Asset Management (PAM system) by means of Communication DTMs.

6.1 FieldCare Configuration

- Start the application FieldCare:



- Select "Create Project" and click on the button "Open":

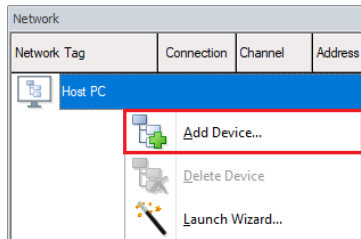


6.1.1 HART Field Device Connection with Excom Remote I/O

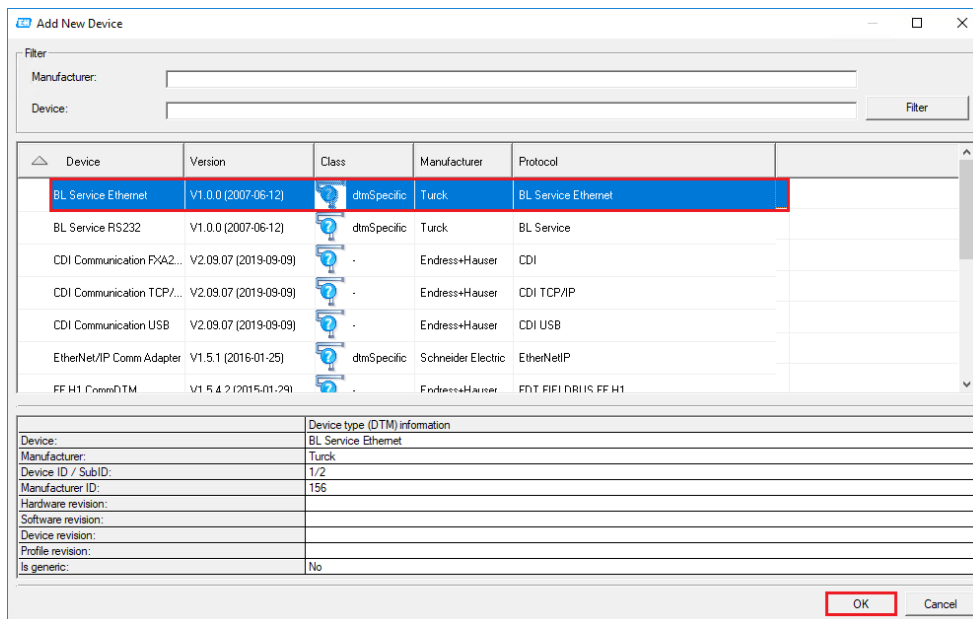
This chapter describes the TURCK Excom Remote I/O configuration workflow as required to connect with HART DeviceDTMs.

Please note that the Remote IO does not support concurrent access with HART Channel IO points in ControlBuilder and HART deviceDTMs in FieldCare. If HART Channel IO points are assigned to analog input channels with the option "HART enabled", as described in chapter 44.1.1, then it will not be possible to connect with DeviceDTMs via the same analog input module. The following steps describe the use case when no HART Channel IO points are assigned to an analog input module:

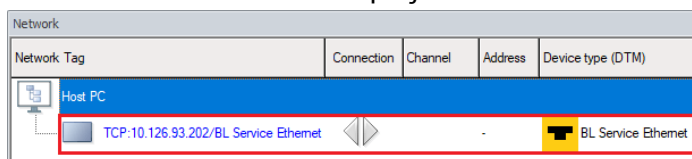
- Right-click on the Network Tag "Host PC" and select the menu "Add Device...":



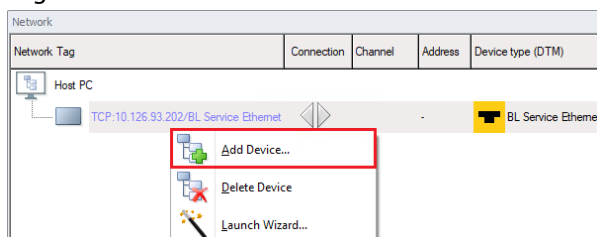
- Select the CommDTM "BL Service Ethernet" from Turck and click on the button "OK":



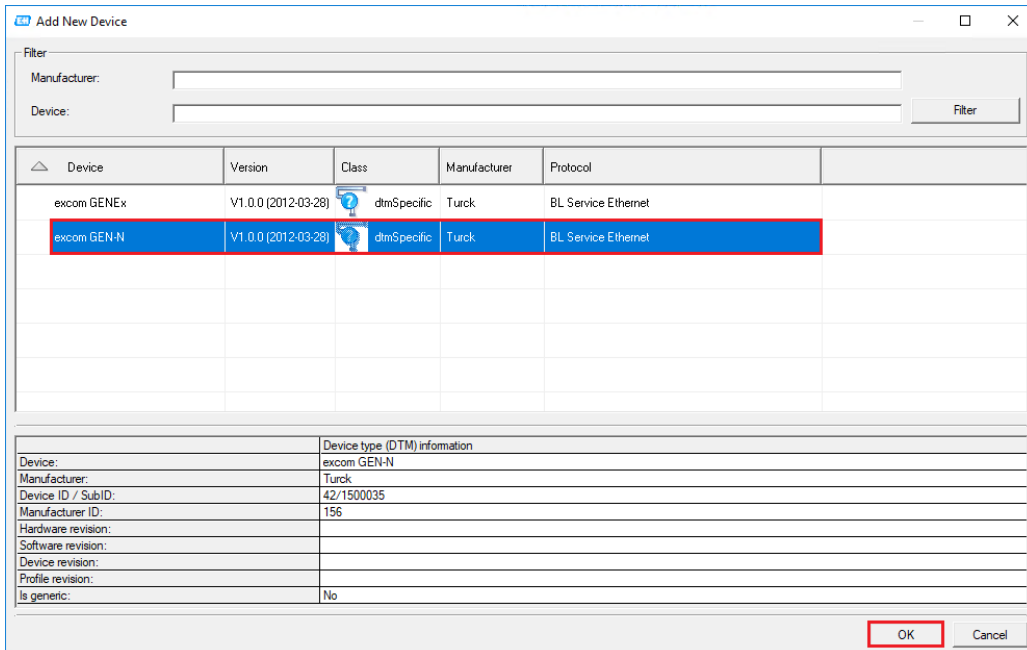
- CommDTM is inserted in the project view:



- Right-click on CommDTM and select the menu "Add Device...":



- Select the CommDTM "excom GEN-N" and click on the button "OK":



Filter

Manufacturer:

Device:

Filter

Device	Version	Class	Manufacturer	Protocol
excom GENex	V1.0.0 (2012-03-28)	dtmSpecific	Turck	BL Service Ethernet
excom GEN-N	V1.0.0 (2012-03-28)	dtmSpecific	Turck	BL Service Ethernet

Device type (DTM) information

Device: excom GEN-N

Manufacturer: Turck

Device ID / SubID: 42/1500035

Manufacturer ID: 156

Hardware revision:

Software revision:

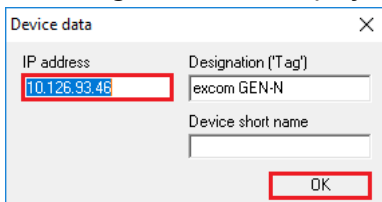
Device revision:

Profile revision:

Is generic: No

OK Cancel

- Following window is displayed:



Device data

IP address: 10.126.93.46

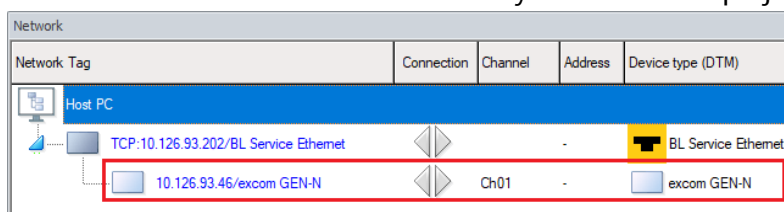
Designation ('Tag'): excom GEN-N

Device short name:

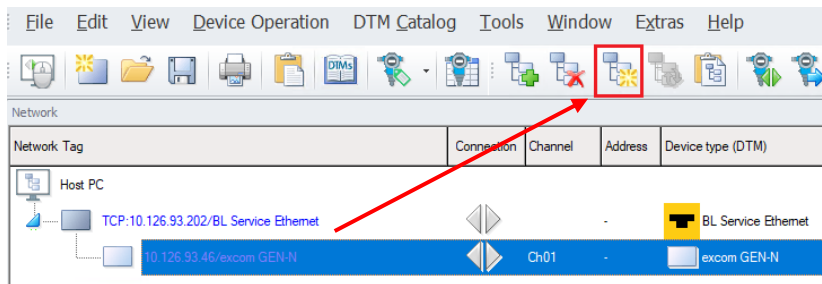
OK

Configure the Gateway IP address and click on the button "OK"

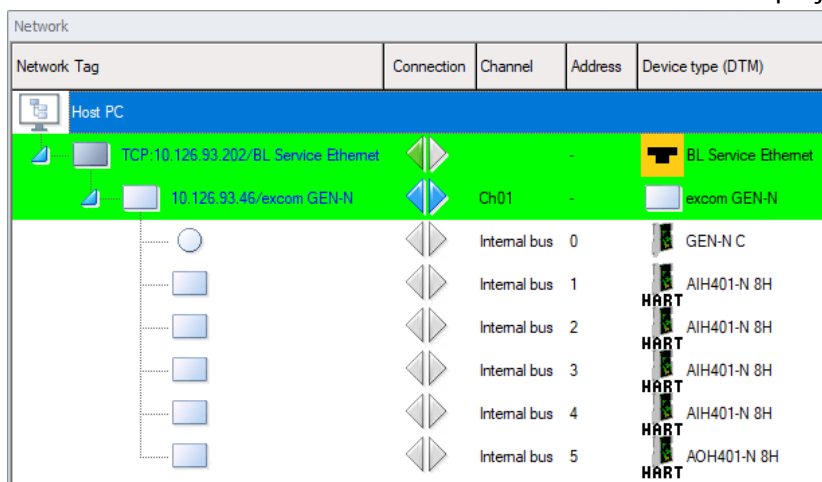
- "Excom GEN-N" CommDTM is successfully inserted in the project:



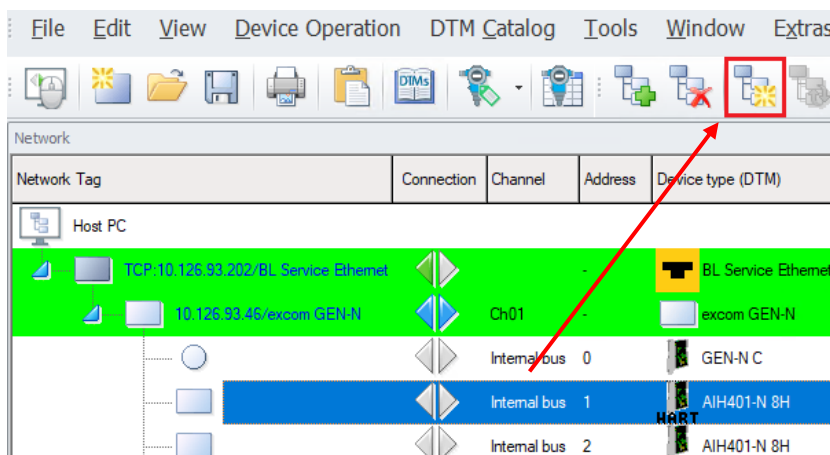
- Select the CommDTM "Excom GEN-N" and click on the shortcut button "Create Network":



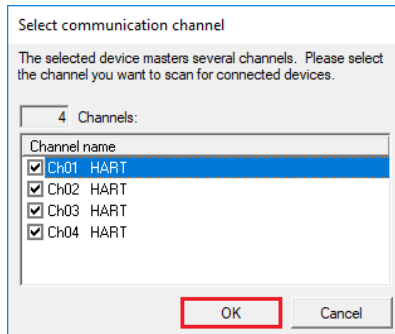
- Excom Remote I/O HART cards are scanned and added in the project:



- Select for example the analog input card on Slot1 and click on the shortcut button "Create Network":

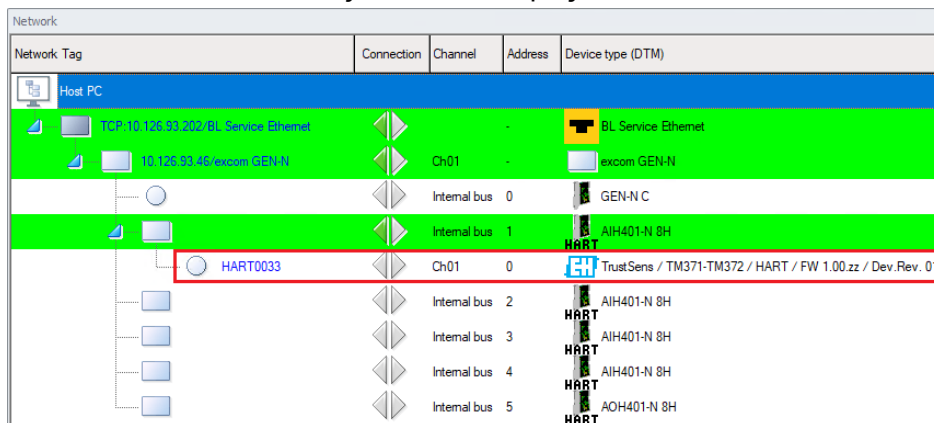


- Select the HART analog input card channels which have to be scanned:

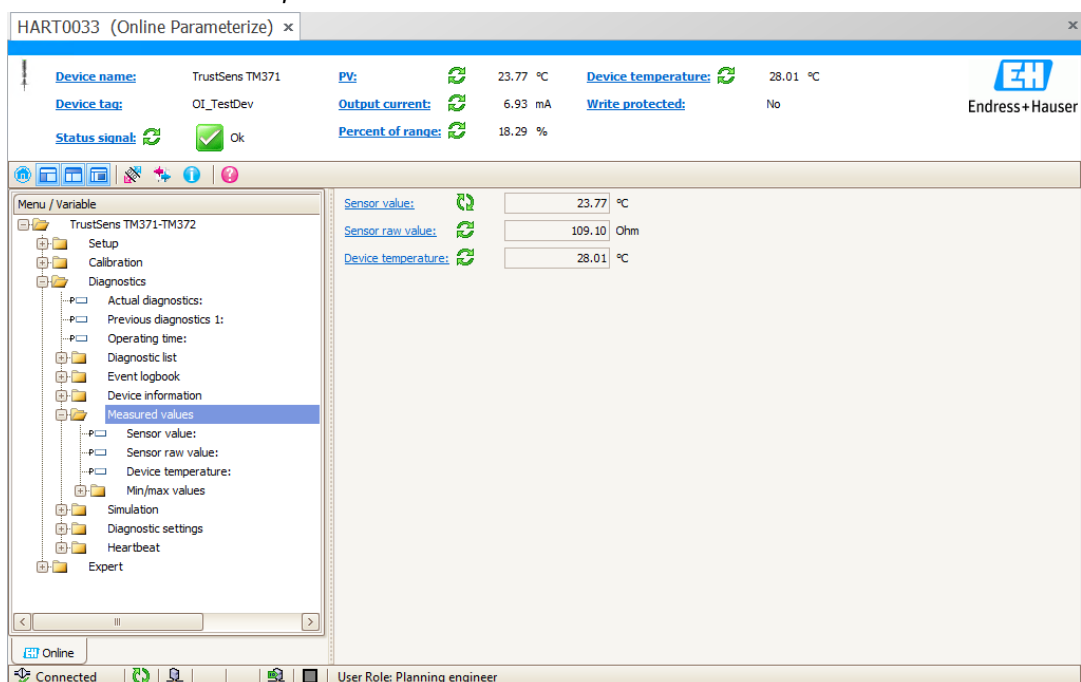


In this example, the four channels will be scanned.

- Device has been successfully added in the project view:



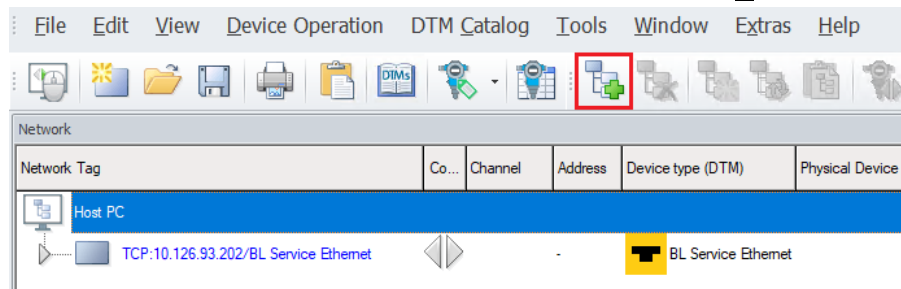
- The HART field device, a TMT371 can be now connected in Online mode:



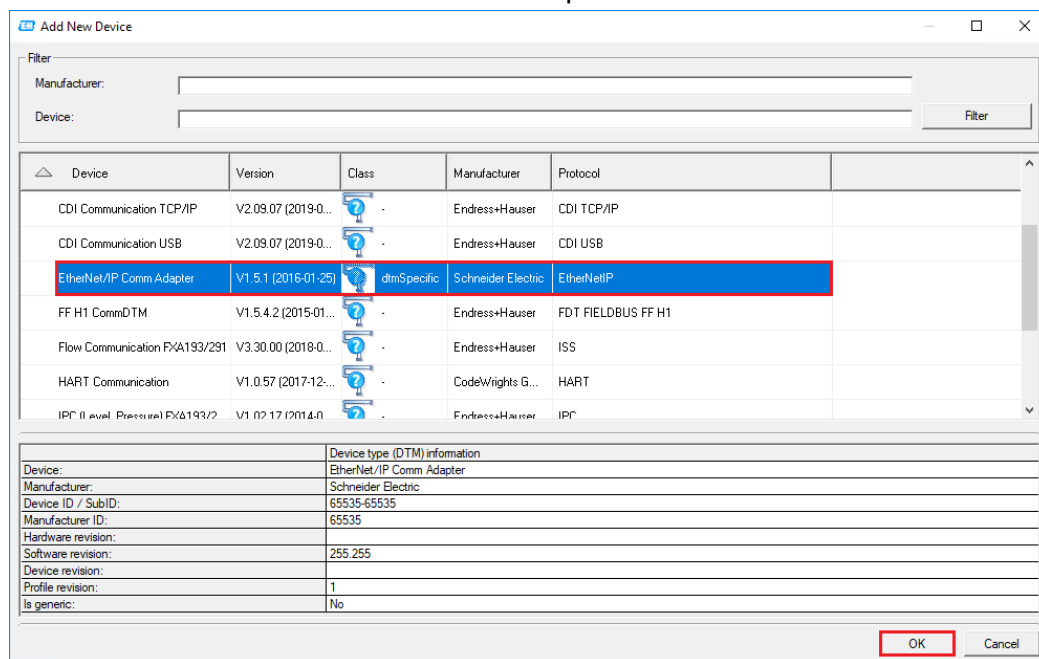
6.1.2 EtherNet/IP Field Device Connection

This chapter describes the Schneider Electric EIP ComDTM configuration workflow in order to connect Endress+Hauser EtherNet/IP Field Devices DTM.

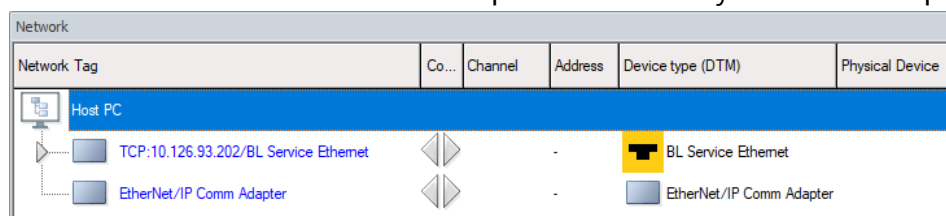
- Select the item "Host PC" and click on the shortcut button "Add Device...":



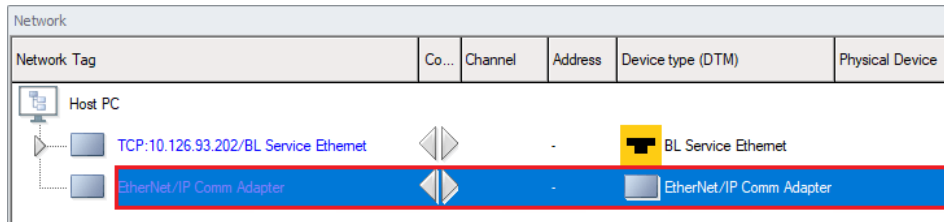
- Select the ComDTM "EtherNet/IP Comm Adapter" from Schneider Electric:



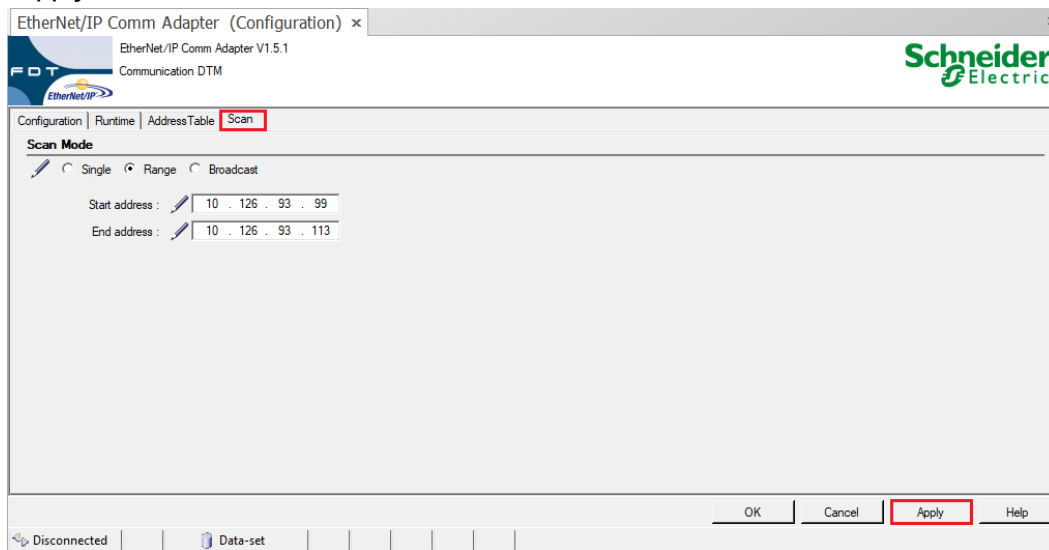
- The ComDTM "EtherNet/IP Comm Adapter" is successfully inserted in the project:



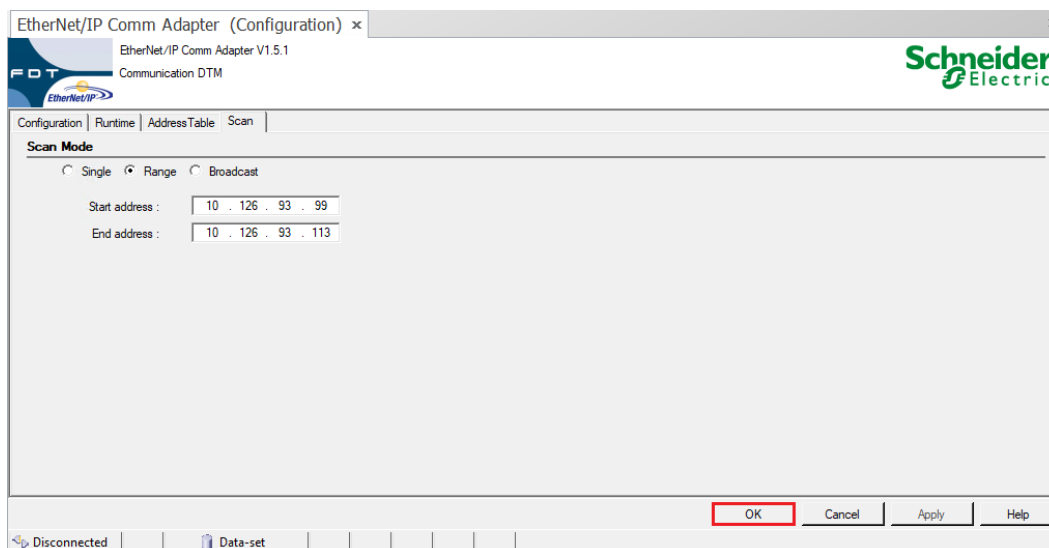
- Double-click on the ComDTM "EtherNet/IP Comm Adapter":



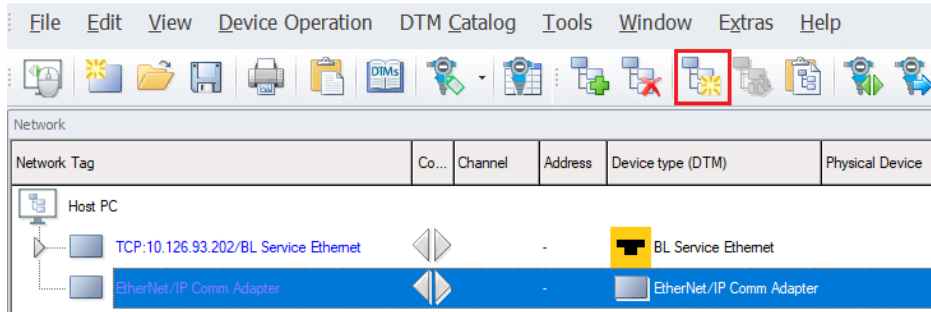
- Select the tab "Scan" and configure the IP range that must be scanned and click on the button "Apply":



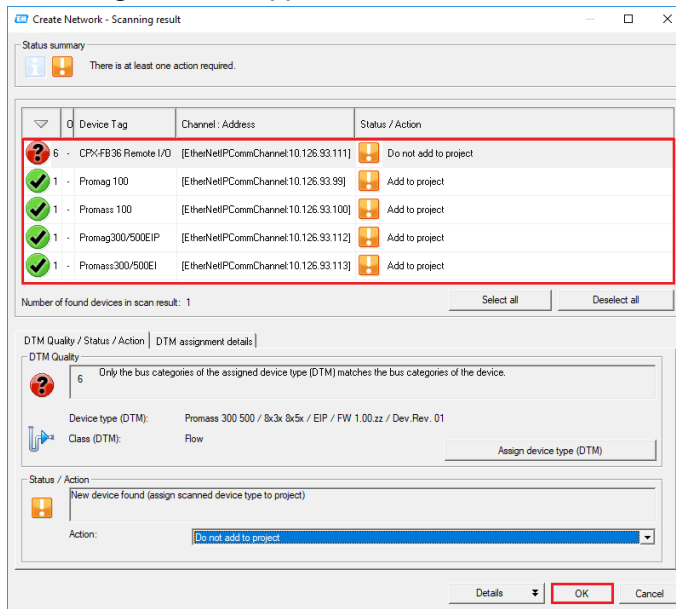
- Click on the button "OK:"



- Select the ComDTM “EtherNet/IP Comm Adapter” and click on the shortcut button “Create Network:”

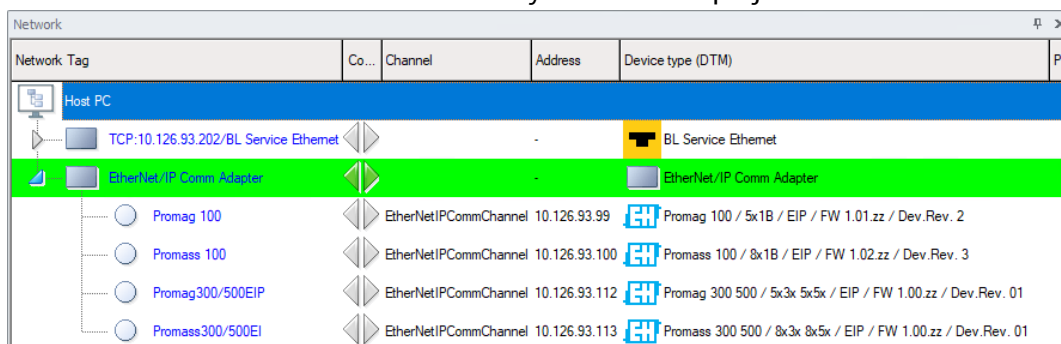


- Following windows appears:

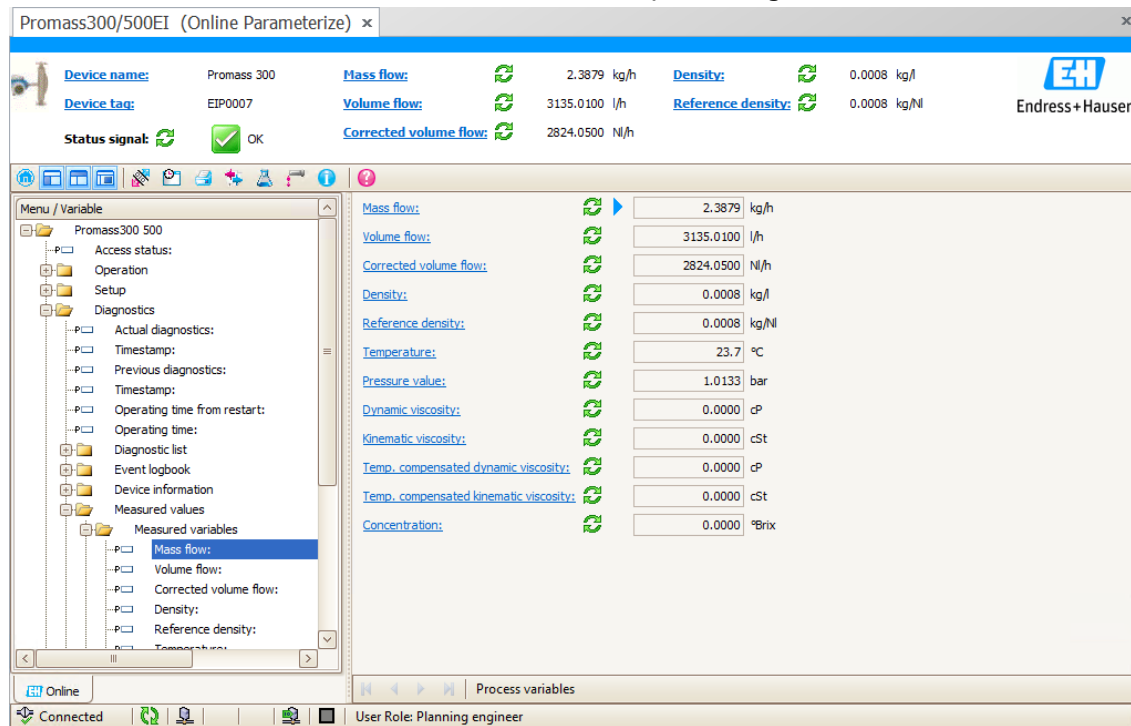


There are no deviceDTM for the CPX valve Island installed. That's why the device status is "6" and action is has been configured to "Do not add to project".

- EtherNet/IP devices have been successfully added in the project view:



- Field device DTM can now be connected for further processing:



6.2 Connection with Web Server

This chapter describes how to access the Endress+Hauser EtherNet/IP devices by using the integrated device Web server for device configuration.

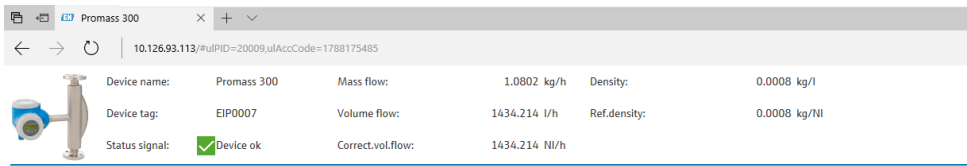
The Web server feature can only be used if the function "Web server" is enabled in the device (Menu "Expert→Communication→Web server").

- Open a Web browser and enter the device IP address:




In this example, the IP address 192.168.1.113 corresponds to the Promass300.

- Device Web server is opened:




Device name:	Promass 300	Mass flow:	1.0802 kg/h	Density:	0.0008 kg/l
Device tag:	EIP0007	Volume flow:	1434.214 l/h	Ref.density:	0.0008 kg/NI
Status signal:	✓ Device ok	Correct.vol.flow:	1434.214 NI/h		

Web server language  English

Login

Access status Maintenance

Enter access code 


Login

Reset access code

- Enter the user level code "0000" and click on the button "Login":




Device name:	Promass 300	Mass flow:	1.6392 kg/h	Density:	0.0008 kg/l
Device tag:	EIP0007	Volume flow:	2110.917 l/h	Ref.density:	0.0008 kg/NI
Status signal:	✓ Device ok	Correct.vol.flow:	2110.917 NI/h		

Web server language  English

Login

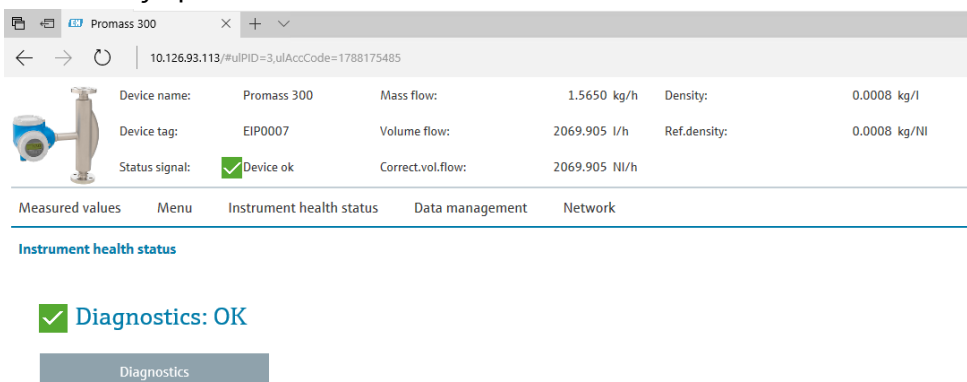
Access status Maintenance

Enter access code 

Login

Reset access code

- This directly opens the Instrument health status window:



Device name:	Promass 300	Mass flow:	1.5650 kg/h	Density:	0.0008 kg/l
Device tag:	EIP0007	Volume flow:	2069.905 l/h	Ref.density:	0.0008 kg/NI
Status signal:	✓ Device ok	Correct.vol.flow:	2069.905 NI/h		

Measured values Menu **Instrument health status** Data management Network

Instrument health status

✓ **Diagnostics: OK**

Diagnostics

- This interface allows to access to the same device menu structure (Operation, Setup, Diagnostics, as this displayed on the device display or in the deviceDTM:

The screenshot shows the Promass 300 device interface. At the top, there is a header bar with the device name 'Promass 300' and a URL '10.126.93.113/#ulPID=106,ulAccCode=1788175485'. Below the header, there is a table displaying device data:

Device name:	Promass 300	Mass flow:	2.2764 kg/h	Density:	0.0008 kg/l
Device tag:	EIP0007	Volume flow:	2995.636 l/h	Ref.density:	0.0008 kg/NI
Status signal:	✓ Device ok	Correct.vol.flow:	2995.636 NI/h		

Below the table, there is a navigation bar with the following tabs: Measured values, **Menu** (highlighted with a red box), Instrument health status, Data management, and Network. Under the 'Menu' tab, there is a 'Main menu' section with a 'Display language' dropdown set to 'English'. Below this, there are four buttons: Operation, Setup, Diagnostics, and Expert, each with a right-pointing arrow.

- Click for example on "Setup→System units" to configure device units:

The screenshot shows the Promass 300 device interface with the 'System units' configuration screen. The header bar is the same as in the previous screenshot. Below the header, there is a table displaying device data:

Device name:	Promass 300	Mass flow:	1.3729 kg/h	Density:	0.0008 kg/l
Device tag:	EIP0007	Volume flow:	1790.651 l/h	Ref.density:	0.0008 kg/NI
Status signal:	✓ Device ok	Correct.vol.flow:	1790.651 NI/h		

Below the table, there is a navigation bar with the following tabs: Measured values, Menu, Instrument health status, Data management, and Network. Under the 'Menu' tab, there is a breadcrumb trail: Main menu > Setup > **System units**. Below this, there is a list of configuration items, each with a dropdown menu:

- Mass flow unit: kg/h
- Mass unit: kg
- Volume flow unit: l/h
- Volume unit: m³
- Corrected volume flow unit: NI/h
- Corrected volume unit: Nm³
- Density unit: kg/l
- Reference density unit: kg/NI
- Temperature unit: °C
- Pressure unit: bar

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