



Quickstart Guide PN/EtherNetIP Coupler

Order number: 700-160-3EN02

Version
4 en

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1 Safety instructions

Target audience



CAUTION

This description is only intended for trained personnel qualified in control and automation engineering who are familiar with the applicable national standards. For installation, commissioning, and operation of the components, compliance with the instructions and explanations in this operating manual is essential. The specialist personnel is to ensure that the application or the use of the products described fulfills all safety requirements, including all applicable laws, regulations, provisions, and standards.

Intended use



WARNING

The device has a protection rating of IP 20 (open type) and must be installed in an electrical operating room or a control box/cabinet in order to protect it against environmental influences. To prevent unauthorized operation, the doors of control boxes/cabinets must be closed and possibly locked during operation. The consequences of improper use may include personal injury to the user or third parties, as well as property damage to the control system, the product, or the environment. Use the device only as intended!.

Operation



ATTENTION

Successful and safe operation of the device requires proper transport, storage, setup, assembly, installation, commissioning, operation, and maintenance. Operate the device only in flawless condition. The permissible operating conditions and performance limits (technical data) must be adhered to. Retrofits, changes, or modifications to the device are strictly forbidden.

Security



ATTENTION

The device is a network infrastructure component and therefore an important element in the security consideration of a plant. When using the device, therefore, observe the relevant recommendations to prevent unauthorized access to installations and systems.

2 Introduction



NOTE

This document explains the initial commissioning of the PN/EtherNetIP Coupler. The latest version of the documentation can be found at www.helmholz.de or scan the QR code directly.



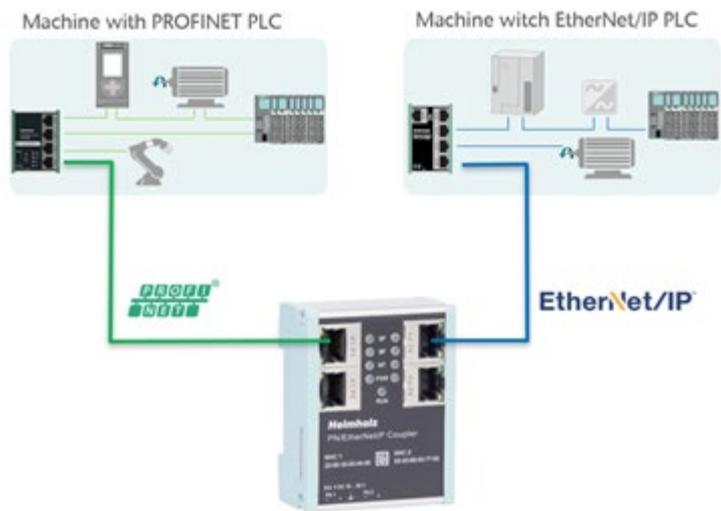
3 Function of the PN/EtherNetIP Coupler

With the PN/EtherNetIP Coupler, a simple and uncomplicated connection of a PROFINET machine to an EtherNet/IP machine is possible. The PN/EtherNetIP Coupler allows data transmission between a PROFINET controller and an EtherNet/IP scanner.

Received input data on one of the network sides are made available as output data on the other network side of the PLC. The I/O data exchange takes place live and as quickly as possible without further handling modules.

The maximum size of the transferable I/O data is 1024 bytes. Up to 3 input and 3 output assemblies can be configured on the EtherNet/IP network side. Up to 300 slots are available for I/O modules.

The integration into the PLC engineering tool is made possible by a GSDML file, an extra configuration software is not necessary. The configuration of the I/O data to be exchanged is carried out in the Siemens engineering tool. An EDS file matching the configuration can then be downloaded from the website by the PN/EtherNetIP Coupler and used to configure the EtherNet/IP PLC.



Ethernet/IP Input assemblies contain output data of the PROFINET PLC, EtherNet/IP Output assemblies provide input data to the PROFINET PLC.

The PN/EtherNetIP Coupler provides beside the PROFINET / EtherNetIP communication also a MQTT Publisher on both network sides. This enables the values exchanged via the gateway to be distributed to visualization or production data acquisition systems via MQTT.

4 Connection

4.1 Power supply

The PN/ModbusTCP coupler must be supplied with DC 24 V at the wide-range input DC 18 ... 28 V via the supplied connector plug. The power supply is redundant, at least one supply path PS 1 or PS 2 must be connected.



The housing of the PN/PN Coupler is not grounded. Please connect the functional earth terminal  of the PN/PN Coupler properly to the reference potential.



The device is intended to be supplied by an isolated Limited Energy Source according to UL61010-1 (3rd ed cl. 9.4) or according to UL60950-1/UL62368-1 or Class 2 according to NEC. Please use Cu power supply wires, AWG 28-12. Maximum length of removed insulation is 10 mm. Temperature cable rating is 87 °C.

4.2 Network

The left RJ45 sockets "X1 P1" and "X1 P2" are used to connect the PROFINET network, the right RJ45 sockets "X2 P1" and "X2 P2" are used to connect the EtherNet/IP network.

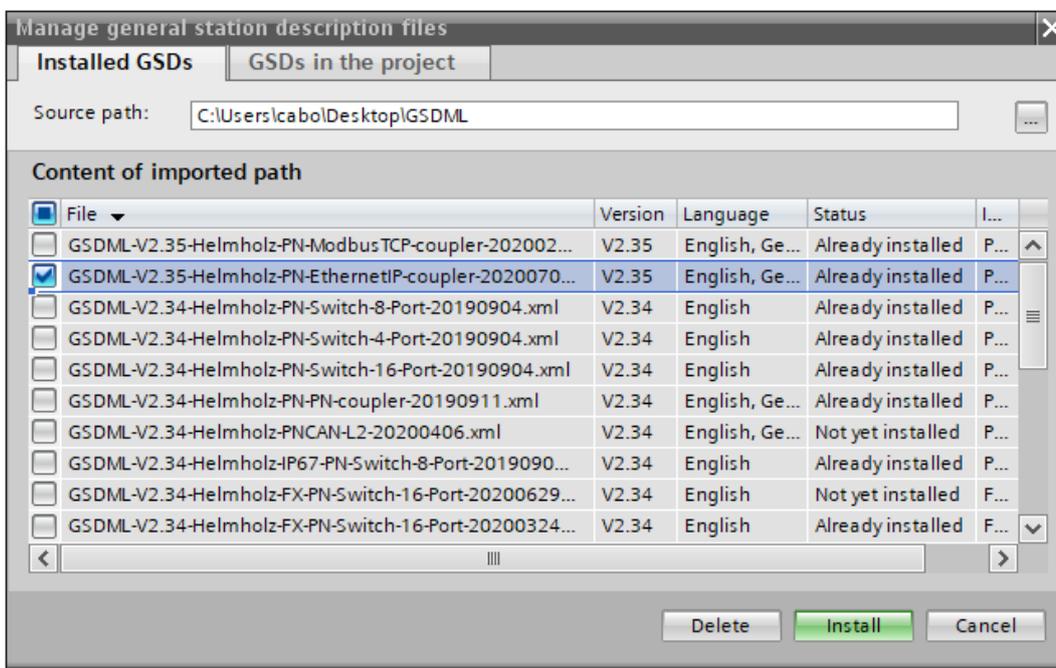


The ETHERNET connections are only intended for connection to computer networks (LANs) and must not be connected to telephone networks or telecommunication lines. The unit is to be connected only to internal Ethernet networks without exiting a facility and being subjected to TNVs.

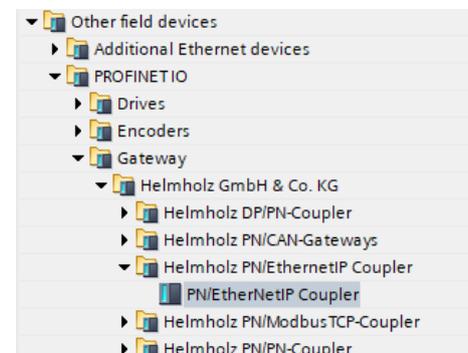
The PN/EtherNetIP coupler must be connected to the wide range input DC 18 ... 30 V via the supplied connector plug, the PN/EtherNetIP Coupler must be supplied with DC 24 V. The power supply is designed redundantly, at least one supply path PS 1 or PS 2 must be connected.

5 Install GSDML file

Please download the GSDML file ("GSDML-V2.35-Helmholz-PN-EthernetIP-coupler-____.xml") from www.helmholz.de or scan the QR code. Install the GSDML file in the TIA Portal under the menu "Tools" / "Manage general station description file (GSD)".



The PN/EtherNetIP Coupler is listed in the hardware catalog under "Other field devices / PROFINET IO / Gateway / Helmholz GmbH & Co. KG".



6 Configuration in TIA Portal

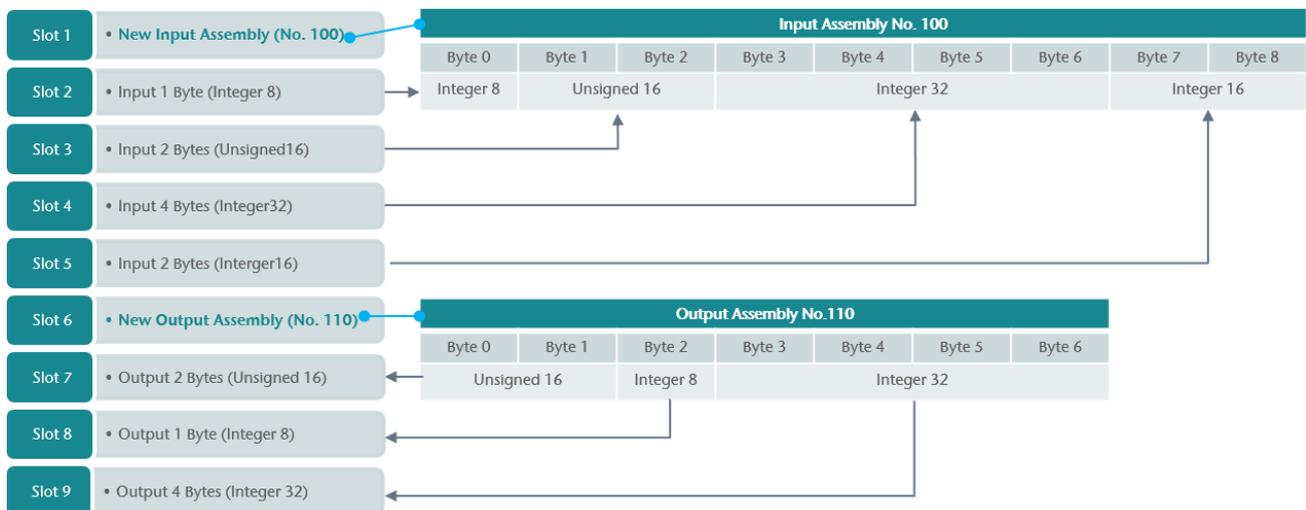
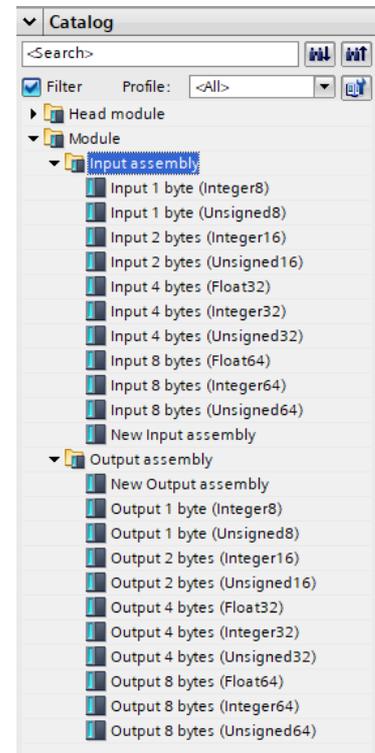
The data exchange between the PROFINET and the EtherNet/IP side of the PN/EtherNetIP coupler is defined exclusively via the Simatic Engineering Tool. New EtherNet/IP assemblies can be created in the slots of the PROFINET configuration and I/O data of the PROFINET PLC can be assigned to these assemblies. Up to 300 slots are available for this purpose.

The first module to be inserted is always a module of type "New Input assembly" or "New Output assembly". Then either input or output modules with the desired data size can be attached.

The assembly number can be set as parameter for the modules for the start of a new assembly. The input and output modules have no parameters.

The PROFINET data are now assigned in the order in which they were specified in the slots.

Device overview						
Module	Rack	Slot	I address	Q address	Type	
PNEtherNetIP	0	0	0...1	2	PN/EtherNetIP Coupler	
PN-IO	0	0 X1			PNEtherNetIPcoupler	
New Input assembly 100	0	1			New Input assembly	
Input 1 byte (Integer8)	0	2		10	Input 1 byte (Integer8)	
Input 2 bytes (Unsigned16)	0	3		11...12	Input 2 bytes (Unsigned16)	
Input 4 bytes (Integer32)	0	4		13...16	Input 4 bytes (Integer32)	
Input 2 bytes (Integer16)	0	5		17...18	Input 2 bytes (Integer16)	
New Output assembly 150	0	6			New Output assembly	
Output 2 bytes (Unsigned16)	0	7	10...11		Output 2 bytes (Unsigned16)	
Output 1 byte (Integer8)	0	8	12		Output 1 byte (Integer8)	
Output 4 bytes (Integer32)	0	9	13...16		Output 4 bytes (Integer32)	
	0	10				



ATTENTION

After a module "New Input assembly" only input modules may be arranged and after a module "New Output assembly" only output modules may be arranged. If the module types are mixed, the PN/EtherNetIP coupler generates a configuration diagnosis.

Data exchange between the EtherNet/IP assemblies and the PROFINET EA data takes place in the PN/EtherNetIP Coupler as quickly as possible when new data is received.

6.1 Parameters of the PN/EtherNetIP coupler

The PN/EtherNetIP Coupler can be parameterized completely via the PROFINET Hardware Configurator (e.g. TIA Portal). However, some parameters can optionally be set via the web page, e.g. the IP address of the device on the EtherNet/IP network side or the DHCP host name.

Settings

Settings

Ethernet/IP IP-address mode: Static IP

Static IP address: 192.168.128.82

Static IP subnet mask: 255.255.0.0

Static IP gateway: 0.0.0.0

Hostname mode: From PROFINET configuration

Ethernet/IP product name / DHCP hostname: PNEthernetIPcoupler1

Ethernet/IP product code: 300

Data alignment in assemblies: Byte

Swap byte order

Status Webpage: on both network sides active

MQTT Publisher option: off

Diagnostic at PS1 failure

Diagnostic at PS2 failure

EtherNet/IP IP-address-Mode: Defines the IP address for the EtherNet/IP network. Possible options are "DHCP", "Static IP" or "IP address from web page".

Static IP address: If the address mode is set to "Static IP", the static IP address can be specified here.

Static IP subnet mask: If the address mode is set to "Static IP", the subnet mask can be specified here.

Static IP gateway: If the address mode is set to "Static IP", the gateway can be specified here

Hostname mode: "From PROFINET configuration" or "Use from web page"

EtherNet/IP product name / DHCP hostname: Name of the device. DHCP names must begin with a letter, end with a letter or digit, and contain only letters, digits, and hyphens.

EtherNet/IP product code: Number of the device in the EtherNet/IP network. The number is used in the EDS file. If more than one PN/EtherNetIP coupler is used in an EtherNet/IP network, this code must be different for each device!

Data alignment in assemblies: If the EtherNet/IP PLC cannot address data by byte alignment it is possible to force the Coupler to align the data to word or double-word addresses.

Swap Byte Order: For 2-byte and 4-byte values, the PN/PN coupler can swap the byte order if required. The standard for values via PROFONET is "Big Endian". The "Swap Byte Order" option can be used if the data is transferred in Little Endian in the Ethernet/IP assemblies due to the PLC used.

Webpage: On which network interfaces should the website be displayed

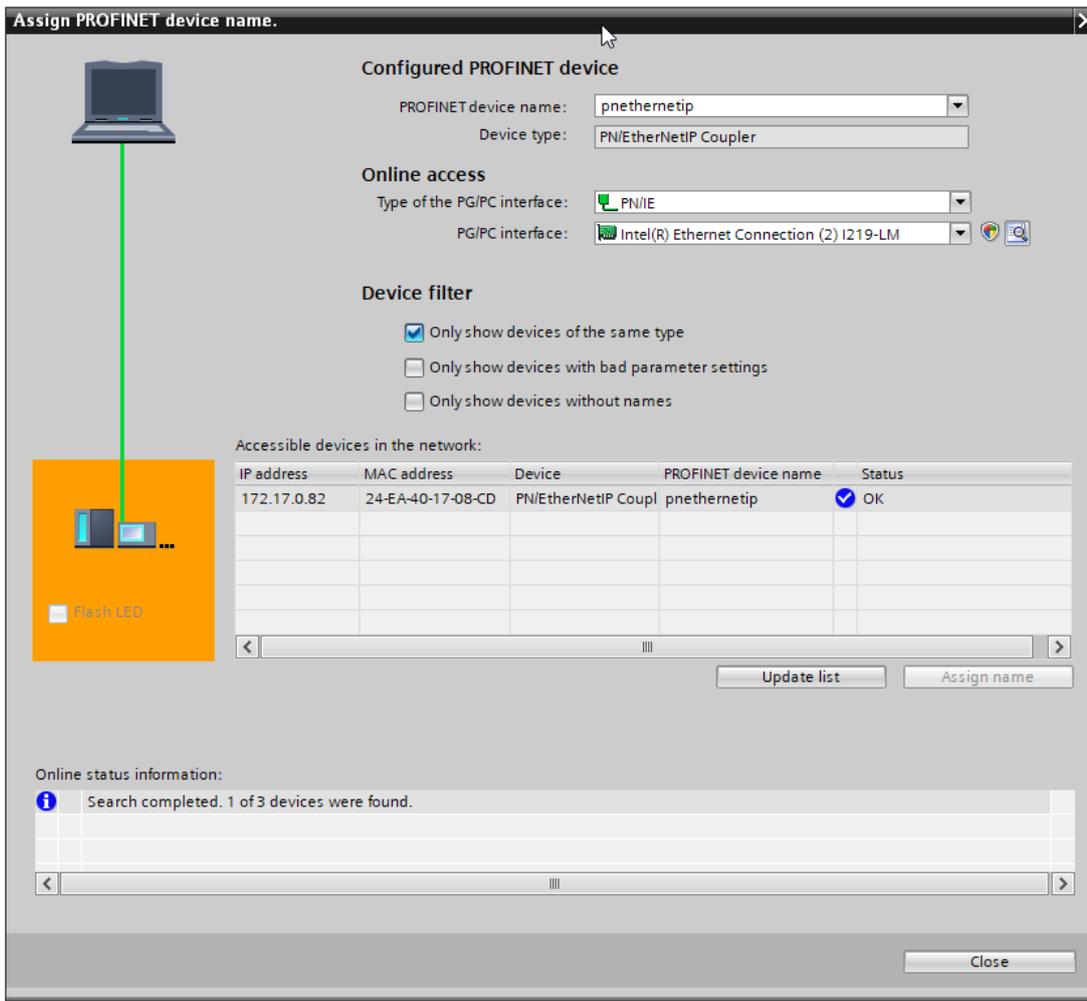
MQTT Publisher Option: On which network interfaces the MQTT Publisher should be activated.

6.2 Assign a name to the PN/EtherNetIP coupler

When the configuration of the PN/EtherNetIP coupler is completed in the hardware configurator of the engineering tool, it can be imported into the PLC.

To enable the PN/EtherNetIP Coupler to be found by the PROFINET controller, the PROFINET device name must be assigned to the PN/EtherNetIP Coupler. To do this, use the "Assign device name" function, which you can access with the right mouse button or in the Online menu if the PN/EtherNetIP Coupler is selected.

Use the "Update list" button to search the network for PROFINET stations. With "Assign name" the PROFINET device name can be assigned to the device.



If the PN/EtherNetIP coupler has received the correct PROFINET name, it is recognized and configured by the PLC. If the configuration is correct, the PROFINET "BF" LED should be off.

To set the PROFINET name, the Helmholz IPSet Tool can also be used, which can be downloaded free of charge from the Helmholz website. Scan the following QR code to download the IPSet Tool:



7 Configuration in Rockwell Studio

7.1 Access the website and download the EDS file

As soon as the PN/EtherNetIP Coupler has been configured via the PROFINET PLC, the website of the device can be accessed via the PROFINET network. If the IP address is also available on the EtherNet/IP network side (Static-IP, DHCP successful), the website can also be accessed via the EtherNet/IP network. At the first access to the device a password must be assigned for the user "admin".

PN/EtherNetIP COUPLER **Helmholz**
COMPATIBLE WITH YOU

Overview Module config EtherNetIP MQTT Account TLS certificates Firmware upgrade

Overview

PN Configuration X1 (left)		EtherNetIP Configuration X2 (right)	
Device name	pnethermetip	Mode	EtherNetIP Adapter
Operating mode	Connected	Operating mode	Not connected
LEDs	SF: ● BF: ● MT: ● PWR: ●	LEDs	SF: ● BF: ● MT: ● PWR: ●
MAC address	24:ea:40:17:08:cd	MAC address	24:ea:40:17:08:d0
IP address	172.17.0.82	IP address	192.168.128.82
Port 1 status	Link up, 100 MB/FD	Port 1 status	Link up, 100 MB/FD
Port 2 status	Link down, -/-	Port 2 status	Link down, -/-
MQTT publisher	Off	MQTT publisher	Off

Software		Hardware	
Firmware version	V1.02.000	Serial Number	50047329
Linux kernel version	4.9.4	Order Number	700-160-3EN02
License terms	pn-eip-coupler-licenses.txt	Hardware Revision	2A-1A

PN/EtherNetIP COUPLER **Helmholz**
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Overview Module config EtherNetIP MQTT Account TLS certificates Firmware upgrade

EtherNetIP server settings

Note: Some settings may be disabled due to PROFINET configuration

Address	Parameters
Mode: <input type="radio"/> DHCP <input checked="" type="radio"/> Static	Maximum number of simultaneous connections: 12
DHCP - Hostname: PNEthernetIP1	Connection watchdog [sec]: 120
Current IP address: 192.168.128.82	Electronic Data Sheet (EDS)
Current netmask: 255.255.0.0	EDS file created from current EtherNetIP configuration
Current gateway: 0.0.0.0	<input type="button" value="Download"/>

The currently valid configuration can be checked in the "Module config" menu.

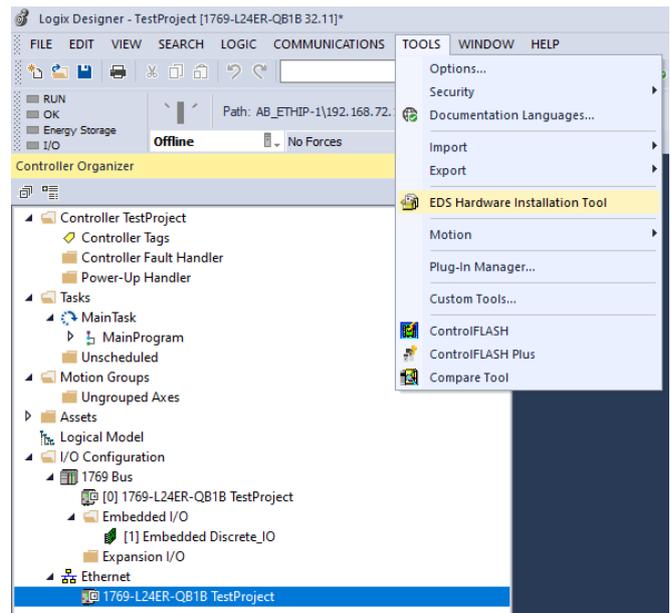
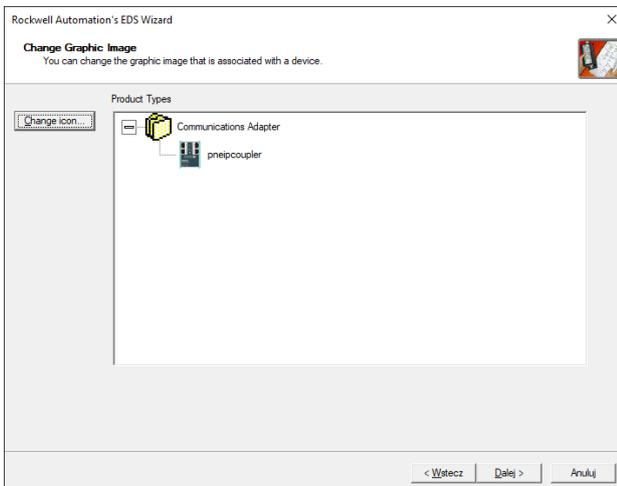
The currently valid configuration can be checked in the "Module config" menu.

The current transferred data is also displayed here.

PN/EtherNetIP COUPLER				
	Overview	Module config	EtherNetIP	MQTT
Module Configuration				
	PN Configuration X1 (left)		EtherNetIP Configuration X2 (right)	
Slot#: 1	No I/O Data		New Input Assembly - Assembly No. 100	
Slot#: 2	OUT 1 Byte (0x00)		Input 1 Byte (Integer8) (0x00)	
Slot#: 3	OUT 2 Bytes (0x00 00)		Input 2 Bytes (Unsigned16) (0x00 00)	
Slot#: 4	OUT 4 Bytes (0x00 00 00 00)		Input 4 Bytes (Integer32) (0x00 00 00 00)	
Slot#: 5	OUT 2 Bytes (0x00 00)		Input 2 Bytes (Integer16) (0x00 00)	
Slot#: 6	No I/O Data		New Output Assembly - Assembly No. 150	
Slot#: 7	IN 2 Bytes (0x00 00)		Output 2 Bytes (Unsigned16) (0x00 00)	
Slot#: 8	IN 1 Byte (0x00)		Output 1 Byte (Integer8) (0x00)	
Slot#: 9	IN 4 Bytes (0x00 00 00 00)		Output 4 Bytes (Integer32) (0x00 00 00 00)	
Slot#: 10	Not configured		Not configured	

7.2 Load EDS file and configure the PN/EtherNetIP coupler

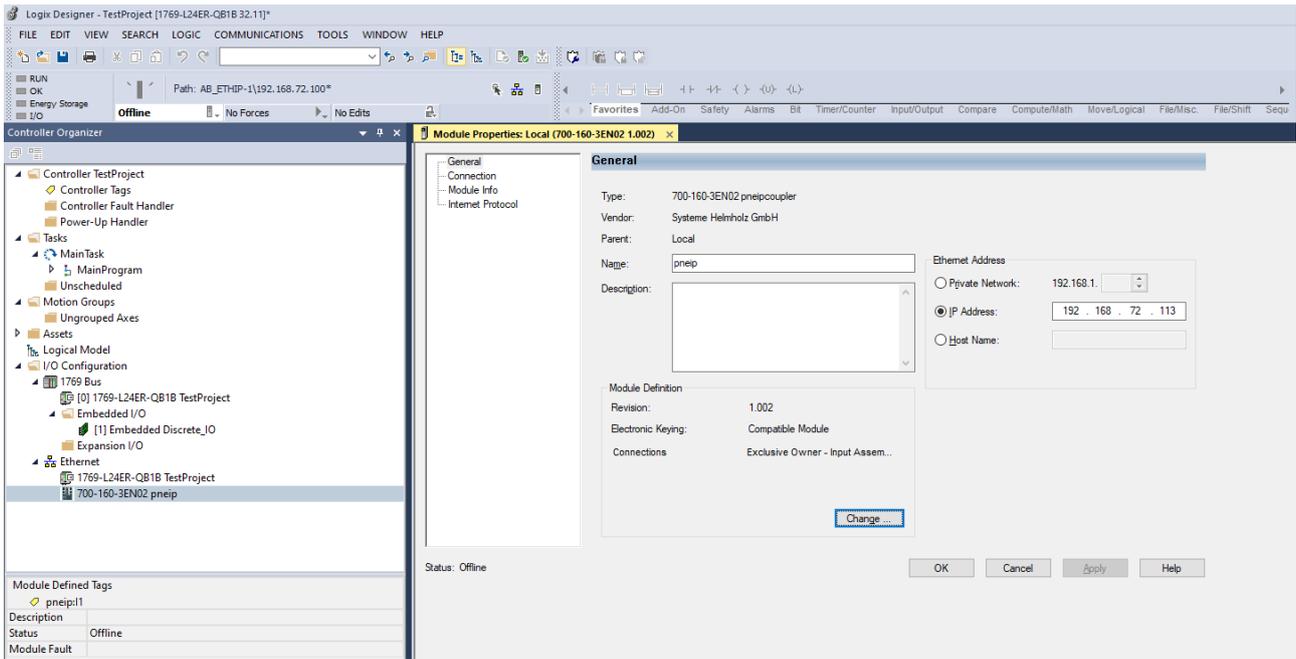
Import the EDS file into the Studio 5000 with the function "EDS Hardware Installation Tool" in the menu "TOOLS".



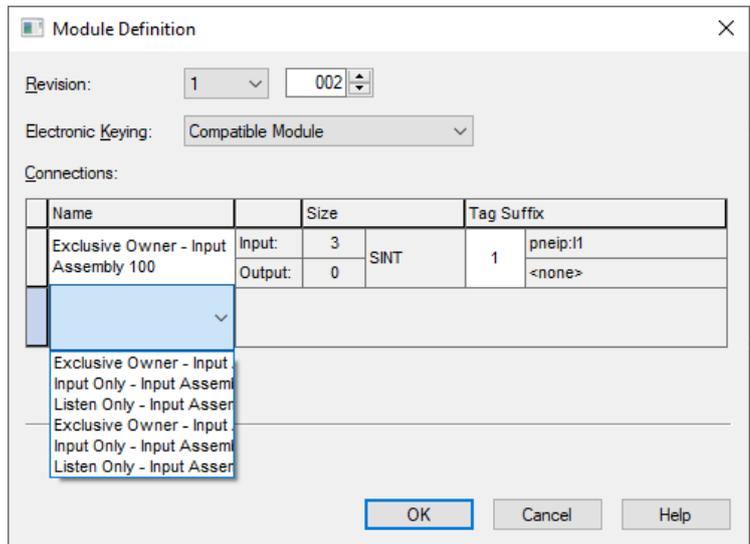
The name of the file is defined by the parameter "EtherNet/IP product name / DHCP host name" in the PROFINET configuration.

The number specified in the PROFINET configuration in the parameter "EtherNet/IP product code" is used in the EDS file to distinguish several couplers in an Ethernet/IP network. Select any different numbers and product names to differentiate the devices.

The module may be added to the hardware configuration under its order number (700-160-3EN02).



The assemblies are based on the data type "SINT" and have a length that corresponds to the data defined in the PROFINET configuration.



ATTENTION

The Rockwell Studio can manage assemblies of up to 500 bytes. If more data is to be exchanged between the PROFINET PLC and the EthernetIP PLC, additional assemblies must be created.

8 Status and control via the PLC

8.1 Status

The PN/EtherNetIP coupler provides a status (2 bytes) via the PROFINET input image:

Byte/Bit	7	6	5	4	3	2	1	0
Byte 0	PROFINET Configuration available	-	PS 1 supply active	PS 2 supply active	MQTT Connection to broker on X1	MQTT Connection to broker on X2	EtherNet/IP IP address available	EtherNet/IP cable detected
Byte 1	Number of active EtherNet/IP connections							

8.2 Control

The PN/EtherNetIP coupler can be controlled via the following control bits (1 byte) in the PROFINET output image

Byte/Bit	7	6	5	4	3	2	1	0
Byte 0	-	-	-	-	-	-	EtherNet/IP Reset	Disable EtherNet/IP connections

9 MQTT Publisher

The PN/EtherNetIP Coupler provides PROFINET / EtherNetIP communication as well as an MQTT Publisher. MQTT is a widely used and simple protocol for distributing information in large networks. The MQTT Publisher can be activated via the PROFINET configuration on the PROFINET or EtherNetIP interface.

For all IO modules defined in the PROFINET configuration, the current values are sent via MQTT when values change. Since MQTT works slower than the primary PROFINET/EtherNetIP communication, it is possible that not all value changes are transmitted via MQTT, but always only the last value state.

9.1 MQTT Publisher settings

To distribute data about MQTT in a network we always need at least one MQTT broker. The broker can run anywhere in the network. The settings of the MQTT publishers can be specified separately for both network sides on the website under "MQTT".

MQTT configuration

Note: Some settings may be disabled due to PROFINET configuration

PN Configuration X1 (left)	EtherNetIP Configuration X2 (right)
ClientID: <input type="text" value="Pn/EtherNetIP Coupler"/>	ClientID: <input type="text" value="Pn/EtherNetIP Coupler"/>
Username (Optional): <input type="text" value="test"/>	Username (Optional): <input type="text" value="Username"/>
Password (Optional): <input type="password" value="****"/>	Password (Optional): <input type="password" value="Password"/>
Broker IP address: <input type="text" value="172.17.0.99"/>	Broker IP address: <input type="text" value="0.0.0.0"/>
Broker TCP port: <input type="text" value="1883"/>	Broker TCP port: <input type="text" value="1883"/>
Keep alive (Seconds): <input type="text" value="60"/>	Keep alive (Seconds): <input type="text" value="60"/>

ClientID: The name of the MQTT Publisher

Username / Password: Optional username and password for login to the MQTT broker

Broker IP address: Address of MQTT-Broker

Broker TCP Port: MQTT-Port for MQTT-Broker

Keep alive (seconds): MQTT- Connection monitoring during inactivity



The MQTT Publisher of the PN/EtherNetIP Coupler does not provide encryption!

10 Technical data

Order no.	700-160-3EN02
Article designation	PN/EtherNetIP Coupler
PROFINET interface	
Connection	2x RJ45, integrated switch
Protocol	PROFINET IO Device as defined in IEC 61158-6-10
Transmission rate	100 Mbit/s full duplex
I/O image size	max. 1024 Byte of input/output data
Number of configurable slots	300
Features	PROFINET Conformance Class B (<i>in preparation</i>), media redundancy (MRP-Client), automatic addressing, Topologieerkennung (LLDP, DCP), diagnosis alarms
EtherNet/IP Schnittstelle	
Connection	2x RJ45, integrated switch
Protocol	EtherNet/IP; implicit messaging (Transport Class 1); explicit messaging (Transport Class 3)
Transmission rate	10/100 Mbit/s, full-/half duplex
I/O image size	3x Input assemblies + 3x Output assemblies, max. 1024 Bytes data
Status indicator	9 LEDs function status, 8 LEDs Ethernet-status
Voltage supply	DC 24 V (18 - 28 V DC)
Current draw	max. 210mA
Power dissipation	max. 5 W
Dimensions (D x W x H)	32,5 x 58,5 x 76 mm
Weight	approx. 135 g
Certifications	CE, PROFINET Conformance Class B (<i>in preparation</i>)
Protection rating	IP 20 (<i>not evaluated by UL</i>)
Relative humidity	95% non-condensing
Mounting position	any
Ambient temperature	0° C to 60° C
Transport and storage temperature	-20° C to 80° C
UL	UL 61010-1 / UL 61010-2-201
Power supply	DC 24 V (18 ... 28 VDC, SELV and limited energy circuit)
Pollution degree	2
Altitude	Up to 2000m
Temperature cable rating	87 °C

11 LED status information

	X1 PROFINET ("PN", left side)	X2 EtherNet/IP ("ENIP", right side)
SF (red)		
Off	Configuration correct	Configuration correct
On	There is no configuration, the configuration is faulty, or a diagnosis is pending.	PROFINET side not configured or failed
Flashing	PROFINET function "LED flashing" for finding the device is executed	-
BF (red)		
Off	The device is configured	Network configuration is valid and there is at least one "Exclusive Owner" or "Input only" connection
On	The device has no configuration, the PROFINET device name is incorrect, or there is no connection with the PROFINET controller	Network configuration is valid, but there is no "Exclusive Owner" or "Input only" connection
Flashing	PROFINET function "LED flashing" for finding the device is executed	No connection possible due to faulty or non-existent network configuration
MT (yellow)		
Flashing	A firmware update is being carried out	A firmware update is being carried out
Flashing with SF and BF	PROFINET function "LED flashing" for finding the device is being carried out	
PWR (green)		
On	PS1 Power supply present	PS1 Power supply present
RUN (green)		
Off	Firmware or device defective. Please contact Support	
On	The device is ready to operate	
RJ45 LEDs	X1 P1/P2 und X2 P1/P2	
Green (Link)	Connected	
Orange (Act)	Data transfer at the port active	



The contents of this Quick Start Guide have been checked by us so as to ensure that they match the hardware and software described. However, we assume no liability for any existing differences, as these cannot be fully ruled out. The information in this Quick Start Guide is, however, updated on a regular basis. When using your purchased products, please make sure to use the latest version of this Quick Start Guide, which can be viewed and downloaded on the Internet from www.helmholz.de.

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