



## Quickstart Guide PN/EtherCAT Coupler

Order number: 700-161-3EC02

Version  
**1** 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 are 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 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/EtherCAT Coupler. The latest version of the documentation can be found at [www.helmholz.de](http://www.helmholz.de) or scan the QR code directly.



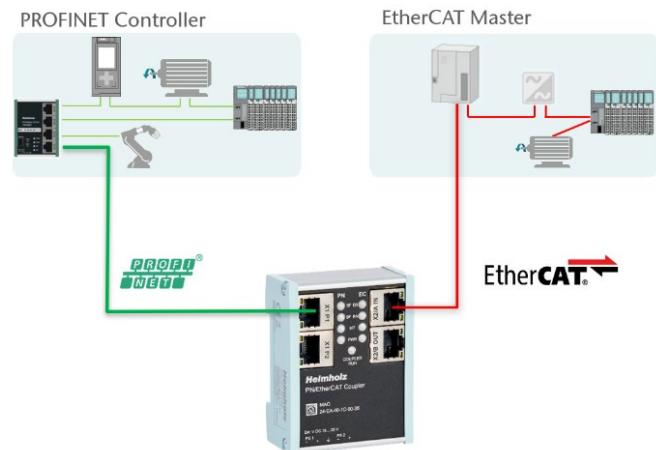
### 3 Function of the PN/EtherCAT Coupler

With the PN/EtherCAT Coupler a simple and easy connection of a PROFINET machine to an EtherCAT machine is possible. The PN/EtherCAT Coupler allows the data transfer between a PROFINET controller and an EtherCAT master.

Output data received on one side of the network is made available to the PLC as input data on the other side of the network. The I/O data exchange takes place live and as fast as possible without further handling blocks.

The maximum size of the transferable I/O data for EtherCAT is 600 bytes in both directions. An additional status byte in the input data enables a simple evaluation of the current operating status.

The integration of the PN/EtherCAT coupler into a PLC engineering tool is made possible by a GSD file on the PROFINET side and an ESI file on the EtherCAT side. The configuration of the I/O data to be exchanged then also takes place in the respective engineering tool. Additional configuration software is not required.



### 4 Connection

#### 4.1 Power supply

The PN/EtherCAT 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/EtherNetIP Coupler is not grounded. Please connect the functional earth terminal  $\perp$  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 Ethernet sockets "X1 P1" and "X1 P2" are used to connect the PROFINET network, the right RJ45 Ethernet sockets "X2/A IN" and "X2/B OUT" are used to connect the EtherCAT network.



*The PROFINET-side Ethernet sockets are only intended for connection to computer networks (LANs) and must not be connected to telephone networks or telecommunications lines.*



*The EtherCAT-side Ethernet ports are only intended for connection to a dedicated EtherCAT network. The connection to a "normal" computer network may cause disturbances there.*

## 5 Download and install the GSDML and ESI file

Please go to the product page of the PN/EtherCAT Coupler at [www.helmholz.de](http://www.helmholz.de) and then to the download area or follow the link provided in the QR code. There you can download the current version of the GSDML and ESI file of the PN/EtherCAT Coupler in zipped form. Before the installation the zipped files must be unzipped accordingly.



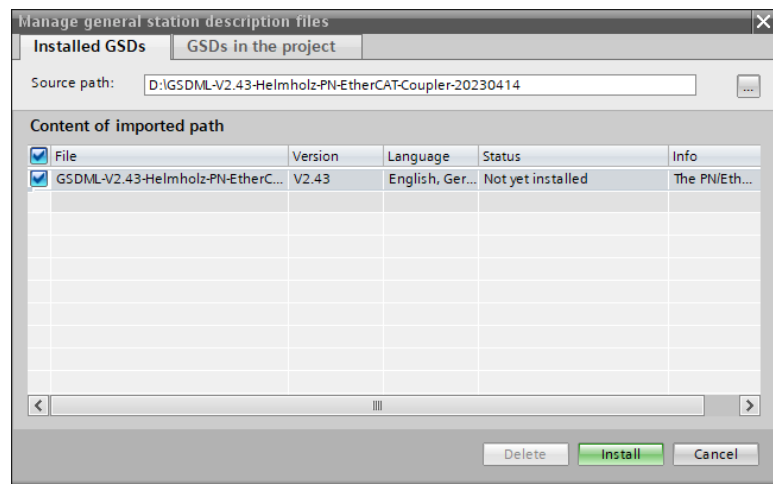
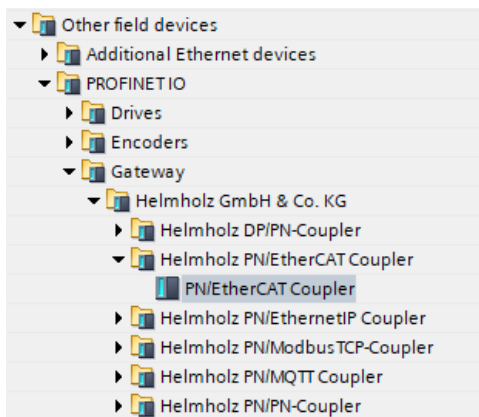
The GSDML file is required for integration into an engineering tool for the PROFINET side. It has the file extension „.xml“ and is delivered together with an image file in BMP format. The installation of the GSDML file in the TIA Portal is described below as an example.

The ESI file is used for integration into a corresponding engineering tool for the EtherCAT side and has the file extension „.xml“. In the following the installation is described using the example of TwinCAT and CODESYS.

### 5.1 Install GSDML file in TIA Portal

You can install the GSDML file of the PN/EtherCAT Coupler in the TIA Portal by selecting the directory with the unzipped GSDML file as source path in the "Extras / Manage device description file (GSD)" menu. Then the GSDML file is displayed for selection and can be installed via the corresponding button.

After successful installation, the PN/EtherCAT Coupler can be found in the hardware catalog of the TIA Portal under "Other field devices / PROFINET IO / Gateway / Helmholz GmbH & Co. KG".



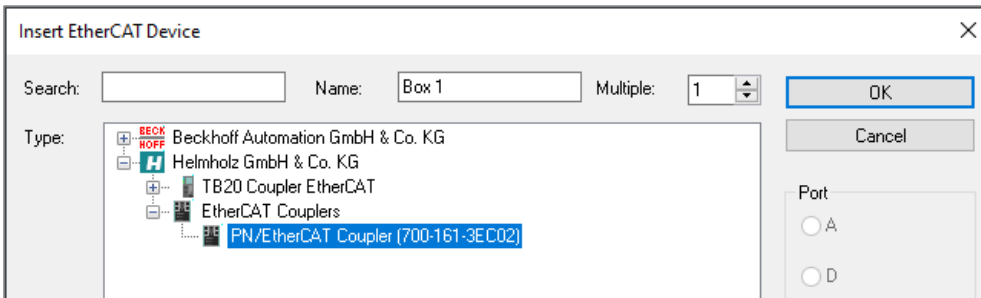
## 5.2 Install ESI file in TwinCAT V2/V3

In TwinCAT V2 and V3 there is currently no dialog-based option for installing the ESI file. Instead you have to copy the unpacked ESI file manually into the following directory:

TwinCAT V2: C:\TwinCAT\IO\EtherCAT

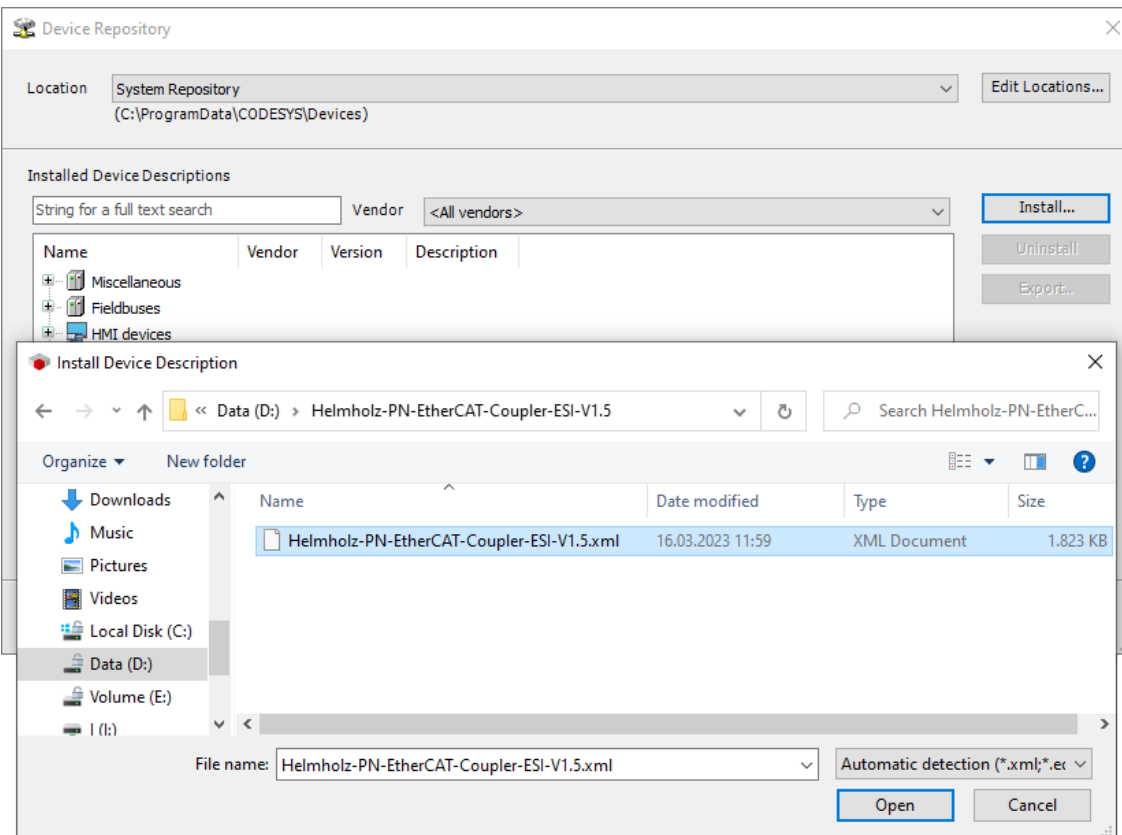
TwinCAT V3: C:\TwinCAT\3.1\Config\Io\EtherCAT

TwinCAT must be restarted so that the PN/EtherCAT Coupler is available afterwards. It can then be selected in the dialog "Insert EtherCAT device" under "Helmholz GmbH & Co. KG / EtherCAT Coupler".



## 5.3 Install ESI file in CODESYS

To install the ESI file of the PN/EtherCAT coupler open the "Device Repository" dialog in the "Tools" menu. Then click on the "Install" button and select the ESI file to be installed using the file dialog that appears.



After successful installation you can find the PN/EtherCAT Coupler in the dialog "Attach device" as shown below. For faster selection the manufacturer "Helmholz GmbH & Co. KG" has been preselected as manufacturer.

Add Device
✕

Name

Action

Append device  
  Insert device  
  Plug device  
  Update device

String for a full text search  Vendor Helmholz GmbH & Co. KG

Name	Vendor	Version
Fieldbuses		
EtherCAT		
Slave		
Helmholz GmbH & Co. KG		
EtherCAT Couplers		
PN/EtherCAT Coupler (700-161-3EC02)	Helmholz GmbH & Co. KG	Revision=16#00000001

Group by category  
  Display all versions (for experts only)  
  Display outdated versions

**Name:** PN/EtherCAT Coupler (700-161-3EC02)


**Vendor:** Helmholz GmbH & Co. KG

**Categories:**

**Version:** Revision=16#00000001

**Order Number:** PN/EtherCAT Coupler

**Description:** EtherCAT Slave imported from Slave XML: Helmholz-PN-EtherCAT-Coupler-ESI-V1.5.xml Device: PN/EtherCAT Coupler (700-161-3EC02). PN/EtherCAT Coupler (700-161-3EC02)



**Append selected device as last child of EtherCAT\_Master**

i (You can select another target node in the navigator while this window is open.)

Add Device
Close

## 6 Data exchange methodology

The data exchange between the two network sides is carried out by the PN/EtherCAT Coupler as fast as possible. This means that as soon as new, valid output data has been received from the controller on one network side, it is transmitted as input data to the controller on the other network side at the next possible time. How fast this exchange can ultimately take place is determined primarily by the cycle times configured on both sides.

### 6.1 Module configuration

The exact structure of the data to be exchanged between the PROFINET and the EtherCAT side is determined by the module configuration of the PN/EtherCAT coupler on both interface sides. For this purpose, 100 slots each and a variety of modules with different data types and array sizes are available in uni- and bidirectional transmission direction.

Overview of the supported data types:

Data type	Description	Value range
BYTE	Byte: 8-Bit-Array	0 .. 256
SINT	Short Integer: 8-bit signed integer	-128 .. +127
USINT	Unsigned Short Integer: 8-bit unsigned integer	0 .. 256
INT	Integer: 16-bit signed integer	-32.768 .. +32.767
UINT	Unsigned Integer: 16-bit unsigned integer	0 .. 65.535
DINT	Double Integer: 32-bit signed integer	- 2.147.483.648 .. +2.147.483.647
UDINT	Unsigned Double Integer: 32-bit unsigned integer	0 .. 4.294.967.296
LINT	Long Integer: 64-bit signed integer	-9.223.372.036.854.775.808 .. +9.223.372.036.854.775.807
ULINT	Unsigned Long Integer: 64-bit unsigned integer	0 .. 18.446.744.073.709.551.616
REAL	Real: 32-bit signed floating point	$-3,4 \cdot 10^{38} .. +3,4 \cdot 10^{38}$
LREAL	Long Real: 64-bit signed floating point	$-1,7 \cdot 10^{308} .. +1,7 \cdot 10^{308}$

The array size specifies how many elements of the same data type make up the data of a module, whereby the total size of the module data per transfer direction can be a maximum of 128 bytes. The available array sizes for all data types are 1, 2, 4, 8 and 16. Depending on the data type there can also be the further array sizes 32, 64 and up to 128. In the module name the array size is specified as multiplier after the respective data type (e.g. UINT 4x, BYTE 64x, REAL 1x).

For each valid combination of data type and array size a module is available as IN, OUT or IN/OUT variant depending on the transfer direction.

Module type	Description
IN	With this module type the controller of the respective network side can receive data from the controller of the other network side. The respective module has only input data for this purpose. On the opposite side, the corresponding OUT type of the module must be configured in the same slot.
OUT	With this module type the controller of the respective network side to transmit data to the controller of the other network side. The respective module has only output data for this purpose. On the opposite side, the corresponding IN type of the module must be configured in the same slot.
IN/OUT	This module type allows a bidirectional data exchange between the controllers of the two network sides. The modules have both input and output data for this purpose. On the opposite side, the IN/OUT type of the module must also be configured in the same slot.



## 6.2 Byte order (endianness)

Since the byte order is different for the two bus systems PROFINET and EtherCAT - PROFINET uses "Big Endian" and EtherCAT "Little Endian" - the values are automatically converted in the PN/EtherCAT coupler.

The conversion is automatically performed by the coupler for all data types that comprise 2, 4 or 8 bytes. For BYTE, SINT and USINT modules, however, the sequence of the data remains unchanged.

## 6.3 Requirements for the exchange of valid data

To ensure that the PN/EtherCAT Coupler can correctly exchange data between the bus systems, certain conditions must be met during configuration.

### On the PROFINET side:

- The module configuration contains at least 1 module in the first slot and further modules are lined up without gaps
- The configured modules match the module configuration of the EtherCAT side regarding data type, array size and transmission direction
- The controller is connected to the coupler and has established an I/O connection (AR) to the coupler
- The controller is in RUN mode (sends valid output data)

### On the EtherCAT side:

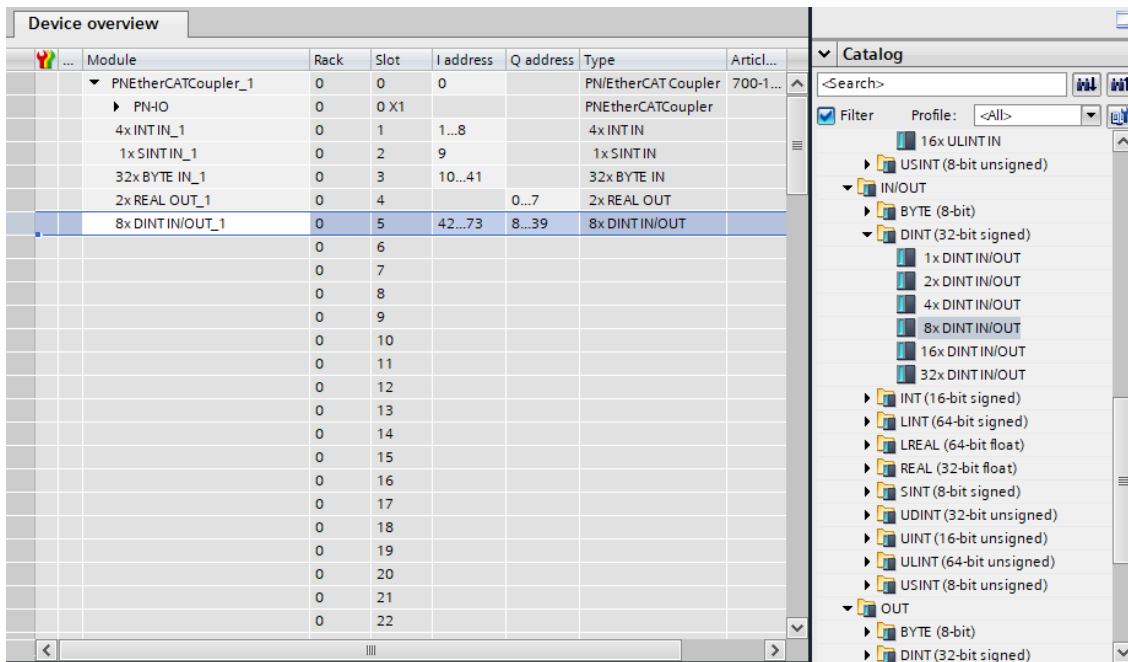
- The module configuration contains at least 1 module in the first slot and further modules are lined up without gaps
- The configured modules match the module configuration of the PROFINET side with regard to data type, array size and transmission direction
- The controller is connected to the coupler and has successfully switched the coupler to the EtherCAT state OPERATIONAL
- The coupler receives valid output data from the controller

Whether the currently exchanged I/O data is valid or not can be read in bit 0 of the status byte, which is provided by the PN/EtherCAT coupler in the cyclic input data on both network sides (see Chap. 10). On the PROFINET side a diagnostic interrupt can be activated additionally concerning the data validity via the parameterization of the PN/EtherCAT coupler (see chapter 7.1).

## 7 Configuration of the PROFINET side

The data exchange between the PROFINET and the EtherCAT side of the PN/EtherCAT coupler is defined via the Simatic Engineering Tool - here using the example of "TIA Portal". The I/O data for exchange can be created in the slots of the PROFINET configuration. Up to 100 slots are available for this purpose.

After installing the GSDML file (see chapter 5.1) and inserting and connecting the PN/EtherCAT coupler in the project, the desired modules from the hardware catalog can be inserted into the slots of the coupler. Please make sure that there is no gap in the list. The I/O addresses for the PLC can be chosen arbitrarily for each slot.



The data sizes must match the configuration of the EtherCAT side slot by slot.

### 7.1 Parameters of the PN/EtherCAT coupler

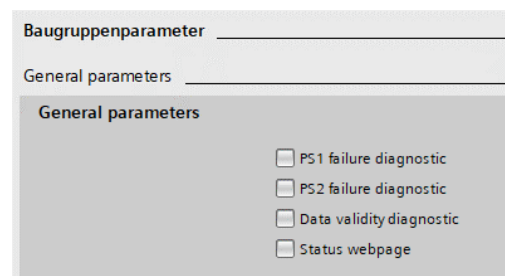
The PN/EtherCAT coupler has 4 parameters:

#### PS1 / PS2 failure diagnostic:

If active, a diagnostic alarm is triggered if there is no sufficient power supply via the corresponding PS1 or PS2 port.

**Data validity diagnostic:** If active, a diagnostic interrupt is triggered whenever there is no valid data exchange between both network sides.

**Status webpage:** When active, the coupler provides a status webpage that can be accessed from the network on the PROFINET side. In addition to displaying status information, a firmware update can also be performed via the web page.

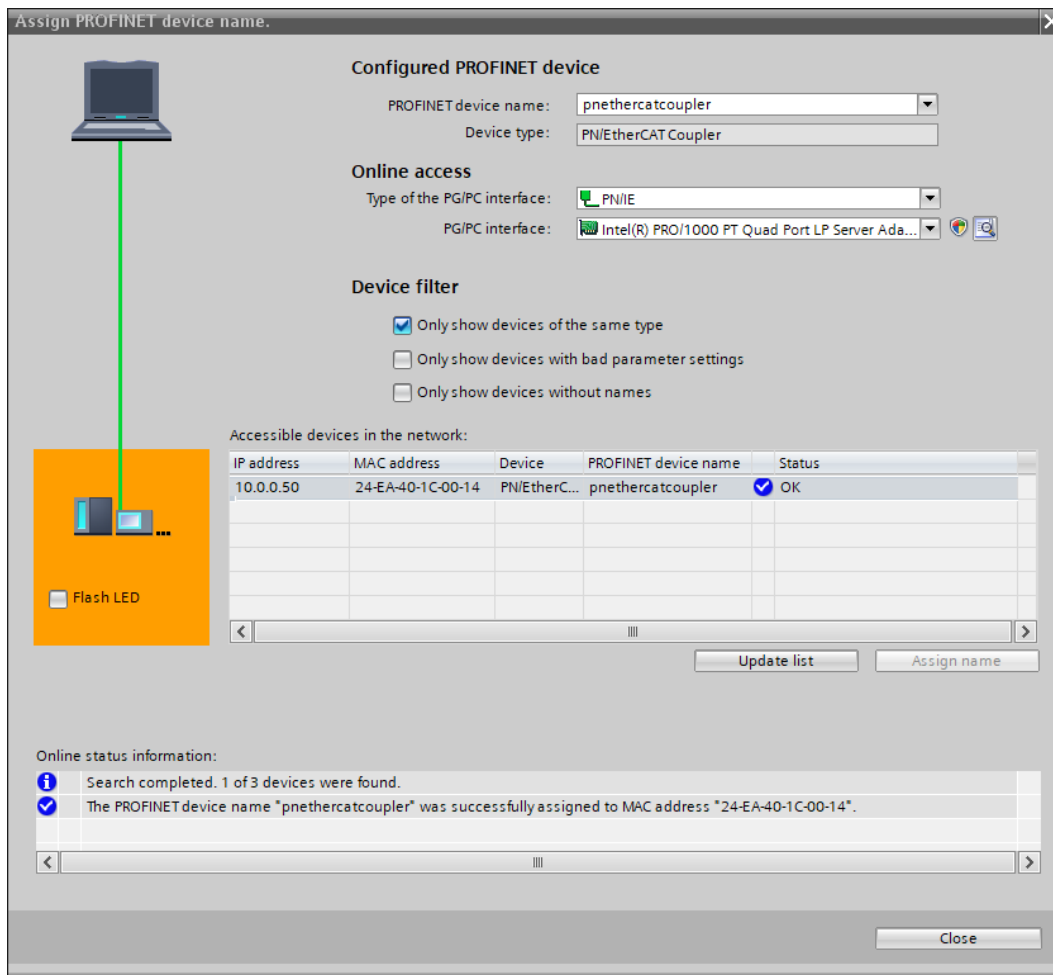


## 7.2 Assign a name to the PN/EtherCAT coupler

When the configuration of the PN/EtherCAT Coupler in the PROFINET Engineering Tool is completed, it can be imported into the PLC.

So that the PN/EtherCAT coupler can be found by the PROFINET controller, the PROFINET device name must be assigned to the PN/EtherCAT coupler. For this use the function "Assign device name" which you can reach with the right mouse button or in the menu "Online" if the PN/EtherCAT Coupler is selected.

With the button "Update list" the network can be searched for PROFINET devices. With "Assign name" the PROFINET device name can be assigned to the device.



The unique identification of the PN/EtherCAT coupler is guaranteed by the MAC address of the PROFINET interface of the device. This MAC address is printed on the front panel of the PN/EtherCAT coupler.

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

The Helmholz IPSet tool, which can be downloaded free of charge from the Helmholz website, can also be used to set the PROFINET device name. Please follow the link in the QR code on the right.



## 8 Configuration of EtherCAT side

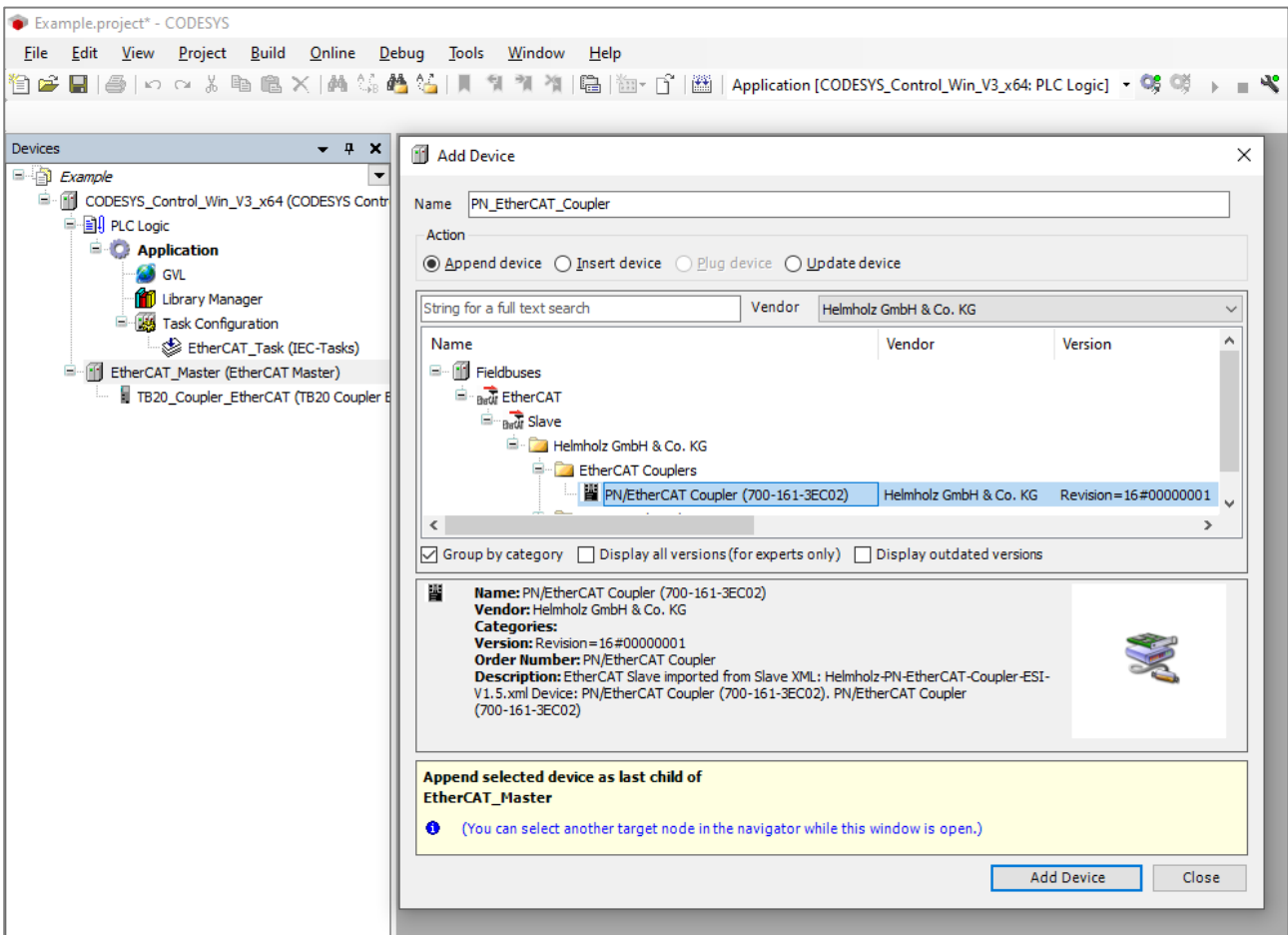
The configuration of the EtherCAT side of the PN/EtherCAT coupler is explained below using CODESYS V3.5 as an example. The configuration should be similar with other tools.

### 8.1 Add PN/EtherCAT Coupler to project

Precondition for a configuration is that there is already an EtherCAT master in the project.

To add the PN/EtherCAT coupler in the device list with right click on the desired EtherCAT master and select the entry "Add device" in the menu to add the coupler behind already existing EtherCAT slaves. Alternatively right click on an EtherCAT slave in the device list and select the entry "Insert device" in the menu to insert the coupler in front of the selected EtherCAT slave.

In both cases the following dialog appears where the PN/EtherCAT coupler can be selected and attached or inserted in the EtherCAT network.



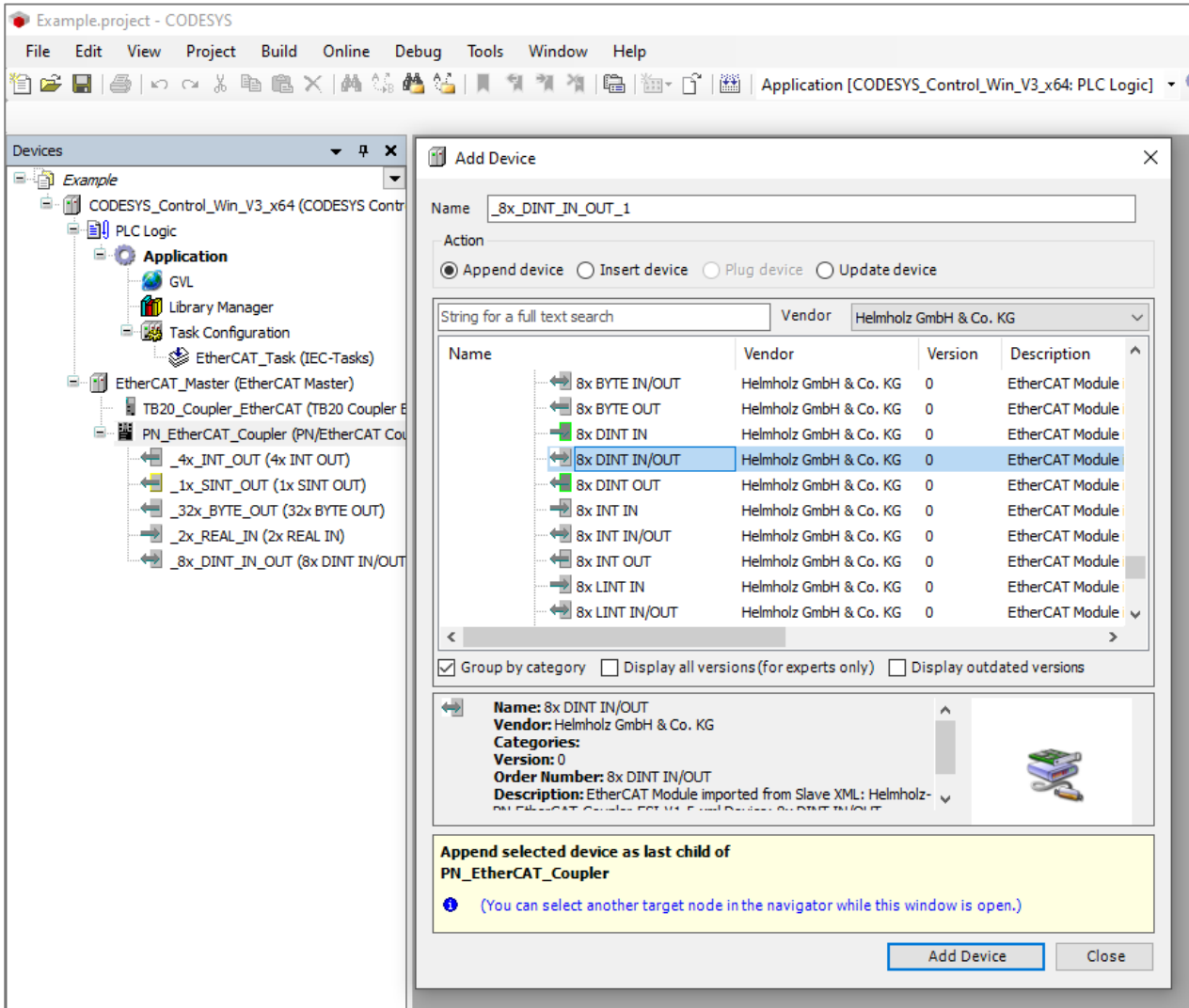
*The sequence/arrangement of the EtherCAT slaves to the EtherCAT master must match the actual topology of the EtherCAT network.*

## 8.2 Module configuration

After creating the coupler, the modules can now be added according to the PROFINET configuration.

To add modules right click on the coupler in the device list and select the entry "Append device" in the menu to add a module behind already existing modules. Alternatively in the device list with right click on an already existing module and select in the menu the entry "Insert device" to insert a module in front of the selected module.

In both cases the following dialog appears, in which you can select the desired modules and append or insert them:



Unfortunately, CODESYS does not group the modules by transmission direction or data type in the selection dialog, so that the list of available modules is very long and not particularly clear. With the help of the full text search field, however, you have the option of significantly reducing the number of modules displayed and thus making the selection easier.



NOTE

*If the PROFINET side has already been configured and commissioned, the coupler can also be read in automatically with a module configuration that matches the PROFINET side. For this you use the function "Search devices" at the EtherCAT master.*

## 9 The PN/EtherCAT Coupler website

As soon as the PN/EtherCAT coupler has been configured by the PROFINET PLC, the web interface of the device is accessible via the IP address configured in PROFINET. The web interface can only be accessed via the PROFINET side.

**PN/EtherCAT Coupler** **Helmholz**  
COMPATIBLE WITH YOU

Overview Module Configuration System

### Overview

**PN Configuration X1 (left)**

Device name	pneecatcoupler
Operating mode	Connected
LEDs	SF: ● BF: ● MT: ● PWR: ●
MAC address	24:ea:40:1c:00:14
IP address	10.0.0.50
Port 1 status	Link up, 100 MB/FD
Port 2 status	Link up, 100 MB/FD

**EtherCAT Configuration X2 (right)**

Configured station alias	0
I/O connection status	Connected
LEDs	ER: ● RN: ● MT: ● PWR: ●
Requested EtherCAT state	OP (Operational)
Current EtherCAT state	OP (Operational)
AL status code	0x0000 (No error)

**Software**

Firmware version	V1.01.005
Linux kernel version	4.9.4
License terms	<a href="#">pn-ecat-coupler-licenses.txt</a>

**Hardware**

Serial Number	50113122
Order Number	700-161-3EC02
Hardware Revision	2B-1

www.helmholz.com

The web interface of the PN/EtherCAT coupler provides an overview of the status and configuration of the device, as well as the possibility to perform a firmware update. In the upper gray line there is the menu for further web pages.



*If the web page of the device is not available, please check the parameter "Status web page" in the PROFINET configuration (see Chap. 7.1)*

The menu "Module Configuration" shows an overview of the I/O configuration of all slots with a short view of the current data.

	PN Configuration X1 (left)	EtherCAT Configuration X2 (right)
Slot# 1	16x BYTE OUT ( 0x28 4F CA C1 ... )	16x BYTE IN ( 0x28 4F CA C1 ... )
Slot# 2	128x BYTE IN ( 0x03 A7 20 00 ... )	128x BYTE OUT ( 0x03 A7 20 00 ... )
Slot# 3	4x INT OUT ( 0x14 73 35 78 ... )	4x INT IN ( 0x14 73 35 78 ... )
Slot# 4	8x DINT OUT ( 0x77 2A 26 BC ... )	8x DINT IN ( 0x77 2A 26 BC ... )
Slot# 5	2x DINT IN ( 0x55 9A B4 32 ... )	2x DINT OUT ( 0x55 9A B4 32 ... )
Slot# 6	32x REAL IN/OUT ( 0x4F 0C 4A 5B ... / 0x74 4C AA 2B ... )	32x REAL IN/OUT ( 0x74 4C AA 2B ... / 0x4F 0C 4A 5B ... )
Slot# 7	1x LREAL OUT ( 0x9A B6 4C C1 ... )	1x LREAL IN ( 0x9A B6 4C C1 ... )



NOTE

*Calling the web page may affect the processing speed of the device.*

## 9.1 Firmware-Update

For a firmware update, please download the latest firmware from the following link:

<https://www.helmholz.de/goto/700-161-3EC02>

The firmware file can be recognized by the file extension "HUF" (Helmholz Update File) and is encrypted to protect it from changes.

Currently installed firmware version is V1.01.004.  
The latest firmware update file can be found on [here](#).

**ATTENTION! Please note that the Device will be unavailable during update procedure. Communication with other devices will be interrupted or stopped.**

## 10 Status-Byte

To be able to consider the state of the PN/EtherCAT coupler in the respective PLC, the coupler contains a status byte in the cyclic input data both on the PROFINET and on the EtherCAT side.

The status byte provides information about the validity of the exchanged I/O data, the status of the respective other network side and the status of the power supply at PS 1 and PS 2.

### 10.1 Status-byte on PROFINET side

In the PLC on the PROFINET side, the status byte is assigned to the head module and can be accessed under the "E address" defined there.

Device overview							
	Module	Rack	Slot	I address	Q address	Type	Artic...
	▼ pncatcoupler	0	0	0		PN/EtherCAT Coupler	700-1...
	▶ PN-IO	0	0 X1			PNEtherCATCoupler	
	4x INT IN_1	0	1	1...8		4x INT IN	
	1x SINT IN_1	0	2	9		1x SINT IN	
	32x BYTE IN_1	0	3	10...41		32x BYTE IN	
	2x REAL OUT_1	0	4		0...7	2x REAL OUT	
	8x DINT IN/OUT_1	0	5	42...73	8...39	8x DINT IN/OUT	
		0	6				

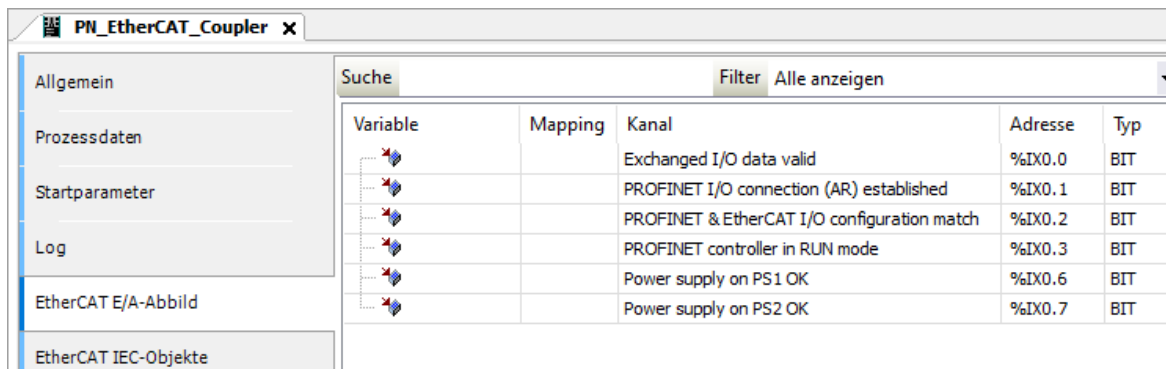
Structure of the status byte:

Bit	Name
0	Exchanged I/O data valid
1	EtherCAT I/O connection established
2	EtherCAT & PROFINET I/O configuration match
3	EtherCAT state OPERATIONAL
4	Reserved (0)
5	Reserved (0)
6	Power supply on PS1 OK
7	Power supply on PS2 OK



## 10.2 Status-Byte on EtherCAT side

In CODESYS you can find the status byte with the contained bits by double-clicking the coupler in the device list and then switching to the "EtherCAT I/O image" view.



Variable	Mapping	Kanal	Adresse	Typ
		Exchanged I/O data valid	%IX0.0	BIT
		PROFINET I/O connection (AR) established	%IX0.1	BIT
		PROFINET & EtherCAT I/O configuration match	%IX0.2	BIT
		PROFINET controller in RUN mode	%IX0.3	BIT
		Power supply on PS1 OK	%IX0.6	BIT
		Power supply on PS2 OK	%IX0.7	BIT

### Structure of the status byte:

Bit	Name
0	Exchanged I/O data valid
1	PROFINET I/O connection (AR) established
2	PROFINET & EtherCAT I/O configuration match
3	PROFINET controller in RUN mode
4	Reserved (0)
5	Reserved (0)
6	Power supply on PS1 OK
7	Power supply on PS2 OK

## 11 Diagnostic LED information

X1 PROFINET (left side)	X2 EtherCAT (right side)
<b>SF-LED (red)</b> System Fault LED for signaling system faults (see chap. 11.3 for details)	<b>ER-LED (red)</b> Error LED for signaling various error states (see chap. 11.4 for details)
<b>BF-LED (red)</b> Bus fault LED for signaling connection errors (see chap. 11.3 for details)	<b>RN-LED (green)</b> RUN LED for signaling the EtherCAT state of the coupler (see chap. 11.4 for details)
<b>MT-LED (yellow)</b> Maintenance LED for signaling maintenance states (see chap. 11.3 for details)	<b>MT-LED (yellow)</b> Maintenance LED for signaling maintenance states (see chap. 11.4 for details)
<b>PWR-LED (green)</b> Power LEDs for signaling the status of the power supply via PS1 (PWR left) and PS2 (PWR right) <ul style="list-style-type: none"> <li>• LED on: Sufficient voltage supply connected to PS1/PS2</li> <li>• LED off: No sufficient voltage supply connected to PS1/PS2</li> </ul>	<b>PWR-LED (green)</b>
<b>RUN (green)</b> LED for signaling the operational state of the coupler <ul style="list-style-type: none"> <li>• LED on: the coupler is ready for operation</li> <li>• LED off: the coupler is not (yet) ready for operation (after power-on for max. 30 seconds)</li> </ul> If the RUN LED remains permanently off despite sufficient power supply (at least one of the PWR LEDs is on), this could indicate a hardware or firmware defect of the coupler. In this case, please contact the support.	
<b>Link-LED (green) and Activity-LED (orange) at both Ports X1/P1 + X1/P2</b> Two LEDs each for signaling the connection and communication status of the respective PROFINET port <ul style="list-style-type: none"> <li>• both LEDs off: No Ethernet connection</li> <li>• both LEDs on: Ethernet connection established, but currently no communication</li> <li>• green LED on + orange LED flashing: Ethernet connection with currently running communication</li> </ul>	<b>Link-/Activity-LED (green) at both Ports X2/A IN + X2/B OUT</b> One LED each for signaling the connection and communication state of the respective EtherCAT port <ul style="list-style-type: none"> <li>• LED off: No Ethernet connection</li> <li>• LED on: Ethernet connection established, but currently no communication</li> <li>• LED flashing: Ethernet connection with currently running communication</li> </ul>

## 11.1 LED diagnostics for PROFINET interface

The LED states listed assume that the coupler is in the ready-to-run state, i.e. the central green RUN LED is lit.

SF-LED (red)	BF-LED (red)	MT-LED links (yellow)	Status of the PROFINET interface
Off	Off	Off	Error-free operating state with valid data exchange between the PROFINET and the EtherCAT control.
On	Off	Off	Data exchange with the EtherCAT side is not possible for at least one of the following reasons: <ul style="list-style-type: none"> <li>• Invalid module configuration on the PROFINET side (no module configured, module gap present or maximum size of I/O image exceeded).</li> <li>• Module configurations of the PROFINET and the EtherCAT side do not fit together</li> <li>• The EtherCAT side is not in the OPERATIONAL state and therefore does not provide valid data.</li> </ul>
Off	On	Off	There is no I/O connection to a PROFINET controller with the following possible causes: <ul style="list-style-type: none"> <li>• PROFINET controller not ready for operation or not connected</li> <li>• In the current project of the controller the coupler is not configured</li> <li>• No or not the correct PROFINET device name was assigned to the coupler (see chap. 7.2)</li> </ul>
Flashing	Flashing	Flashing	The PROFINET function "LED flashing" for device identification is active. This function has no influence on the current operating state of the coupler.
Off	On	Off	A firmware update of the coupler was started via the web interface (see chap. 9.1), which will end with an automatic restart of the coupler. During the firmware update, no I/O communication and thus no data exchange takes place on either interface side.

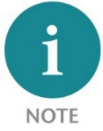
## 11.2 LED diagnostics for EtherCAT interface

The LED states listed assume that the coupler is in the ready-to-run state, i.e. the central green RUN LED is lit.

LED (color)	State	Function
ER-LED (rot)	Off	No error condition
	Flashing	Request of the controller to the coupler to change to a higher EtherCAT state was rejected (e.g. due to gap in the module configuration)
	strokes periodically 1x briefly	Self-triggered change to a lower EtherCAT state due to an event or error (e.g. start of firmware update).
	strokes periodically 2x briefly	Process data or communication watchdog has expired (e.g. by disconnecting the connection to the controller).
RN-LED (green)	Off	EtherCAT-State des Couplers: Init (INIT)
	Flashing	EtherCAT-State des Couplers: Pre-Operational (PREOP)
	strokes periodically 1x briefly	EtherCAT-State des Couplers: Safe-Operational (SAFEOP)
	On	EtherCAT-State des Couplers: Operational (OP)
MT-LED (yellow)	Off	Error-free operating state with valid data exchange between the EtherCAT and the PROFINET controller. In this case the ER LED is always off (no error state) and the RN LED is always on (EtherCAT state OP).
	Flashing	A firmware update of the coupler was started via the web interface (see chap. 9.1), which will end with an automatic restart of the coupler. During the firmware update, no I/O communication and thus no data exchange takes place on either interface side.
	On	Error-free operating state with valid data exchange between the EtherCAT and the PROFINET controller.

## 12 Technical data

<b>Order no.</b>	<b>700-161-3EC02</b>
Article name	PN/EtherCAT Coupler
Scope of delivery	PN/EtherCAT Coupler with power supply connector
Dimensions (D x W x H)	32,5 x 58,5 x 76 mm
Weight	approx. 135 g
<b>PROFINET interface (X1)</b>	
Number	1
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	600 bytes input and 600 bytes output data
Number of configurable slots	100
Features	PROFINET Conformance Class B ( <i>in preparation</i> ), media redundancy (MRP-Client), automatic addressing, Topologieerkennung (LLDP, DCP), diagnosis alarms
<b>EtherCAT interface (X2)</b>	
Number	1
Connection	2x RJ45, IN/OUT
Protocol	EtherCAT as of IEC 61158-x-12
Transmission rate	100 Mbit/s
I/O image size	600 bytes input and 600 bytes output data
Features	Automatic process data configuration, Support of 'CANopen over EtherCAT' (CoE), Object dictionary according to 'Modular Device Profile' (MDP), Support of 'SDO Info' and 'Complete Access
Status indicator	9 LEDs function status, 6 LEDs Ethernet-status
<b>Power supply</b>	
Operating voltage	DC 24 V (18 - 28 V DC)
Current draw	max. 180mA at DC 24 V
Power dissipation	max. 4,7 W
<b>Ambient conditions</b>	
Ambient temperature	0° C to 60° C
Relative humidity	95% non-condensing
Transport and storage temperature	-20° C to 80° C
Protection rating	IP 20
Mounting position	as desired
<b>Compliance</b>	
Approvals	CE
RoHS	yes
REACH	yes



*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](http://www.helmholz.de).*

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