



Quickstart Guide PN/CAN Gateway CAN Layer 2

Order number: 700-671-PNC01

Version
4 en

Content

1	Safety instructions	3
2	Introduction	3
3	Function of PN/CAN Gateway CAN Layer 2	4
4	Connection	4
4.1	Power supply	4
4.2	CAN-Bus	4
4.3	PROFINET	4
4.4	USB interface	4
5	Download and Installation of GSDML file	5
5.1	Install GSDML file in TIA Portal	5
6	Configuring the PN/CAN-Gateway	6
6.1	Parameterize the PN/CAN-Gateway	6
6.2	Adding CAN messages	7
6.2.1	Automatically receiving CAN messages	8
6.2.2	Automatically transmitting CAN messages	8
7	Assign a PROFINET device name to the PN/CAN gateway	9
8	Programming in the PLC	10
8.1	Control (2 bytes outputs)	10
8.2	Status (6 bytes input)	10
9	LED-based diagnosis	11
10	Technical data	12

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/CAN-Gateway CAN Layer 2. The latest version of the documentation can be found at www.helmholz.de or scan the QR code directly.



3 Function of PN/CAN Gateway CAN Layer 2

The "PN/CAN Gateway, PROFINET/CAN Layer 2" connects a CAN network to a PROFINET network. The gateway can integrate the data of CAN messages in 11-bit or 29-bit format (CAN 2.0A / CAN 2.0B) into the IO area of a PROFINET CPU.

4 Connection

4.1 Power supply

The PN/CAN gateway must be supplied with DC 24 V at the connection "Ext. V DC 18 ... 30 V" via the supplied connector plug.



The housing of the PN/CAN-Gateway Coupler is not grounded. Please connect the functional earth terminal of the PN/CAN-Gateway 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 CAN-Bus

The CAN bus is connected to the "CAN" interface using a SUB-D plug (e.g. Helmholz CAN bus connector) to the "CAN" interface.



The PN/CAN gateway does not contain a CAN terminating resistor. If the PN/CAN gateway is connected to the end of a CAN stub line, the terminating resistor in the CAN connector must be activated.

"CAN-GND" is isolated from the operating voltage and USB.

Pin	CAN bus D-sub-connector
1	-
2	CAN Low
3	CAN GND
4	-
5	-
6	-
7	CAN High
8	-
9	-

4.3 PROFINET

The RJ45 Ethernet sockets "X1 P1" and "X1 P2" are used to connect the PROFINET network.



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

4.4 USB interface

The service USB interface is only required for the firmware update and for diagnoses in the event of support. The USB interface is isolated potential-free from the supply voltage.

5 Download and Installation of GSDML file

The current GSDML file is available on the website www.helmholz.de. Go to the product page of the "PN/CAN Gateway CAN Layer 2" and then to the download area or follow the link stored in the QR code. There you can download the GSDML file of the "PN/CAN Gateway CAN Layer 2" in zipped form. Before installation, the zipped files must be unzipped accordingly.

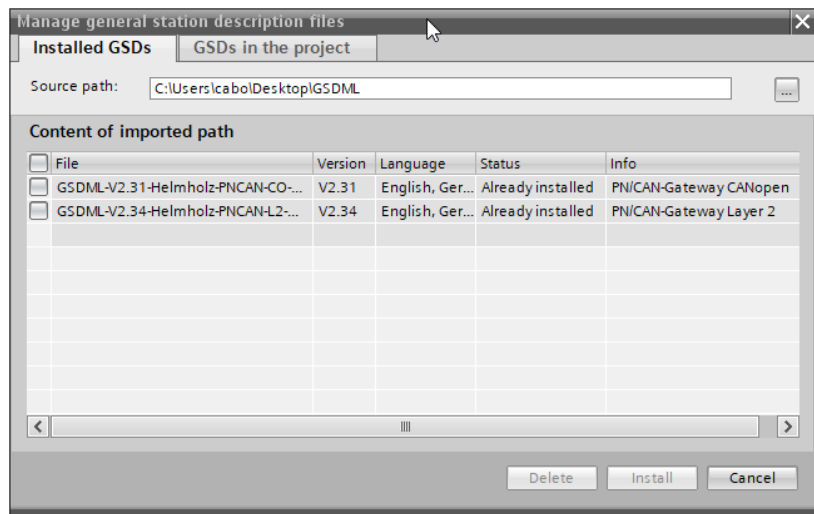
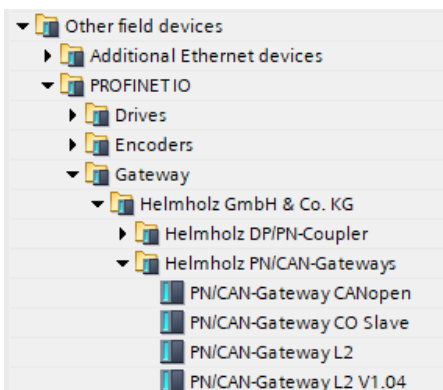


The GSDML file is required for integration into an engineering tool for the PROFINET side. It has the file extension ".xml" and is delivered together with an image file in BMP format. The installation of the GSDML file in the TIA Portal is described below as an example.

5.1 Install GSDML file in TIA Portal

You can install the GSDML file of the PN/CAN gateway in the TIA Portal by selecting the directory with the unzipped GSDML file as the 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/CAN Gateway Layer 2" is available in the hardware catalog of the TIA Portal under "Other field devices / PROFINET IO / Gateway / Helmholz GmbH & Co. KG / Helmholz PN/CAN gateways".

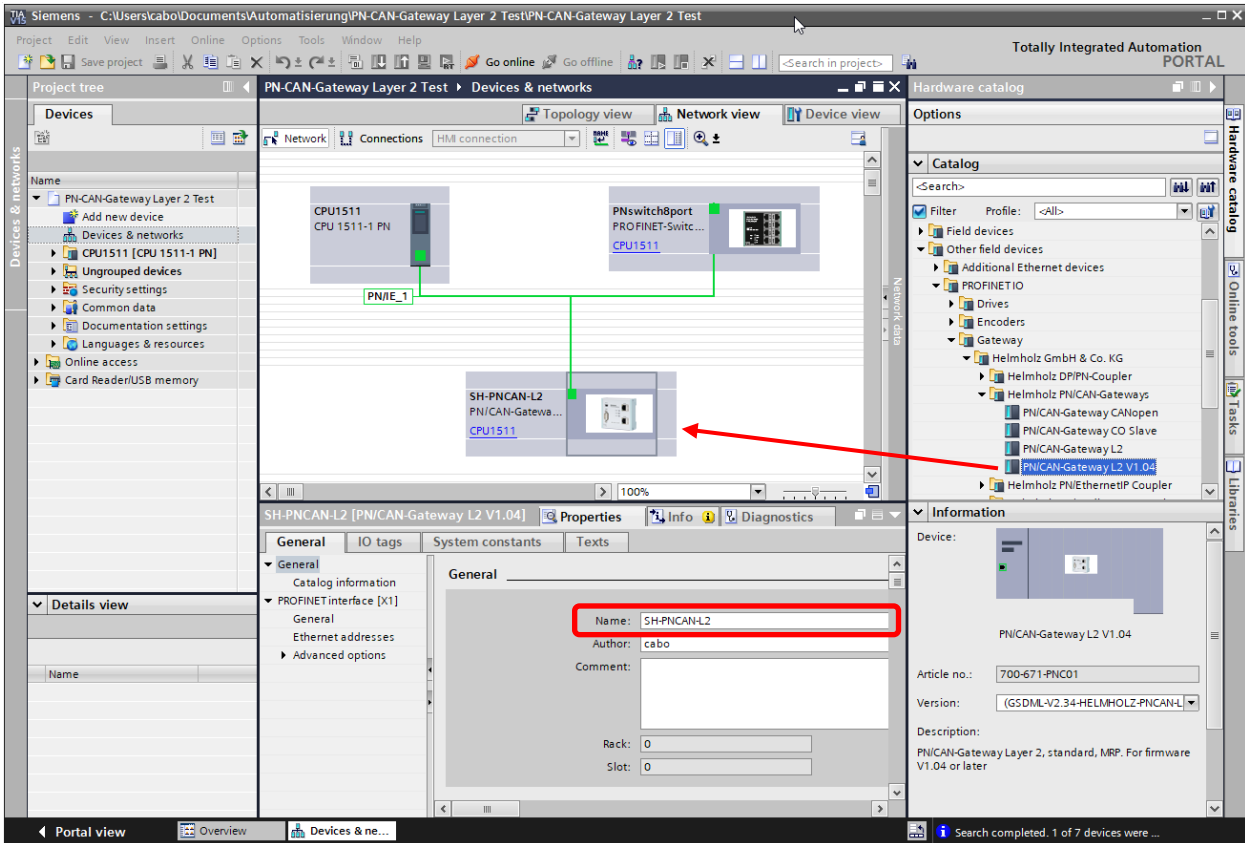


Use the entry "PN/CAN-Gateway L2 V1.04" for new projects.

The second entry "PN/CAN-Gateway L2" is present for old projects for compatibility reasons and should not be used in new projects.

6 Configuring the PN/CAN-Gateway

Add the "PN/CAN-Gateway L2 V1.04" to the project and connect it to your PROFINET network.

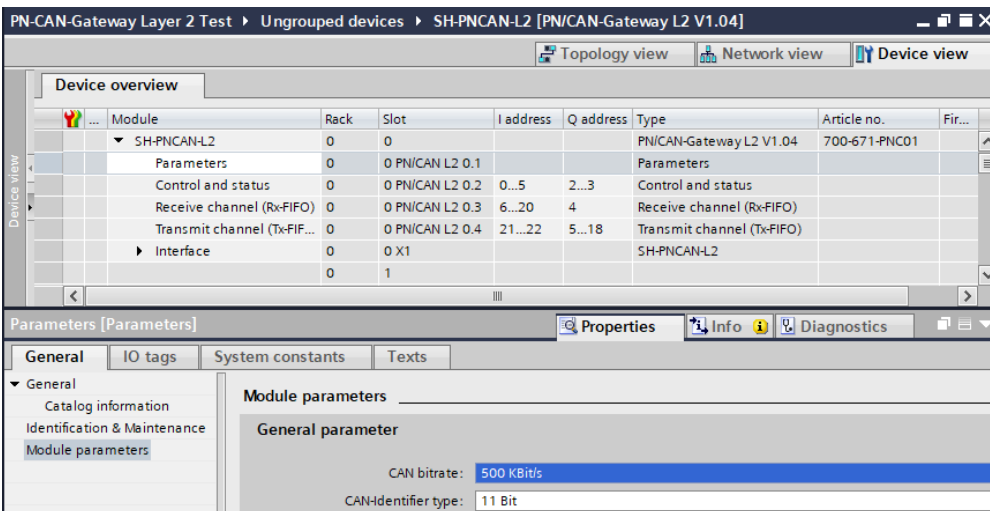


By calling the properties a unique PROFINET name should be assigned to the PN/CAN gateway and the IP address should be checked for plausibility.

The name of the configured device must be assigned to the physical device later (see Chap. 7).

6.1 Parameterize the PN/CAN-Gateway

The first slot entry after the ports is the slot for the parameters. Set the CAN bitrate, and the type of CAN identifier (11 bit or 29 bit).



The meaning of the other parameters can be taken from the manual and have no relevance for standard applications. The other "PN/CAN L2" slot 0 modules do not contain any parameters.

6.2 Adding CAN messages

The PN/CAN gateway layer 2 can send and receive CAN messages with 0 to 8 bytes of data and any CAN ID. For each expected CAN message and each CAN message to be sent, a module with the CAN identifier must be configured in the slots of the PN/CAN gateway.

There are two variants of CAN message modules: **Automatic Receive/Transmit** and **Controlled Receive/Transmit**.

Using **Automatic Receive**, the data of the last received CAN message is always in the input data of the PLC. If a CAN message is received several times with the same data or quickly changing data, no distinction can be made in the PLC.

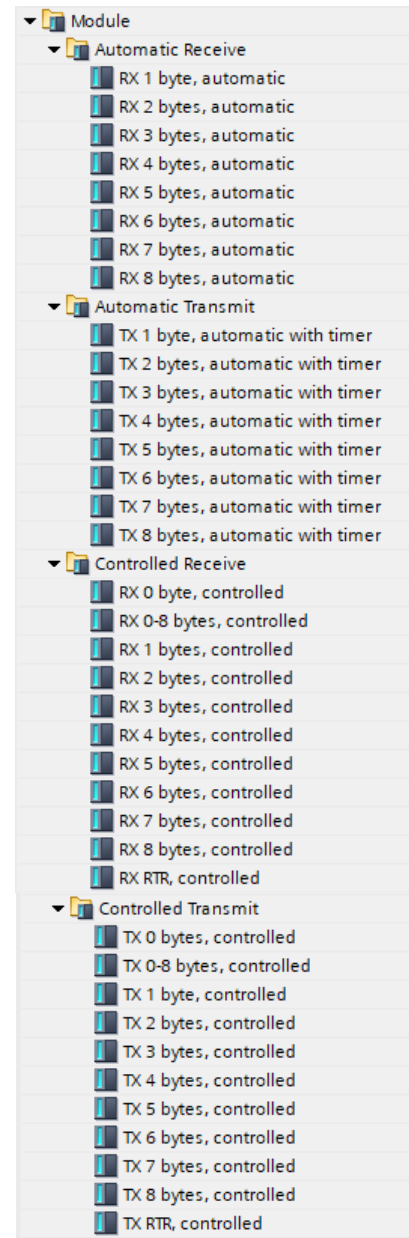
Using **Automatic Transmit**, the CAN message is transmitted as soon as something changes in the output data of the message or with an adjustable time interval.

With **Controlled Receive** and **Controlled Transmit** of CAN messages, the PLC program has direct control over the transmission or processing of each message via control and status bits.

In addition to the CAN message modules, which each have only one fixed CAN identifier, random CAN message can also be received via a **Receive channel (Rx-FIFO)** and a **Transmit channel (Tx-FIFO)**.

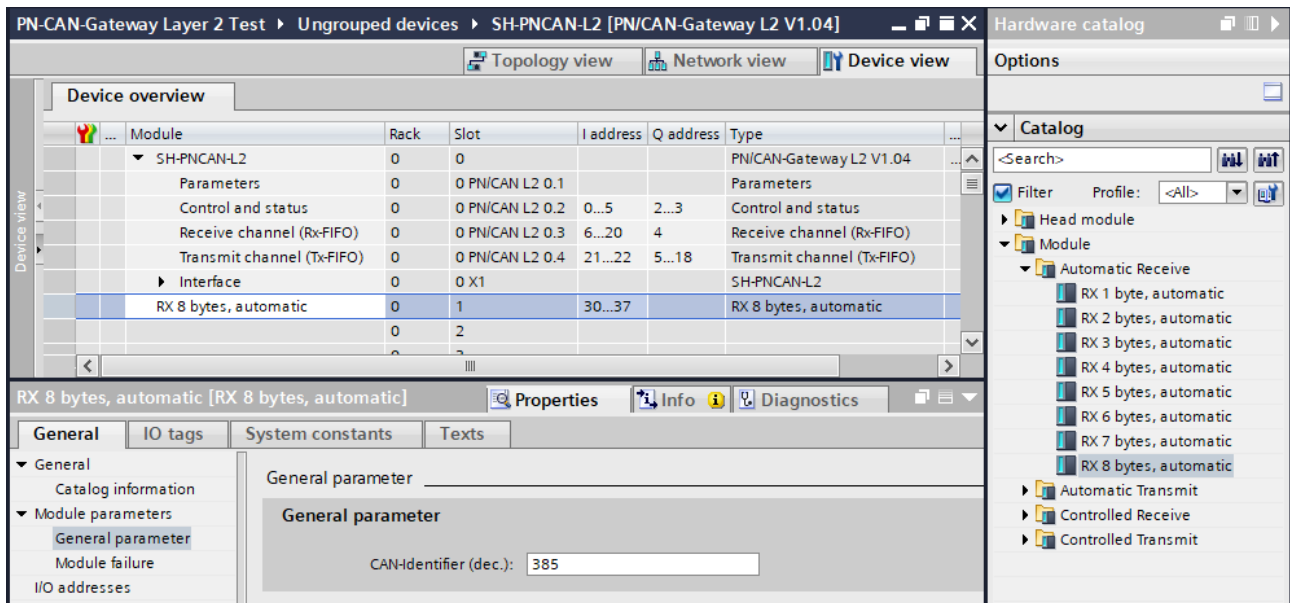
Automatic Receive and **Transmit** is explained in the following chapters and does not require any programming. The configuration of the gateway and the CAN modules is sufficient.

Controlled Receive and Controlled Transmit as well as the application of the Receive channel and the Transmit channel must be actively programmed in the PLC. A detailed description can be found in the manual of the PN/CAN-Gateway Layer 2.



6.2.1 Automatically receiving CAN messages

In the case of the Automatic Receive of CAN messages, the data of the most recently received CAN message is always found in the input data. Each configured CAN message has a clear CAN identifier. If two receive objects with the same CAN identifier are being configured, that results in a configuration error.



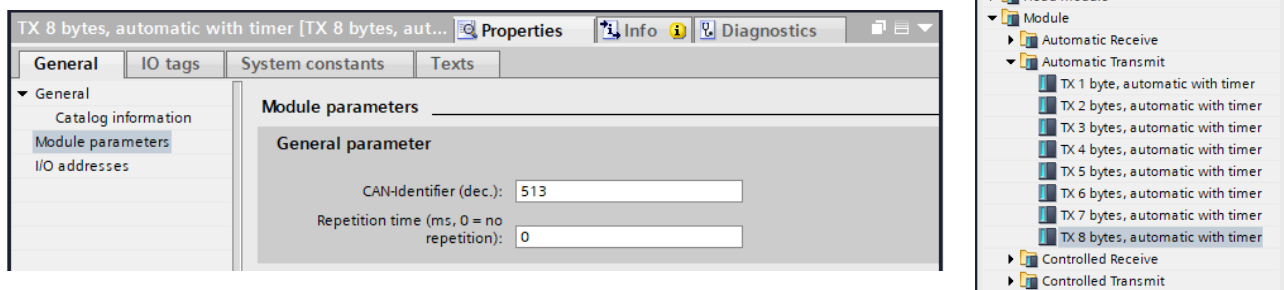
A CAN message always has a fixed data length. In the case of Automatic Receive, CAN messages with 1 to 8 bytes can be configured.

If a CAN message is received that has the correct CAN identifier but a false data length, the message is rejected, and the data is not forwarded to the PLC!

CAN messages with differing data lengths can be processed with the receiving channel (Rx-FIFO) or with the receive module "RX 0-8 Bytes, controlled".

6.2.2 Automatically transmitting CAN messages

In the case of Automatic transmission of a CAN message, a message is always sent to the CAN bus when the output data of the module changes. Each configured CAN message has a unique CAN identifier.



The repetition time enables a cyclic transmission of the CAN message with the actual data bytes.

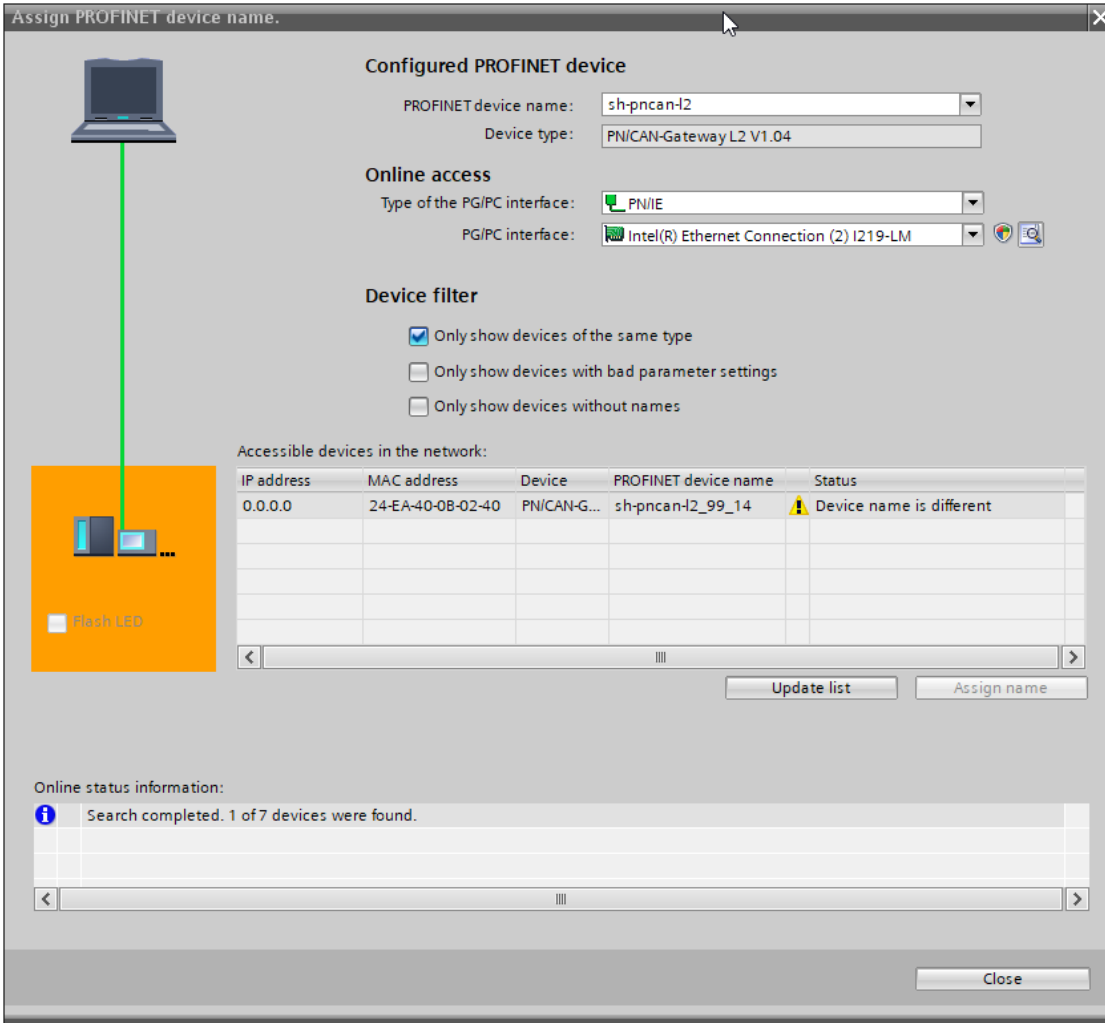
In the case of automatic transmission, CAN messages with 1 to 8 bytes can be configured. The transmission of CAN messages with changing data lengths using the same CAN-Identifier can be carried out with the transmission channel (Tx-FIFO) or with the transmit module "TX 0-8 Bytes, controlled".

7 Assign a PROFINET device name to the PN/CAN gateway

When the configuration of the PN/CAN gateway in the PROFINET Engineering Tool is complete, it can be imported into the PLC.

So that the PN/CAN gateway can be found by the PROFINET controller, the PROFINET device name must be assigned to the PN/CAN gateway. To do this, use the "Assign device name" function which you can access with the right mouse button or in the Online menu when the PN/CAN gateway 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.



The clear identification of the PN/CAN gateway is ensured here by the MAC address of the device. The MAC address of the device is on the front of the PN/CAN gateway.

If the PN/CAN gateway has been assigned the correct PROFINET device name, it is recognized by the PLC and configured. When the configuration has run correctly, the blue "Mode" LED should blink.

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 "IPSet" Tool



8 Programming in the PLC

No handling blocks are required for operation of the PN/CAN gateway in the PLC. The control and status query of the PN/CAN gateway can be carried out directly via the I/O image.

To start the example project, the value 3 must be written into the "Control" output word to switch to normal operation.

8.1 Control (2 bytes outputs)

Byte/bit	7	6	5	4	3	2	1	0
Out 0	-	Reset	-	-	-	-	-	-
Out 1	-	-	-	-	-	-	Mode	

The **mode** bits are used for the status control of the PN/CAN gateway.

INIT (0) = CAN controller is at the bus, no messages are transmitted, received messages are discarded; outputs/inputs are set to zero; FIFOs are deleted. The INIT (0) status is automatically active in the event of a PROFINET network cancellation or stoppage of the PLC.

PASSIV (1) = CAN Controller is online; received messages are discarded, no messages are transmitted; error counters are transmitted to the PLC; controlled transmission modules can be operated; data from automatic receiver modules remain frozen

RX-Only (2) = Only the CAN reception is processed. No CAN messages are transmitted.

RX-TX (3) = Normal operation with transmitter and receiver.



To change to the desired operating mode, it is permitted to directly activate the desired mode.

8.2 Status (6 bytes input)

Byte/bit	7	6	5	4	3	2	1	0
In 0	1= Gateway ready	1 = Reset carried out	-	-	-	-	-	-
In 1	Error code for configuration errors				-	-	Mode status	
In 2	CAN receive error counter							
In 3	CAN transmit error counter							
In 4+5	first plug point with configuration error							

The two **mode status** bits show the status of the PN/CAN gateway. Principally, an attempt is made to activate the status requested in the mode of the control word. However, this can be prevented by configuration errors.

Error codes of configuration errors: see manual

CAN receive error counter: Error counter of the CAN controller

CAN transmit error counter: Error counter of the CAN controller

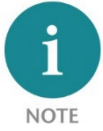
First plug point with configuration error: In connection with the error code for configuration errors, this value indicates the plug point of the first module with a configuration error.

9 LED-based diagnosis

MODE	
Off	No power supply or device defective
Blue on	PN/CAN gateway is correctly configured via PROFINET Mode 3 – Transmission and receiving active
Flashing blue	PN/CAN gateway is correctly configured via PROFINET Mode is 0, 1, or 2
Red on	No connection with PROFINET controller (PLC)
Flashing red	Connection with the PROFINET controller (PLC) exists, but a configuration error exists
CAN RX	
Flashing green	CAN frame is received without errors
Red	CAN bus error in the recipient or PN/CAN gateway hasn't been configured yet or No connection
CAN TX	
Flashing green	CAN frames are being transmitted
Red	Transmission not possible (e.g. false Baud rate, CAN bus disrupted) or PN/CAN gateway has not yet been configured or No connection
BF/SF	
yellow	MODE flashes red: Configuration error MODE on blue: CAN alarm active
red	PROFINET network error

10 Technical data

Order no.	700-671-PNC01
Name	PN/CAN gateway, PROFINET/CAN Layer 2
Scope of delivery	PN/CAN gateway with power plug
Dimensions (D x W x H)	35,5 x 83,5 x 76 mm
Weight	Approx. 160 g
PROFINET interface (X1)	
Number	1
Connection	2x RJ45, integrated switch
Transmission rate	100 Mbps full duplex
Protocol	PROFINET IO device as defined in IEC 61158-6-10
I/O image size	max. 1440 bytes input / 1440 bytes output data
Features	PROFINET Conformance Class C, Media redundancy (MRP client), Automatic addressing, Topology detection (LLDP, DCP), Diagnosis alarms
CAN interface	
Number	1
Type	ISO/DIN 11898-2 CAN High-speed physical layer
Connection	9-pin D-sub male connector
Protocol	CAN 2.0A (11-bit identifier) or CAN 2.0B (29-bit identifier)
Baud rate	10, 50, 100, 125, 250, 500, 800, 1000 kbps
USB interface	
Protocol	Full-speed USB 2.0 device
Connection	USB-C
Electrically isolation	500 V
Status indication	
Function status	4 LEDs (bi-colored)
Ethernet status	4 LEDs
Power supply	
Operating voltage	24 V DC, 18 ... 30 V DC
Current draw	Max. 150mA
Power dissipation	Max. 4 W
Ambient conditions	
Ambient temperature	0° C to 60° C
Transport and storage temperature	-20° C to 80° C
Relative humidity	95% without condensation
Protection rating	IP 20
Mounting position	As desired
Compliance	
Approvals	CE
RoHS	yes
REACH	yes



The contents of this Quick Start Guide have been checked by us 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.

Our products contain open-source software, among others. This software is subject to the respectively relevant license conditions. We can send you the corresponding license conditions, including a copy of the complete license text together with the product. They are also provided in our download area of the respective products under www.helmholz.de. We also offer to send you or any third party the complete corresponding source text of the respective open-source software for an at-cost fee of 10.00 Euro as a DVD upon request. This offer is valid for a period of three years, starting from the date of product delivery.

Our customers are important to us, we are happy to receive suggestions and ideas for improvement. If you have any questions regarding the use of the product, please contact Helmholtz Support by phone or send an e-mail to support@helmholz.de.

All trademarks shown or mentioned in this document are the property of their respective owners or manufacturers. The representation and naming serve exclusively to explain the use and setting options of the products documented here.