Helmholz®
COMPATIBLE WITH YOU

Quick Start Guide
PN/CAN-Gateway PROFINET/CAN Layer 2

Version 3 en

Order number: 700-671-PNC01

Helmholz GmbH & Co. KG | Hannberger Weg 2 | 91091 Großenseebach | Germany
Phone +49 9135 7380-0 | Fax +49 9135 7380-110 | info@helmholz.de | www.helmholz.de

22.06.2020

Content

1 Safety instructions 2
2 Introduction 3
3 Preparing the PN/CAN Gateway 3
3.1 Wiring 3
3.2 CAN bus connection 3
4 Setup and use 4
4.1 Install GSDML file 4
4.2 Configuring the gateway 4
4.3 Setting gateway parameters 5
4.4 Adding CAN messages 6
4.4.1 Automatically receiving CAN messages 7
4.4.2 Automatically transmitting CAN messages 7
5 Assigning of the PROFINET device-name 8
6 Programming of the PLC 9
6.1 Control (2 bytes outputs) 9
6.2 Status (6 bytes input) 9
7 Technical data 10
8 LED-based diagnosis 11

1 Safety instructions

Target audience

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

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.

2 Introduction

NOTE

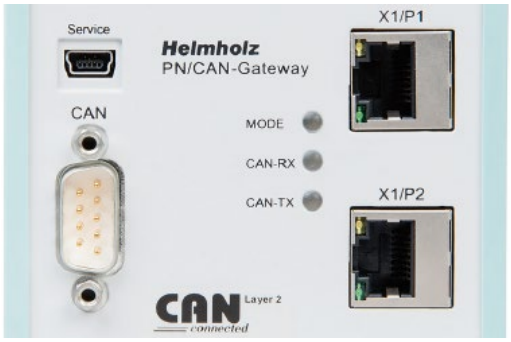
Please consider the safety instructions for the product, which can be found in the PN/CAN-Gateway manual. You can download the manual from the website www.helmholz.de in the download area of the product or use the shown QR code.

This document is intended to explain the initial commissioning of the PN/CAN Gateway Layer 2 with simple CAN nodes.

3 Preparing the PN/CAN Gateway

3.1 Wiring

The PN/CAN gateway is supplied with 24 V DC voltage via the 3-pin power supply plug: GND (-), 18...30V DC (+),FE.



NOTE

The housing of the PN/CAN Gateway is not grounded. Please connect the functional grounding connection (FG named FE on front) of the PN/CAN Gateway correctly with the reference potential.

The PROFINET cable is connected to X1/P1 or X1/P2.

The Service USB interface is required for firmware updates and for diagnostics in case of support.

3.2 CAN bus connection

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

ATTENTION

The CAN bus connection is galvanically isolated from the electronics of the PN/CAN gateway. Please connect the 3 lines CAN Low, CAN High and CAN GND according to the CAN installation guidelines. CAN GND is neither connected to FE nor to GND of the power supply of the device!

PN/CAN gateway contains no terminating resistor for use at the end of a CAN bus network segment! To this purpose use CAN bus plugs with integrated terminating resistors.

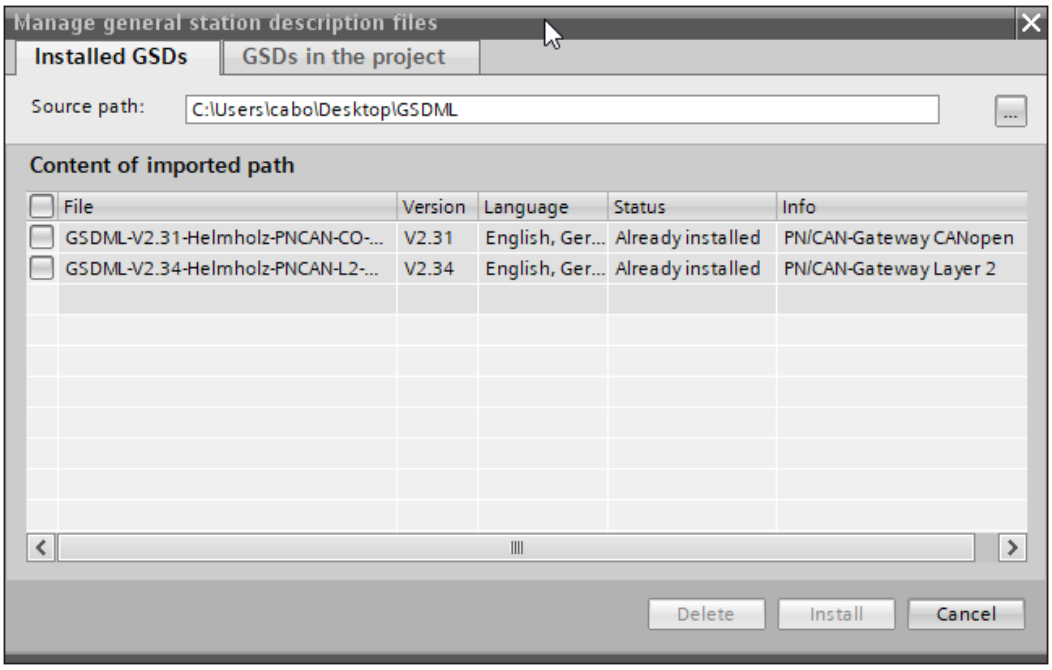
Pin	Sub-D plug CAN-Bus
1	-
2	CAN Low
3	CAN GND
4	-
5	-
6	-
7	CAN High
8	-
9	-

4 Setup and use

4.1 Install GSDML file

You can download the GSDML file from the website www.helmholz.de in the download area of the product or use the shown QR code.

Install the GSDML file in the TIA Portal in the menu "Tools" / "Load device description file (GSD)".

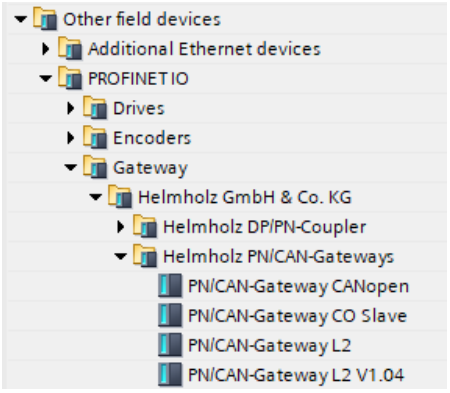


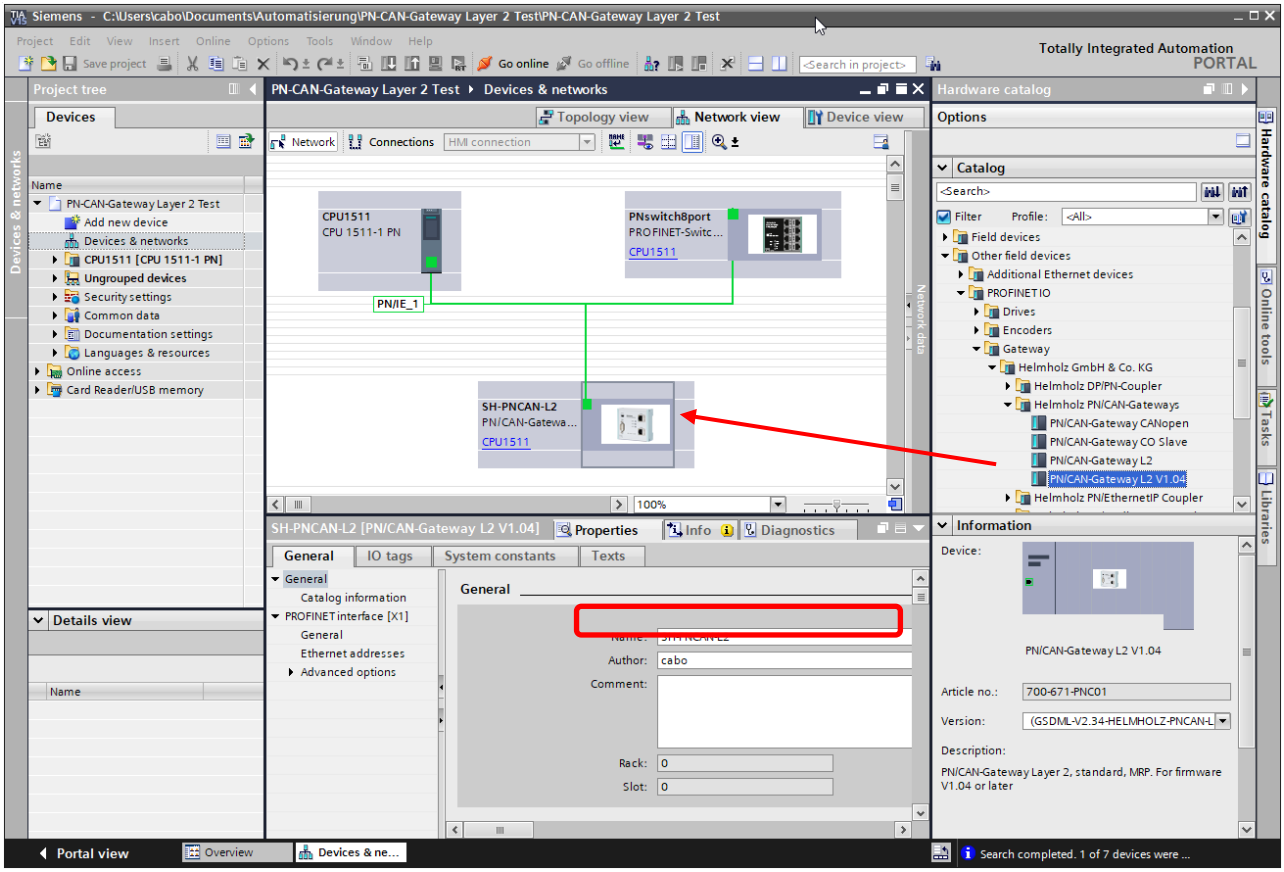
4.2 Configuring the gateway

The PN/CAN gateway can be found in the hardware catalogue under " Other field devices → PROFINET IO → Gateway → Helmholz PN/CAN gateways".

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

The further entry "PN/CAN-Gateway L2" is available for compatibility reasons for old projects and should no longer be used in new projects.

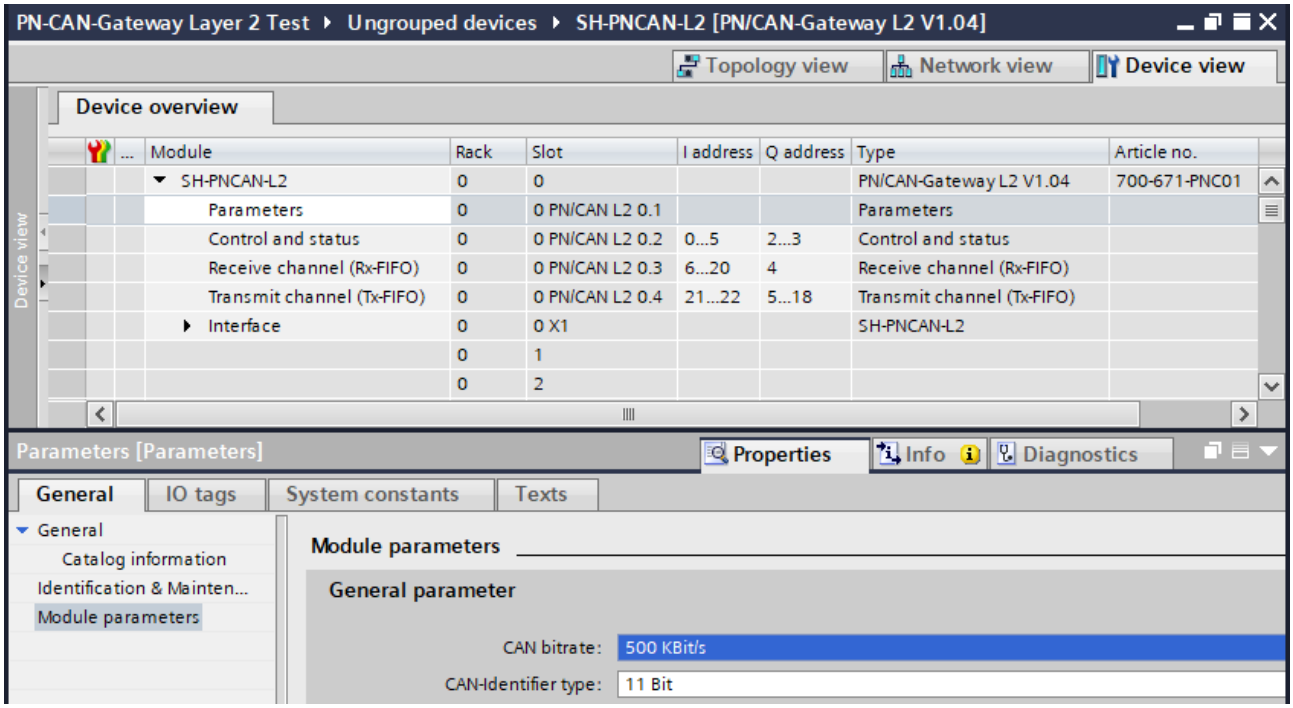




By calling up the object properties, the PN/CAN gateway should be assigned a unique PROFINET name and the IP address be checked for plausibility.

4.3 Setting gateway parameters

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



The meaning of the other parameters can be found in the manual and are not relevant for standard applications. The other "PN/CAN L2" slot 0 modules do not contain any parameters.

4.4 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.

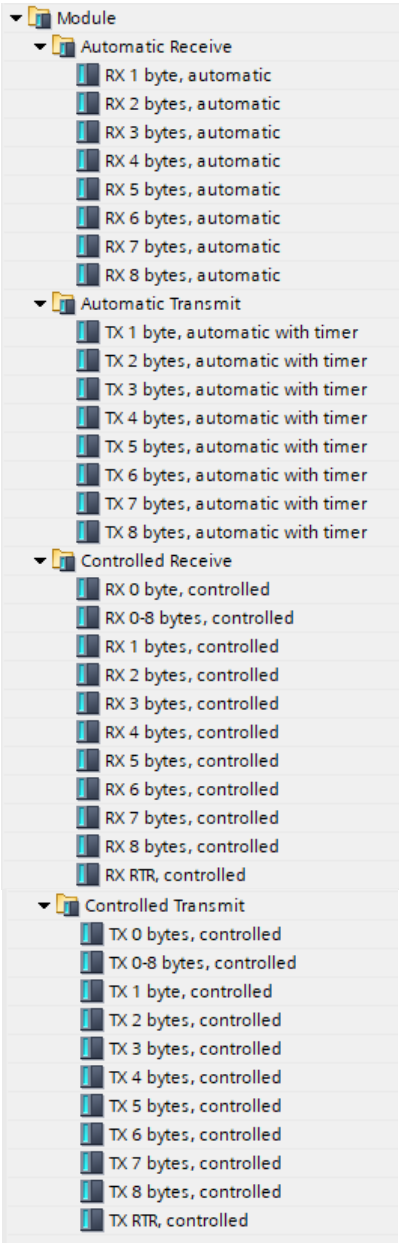
Using **Automatic Transmit**, the CAN message is transmitted as soon as something changes in the output data of the message or with an adjustable time interval.

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)**.

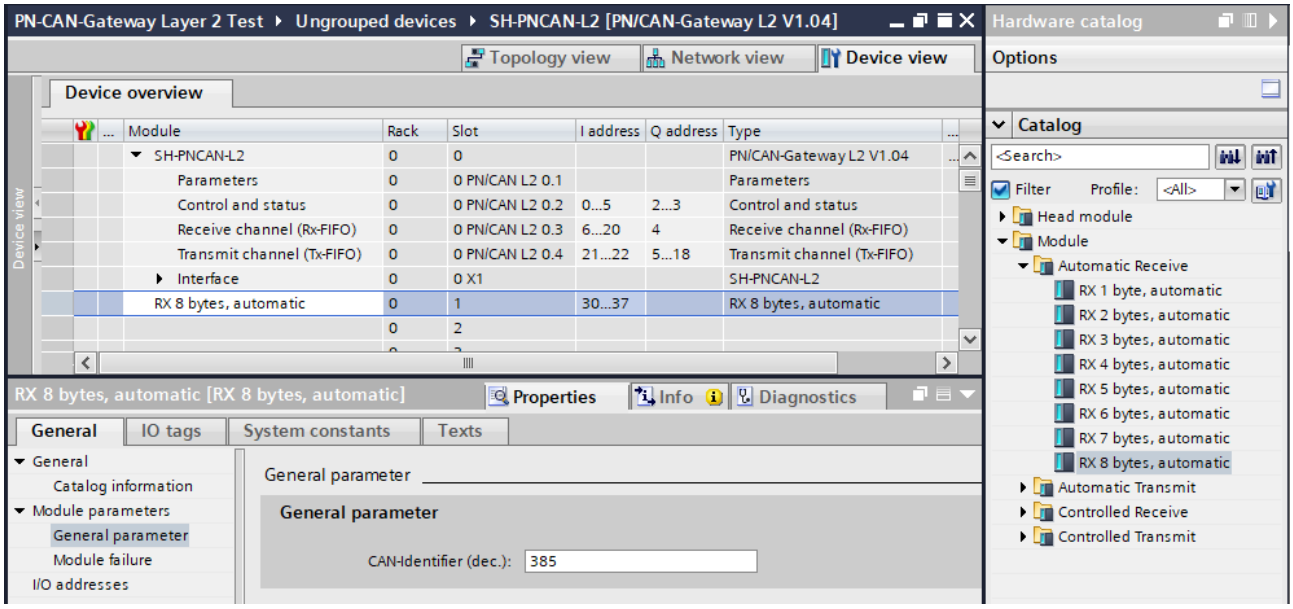
Automatic Receive and **Transmit** is explained in the following chapters and does not require any programming. The configuration of the gateway and the CAN modules is sufficient.

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.



4.4.1 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.



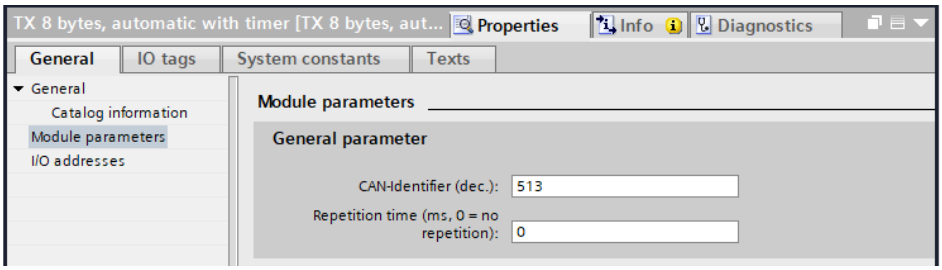
A CAN message always has a fixed data length. In the case of **Automatic Receive**, CAN messages with 1 to 8 bytes can be configured.

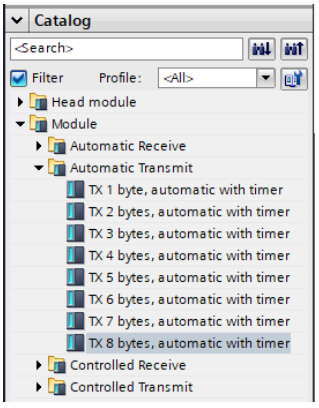
If a CAN message is received that has the correct CAN identifier but a false data length, the message is rejected, and the data is not forwarded to the PLC!

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".

4.4.2 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.

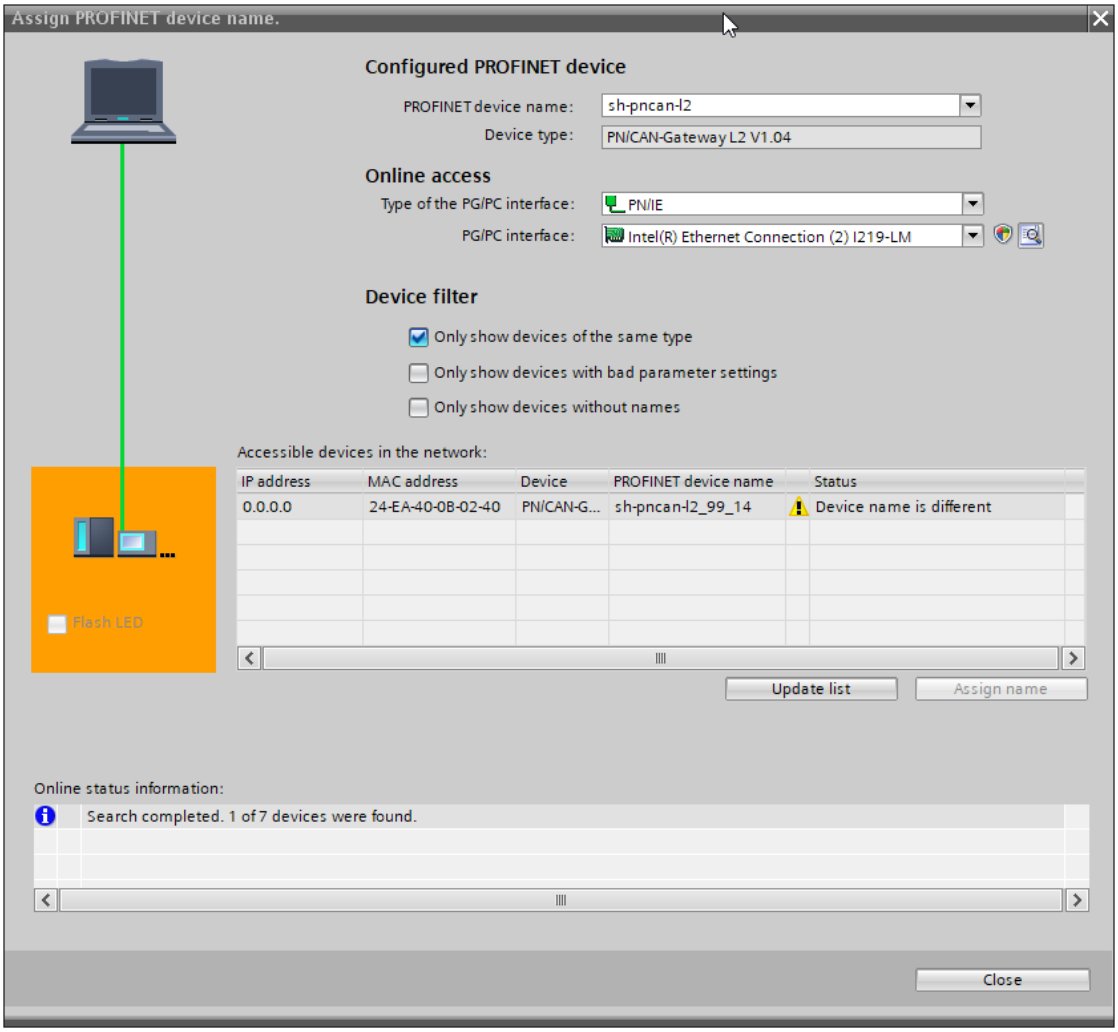
In the case of automatic transmission, CAN messages with 1 to 8 bytes can be configured. The transmission of CAN messages with changing data lengths using the same CAN-Identifier can be carried out with the transmission channel (Tx-FIFO) or with the transmit module "TX 0-8 Bytes, controlled".

5 Assigning of the PROFINET device-name

When the configuration of the PN/CAN gateway has been completed in the hardware configurator, it can be loaded into the PLC.

In order for the PN/CAN gateway to 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 "Refresh 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:

6 Programming of 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.

6.1 Control (2 bytes outputs)

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

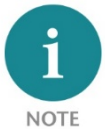
The **mode** bits are used for the status control of the PN/CAN gateway.

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.



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

6.2 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.

7 Technical data

Order no.	**700-671-PNC01**
Name	PN/CAN gateway Layer 2
PROFINET interface	
Protocol	PROFINET IO device as defined in IEC 61158-6-10
Transmission rate	100 Mbps full duplex
I/O image size	1440 bytes
Number of configurable slots	512
Connection	2x RJ45, integrated switch
Features	PROFINET Conformance Class C, Media redundancy (MRP client), Automatic addressing, Topology detection (LLDP, DCP), Diagnosis alarms
CAN interface	
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 identifier)
Baud rate	50, 100, 125, 250, 500, 800, 1000 kbps
USB interface	
Protocol	Full-speed USB 2.0 device
Connection	Mini-USB
Electrically isolated from USB	Yes; insulation 15 kV
Voltage supply	24 V DC, 18–28 V DC
Current draw	Max. 250mA
Dimensions (D x W x H)	35,5 x 83,5 x 76 mm (without power plug)
Weight	Approx. 160 g
Certifications	CE, PROFINET Conformance Class C (in progress)
Noise immunity	DIN EN 61000-6-2 “EMC Immunity”
Interference emission	DIN EN 61000-6-4 “EMC Emission”
Vibration and shock resistance	DIN EN 60068-2-6:2008 “Vibration” DIN EN 60068-2-27:2010 “Shock”
Protection rating	IP 20
Relative humidity	95% without condensation
Installation position	Any
Permissible ambient temperature	0° C to 60° C
Transport and storage temperature	-20° C to 80° C

8 LED-based diagnosis

MODE	
Off	No power supply or device defective
Blue on	PN/CAN gateway has been correctly configured through PROFINET Mode 3 – Transmission and receiving active
Flashing blue	PN/CAN gateway has been correctly configured through PROFINET Mode is 0, 1, or 2
Flashing red	No connection with the PROFINET controller (PLC) exists, or a configuration error exists
Red on	PN/CAN gateway has not been configured yet
CAN-RX	
Flashing green	CAN message is received without errors
Red on	CAN bus error in the receiver or PN/CAN gateway has not been configured yet
CAN-TX	
Flashing green	CAN messages are being transmitted
Red on	Transmission error has occurred (e.g. false Baud rate, CAN bus disrupted) or PN/CAN gateway has not been configured yet

HINWEIS

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.

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 Helmholz Support by phone or send an e-mail to support@helmholz.de.

** Simatic and STEP 7 are registered trademarks of Siemens AG.*
** Windows is a registered trademark of Microsoft Corporation.*