



## Quick Start Guide PN/CAN-Gateway CANopen<sup>®</sup>

Version

**1**<sub>en</sub>  
from FW 1.00

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# 1. Introduction

## Before getting started:

Please observe the safety instructions for the product, which can be found in the manual. You can find the manual on the accompanying CD or it can be downloaded from the website [www.helmholz.com](http://www.helmholz.com) in the download area.

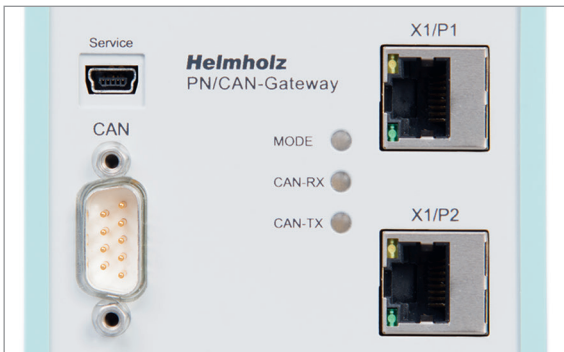
This document should present the initial commissioning of the PN/CAN-Gateway with a simple CANopen® device. It is presumed that the CANopen® device has already been basically configured (Node ID, device-specific parameters, PDO mapping, etc.).

## 2. Preparation of the PN/CAN-Gateway

### 2.1 Connection

The PN/CAN-Gateway is supplied via the 3-pin connection plugs with 24 V DC voltage.

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



Pin	SUB-D plug CAN bus
1	–
2	CAN Low
3	CAN GND
4	–
5	–
6	–
7	CAN High
8	–
9	–

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

The service USB interface is required for the firmware update and for diagnoses in the event of support.

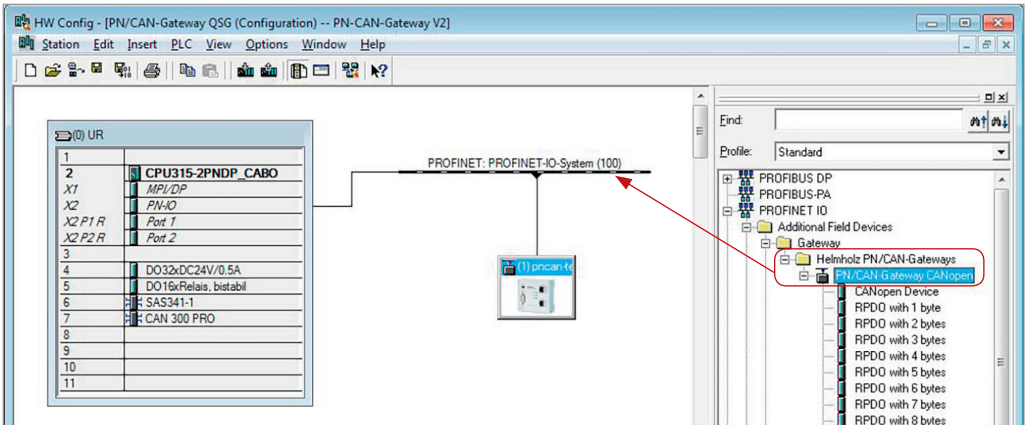
### 2.2 Install GSDML file

The GSDML file can be found on the accompanying CD or in the download area of the PN/CAN-Gateway at [www.helmholz.com](http://www.helmholz.com).

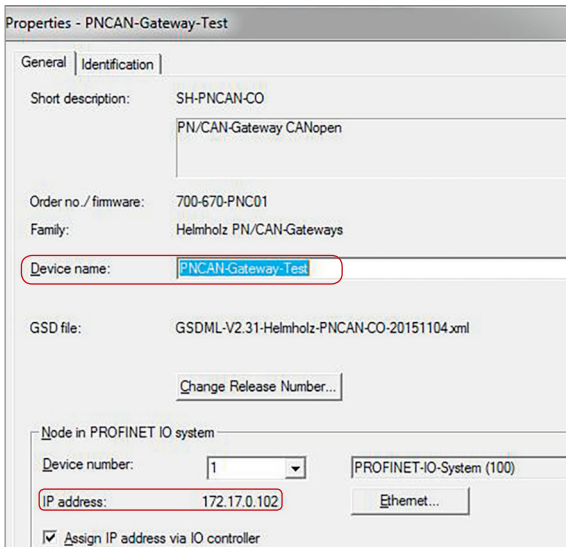
### 3. Plan PN/CAN-Gateway

Following the installation, the PN/CAN-Gateway can be found in the hardware catalogue under "PROFINET IO -> Additional field devices -> Gateway -> Helmholz PN/CAN-Gateways".

Add the "PN/CAN-Gateway CANopen" device to the project and connect it with your PROFINET network.



By calling up the object properties, you can assign the PN/CAN-Gateway a unique PROFINET name and check the IP address assigned by the system for plausibility.



## 4. Configure PN/CAN-Gateway

The first slot entry after the ports is the slot for the CANopen® master parameters.

Slot	Module	Order number ...	I Address	Q address	Diagnostic...	Comment
0	SH-PNCAN-CO	700-670-PNC01			2039*	
X1	Interface				2042*	
X1 P1	Port 1				2041*	
X1 P2	Port 2				2040*	
FN/CAN CO 0.1	Parameters				2039*	
FN/CAN CO 0.2	Master Status		100..103			
FN/CAN CO 0.3	Master Control			100..101		
FN/CAN CO 0.4	SDO communication		110..118	110..118		
FN/CAN CO 0.5	Emergency messages		120..129	120		
1						
2						

Properties - Parameters

General | Addresses | Identification | Parameters

Parameter	Value
Parameters	
General parameter	
CAN Baudrate	500 KBit/s
CAN Master Node-ID	0
SYNC Repetition Time (msec.)	0
Master-Heartbeat Repetitiontime (mSec)	500
Bootup-Timeout (msec.)	2000
SDO-Response-Timeout (msec.)	200
On PLC-Stop -> Master Reset	<input checked="" type="checkbox"/>
At Master-Reset NMT-STOP instead of NMT-PreOp.	<input type="checkbox"/>

Set the CAN Baudrate and the CAN Master Node ID. In some applications, a SYNC frame or heartbeat frame of the master is necessary for operation.

The other "PN/CAN CO" slot entries contain no parameters.

## 5. Add CANopen® device

A "CANopen® device" is a CANopen® slave. An entry must be created for each CANopen® slave.

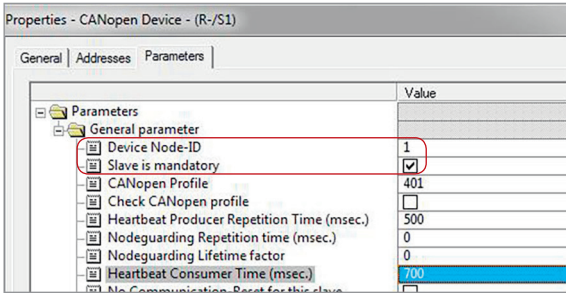
Slot	Module	Order number ...	I Address	Q address	Diagnos...	Comment
0	PNCAN-Gateway-Test	700-670-PNC01				
X1	Interface				2042*	
X1 P1	Port 1				2041*	
X1 P2	Port 2				2040*	
FN/CAN CO 0.1	Parameter				2039*	
FN/CAN CO 0.2	Master Status		100..103			
FN/CAN CO 0.3	Master Control			100..101		
FN/CAN CO 0.4	SDO communication		110..118	110..118		
FN/CAN CO 0.5	Emergency/Nachrichten		120..129	120		
1	CANopen Device		0..2	4		
2						
3						

Additional Field Devices

- Gateway
  - Helmholtz PN/CAN-Gateways
    - PN/CAN-Gateway CANopen
      - CANopen Device
        - RPDO with 1 byte
        - RPDO with 2 bytes
        - RPDO with 3 bytes
        - RPDO with 4 bytes
        - RPDO with 5 bytes
        - RPDO with 6 bytes
        - RPDO with 7 bytes
        - RPDO with 8 bytes
        - TPDO with 1 byte
        - TPDO with 2 bytes
        - TPDO with 3 bytes

## 6. Configure CANopen® device

The node ID of the CANopen® slave must be set absolutely correctly.



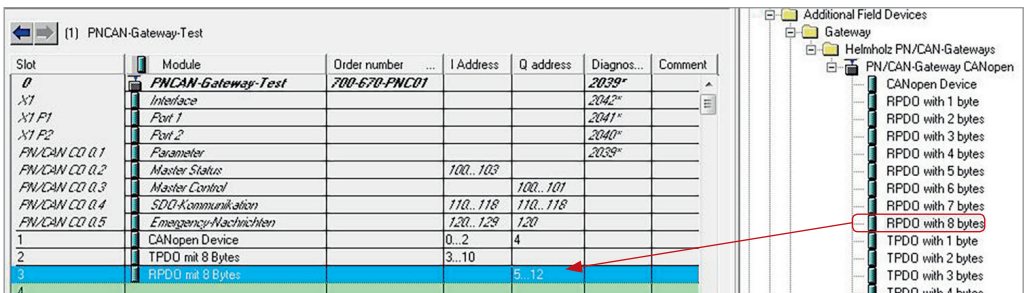
When the option **Slave is mandatory** (Mandatory Device) is selected, all CANopen® devices on the CAN bus of the PN/CAN-Gateway are first switched to operational when this device is present and configured.

## 7. Add PDOs (process data objects)

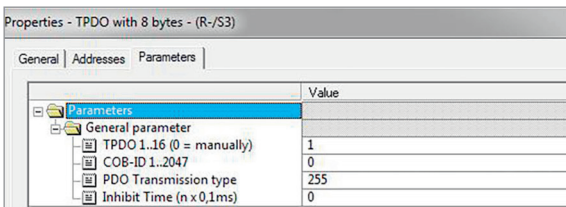
Each CANopen® device should have at least one PDO (process data object).

TPDOs (transmit process data objects) are data sent by the CANopen® slave to the PLC (input data from PLC view). RPDOs (receive process data objects) are sent by the PLC to the CANopen® slave (output data from PLC view). The data size of the PDOs depends upon the data found in the PDO (PDO mapping) and can range between one and 8 bytes.

Which PDOs of which sizes the connected CAN device has can generally be determined in the manufacturer manual of the respective CANopen® slave.



With the specification of the PDO number (1..16), all necessary settings for the PDO are made automatically by the PN/CAN-Gateway at the start.



It is also possible to define a device-specific COB-ID (PDO number must then be '0'). In this case it is presumed that all PDO settings have already been set in the CAN device. The PN/CAN-Gateway will then not alter the PDO settings when starting up.

## 8. Assign the PN/CAN-Gateway a PROFINET 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 that the PN/CAN-Gateway can be found on the PROFINET by the PROFINET master (controller), the PROFINET name and possibly the IP address must be set.

To this purpose the function "Edit Ethernet Node" is used in the SIMATIC\* manager. With the "Browse..." button, the network can be browsed for PROFINET devices.

The clear identification of the PN/CAN-Gateway is ensured here by the MAC address of the device.

**Important:** *The assigned name must agree with the name defined in the hardware configurator.*

Edit Ethernet Node

Ethernet node

Nodes accessible online

MAC address: 24-EA-40-08-82-55 Browse...

Set IP configuration

Use IP parameters

IP address: 172.17.0.102 Subnet mask: 255.255.0.0

Gateway

Do not use router  Use router

Address: 172.17.0.102

Obtain IP address from a DHCP server

Identified by

Client ID  MAC address  Device name

Client ID:

Assign IP Configuration

Assign device name

Device name: PNCAN-Gateway-Test Assign Name

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

## 9. Programming in the PLC

No handling blocks for simple operation are required in the PLC.

The control and status query of the PN/CAN-Gateway can be carried out directly via the I/O data in the PLC.

For the start up of the example project, the value 2 must be written into the output word in master control ("NMT state control"). Following the start up of the PN/CAN-Gateway and the initialization of the CANopen® slave, the gateway in the 4th byte of the master status also reports a 2 ("NMT state", see below).

The CANopen® system is operational and the I/O data of the slave can be read and written.

### 9.1 Master control (2 bytes outputs)

Byte/Bit	7	6	5	4	3	2	1	0
<b>Out 0</b>	–	–	–	–	–	–	–	–
<b>Out 1</b>	User reset	–	Clear Emergency FIFO Error	Send SYNC- Frame	Clear CAN-Tx Overflow Error	Clear CAN-Rx Overflow Error	<b>NMT-State Control</b>	

The NMT-State Control bits are used for the status control of the CANopen® network.

0 = The CANopen® master has been switched off. No CAN frames are being transmitted or received.

The CANopen® slaves are stopped if the status was previously Operational (value 2).

1 = If the previous status was 0, all CANopen® slaves are initialized. The status 1 is subsequently displayed in the Master state.

If the previous state was Operational (2) or Stop (3), only an NMT-Pre-Operational is transmitted.

2 = If the previous status was 0, all CANopen® slaves are initialized and NMT-Operational subsequently transmitted.

The PDO data is only exchanged in status 2. If the previous state was Pre-Operational (1) or Stop (3), only an NMT-Operational is transmitted.

3 = An NMT-Stop is transmitted to all slaves.

### 9.2 Master status (4 bytes inputs)

Byte/Bit	7	6	5	4	3	2	1	0
<b>In 0</b>	1= Gateway ready	–	–	–	–	–	–	–
<b>In 1</b>	Mirroring reset bit	–	Emergency Lost	SYNC trans- mitted	CAN-Tx Overflow	CAN-Rx Overflow	CAN bus error	CAN bus offline
<b>In 2</b>	–	–	–	–	General error bits of the slave errors			
<b>In 3</b>	Master error				0	0	<b>NMT state</b>	

The two NMT state bits show the status of the CANopen® master. Principally an attempt is made to assume the state called for in the NMT-State Control. However, this can be prevented by the absence of slaves configured as mandatory (necessary).

0 = The master is switched off. No CAN frames are being transmitted or received.

1 = The master is found at the end of the slave configuration (Pre-Operational), all mandatory slaves are configured and in Pre-Operational state

2 = The master is in the Operational state, all mandatory slaves are in Operational.

Slaves that are not in the operational state are automatically booted up to the Operational state as soon as they can be addressed.

3 = The master is in the Stop state; all accessible slaves have been brought to the Stop state.



### 9.3 CAN node status (3 bytes inputs, 1 byte output)

The status of the slave can be read from the input data of the CAN device entry.

Byte/Bit	7	6	5	4	3	2	1	0
In 0	Restart Slave Ack	Resend RP-DOs done	CANopen® profile false	Slave is sending false TPDO length	Slave not answering	SDO abort or profile false	Slave time-out/lost	False configuration
In 1	SDO 1001 value of the slave							
In 2	Configuration error (see manual)				0	0	Slave state	

The two slave state bits show the status of the CANopen® master:

- 0 = Slave is still in the BootUp, not present or cannot be addressed
- 1 = Slave has been initialized, Nodeguarding or Heartbeat are running and it is in the Pre-Operational state
- 2 = Slave is in Operational state
- 3 = Slave is in Stop state

### 9.4 PDO data

The PDO data is found as inputs (TPDOs) or as outputs (RPDOs) directly in the process map.

The inputs always show the last received data of the TPDO.

When changed values are written onto the outputs, RPDO frames are sent to the corresponding CANopen® slave.

### 9.5 SDO communication

SDO communication with the slaves can take place following the initialization phase of the PN/CAN-Gateway both in the Pre-Operational and Operational modes.

Only one SDO job can be carried out at a time. Both the reading and writing of SDOs is possible.

Details on the programming of the SDO communication channel of the PN/CAN-Gateway can be found in the manual.

### 9.6 Emergency messages

Emergency messages from the slaves are always received by the PN/CAN-Gateway and forwarded to the PLC. The PN/CAN-Gateway itself doesn't react actively to the emergency messages.

Details on the programming of the emergency message channel of the PN/CAN-Gateway can be found in the manual.

## 10. LED status information

<b>MODE</b>	
Off	No power supply or device defective
Blue on	PN/CAN-Gateway is correctly configured via PROFINET and all CANopen® slaves are in Operational
Flashing blue	PN/CAN-Gateway is correctly configured via PROFINET and at least one CANopen® slaves is in Pre-Operational or Stop or the gateway is not started.
Red on	No connection with PROFINET controller (PLC)
Flashing red	Connection with the PROFINET controller (PLC) exists, but a configuration error exists
<b>CAN-RX</b>	
Flashing green	CAN frame is received without errors
Red	CAN bus error in the recipient or PN/CAN-Gateway hasn't been configured yet
<b>CAN-TX</b>	
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

## 11. Technical data

Order no.	700-670-PNC01
<b>PROFINET interface</b>	
- Protocol	PROFINET IO as defined in IEC 61158-6-10
- Transmission rate	100 Mbps full duplex
- I/O image size	1440 bytes
- Connection	2 x RJ45, integrated switch
- Features	Media Redundancy Protocol (MRP), automatic addressing / topology detection (LLDP, DCP), diagnosis alarm
<b>CAN interface</b>	
- Type	ISO/DIN 11898-2 CAN High Speed physical Layer
- Connection	9-pin D-sub male connector
- Protocol	CANopen® master as defined in DSP301 V4.2
- Baud rate	50, 100, 125, 250, 500, 800, 1000 kbps
- Number of slaves	126
- TPDOs/RPDOs per slave	16/16
<b>USB interface</b>	
- Protocol	Full-speed USB 2.0 device
- Connection	Mini-USB
- Electrically isolated from USB	Yes; insulation 1.5 kV
Voltage supply	DC 24 V , 18 – 28 V DC
Current draw	Max. 250 mA
Dimensions (D x W x H)	35 mm x 83 mm x 72 mm
Weight	Approx. 160 g
Certifications	CE
Protection rating	IP 20
Permissible ambient temperature	0 °C to 60 °C
Transport and storage temperature	-20 °C to 80 °C

**Note:**

*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 at [www.helmholz.com](http://www.helmholz.com).*

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