PLIN-USB

User Manual

PEAK System

Relevant Products

Product name	Part number
PLIN-USB	IPEH-004052

Imprint

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Contents

1 Introduction

The PLIN-USB enables the connection of a Windows computer to a LIN network via USB. The LIN interface supports the LIN protocol according to the standard ISO 17987 and complies with all LIN specifications up to version 2.2. The interface can be operated as a master or a slave.

The monitor application PLIN-View Pro as well as the PLIN programming interface for the development of applications with LIN connection are included in the scope of delivery.

1.1 Properties at a Glance

- LIN interface for the USB connection (Full-Speed mode, compatible with USB 1.1, USB 2.0, and USB 3.0)
- LIN connection (ISO 17987)
- Complies with all LIN specifications (up to version 2.2)
- Bit rates from 1 kbit/s up to 20 kbit/s
- Can be used as a LIN master or slave (1 ms master task resolution)
- Automatic bit rate, frame length, and checksum type recognition
- Autonomous scheduler with support for unconditional, event, and sporadic frames
- LIN bus connection via D-Sub, 9-pin
- LIN connection short-circuit-proof against transceiver supply and ground
- NXP LIN transceiver TJA1028T or TI LIN transceiver TLIN1028D
- Galvanic isolation on the LIN connection up to 500 V
- Indicator LED for interface status
- Voltage supply 5 V DC via USB port
- Transceiver supply 6 to 28 V DC via D-Sub, pin 9
- Extended operating temperature range from -40 to +85 °C (-40 to +185 °F)

1.2 System Requirements

- Computer with:
  - Operating system Windows 11 (x64/ARM64), 10 (x64), or Linux
  - a vacant USB port (USB 1.1, USB 2.0, or USB 3.0)
- Power supply with nominal voltage between 6 and 28 V DC

1.3 Scope of Supply

- PLIN-USB in plastic casing

Downloads

- Device drivers package for Windows 11 (x64/ARM64), 10 (x64) including:
  - LIN device driver
  - LIN monitor PLIN-View Pro
- Device driver for Linux
- Programming interface PLIN-API for Windows 11 (x64/ARM64), 10 (x86/x64)
- Manual in PDF format

Optional accessories

- LIN connection cable for PC LIN interfaces (IPEK-003013)

2 Installation

This chapter covers the software setup for the LIN interface PLIN-USB under Windows and the connection of the LIN interface to the computer.

Install the device drivers package before you connect the LIN interface.

2.1 Install Software and Driver

1. Download the device drivers package from our website: www.peak-system.com/quick/DL-Driver-E.
2. Extract the file `PEAK-System_Driver-Setup.zip`
3. Double-click the file `PeakOemDrv.exe`
   The driver setup starts.
4. Confirm the start and the license agreements.
5. Follow the program's instructions. When selecting components, select the LIN device driver (other components as needed).

The LIN monitoring software PLIN-View Pro is installed automatically.

2.2 Connection

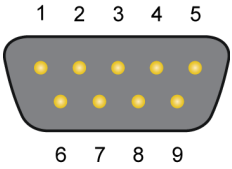
> **Note:** Do not use a USB extension cable to connect the LIN interface to the computer. Extension cables do not comply with the USB specification.

1. Connect the LIN interface to a USB port on the computer or to a USB hub. Windows notifies you about the new hardware and completes the driver installation.
2. Check the status LED. If the LED is green, the driver has been successfully initialized.

2.3 Connect LIN Bus

The transceiver of the LIN interface requires a power supply between 6 and 28 V DC. This must be provided via pin 9 on the D-Sub connector.

To facilitate the connection, use the optional LIN connection cable for PC LIN interfaces (IPEK-003013).

Pin	Assignment	D-Sub plug on LIN interface
1	None	
2	None	
3	None	
4	LIN	
5	LIN_GND	
6	LIN_GND	
7	None	
8	None	
9	LIN_V_{Bat}	

3 Operation

3.1 Status LED

LED status	Meaning
Green on	There's a connection to a driver of the operating system.
Green slow blinking	The LIN interface is initialized with a valid bitrate. A software application is connected to the LIN interface.
Green quick blinking	Data is transmitted via the connected LIN bus.

3.2 Unplugging the USB Connection

The LIN interface can be disconnected from the computer without further actions. In Windows, the LIN interface is not listed under "Safely Remove Hardware".

3.3 Distinguishing several PLIN-USB

You can operate several PLIN-USB interfaces on a single computer at the same time. For this purpose, the device ID can be determined in order to distinguish the LIN interfaces in a software environment.

PLIN-View Pro

To set the device ID in PLIN-View Pro:

1. Open the tab *PLIN-USB*.
2. Enter a hexadecimal number with suffix “h” as the new hardware ID.
3. Confirm the entry with *Set*.

PEAK Settings

To set the device ID in PEAK Settings:

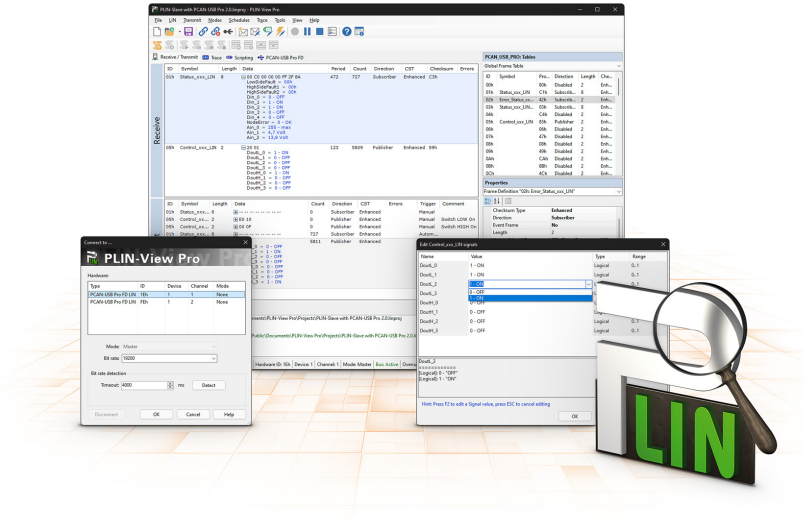
1. Select *LIN hardware*.
   The installed hardware is displayed.
2. Click on *PLIN-USB*.
   The view expands and the current ID is displayed in an input field.
3. Enter a hexadecimal number with suffix “h” as the new *Device ID*.
4. Confirm the entry with *Set*.

3.3.1 Identifikation

If you have connected several PLIN-USB interfaces you can identify a single interface via PEAK Settings.

1. Select *LIN hardware*.
   The installed hardware is displayed.
2. Click on *PLIN-USB*.
   The view expands and the *Identify* button is displayed.
3. Click on *Identify*.
   The LED of the selected PLIN-USB flashes orange for five seconds.

4 LIN Monitor PLIN-View Pro



The LIN monitor PLIN-View Pro is a Windows software for viewing, sending and recording LIN messages. The software is installed ready for operation under Windows with the installation of the device driver package.

In the following the initialization of a LIN interface is described as an example.

Detailed information on the use of PLIN-View Pro can be found in the program window under the menu item *Help*.

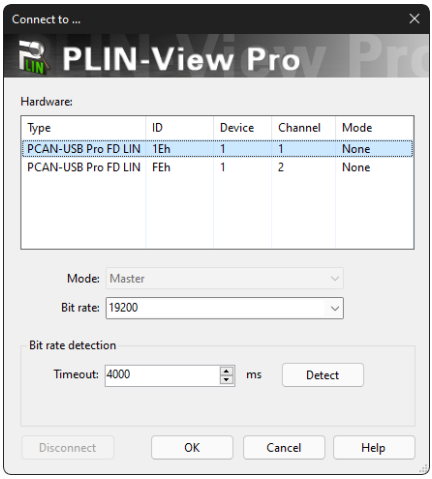
4.1 Features

- Display of incoming LIN frames
- Symbolic display of LIN messages (LDF files)
- Master or Slave mode
- Administration and processing of schedule tables
- Configurable recording of LIN frames (trace)
- Display and recording of frame events such as bus sleep, bus wake-up, and overrun
- Automation of various processes with VBScript
- Automation of LIN data and elements with C# scripts; optional use of C# assemblies
- Integrated text editor for C# with syntax highlighting
- Separate views for:
  - Transmit and Receive
  - Trace (data logger)
  - Scripting
  - Connected LIN interface

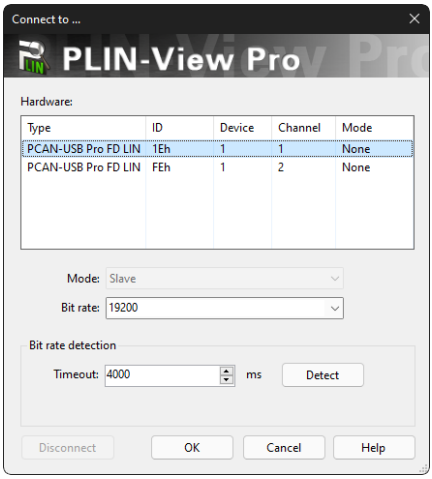
4.2 Start and Initialize PLIN-View Pro

1. From the Windows Start menu, select *PLIN-View Pro*.

   The main window and the *Connect to ...* dialog box for selecting the LIN hardware appear. The parameters for the LIN interface are set in the dialog window.



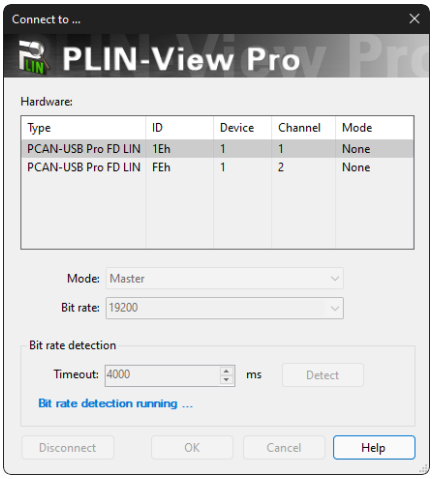
Selection of the hardware as master.



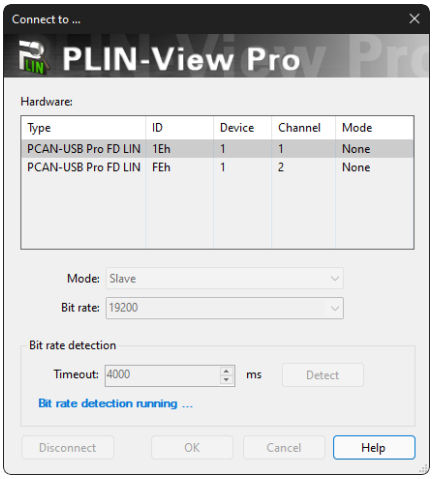
Selection of the hardware as slave.

2. If there are several LIN interfaces, select the desired interface. If there are several channels, select the desired channel from the list.
3. Determine the operation *Mode* to be used for the LIN connection.

4. If the bit rate is known: Select the bit rate of the LIN bus from the *Bit rate* list.
   If the bit rate is unknown: Determine the bit rate under *Bit rate detection* with *Detect*.
   Note: The LIN interface must not be initialized by any other software.



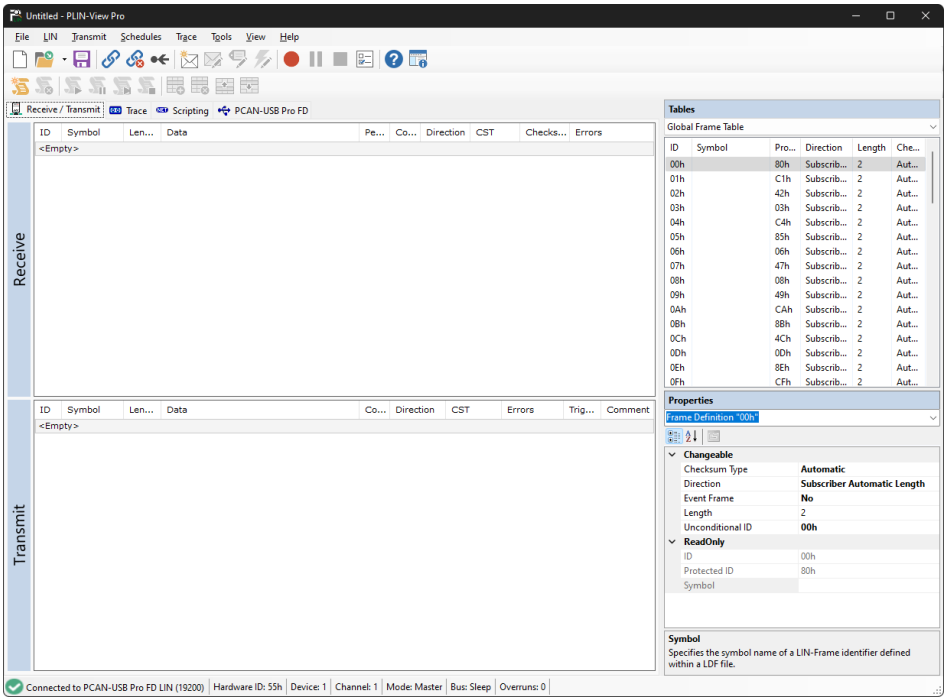
Bit rate detection as master.



Bit rate detection as slave.

5. Confirm the settings with *OK*.
6. Optional: To initialize another channel or LIN interface, open another instance of PLIN-View Pro.

4.3 Receive / Transmit Tab



In the upper area, the *Receive / Transmit* tab displays the Recieve window for received LIN frames. Depending on the operation mode Master or Slave, the lower area shows the *Transmit* window for the operation mode „Master“ or *Publish* for „Slave“. If the master requests data from a slave, the slave can publish the data in the LIN frame.

In the *Global Frame Table* all 64 defined LIN frame entries are stored, which can be processed with the LIN interface (LIN ID 0x00 to 0x3F). To send a LIN frame, the underlying frame definition must be adapted in the *Properties* window.

4.4 Transmit a LIN Frame

Depending on the customer's requirements, different scenarios for sending LIN frames are possible.

4.4.1 With LDF (LIN Description File)

> **Note:** An LDF must be provided by the system manufacturer of the LIN bus or created by the customer.

Application examples with an LDF:

- **Master with scheduler:** The Publisher data is edited in the *Transmit* window and assigned to the *Scheduler* with the Space bar.
- **Slave (Listen Only):** Selecting "All - Listen Only" will receive the data as a silent listener.
- **Slave (LIN node simulation):** The publisher data of the slave are changed in the *Publish* window. With the Space bar the data is sent to the hardware and thus made available on the LIN bus.
- **Master with LIN diagnostic frames**: Diagnostic frames 3C/3D are processed via a script to be created by the customer for the LDF used. Examples can be found in the *Help*.

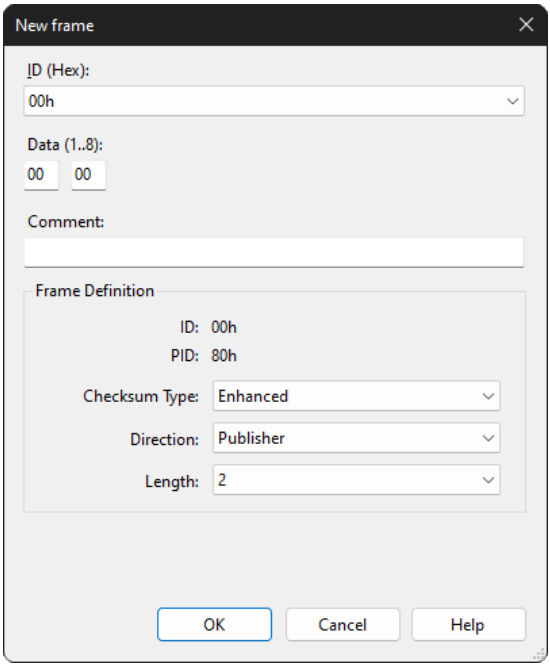
4.4.2 Manually

Manual sending is done according to the connected hardware as master or slave. Frames are configured beforehand for this. For periodic sending, a scheduler can also be created.

> **Note:** In the following example, a frame is sent manually from a master as publisher without a scheduler. For automated sending, further expertise in configuring LIN frames and at least one additional LIN node are required.

1. Connect your LIN interface as master, see chapter *Start and Initialize PLIN-View Pro*.
2. Select the menu command *Transmit* > *New Frame*.

   The *New frame* dialog box appears.



3. Select a frame from the *ID* list.
4. Select "Publisher" for *Direction*.

   The *Data* fields can now be filled.
5. Enter the data of the LIN frame in the *Data* fields.
6. Confirm the entries with *OK*.

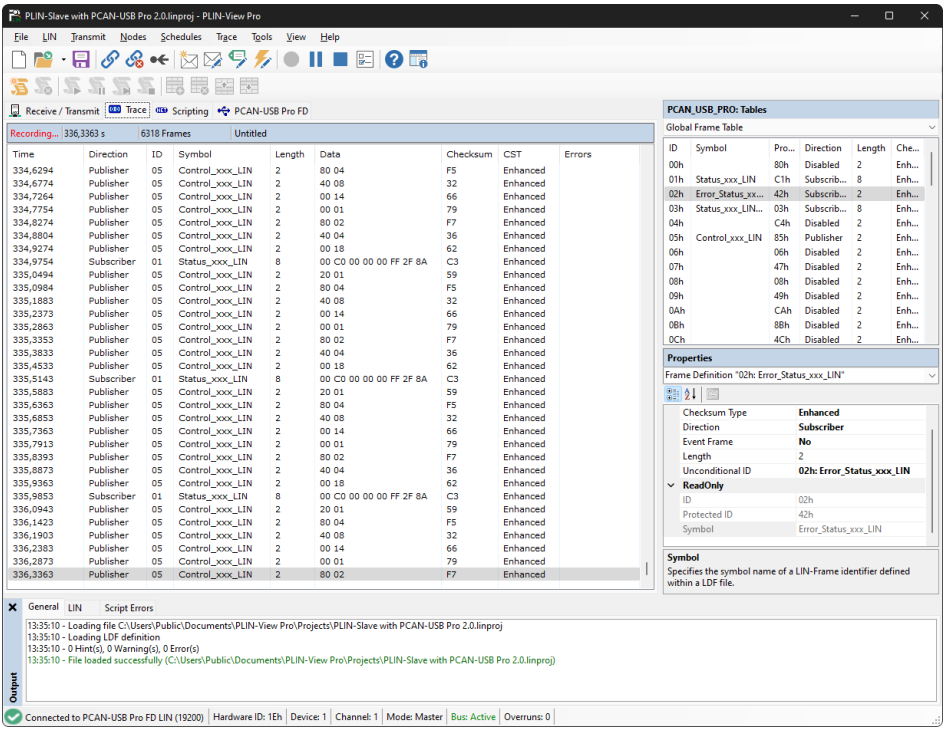
   The configured message appears in the *Transmit* window. „0" is displayed in the *Count* column.
7. Send the selected frame with the menu command *Transmit* > *Send* or with the Space bar.

   The message is sent on the LIN bus and appears in the *Receive* window. „1" for *Transmit* and *Receive* is displayed in the *Count* column.

Change data

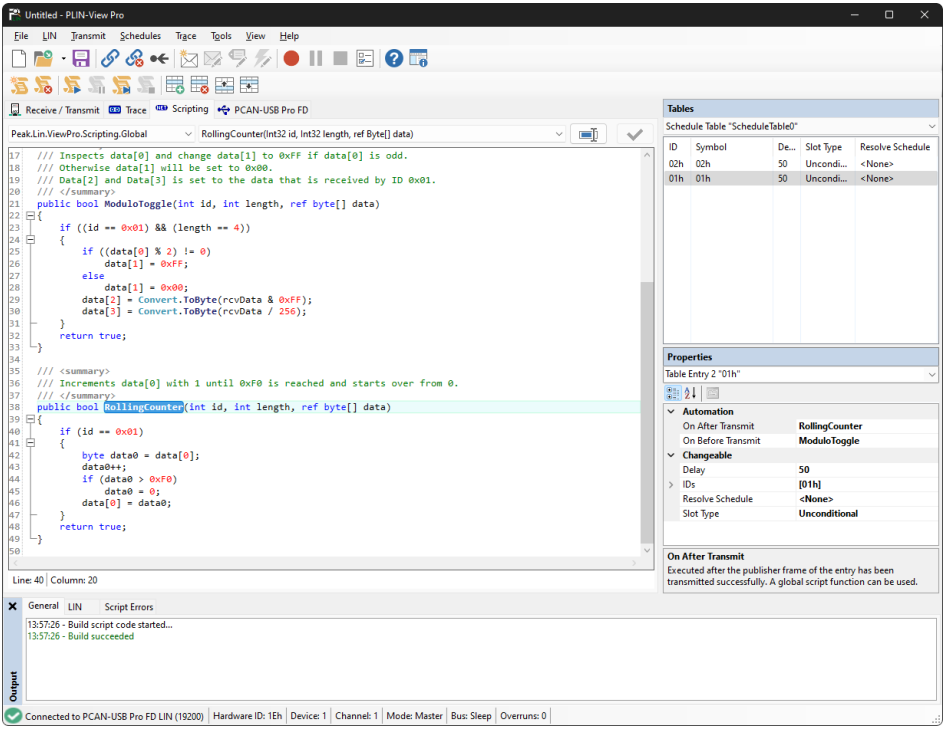
1. Double-click the message in the *Transmit* window.
   The *New frame* dialog box appears again.
2. Change the data and confirm with *OK*.
   The changed data will be displayed in the *Transmit* window.
3. Send the frame again.
   The data in the *Receive* window is updated. The value in the *Count* column is increased by one for *Transmit* and *Receive*.

4.5 Trace Tab



The tracer records all sent and received LIN frames if required. The header displays the current status, the complete runtime and the number of recorded LIN frames. Newly recorded LIN frames are appended to the bottom of the list. Depending on the selected setting, recording is done temporarily or directly to a file.

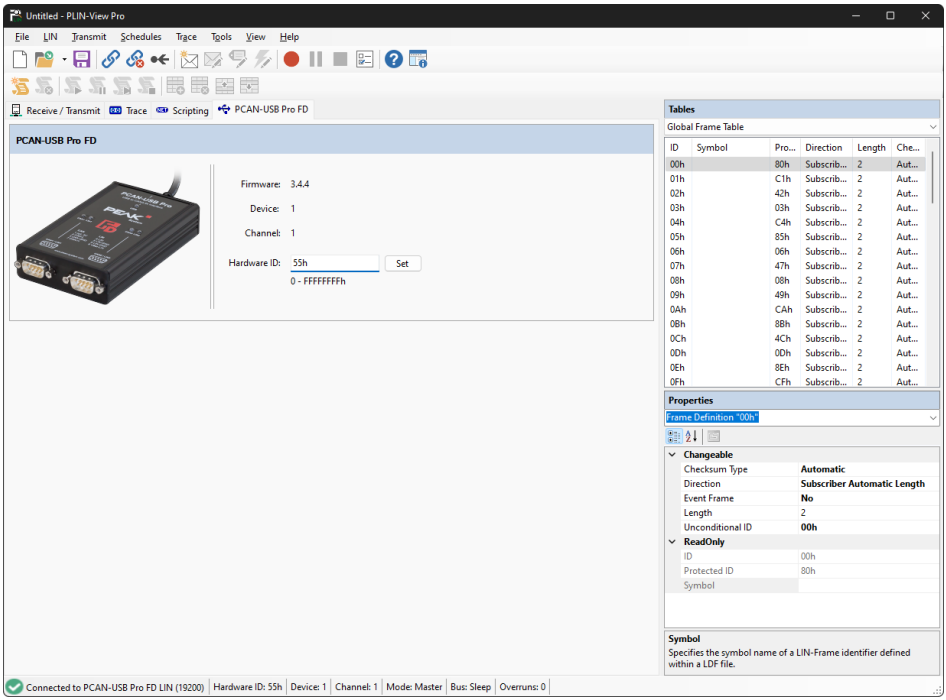
4.6 Scripting Tab



The *Scripting* tab is a text editor with syntax highlighting for the C# programming language. Scripts can be written to automate LIN data and LIN elements. Compiling and deploying a script is done with the check mark in the upper right corner. Feedback, warnings, and errors for the script are displayed in the *Output* section below.

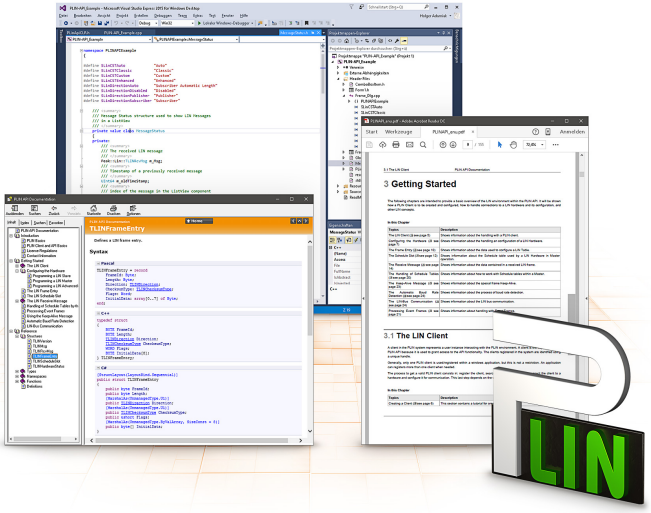
C# assemblies can optionally be included via the menu *Tools* > *Options* > *Tab References* > *Assemblies*. For more details open the *Help* with the key F1.

4.7 LIN Interface Tab



The LIN Interface tab receives the name of the connected hardware and shows information about the hardware and the firmware used. In this example for the Interface PCAN-USB Pro FD. To distinguish several LIN interfaces of the same type, the *Hardware ID* of the LIN interface can be determined here.

5 PLIN-API



The intended use of PLIN-API requires compliance with the license rights. Read the license agreement for end users at: https://www.peak-system.com/quick/eula

The programming interface PLIN-API provides basic functions for the connection of own programs to the LIN hardware of PEAK-System. PLIN-API is the interface between the program and the device driver. In Windows operating systems this is a DLL (Dynamic Link Library).

The PLIN-API and examples for all common programming languages as well as libraries and help files are available as download package under www.peak-system.com/quick/DL-Develop-E

5.1 Features

- API for developing applications with LIN connection
- Windows DLLs for the development of x86, x64, and ARM64 applications
- Multiple applications can be operated on a physical channel at the same time
- Simple switching between the channels of a PLIN PC hardware
- Internal buffering of messages on software level (system service)
- Precision of time stamps on received messages up to 1 µs
- Allows storing custom data (max. 24 bytes) on the hardware
- Notification of the application through Windows events when a message is received and on plug-in or plug-out of a device
- Function to get error code descriptions in 4 languages

6 Technical Data

USB	
USB mode	USB 2.0 Full-speed
USB port	Plug type A

LIN	
LIN standard	2.2, downward-compatible
LIN connection	D-Sub, 9-pin, LIN signal on pin 4
Time stamp resolution	1 µs
Mastertask resoloution	1 ms
Transceiver	NXP LIN transceiver TJA1028T/3V3/20 or TI LIN transceiver TLIN10283DDRQ
Bit rates	1 to 20 kbit/s
Scheduler	Initialized by software, processed by hardware, 8 schedule tables with 256 slots in all configurable
Galvanic isolation	up to 500 V

Power supply		
PLIN-USB (without Transceiver)	5 V DC via USB port	
Transceiver	6 to 28 V DC via D-Sub, Pin 9	
Current consumption	USB	30 mA
	Transceiver	max. 20 mA at 12 V

Measures	
Size without cablel (W x L x H)	43 x 86 x 21 mm
Length USB connection cable	60 cm
Weight including cable	80 g

Environment	
Operating temperature	-40 to +85 °C (-40 to +185 °F)
Temperature for storage and transport	-40 to +100 °C (-40 to +212 °F)
Relative humidity	15 to 90 %, not condensing
Ingress protection (IEC 60529)	IP20

Conformity	
RoHS	EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU DIN EN IEC 63000:2019-05
EMC	EU Directive 2014/30/EU DIN EN 55032:2022-08 DIN EN 55035:2018-04

Appendix A CE Certificate

EU Declaration of Conformity

This declaration applies to the following product:

Product name:	**PLIN-USB**
Item number(s):	**IPEH-004052**
Manufacturer:	PEAK-System Technik GmbH Leydheckerstraße 10 64293 Darmstadt Germany

CE We declare under our sole responsibility that the mentioned product is in conformity with the following directives and the affiliated harmonized standards:

EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU (amended list of restricted substances)

DIN EN IEC 63000:2019-05
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

EU Directive 2014/30/EU (Electromagnetic Compatibility)

DIN EN 55032:2022-08
Electromagnetic compatibility of multimedia equipment - Emission requirements (CISPR 32:2015);
German version of EN 55032:2015 + AC:2016 + A11:2020 + A1:2020

DIN EN 55035:2018-04
Electromagnetic compatibility of multimedia equipment - Immunity requirements (CISPR 35:2016, modified);
German version of EN 55035:2017

Darmstadt, 7 June 2024

Uwe Wilhelm, Managing Director

Appendix B UKCA Certificate

UK Declaration of Conformity

This declaration applies to the following product:

Product name: **PLIN-USB**

Item number(s): **IPEH-004052**

Manufacturer:
PEAK-System Technik GmbH
Leydheckerstraße 10
64293 Darmstadt
Germany

UK authorized representative:
Control Technologies UK Ltd
Unit 1, Stoke Mill,
Mill Road, Sharnbrook,
Bedfordshire, MK44 1NN, UK

We declare under our sole responsibility that the mentioned product is in conformity with the following UK legislations and the affiliated harmonized standards:

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

DIN EN IEC 63000:2019-05
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

Electromagnetic Compatibility Regulations 2016

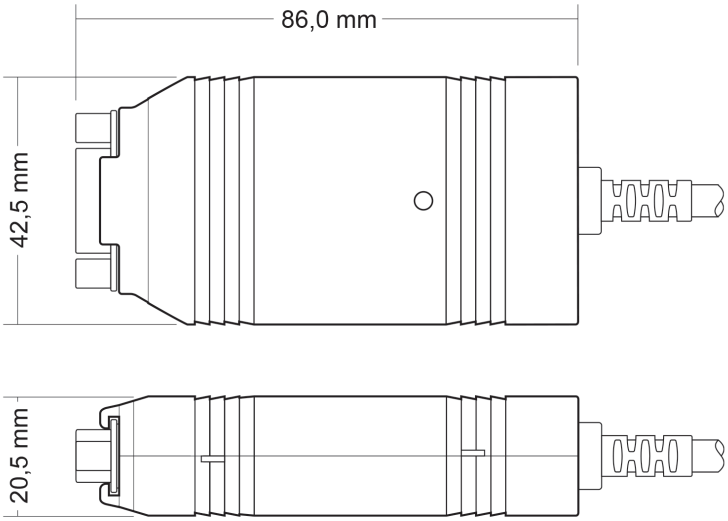
DIN EN 55032:2022-08
Electromagnetic compatibility of multimedia equipment - Emission requirements (CISPR 32:2015);
German version of EN 55032:2015 + AC:2016 + A11:2020 + A1:2020

DIN EN 55035:2018-04
Electromagnetic compatibility of multimedia equipment - Immunity requirements (CISPR 35:2016, modified);
German version of EN 55035:2017

Darmstadt, 7 June 2024

Uwe Wilhelm, Managing Director

Appendix C Dimension Drawings



Appendix D Disposal

The product must not be disposed of in household waste. Dispose of the product properly in accordance with local regulations.