PCAN-USB XL

User Manual

Relevant Products

Product name	Part number
PCAN-USB XL	IPEH-005022

Imprint

PEAK-System Technik GmbH
Leydheckerstraße 10
64293 Darmstadt
Germany

Phone: +49 6151 8173-20
Fax: +49 6151 8173-29

www.peak-system.com
info.peak@hms-networks.com

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Contents

1 Introduction

The CAN interface PCAN-USB XL ensures an uncomplicated connection to CAN XL, CAN FD, and CAN CC buses via the USB port of a computer. Galvanic isolation of up to 500 Volts decouples the PC from the CAN bus. With its compact plastic casing, it is ideal for mobile applications.

The PCAN-USB XL is delivered ready to use with Windows and Linux drivers, the PCAN-View monitoring software, and the PCAN-Basic API for developing applications with CAN connection. PCAN-Basic 5 and PCAN-View 6 support the new standard CAN XL.

CAN XL

CAN XL (Extended Data-Field Length) was designed to improve the cooperation of CAN and TCP/IP networks and to enable transmitting larger data streams for use cases such as ECU flashing and software updates. For this, the new standard provides bit rates of up to 20 Mbit/s and data transmission with up to 2048 bytes per message.

This manual describes the use of the CAN interface with **Windows**. Device drivers and application information for **Linux**: www.peak-system.com/quick/DL-Driver-E

1.1 Properties at a Glance

- CAN interface for High-speed USB 2.0 (compatible to USB 3.0)
- High-speed CAN connection (ISO 11898-2:2024)
  - Complies with CAN specifications CAN CC (classic CAN 2.0), CAN FD, and CAN XL (ISO 11898-1:2024)
  - CAN bit rates from 20 kbit/s up to 1 Mbit/s
  - CAN FD data bit rates up to 8 Mbit/s
  - CAN XL data bit rates up to 8 Mbit/s, CAN FD compatible transmission mode
  - CAN XL data bit rates up to 20 Mbit/s by using the transceiver mode switch
  - CAN bus connection via D-Sub, 9-pin (in accordance with CiA® 106)
- Time stamp resolution 1 µs
- FPGA implementation of the CAN XL core by PEAK-System; validated with the CAN XL Evaluation Board by C&S (www.cs-group.de)
- CAN SIC XL transceiver TI TCAN6062V
- Galvanic isolation between CAN and USB up to 500 V
- CAN termination can be activated through solder jumpers
- Voltage supply via USB
- Extended operating temperature range from −40 to +85 °C (−40 to +185 °F)

1.2 Scope of Supply

- PCAN-USB XL in plastic casing

Downloads

- Device drivers for Windows 11 (x64/ARM64), 10 (x64), and Linux
- CAN monitor PCAN-View for Windows
- Programming interface PCAN-Basic for developing applications with CAN CC, CAN FD, and CAN XL connection
- Programming interfaces for standardized protocols from the automotive sector
- Manual in PDF format

1.3 System Requirements

Computer with:

- Operating system Windows 11 (x64/ARM64), 10 (x64), or Linux
- A free USB port (USB 2.0, USB 3.0)

2 Settings

The following describes the setting for the internal termination. If you do not need this setting, skip this chapter.

2.1 Internal Termination

The internal termination can be activated by solder jumpers on the circuit board to terminate one end of the CAN bus. At delivery the termination is not activated.

Tip: We recommend to do termination at the CAN cabling, for example with the terminating resistors PCAN-Term (IPEK-003002) or PCAN-MiniTerm (IPEK-003002-Mini). Thus, CAN nodes can be flexibly connected to the bus.

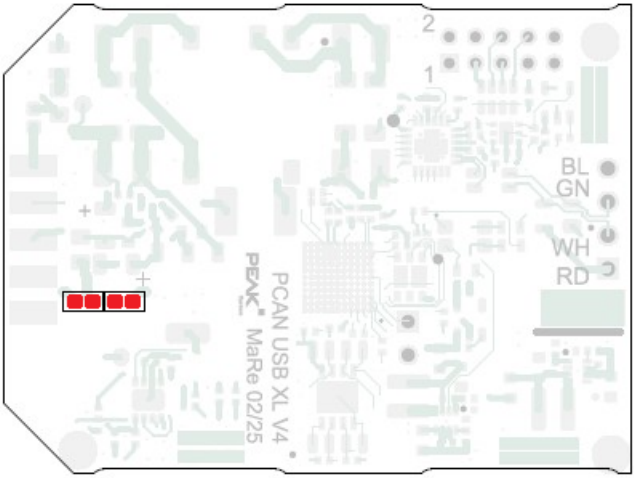
2.1.1 Activate Internal Termination

Risk of short circuit! Soldering on the CAN interface may only be performed by qualified electrical engineering personnel.

Attention! Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

1. Open the CAN interface casing. Push the latches on both sides cautiously with a slotted screwdriver.
2. Remove the circuit board.

3. Set the corresponding solder bridges on the circuit board.



Circuit board of hardware version 4

Termination High-speed CAN bus 120 Ω	
Without (default)	**Activated**
	

4. For assembly, place the circuit board on the upper half of the housing. The strain relief and the LED must be in the corresponding recesses.
5. Press the lower half of the housing onto the upper half of the housing until the latches engage.

3 Installation

This chapter covers the software setup for the PCAN-USB XL interface under Windows and the connection of the CAN interface to the computer.

Install the driver before you connect the CAN Interface

3.1 Install Device Driver Setup

1. Download the device driver setup from our website: www.peak-system.com/quick/DL-Driver-E
2. Unpack the file `PEAK-System_Driver-Setup.zip`
3. Double-click the file `PeakOemDrv.exe`
   The driver setup starts.
4. Follow the program instructions.

3.2 Connecting the CAN Interface

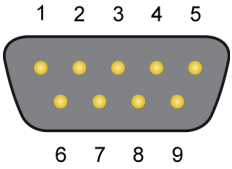
Attention! Do not use a USB extension cable to connect the CAN interface to the computer. Extension cables do not comply with the USB specification.

1. Connect the CAN interface to a USB port of the computer or of a connected USB hub. The computer can remain powered on.
   Windows detects the new hardware and completes the driver installation.
2. Check the LED on the CAN interface. If the LED is blue the driver was initialized successfully.

4 Connecting the CAN Bus

4.1 Connection over D-Sub Connector

After the CAN interface is connected, a CAN bus can be connected to the D-Sub connector. The pin assignment for CAN corresponds to the specification CiA® 106:

Pin	Assignment	D-Sub plug
1	Not connected	
2	CAN_Low	
3	CAN_GND	
4	Not connected	
5	Not connected	
6	CAN_GND	
7	CAN_High	
8	Not connected	
9	Not connected	

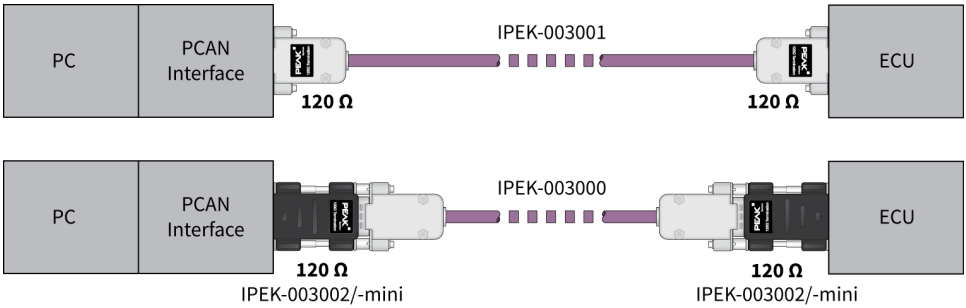
4.2 Cabling

4.2.1 Termination

The High-speed CAN bus (ISO 11898-2) must be terminated with 120 Ω on both ends. The termination prevents interfering signal reflections and ensures the proper operation of the transceivers of the connected CAN nodes (CAN interfaces, control devices).

The PCAN-USB XL has an optional internal termination with 120 Ω. For more information see chapter 2.1 *Internal Termination*.

4.2.2 Example of a Connection



This example shows a connection between the PCAN Interface and a control unit (ECU). The upper example shows a connection with a cable which is terminated with 120 Ω at both ends. At the lower example the connection is made with termination adapters.

4.2.3 Maximum Bus Length

The maximum bus length depends on the nominal bit rate:

Nominal bit rate	Buslength
1 Mbit/s	40 m
500 kbit/s	110 m
250 kbit/s	240 m
125 kbit/s	500 m
50 kbit/s	1.3 km

The listed values have been calculated on the basis of an idealized system and can differ from reality.

> **Note:** Despite the higher data bit rate, the same maximum bus lengths apply for CAN FD and CAN XL as for CAN. The dependency is based on the nominal bit rate during arbitration.

5 Operation

5.1 Status LED

The LED can be in the following states:

Status	Meaning
Blue on	There's a connection to a driver of the operating system.
Blue slow blinking	A software application is connected to the interface.
Blue quick blinking	Data is transmitted via the connected CAN bus.
Red blinking	An error is occurring during the transmission of CAN data.
Orange quick blinking	Identification of an interface when multiple interfaces are plugged.

5.2 Unplugging the USB Connection

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

5.3 Distinguishing several PCAN-USB XL Interfaces

You can operate several PCAN-USB XL interfaces on a single computer at the same time. The supplied program PEAK-Settings allows the assignment of device IDs in order to distinguish the CAN interfaces in a software environment.

PEAK-Settings is part of the device driver setup and can be started by entering PEAK-Settings in the Windows search bar. More information, see Distinguishing between multiple CAN interfaces on page 24

6 First Steps with PCAN-Explorer 7

For owners of a PCAN-Explorer 7 license, this chapter covers the first steps with the program.

- Setting Up a CAN Connection
- Creating a Send Message
- Tracing CAN Messages

The procedures are described in the following sections.

You can obtain detailed program help in the PCAN-Explorer by pressing F1.

6.1 Setting Up a CAN Connection

PCAN-Explorer does not directly access a CAN interface to establish a CAN connection. Instead, a so-called PCAN Net, basically a virtual CAN bus in the computer, is used. The PCAN Net defines the bit rates and the CAN interface to the physical CAN bus.

Creating a PCAN Net

PCAN Nets are managed with the separate Windows program PCAN Nets Configuration independently of the PCAN-Explorer. The process for creating a PCAN Net is usually carried out once. Afterwards, the PCAN Net can be used by the PCAN-Explorer in different situations.

1. Make sure that the CAN interface PCAN-USB XL is connected to the computer and that its LED lights up blue.
2. Start the PCAN Nets Configuration program via the Windows Start menu and expand the *USB* category in the tree view.

   The *PCAN-USB XL* CAN interface appears in the list.
3. Right-click on the *PCAN-USB XL* entry to open the context menu and select *New Net*.

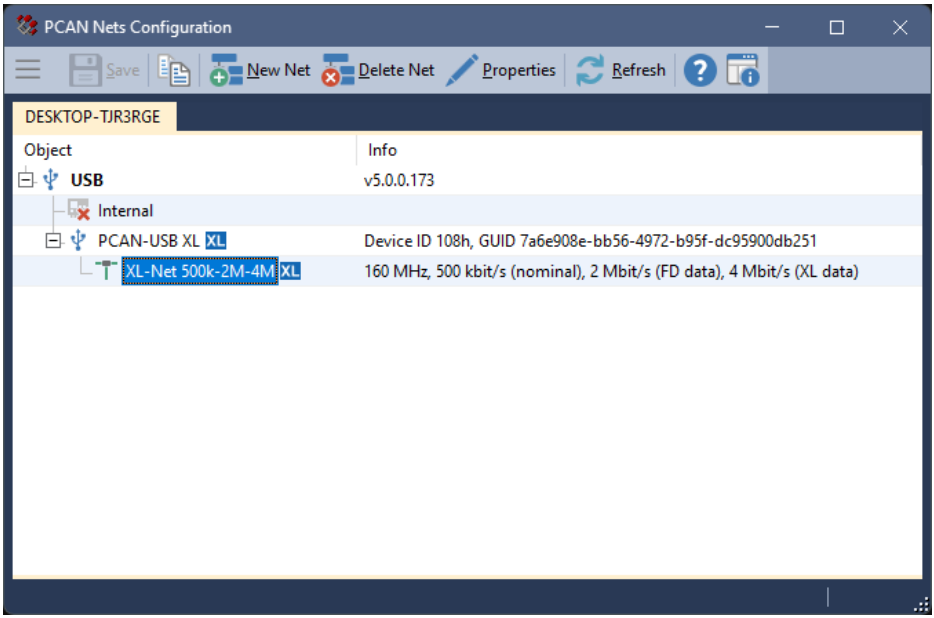
   The *Net Properties* dialog box appears.
4. Enter a name for the Net in the corresponding field.

5. On the *CAN Setup* tab, select the *CAN Mode* to be used.

> Make sure that you configure the PCAN Net according to the parameters used on the CAN bus, also in the following step.

6. Assign the *Clock Frequency* as the starting point and the bit rates to the new PCAN Net.
7. Confirm the entries with *OK*.

   A new entry under *PCAN-USB XL* appears in the main window of PCAN Nets Configuration.
8. Click on *Save* to save the changes to the Net configuration on your computer.



The created PCAN Net is now available to the PCAN-Explorer for a connection.

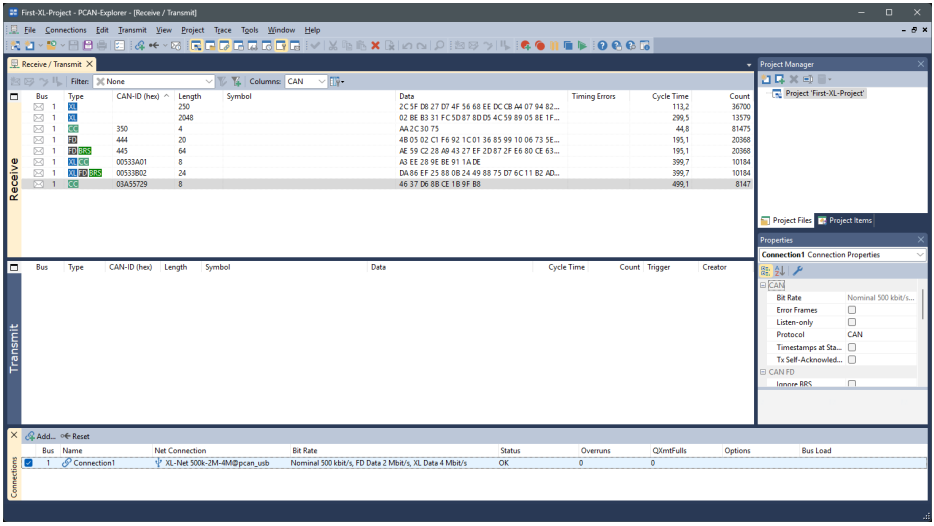
Establishing a Connection in the PCAN-Explorer

1. Start the PCAN-Explorer.
2. Create a new Project via *File* > *New* > *New Project*.

   Project 'Project1' appears in the Project Manager window on the right.
3. Give the project a name. To do this, right-click on the Project entry and select *Rename*.
4. In the *Connections* window at the bottom, select *Add*.

   In the dialog box that appears, the previously created network is displayed on the *USB* tab.
5. Make sure that the network is selected - no further information is required - and confirm with *OK*.

   The *Receive* area displays the incoming CAN messages of the connected CAN bus.



6. Save the current settings to any location using *File* > *Save Project As*. Later, you can quickly regain access to the CAN bus by opening the Project without having to repeat the settings in detail.

6.2 Creating a Send Message

CAN messages with static data are assembled in the *Transmit* section of the PCAN-Explorer. When doing so, several entries with the same CAN ID or PID can be provided, each with different data bytes.

This procedure requires at least one Connection using CAN XL.

Creating a New CAN XL Transmit Message

1. If the *Receive / Transmit* window is not visible, select the menu command *View* > *Receive/Transmit*.
2. Above the *Receive* area, switch the *Columns* view to *CAN XL* in order to be able to see all the key data of the CAN XL messages in the lists.
3. Select the menu command *Send* > *New Message*.

   The *Edit Message* dialog box appears.
4. Indicate a *Type* for the new CAN XL message:
   - *CAN XL*: freely configurable CAN XL message with selectable Service Data Type (SDT)
   - *CAN XL (… Tunneling)*: Transmission of a CAN CC or CAN FD message embedded in a CAN XL message (SDTs 03h, 06h, 07h)
5. Specify the parameters and data for the CAN XL message. When using the tunneling types, you can specify the basic parameters of the embedded CAN CC or CAN FD message as usual.
6. Using the *Cycle Time* field, specify if the message is to be transmitted periodically (value greater than 0) or only manually (value 0).
7. Confirm the settings with *OK*.

   The completed transmit message appears in the *Transmit* area and is transmitted with the specified data periodically according to the set cycle time.
8. To transmit manually, select this or another transmit message from the list and press Space.

   The CAN message is transmitted once, when having a periodically transmitted CAN message once in addition. This is also indicated in the *Count* column.

6.3 Tracing CAN Messages

You can easily record the whole traffic of incoming and outgoing CAN messages to a trace file. Starting with trace format version 3.0, PCAN-Explorer 7 can also handle CAN XL messages in trace files.

Starting a Trace Recording

1. Make sure that your current Project in PCAN-Explorer is saved. You can use *File* > *Save Project As*.

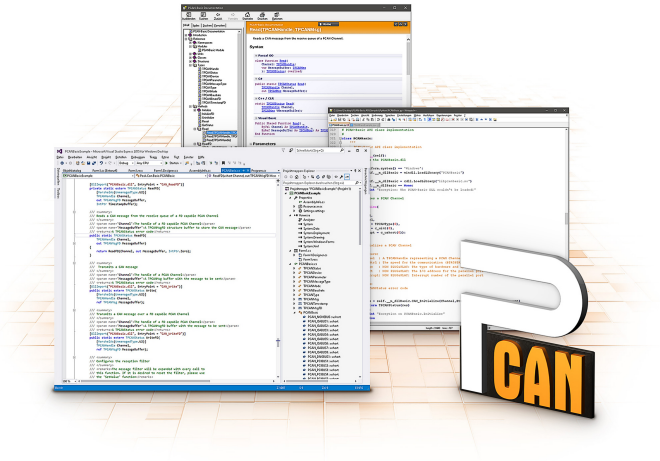
   By default, PCAN-Explorer uses the Project's directory for creating a temporary subdirectory for trace files.
2. Select *Trace* > *Start New Tracer*.

   A new window appears, showing all occurring messages being written to the trace file.
3. Stop the recording with *Trace* > *Stop*.

   The trace file now exists in the temporary location that is indicated on the tab label. When hovering with the mouse over this label, you can see the full path in the info bar on the bottom of the PCAN-Explorer window.
4. Use *File* > *Save As* to move the trace file from its temporary location to a path of your choice.

You can use the PCAN-Explorer to play back trace files on a connected CAN bus. Another possibility is to extract Signals from the CAN messages of a trace file by using symbol files.

7 API PCAN-Basic



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

The programming interface (API) PCAN-Basic provides basic functions for the connection of own programs to CAN CC, CAN FD, and CAN XL buses using Interfaces from PEAK-System. PCAN-Basic is the interface between the program and the device driver. In Windows operating systems, these are DLL files (Dynamic Link Library) and in Linux operating systems an SO (Dynamic Shared Object). PCAN-Basic is designed to be cross-operating system compatible. Software projects can be ported between supported systems with little effort.

With the installation of the device driver package under Windows the DLL files of the API PCAN-Basic are placed in the system folder. Examples for all common programming languages as well as libraries and help files are available as a download package at: www.peak-system.com/quick/DL-Develop-E

For Linux, a download of the API is available under this link. For a use of PCAN-Basic another driver package with a chardev driver is needed, because an access under SocketCAN is not possible. The "Driver Package for Proprietary Purposes", the user manual, and further information about the implementation can be found at https://linux.peak-system.com

7.1 Features of PCAN-Basic

- API for developing applications with CAN CC, CAN FD, and CAN XL connections
- Support for CAN specifications CAN CC (classic CAN 2.0), CAN FD, and CAN XL (ISO 11898-1 2024)
- Application development for the platforms Windows 11 (x64/ARM64), 10 (x86/x64), and Linux
- Multiple PEAK-System applications and your own can be operated on a physical channel at the same time
- Use of up to 16 channels for each hardware type
- Simple switching between channels of a PEAK CAN interface
- Access to the CAN channels of a PCAN-Gateway via the PCAN-LAN hardware type
- Driver-internal buffering of up to 32,768 CAN messages per CAN channel
- Precision of time stamps on received messages up to 1 µs (depending on the PEAK CAN interface used)
- Supports PEAK-System‘s trace formats
  - Version 1.1 for CAN CC recordings
  - Version 2.0 for CAN FD recordings
  - Version 3.0 for CAN XL recordings
- Access to specific hardware parameters, such as listen-only mode
- Notification of the application through Windows® events when a message is received
- Support of CAN error frames
- Confirmation of physical transmission by CAN echo frames
- Extended system for debugging operations
- Multilingual debugging output
- Output language depends on operating system

- Debugging information can be defined individually
- Thread-safe API

7.2 Principle Description of the API

The sequence of accessing the CAN interface is divided into three phases:

Initialization

A CAN channel must be initialized before using it. This is done by the simple call of the function `CAN_Initialize` for CAN CC, `CAN_InitializeFD` for CAN FD, and `CAN_InitializeXL` for CAN XL. Up to 16 CAN channels can be opened at the same time. After a successful initialization the CAN channel is ready. No further configuration steps are required.

Interaction

For receiving and transmitting messages the functions `CAN_Read` and `CAN_Write`, `CAN_ReadFD` and `CAN_WriteFD` , as well as `CAN_ReadXL` and `CAN_WriteXL` are available depending on the initialization mode. Additional settings can be done, such as setting up message filters to confine to specific CAN IDs or setting the CAN controller to Listen-only mode.

With the corresponding parameter activated, events are used to automatically notify an application (client) when CAN messages are received. This offers the following advantages:

- The application no longer needs to check for received messages periodically (no polling).
- The response time at reception is reduced.

Completion

To end the communication the function `CAN_Uninitialize` is called in order to release the reserved resources for the CAN channel, among others. In addition the CAN channel is marked as "Free" and is available to other applications.

8 Hardware Management with PEAK-Settings

PEAK-Settings is a software that can be used to display, manage, and configure all available devices, installed drivers, and APIs of PEAK-System.

8.1 Installation

PEAK-Settings is installed together with the device driver setup of PEAK-System.

8.2 Working with PEAK-Settings

After installation, the software can be started. To do this, enter PEAK-Settings in the search field.

When you run PEAK-Settings, the start page is displayed. From here you can navigate to the individual categories.

Distinguishing between multiple CAN interfaces

All connected **CAN interfaces** are listed in the CAN hardware area. Information about the device ID, the GUID, the firmware version and the number of channels can be called up here.

You can operate several interfaces of the same type on one computer. The device ID and GUID make it possible to identify the hardware in a software environment. The GUID is an unchangeable, unique string. The device ID, on the other hand, can be configured with PEAK settings as follows.

1. Click on CAN Hardware to display the connected hardware.
2. Enter a hexadecimal number ending in “h” as the new hardware ID.
3. Confirm the entry with Set.

9 Technical Data

Connectors	
Computer	USB plug type A
CAN	D-Sub (m), 9 pins, pin assignment according to CiA® 106
USB	High-speed USB 2.0, compatible with USB 3.0

CAN		
Protocols	CAN CC, CAN FD, and CAN XL according to ISO 11898-1:2024; non-ISO CAN FD	
Physical transmission	ISO 11898-2:2024 (High-speed CAN)	
Bit rates	Nominal:	20 kbit/s to 1 Mbit/s
	CAN FD data bit rates:	max. 8 Mbit/s
	CAN XL data bit rates (CAN FD compatible):	max. 8 Mbit/s
	CAN XL data bit rates (with transceiver mode switch):	max. 20 Mbit/s
Controller	FPGA implementation	
Transceiver	CAN SIC XL transceiver TI TCAN6062V	
Galvanic isolation	500 V	
Internal Termination	120 Ohm between CAN-High and CAN-Low via solder bridges, disabled at delivery	
Time stamp resolution	1 µs	

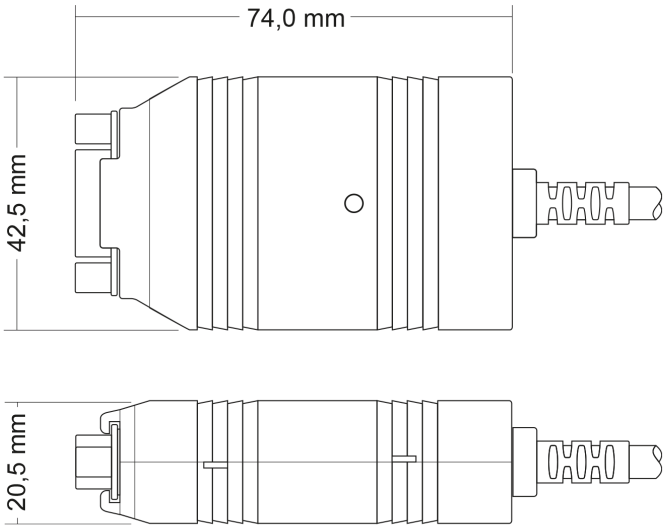
Power supply	
Rated voltage	+5 V DC (via USB connection)
Current consumption	max. 250 mA

Measures	
Size	75 x 43 x 22 mm
Connection cable length	approx. 0.75 m
Weight	79 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 Dimension Drawings



Appendix B CE Certificate

EU Declaration of Conformity

This declaration applies to the following product:

Product name:	**PCAN-USB XL**
Item number(s):	**IPEH-005022**
Manufacturer:	PEAK-System Technik GmbH Leydheckerstraße 10 64293 Darmstadt Germany

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, 28 April 2025

Andreas Staat, Engineering Manager HW

Appendix C Disposal

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