

PCAN-PC Card

CAN Interface for the PC Card Slot

User Manual



Document version 2.5.0 (2019-03-21)

PEAK
System

Relevant products

Product name	Model	Part number
PCAN-PC Card Single Channel	One CAN channel	IPEH-002090
PCAN-PC Card Dual Channel	Two CAN channels	IPEH-002091
PCAN-PC Card Single Channel opto-decoupled	One CAN channel, galvanic isolation for CAN connection	IPEH-002092
PCAN-PC Card Dual Channel opto-decoupled	Two CAN channels, galvanic isolation for CAN connections	IPEH-002093

The cover picture shows the product PCAN-PC Card Dual Channel. The Single Channel models have an identical form factor but only one breakout cable for the CAN connection.

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1 Introduction

The PCAN-ExpressCard provides a connection between a CAN bus and a laptop or desktop PC with an ExpressCard slot. The card is available in single and dual-channel versions. There are also galvanically separated versions which guarantee galvanic separation up to a maximum of 300 Volts between the PC and CAN sides.

The monitor software PCAN-View and the programming interface PCAN-Basic for the development of applications with CAN connection are included in the scope of supply.

Device drivers exist for different operating systems, so programs can easily access a connected CAN bus.



Tip: At the end of this manual (Appendix C) you can find a Quick Reference with brief information about the installation and operation of the PCAN-PC Card.

1.1 Properties at a Glance

- └ Card for the PC Card slot
- └ Form factor Type II, maximum 5 mm in height
- └ 1 or 2 High-speed CAN channels (ISO 11898-2)
- └ Bit rates from 5 kbit/s up to 1 Mbit/s
- └ Compliant with CAN specifications 2.0A (11-bit ID) and 2.0B (29-bit ID)
- └ CAN bus connection via D-Sub, 9-pin (in accordance with CiA® 303-1)
- └ NXP SJA1000 CAN controller, 16 MHz clock frequency

- └ NXP PCA82C251 CAN transceiver
- └ Software option to switch on 5 Volt supply to CAN connection, e.g. for external bus converter
- └ Galvanic isolation on the CAN connection up to 100 V (only opto-decoupled models), separate for each CAN connection
- └ Operating temperature range from 0 to 70 °C (32 to 158 °F)



Note: This manual describes the use of the PCAN-PC Card with **Windows**. You can find device drivers for **Linux** and the corresponding application information on the provided DVD in the directory branch *Develop* and on our website under www.peak-system.com/linux.

1.2 System Requirements

- └ A vacant PC Card slot at the computer, PCMCIA type II
- └ Operating system Windows 10, 8.1, 7 (32/64-bit) or Linux (32/64-bit)

1.3 Scope of supply

- └ PCAN-PC Card CAN interface
- └ Device drivers for Windows 10, 8.1, 7 and Linux (32/64-bit)
- └ CAN monitor PCAN-View for Windows
- └ Programming interface PCAN-Basic for developing applications with CAN connection
- └ Programming interfaces for standardized protocols from the automotive sector
- └ Manual in PDF format

2 Installing the Software and the Card

This chapter covers the software setup for the PCAN-PC Card under Windows and the installation of the card.

Install the driver before you install the card.

▶ Do the following to install the driver:

1. Start `Intro.exe` from the root directory of the DVD.
The navigation program starts.
2. Select in the main menu **Drivers** and click on **Install now**.
3. Confirm the message of the User Account Control related "Installer database of PEAK Drivers".
The driver setup starts.
4. Follow the program instructions.

▶ Do the following to install the card:

1. Insert the PCAN-ExpressCard into an ExpressCard slot of your computer. The computer can remain powered on.
Windows notifies that new hardware has been detected. The drivers are found and installed by Windows automatically.
2. Check the LED on the card. If the LED (one for each CAN channel) is red, then the driver was initialized successfully.

3 Connecting CAN Bus

The arrangement of the CAN channels at the PCAN-PC Card is as follows:

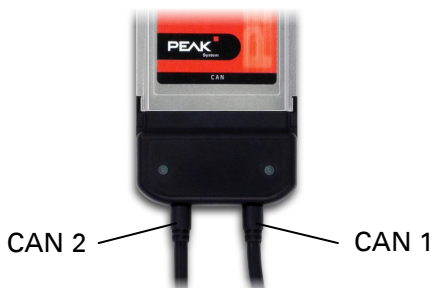


Figure 1: Arrangement of the CAN channels
(CAN 2 only with Dual Channel models)

3.1 Connection over D-Sub Connector

A High-speed CAN bus (ISO 11898-2) is connected to the 9-pin D-Sub connector. The pin assignment for CAN corresponds to the specification CiA® 303-1.

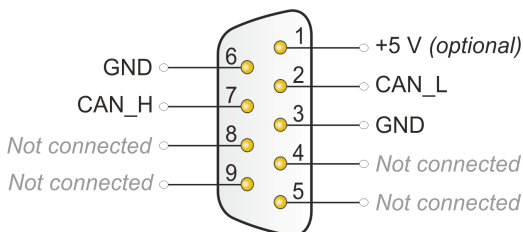


Figure 2: Pin assignment High-speed CAN
(view onto a male D-Sub connector at the PCAN-PC Card)

With pin 1 devices with low power consumption (e.g. bus converters) can be directly supplied via the CAN connector. At delivery this pin is deactivated. You can find a detailed description in the following section 3.2.



Tip: You can connect a CAN bus with a different transmission standard via a bus converter. PEAK-System offers different bus converter modules (e.g. PCAN-TJA1054 for a Low-speed CAN bus according to ISO 11898-3).

3.2 voltage supply of External Devices

External devices with low power consumption (e.g. bus converters) can be directly supplied via the CAN connector (with the Dual Channel model simultaneously for both CAN connectors). With the provided Windows software PCAN-View, the 5-Volt supply can be activated onto pin 1 of the D-Sub CAN connector.

The galvanically decoupled models of the card have an interconnected DC/DC converter. Therefore, the current output is limited to 50 mA.

You find further information about the use of this option in PCAN-View in section 5.1.3.

3.3 Cabling

3.3.1 Termination

A High-speed CAN bus (ISO 11898-2) must be terminated on both ends with 120 Ohms. Otherwise, there are interfering signal reflections and the transceivers of the connected CAN nodes (CAN interface, control device) will not work.

The PCAN-PC Card does not have an internal termination. Use the card on a terminated CAN bus.

3.3.2 Example of a Connection

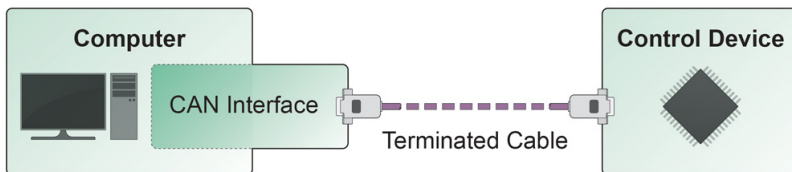


Figure 3: Simple CAN connection

This example shows a connection between the PCAN-PC Card and a control unit. The connection cable is terminated with 120 ohms at both ends.

3.3.3 Maximum Bus Length

High-Speed-CAN networks may have bit rates of up to 1 Mbit/s. The maximum bus length depends primarily on the bit rate.

The following table shows the maximum possible CAN bus length at different bit rates:

Bit rate	Bus length
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
20 kbit/s	3.3 km
10 kbit/s	6.6 km
5 kbit/s	13.0 km

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

4 operation

4.1 Status LED

The PCAN-PC Card has a status LED for each existing CAN channel which may be in one of the following conditions:

Status	Meaning
On	There's a connection to a driver of the operating system
Slow blinking	A software application is connected to the CAN channel
Quick blinking	Data is transmitted via the connected CAN bus

4.2 Removing the Card

Under Windows the icon for removing hardware safely is not used with the PCAN-PC Card. You may remove the card from the computer without any preparation under Windows.

5 software and API

This chapter covers the provided software PCAN-View and the programming interface PCAN-Basic.

5.1 CAN Monitor PCAN-View for windows

PCAN-View is simple Windows software for viewing, transmitting, and logging CAN and CAN FD messages.



Note: This chapter describes the use of PCAN-View with a CAN adapter.

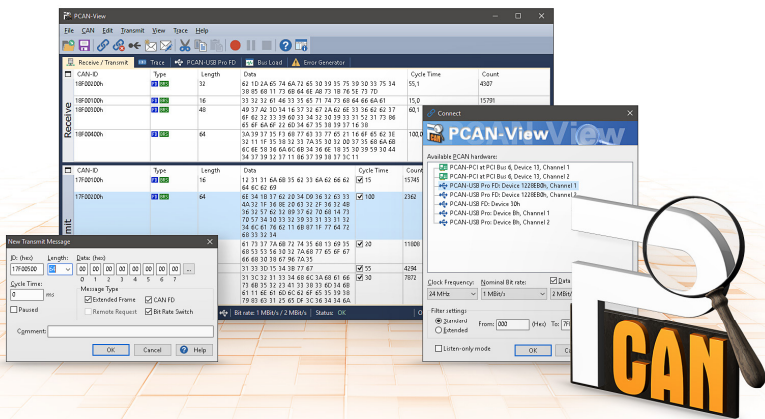


Figure 4: PCAN-View for Windows

▶ Do the following to start and initialize PCAN-View:

1. Open the Windows Start menu and select **PCAN-View**.

The **Connect** dialog box appears.

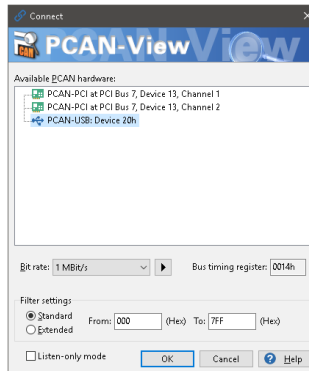


Figure 5: Selection of the specific hardware and parameters

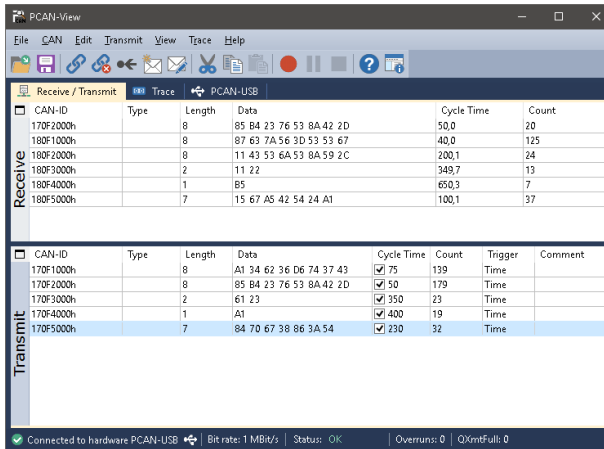
2. Select an interface from the list.
3. From the dropdown list, select the **Bit rate** that is used by all nodes on the CAN bus.



Tip: You can create custom bit rates by using the button (▶).

4. Under **Filter settings** you can limit the range of CAN IDs to be received, either for standard frames (11-bit IDs) or for extended frames (29-bit IDs).
5. Activate the **Listen-only mode** if you do not actively participate in the CAN traffic and just want to observe. This also avoids an unintended disruption of an unknown CAN environment (e.g. due to different bit rates).
6. Confirm the settings in the dialog box with **OK**. The main window of PCAN-View appears (see Figure 6).

5.1.1 Receive/Transmit Tab




CAN-ID	Type	Length	Data	Cycle Time	Count
170F2000h		8	85 B4 23 76 53 8A 42 2D	50,0	20
180F1000h		8	87 63 7A 56 3D 53 53 67	40,0	125
180F2000h		8	11 43 53 6A 53 8A 59 2C	200,1	24
180F3000h		2	11 22	349,7	13
180F4000h		1	B5	650,3	7
180F5000h		7	15 67 A5 42 54 24 A1	100,1	37

CAN-ID	Type	Length	Data	Cycle Time	Count	Trigger	Comment
170F1000h		8	A1 34 62 36 D6 74 37 43	<input checked="" type="checkbox"/> 75	139	Time	
170F2000h		8	85 B4 23 76 53 8A 42 2D	<input checked="" type="checkbox"/> 50	179	Time	
170F3000h		2	61 23	<input checked="" type="checkbox"/> 350	23	Time	
170F4000h		1	A1	<input checked="" type="checkbox"/> 400	19	Time	
170F5000h		7	84 70 67 38 86 3A 54	<input checked="" type="checkbox"/> 230	32	Time	

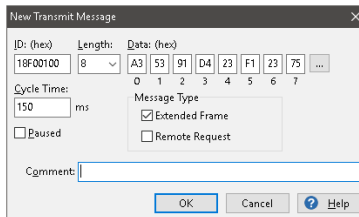
Figure 6: Receive/Transmit Tab

The **Receive/Transmit** tab is the main element of PCAN-View. It contains two lists, one for received messages and one for the transmit messages. The CAN data format is hexadecimal by default.

► Do the following to transmit a CAN message with PCAN-View:

1. Select the menu command **Transmit > New Message** (alternatively  or **Ins**).

The **New Transmit Message** dialog box appears.



New Transmit Message

ID: (hex) Length: Data: (hex)

18F00100 8 A3 53 91 D4 23 F1 23 75 ...

Cycle Time: 150 ms

☐ Paused

Message Type

☒ Extended Frame

☐ Remote Request

Comment:

OK Cancel Help

Figure 7: Dialog box New transmit message

2. Enter the **ID**, the data **Length** and the CAN message **Data**.



Note: With the program version 4 of PCAN-View, the DLC field was renamed to **Length**. Latter reflects the actual data length.

3. Enter a value into the **Cycle Time** field to choose manually or periodically message transmission. Enter a value greater than 0 to transmit periodically. Enter the value 0 to transmit only manually.

4. Confirm the entries with **OK**.

The created transmit message appears on the **Receive/Transmit** tab.

5. You trigger selected transmit messages manually with the menu command **Transmit > Send** (alternatively Space bar). The manual transmission for CAN messages being transmitted periodically is carried out additionally.



Tip: Using the menu command **File > Save** the current transmit messages can be saved to a list and loaded for reuse later on.

5.1.2 Trace Tab

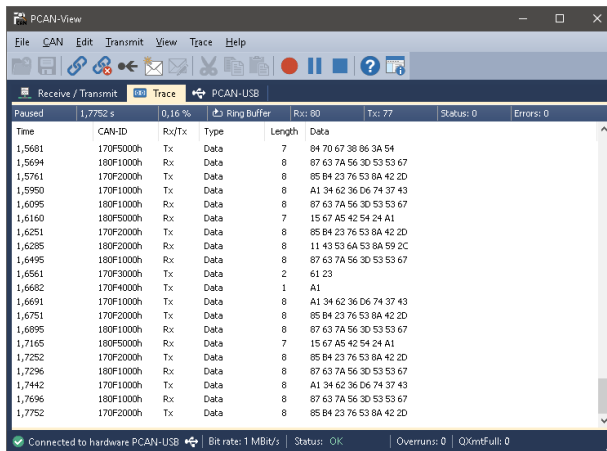


Figure 8: Trace Tab

On the **Trace** tab, the data tracer (data logger) of PCAN-View is used for logging the communication on a CAN bus. During this process the messages are cached in the working memory of the PC. Afterwards, they can be saved to a file.

The Tracer runs either in linear or in ring buffer mode. The linear buffer mode stops the Tracer as soon as the buffer is full. The ring buffer mode overwrites the oldest messages by new ones as soon as the buffer is full.

5.1.3 PCAN-PC Card Tab

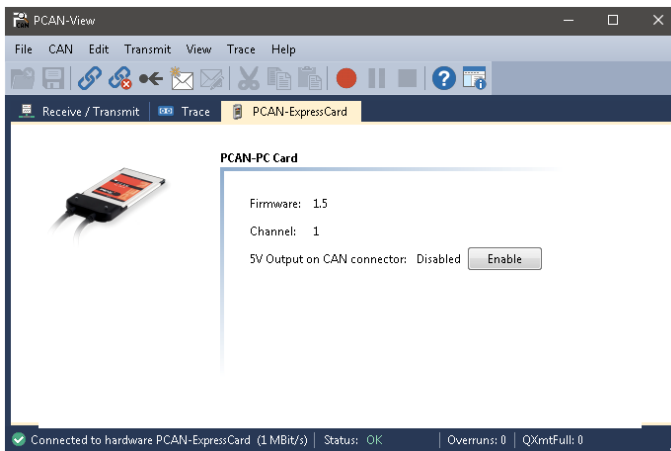


Figure 9: PCAN-PC Card Tab

On the **PCAN-PC Card** tab, the 5-Volts supply on pin 1 of the D-Sub CAN connector is enabled or disabled. For the Dual Channel model the setting is valid for both CAN connectors simultaneously. You find information about technical details in section 3.2.

▶ Do the following to activate the voltage supply:

Press the button **Enable** / **Disable** to change the settings.



Risk of short circuit! The 5-Volt supply is not protected separately. Therefore, turn off the computer before you connect and disconnect CAN cables or peripheral systems.

Consider that some computers still supply the USB ports with power even when they are turned off (standby operation).

5.1.4 Status Bar



Figure 10: Example of a status bar

The status bar shows information about the current CAN connection, about error counters (Overruns, QXmtFull) and shows error messages.

You can find further information about the use of PCAN-View in the help which you can invoke in the program via the **Help** menu or with the **F1** key.

5.2 Linking Own Programs with PCAN-Basic

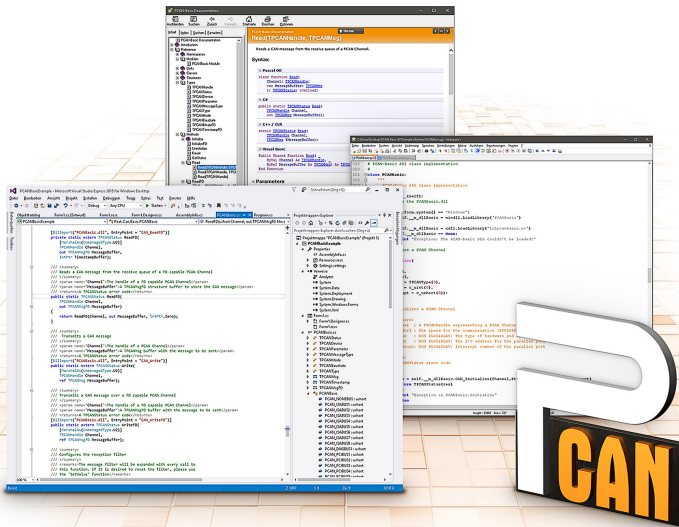


Figure 11: PCAN-Basic

On the provided DVD, you can find files of the programming interface PCAN-Basic in the directory branch `Develop`. This API provides basic functions for linking own programs to CAN- and CAN FD interfaces by PEAK-System and can be used for the following operating systems:

- └ Windows 10, 8.1, 7 (32/64-bit)
- └ Windows CE 6.x (x86/ARMv4)
- └ Linux (32/64-bit)

The API is designed for cross-platform use. Therefore software projects can easily be ported between platforms with low efforts. For all common programming languages examples are available.

Beginning with version 4, PCAN-Basic supports the new CAN FD standard (CAN with Flexible Data Rate) which is primarily characterized by higher bandwidth for data transfer.

5.2.1 Features of PCAN-Basic

- └ API for developing applications with CAN and CAN FD connection
- └ Access to the CAN channels of a PCAN-Gateway via the new PCAN-LAN device type
- └ Supports the operating systems Windows 10, 8.1, 7 (32/64-bit), Windows CE 6.x, and Linux (32/64-bit)
- └ Multiple PEAK-System applications and your own can be operated on a physical channel at the same time
- └ Use of a single DLL for all supported hardware types
- └ Use of up to 16 channels for each hardware unit (depending on the PEAK CAN interface used)
- └ Simple switching between channels of a PEAK CAN interface
- └ Driver-internal buffer for 32,768 messages per CAN channel
- └ Precision of time stamps on received messages up to 1 μ s (depending on the PEAK CAN interface used)
- └ Supports PEAK-System's trace formats version 1.1 and 2.0 (for CAN FD applications)
- └ Access to specific hardware parameters, such as listen-only mode
- └ Notification of the application through Windows events when a message is received
- └ Extended system for debugging operations
- └ Multilingual debugging output

- └ Output language depends on operating system
- └ Debugging information can be defined individually



Tip: An overview of the API functions is located in the header files. You can find detailed information about the PCAN-Basic API on the provided DVD in the text and help files (file name extensions `.txt` and `.chm`).

5.2.2 Principle Description of the API

The PCAN-Basic API is the interface between the user application and device driver. In Windows operating systems this is a DLL (Dynamic Link Library).

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

1. Initialization
2. Interaction
3. Completion

Initialization

A channel must be initialized before using it. This is done by the simple call of the function `CAN_Initialize` for CAN and `CAN_InitializeFD` for CAN FD. Depending on the type of the CAN hardware, 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` as well as `CAN_ReadFD` and `CAN_WriteFD` are available. Additional settings can be made, e.g. setting up message filters to confine to specific CAN IDs or setting the CAN controller to listen-only mode.

When receiving CAN messages, events are used for an automatic notification of an application (client). 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.

5.2.3 Notes about the License

Device drivers, the interface DLL, and further files needed for linking are property of the PEAK-System Technik GmbH and may be used only in connection with a hardware component purchased from PEAK-System or one of its partners. If a CAN hardware component of third-party suppliers should be compatible to one of PEAK-System, then you are not allowed to use or to pass on the driver software of PEAK-System.

If a third-party supplier develops software based on the PCAN-Basic and problems occur during the use of this software, consult the software provider.

6 Technical specifications

Connectors

Computer	PC Card PCMCIA type II (16-bit, 5 V)
CAN	D-Sub (m), 9 pins (at Dual Channel model 2 x) Pin assignment according to specification CiA® 303-1

CAN

Specification	ISO 11898-2, High-speed CAN 2.0A (standard format) and 2.0B (extended format)
Bit rates	5 kbit/s - 1 Mbit/s
Controller	NXP SJA1000
Transceiver	NXP PCA82C251
Galvanic isolation	PCAN-PC Card: none PCAN-PC Card opto: up to 100 V, separate for each CAN channel
Supply external devices	PCAN-PC Card: D-Sub Pin 1; 5 V, max. 100 mA PCAN-PC Card opto: D-Sub Pin 1; 5 V, max. 50 mA via solder bridge(s), not assigned at delivery
Internal termination	none

Power supply

Supply voltage	+5 V DC (via PC Card slot)	
Power consumption	PCAN-PC Card Single Channel:	max. 150 mA
	PCAN-PC Card Dual Channel:	max. 250 mA
	PCAN-PC Card Single Channel opto:	max. 250 mA
	PCAN-PC Card Dual Channel opto:	max. 400 mA

Measures

Size (without cables)	116 x 54 x 12 mm (L x W x D)	
Weight	PCAN-PC Card Single Channel:	55 g
	PCAN-PC Card Dual Channel:	75 g
	PCAN-PC Card Single Channel opto:	55 g
	PCAN-PC Card Dual Channel opto:	76 g

Environment

Operating temperature	0 - 70 °C (32 – 158 °F)
Storage temperature	-40 - 100 °C (-40 - 212 °F)
Relative humidity	15 - 90 %, not condensing
Ingress protection (IEC 60529)	IP30

Conformity

EMV	Directive 2014/30/EU DIN EN 55024:2016-05 DIN EN 55032:2016-02
RoHS 2	Directive 2011/65/EU DIN EN 50581 VDE 0042-12:2013-02


Appendix A CE Certificate

EU Declaration of Conformity



This declaration applies to the following product:

Product name: PCAN-PC Card
Item number(s): IPEH-002090/91/92/93
Manufacturer: PEAK-System Technik GmbH
Otto-Roehm-Strasse 69
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)

DIN EN 50581 VDE 0042-12:2013-02

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances;
German version EN 50581:2012

EU Directive 2014/30/EU (Electromagnetic Compatibility)

DIN EN 55024:2016-05

Information technology equipment – Immunity characteristics – Limits and methods of measurement (CISPR 24:2010 + Cor.:2011 + A1:2015);
German version EN 55024:2010 + A1:2015

DIN EN 55032:2016-02

Electromagnetic compatibility of multimedia equipment - Emission Requirements (CISPR 32:2015);
German version EN 55032:2015

Darmstadt, 22 February 2019

A handwritten signature in black ink, appearing to read "Uwe Wilhelm".

Uwe Wilhelm, Managing Director

Appendix B Dimension Drawing

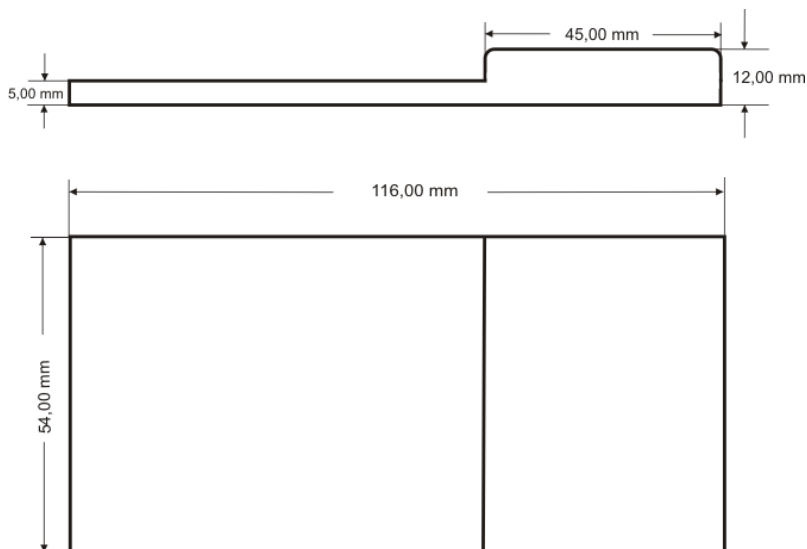


Figure 12: View PCAN-PC Card

The figure doesn't show the actual size of the product.

Appendix C Quick Reference

Software/Hardware Installation under windows

Install the driver from the supplied DVD, before you insert the PCAN-PC Card into a vacant PC Card slot. The card is recognized by Windows and the driver is initialized. The LED (one for each CAN channel) must light red.

Getting started under windows

Run the CAN monitor PCAN-View from the Windows Start menu as a sample application for accessing the PCAN-PC Card. For initialization of the PCAN-PC Card select the desired CAN channel and the CAN bit rate.

Status-LED	Meaning
On	There's a connection to a driver of the operating system
Slowly blinking	A software application is connected to the CAN channel
Quick blinking	Data is transmitted via the connected CAN bus

High-speed CAN connector (D-Sub, 9 pins)

