CAN-PC Interface

CPC-USB/ARM7

User manual

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User manual for CAN Interface CPC-USB/ARM7 Version 2.0

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If you discover a security vulnerability in one of our products, please report it to **security@ems-wuensche.com**. Thank you for your support.

Our products are continously improved. Due to this fact specifications may be changed at any time and without announcement.

FCC: **This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

WARNING: **CPC-USB/ARM7 hardware and software may not be used in applications where damage to life, health or private property may result from failures in or caused by these components.**

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1 Overview

1.1 Attributes

- CAN interface for industrial applications
- Powerful Cortex M3 microcontroller with internal CAN and USB controller
- CiA DS102 and ISO11898 compatible physical layer
- Display of USB communication and CAN data transfer via LEDs
- Supply completely over USB
- USB 2.0 Full Speed
- Galvanic isolation between PC and CAN bus (optional)
- Low speed transceiver TJA1054A (optional)
- Optional with ±80V tolerant CAN transceiver MAX13052 available
- Optional available with RJ45 CAN connector
- Firmware programmable over USB
- Linux socketCAN is supported

1.2 General Description

CPC-USB is a CAN interface for USB ports in a compact and robust metal housing. Due to easy handling and favourable price CPC-USB is suitable for configuration and analysis of CAN systems.

CPC-USB is equipped with a Cortex M3 microcontroller providing onChip CAN and USB controller. The interface is supplied via USB, a separate supply for the CAN side is not needed. It supports 11bit and 29bit CAN identifiers.

The interface is optionally available with galvanic isolation. In addition, a variant with low speed transceiver for automotive environments is also available. Optional CAN Connection with RJ45 instead of D-Sub9.

For applications, where a higher fault voltage on the CAN bus terminals cannot be avoided, the version -HV is available. The use of the transceiver MAX13052 allows voltages up to ±80V on the CAN bus lines.

Application development kits for the operating systems MS-Windows and Linux are available free of charge.

1.3 Ordering Information

10-08-400-xx	**CPC-USB/ARM7** CAN-PC interface for USB ports with Cortex M3 microcontroller
10-08-401-xx	**CPC-USB/ARM7-GTI** CAN-PC interface for USB ports with Cortex M3 microcontroller and galvanic separation of the CAN transceiver
10-08-403-xx	**CPC-USB/ARM7 Version LS** CAN-PC interface for USB ports with Cortex M3 microcontroller and CAN transceiver TJA1054
10-08-404-xx	**CPC-USB/ARM7-GTI Version LS** CAN-PC interface for USB ports with Cortex M3 microcontroller and CAN transceiver TJA1054, galvanic separation of the CAN transceiver
10-08-406-xx	**CPC-USB/ARM7-GTI -HV** CAN-PC interface for USB ports with Cortex M3 microcontroller and galvanic separation of the CAN transceiver MAX13052 with ±80V protection
10-08-461-xx	**CPC-USB/ARM7-GTI-RJ45** CAN-PC interface for USB ports with Cortex M3 microcontroller and galvanic separation of the CAN transceiver with RJ45 CAN connector

Note: xx denotes language of delivery:

10 German
20 English

2 Electrical Characteristics

2.1 Absolute Limiting Values

Any (also temporary) stress in excess of the limiting values may cause permanent damage on CPC-USB and connected devices.

Exposure to limiting conditions for extended periods may affect the reliability and shorten the life cycle of the device.

Parameter	Min.	Max.	Unit
Storage temperature	-20	+80	°C
Operating temperature	0	+60	°C
Supply voltage	0	+6	V
Voltage on the bus connections, standard version	-30	+30	V
Voltage on the bus connections, LS version	-27	+30	V
Voltage on the bus connections, HV version	-80	+80	V

2.2 Nominal Values

Parameter	Min.	Typ.	Max.	Unit
Current consumption (idle mode)	-	100	-	mA
Current consumption (operation mode)	-	-	250	mA
Supply voltage	4,0	5,0	5,5	V

All values, unless otherwise specified, refer to a supply voltage of 5V and an environmental temperature of 20°C.

3 Operating Instructions

3.1 Pin configuration of CAN connector

The CAN interface connector (D-Sub9 male) for the standard version complies to CiA Standard DS 102.

The pin usage is detailed in the following table:

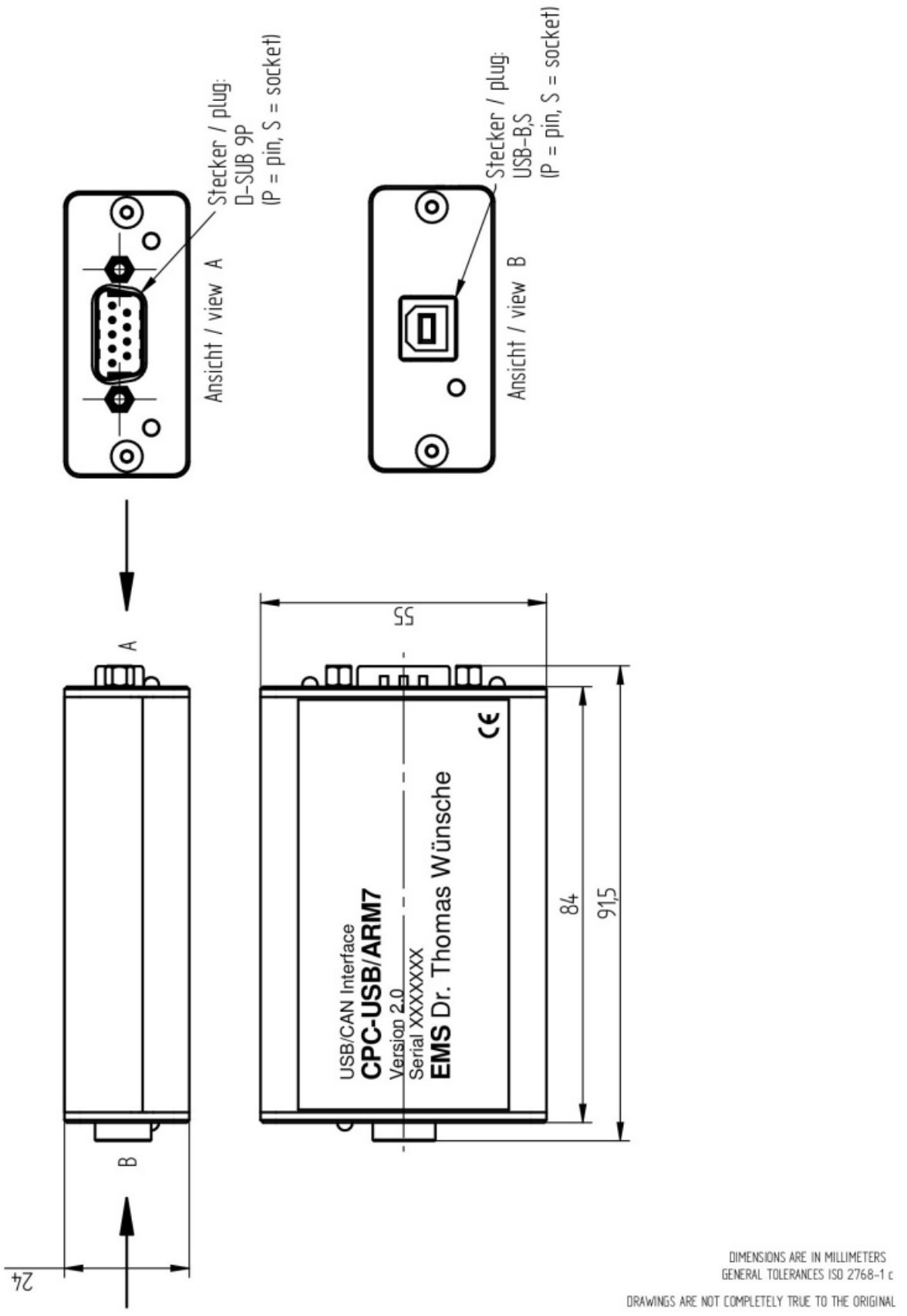
Pin Number	Pin Name	Description Standard Version	Description Low Speed Version
Pin 1	RTL	Not connected	Connected with Pin 2 by a 5k6 resistor and with dedicated Pin of TJA1054 CAN transceiver
Pin 2	CAN_L	CAN bus line, dominant low	CAN bus line, dominant low
Pin 3	GND	Ground	Ground
Pin 4, 5, 6, 9	-	Not connected	Not connected
Pin 7	CAN_H	CAN bus line, dominant high	CAN bus line, dominant high
Pin 8	RTH	Not connected	Connected with Pin 7 by a 5k6 resistor and with dedicated Pin of TJA1054 CAN transceiver

3.2 Pin configuration of RJ45 CAN connector

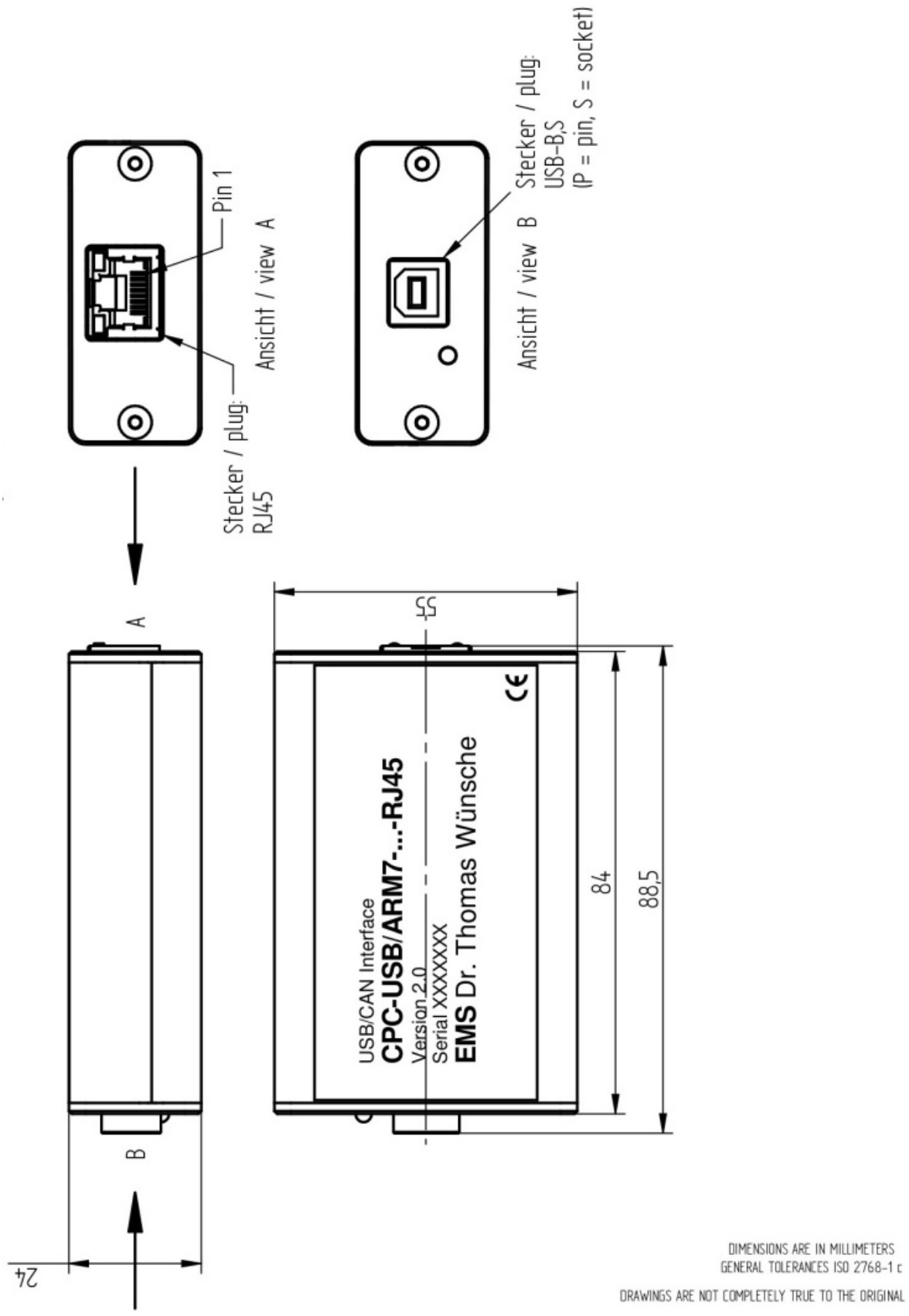
The pin usage of RJ45 CAN interface connector is detailed in the following table:

Pin Number	Pin Name	Description Standard Version
Pin 1	CAN_H	CAN bus line, dominant high
Pin 2	CAN_L	CAN bus line, dominant low
Pin 3	GND	Ground
Pin 4, 5, 6, 8	-	Not connected
Pin 7	GND	Ground

3.3 Dimensions standard CPC-USB/ARM7



3.4 Dimensions CPC-USB/ARM7-RJ45



3.5 Installation

CPC-USB may be connected to a free USB port of a computer. To avoid damage please pay attention to the following hints:

WARNING: Avoid damage by achieving equal potential between the corresponding devices before plugging any connections to CPC-USB.

To the CAN connector of CPC-USB only CAN networks with a connector and electrical character complying with this specification may be attached.

PC interface and CAN bus are not galvanic decoupled in the standard version of CPC-USB. Use in systems with diverging ground potential of PC and CAN bus is not permitted in this case.

Besides the instructions mentioned in this manual carefully observe the instructions in your computers users manual.

If you are not sure about the installation please contact **EMS Dr. Thomas Wünsche**.

CPC-USB needs a driver to operate on Windows operating systems. This driver is part of the ´CPC-Series Runtime Kit for MS-Windows Environment´, which is part of the delivery.

3.6 Socket CAN

With a recent Linux kernel the socketCAN driver for the CPC-USB/ARM7 (ems_usb.ko) is already included. It supports the following interface versions:

CPC-USB/ARM7	v1.0 and v2.0, also low speed variants
CPC-USB/ARM7-GTI	v1.0 and v2.0, also low speed variants
CPC-USB/embedded	

After the device is attached to the USB connector the driver will be loaded automatically. This can be verified by entering the "dmesg" command on a console. It should output the following lines:

```
CPC-USB: Serial 0005001
CPC-USB: Product CPC-USB/ARM7
CPC-USB: cpcusb_probe - 10 reading URB's allocated
CPC-USB: cpcusb_probe - 10 writing URB's allocated
CPC-USB: Allocated memory for 1500 messages (114 kbytes)
CPC-USB: Device now attached to USB-0
CAN device driver interface
usbcore: registered new interface driver ems_usb
```

Before the interface can be used in an application it must be configured using the "ip" command:

First the baud rate is set to i.e. 125kBaud:

```
ip link set can0 type can bitrate 125000
```

Then the interface is set up:

```
ip link set up can0
```

Now received CAN messages can be shown with the following command:

```
candump can0
```

Useful links:

An introduction is given here:

en.wikipedia.org/wiki/SocketCAN

The can-utils can be found here:

www.github.com/linux-can/can-utils/

Also a good introduction is in the kernel documentation:

/usr/src/linux/Documentation/networking/can.txt

4 Appendix

4.1 Instruction for Disposal

Electronic Equipment Act (WEEE)

EMS is selling its products exclusively to commercial customers. This is the reason why all devices are designed for commercial use and have to be disposed appropriately. In accordance to § 10 para. 2 clause 3 Electronic Equipment Act (WEEE) the disposal of EMS products is regulated the following way.

The equipment must not be disposed at the public collection points. In accordance with the applicable law the disposal has to be done by the customer for own account. The same applies to products, which have been sold to third parties, if those parties do not take care of a disposal in accordance to the applicable law. As an alternative the products can be returned to EMS free of charge.

4.2 FCC Statement

CPC-USB/ARM7 and CPC-USB/ARM7-GTI have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

4.3 CE Conformity

Declaration of Conformity

CE

The manufacturer

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hereby declares, that the following products:

Name	Article Number
CPC-USB/ARM7	10-08-400-xx
CPC-USB/ARM7-GTI	10-08-401-xx
CPC-USB/ARM7 Version LS	10-08-403-xx
CPC-USB/ARM7-GTI Version LS	10-08-404-xx
CPC-USB/ARM7-GTI -HV	10-08-406-xx
CPC-USB/embedded	10-08-241-xx

meet the requirements of the following standards:

Electromagnetic Immunity
EN 55035:2018-04; VDE 0878-35:2018-04 – Electromagnetic compatibility of multimedia equipment – Immunity requirements (CISPR 35:2016, modified); German version EN 55035:2017

Electromagnetic Emission
EN 55032:2016-02; VDE 0878-32:2016-02 – Electromagnetic compatibility of multimedia equipment – Emission Requirements (CISPR 32:2015); German version EN 55032:2015

and therefore conform with the EU requirements on:

Electromagnetic compatibility (2014/30/EU)

In accordance with the above mentioned EU directives, the EC declarations of conformity and the associated documentation are held at the disposal of the competent authorities.

RoHS 3 EEE

The RoHS 3 (EU 2015/863) commits manufacturers of „Electrical and Electronic Equipment" (EEE) to secure compliance with the RoHS Directive before placing a CE mark.

Based on technical documentation and to the best of our knowledge, we hereby confirm that the above mentioned products do not contain any of the restricted substances according to Article 4 of the RoHS Directive in excess of the maximum concentration values tolerated by weight in any of their homogeneous materials.

Ilmmünster, 13.05.2020

Dr. Thomas Wünsche

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Thomas Wünsche