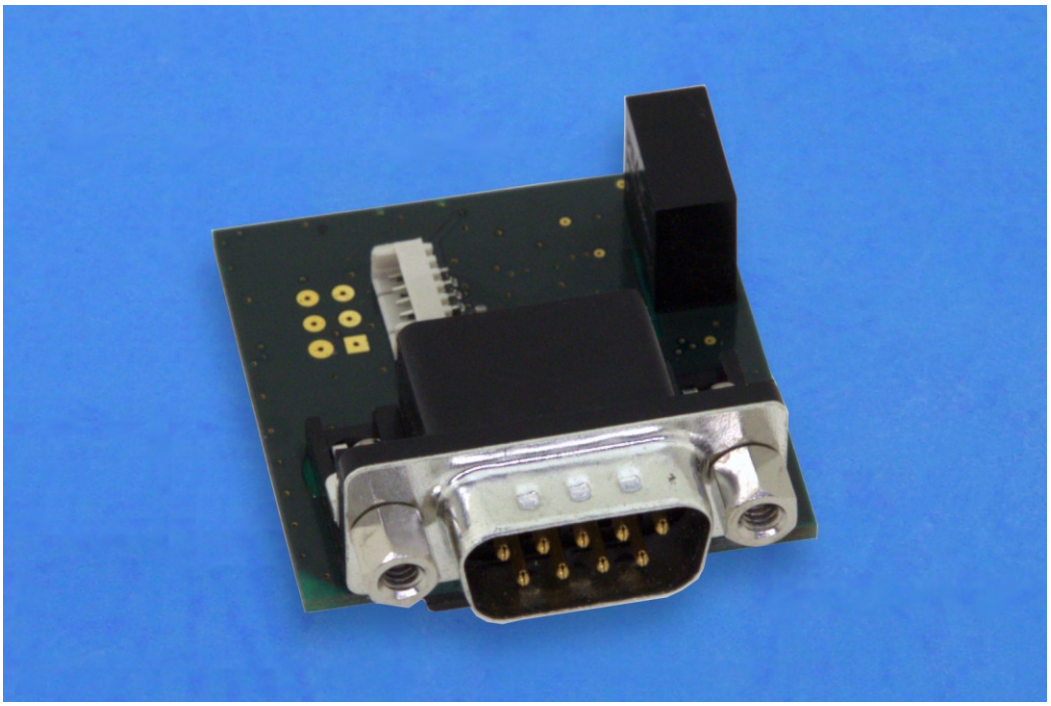

CAN PC Interface

CPC-USB/FDembedded

User manual

EMS
Thomas Wünsche

User manual for CAN Interface CPC-USB/FDembedded

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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/FDembedded 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 M4 microcontroller with internal CAN and USB controller
- Meets the ISO 11898-2:2016 physical layer standard
- Supports data rates up to 5 Mbaud
- Supports CAN protocols 2.0A and 2.0B
- Galvanic isolation
- Supply completely over USB
- USB 2.0 High Speed
- Galvanic isolation between PC and CAN bus
- Firmware programmable over USB
- Linux socketCAN is in development

1.2 General Description

CPC-USB/FDembedded is a CAN interface for internal USB ports. Due to its compact size it is eminently suitable for applications in embedded PCs. It is installed directly at a SUB-D9 case opening or a slot panel and wired with the included cable to a pin connector of an internal USB interface of the mainboard.

CPC-USB/FDembedded is equipped with a Cortex M4 microcontroller providing onChip CAN FD and USB controller. The interface is supplied via USB, a separate supply for the CAN side is not needed. It supports 11 bit and 29 bit CAN identifiers.

The interface is equipped with galvanic isolation between CAN and host USB connection and has an extended operating temperature range.

Application development kits for the operating systems Windows and Linux are available separately.

1.3 Ordering Information

10-08-502-xx	**CPC-USB/FDembedded** CAN FD PC interface for internal USB ports with Cortex M4 microcontroller and galvanic separation of the CAN transceiver

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/FDembedded 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	-40	+80	°C
Operating temperature	-30	+70	°C
Supply voltage	0	+6	V
Voltage on bus pins (CANH, CANL)	-70	+70	V
Differential Voltage on bus pins (CANH-CANL)	-70	+70	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 5 V 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.

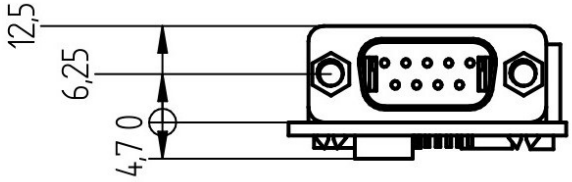
The pin usage is detailed in the following tables:

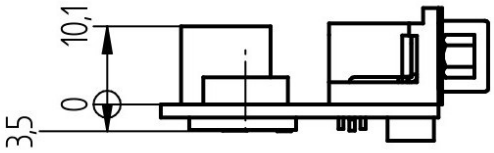
Pin	Name	Description
2	CAN_L	CAN data line (dominant low)
3	GND	CAN Ground
7	CAN_H	CAN data line (dominant high)
1,4,5,6,8	-	Not connected

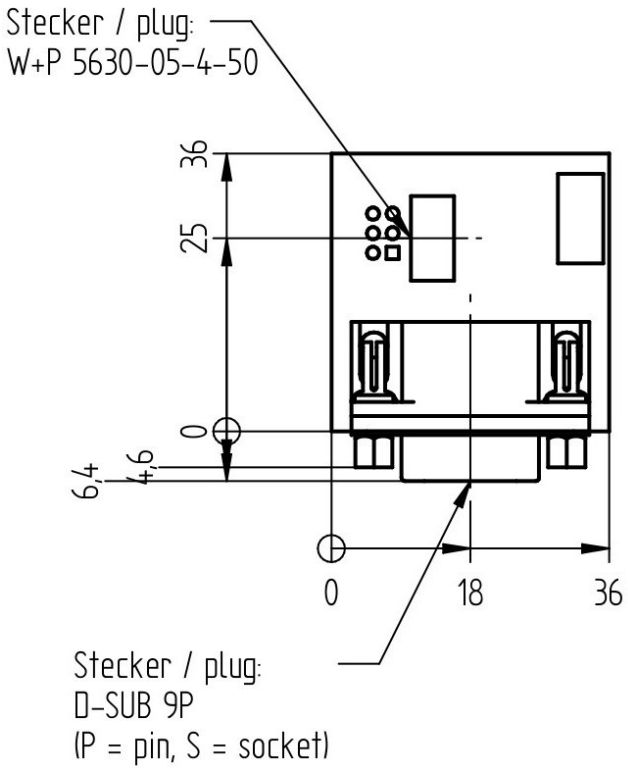
3.2 Pin Assignment of USB connection cable

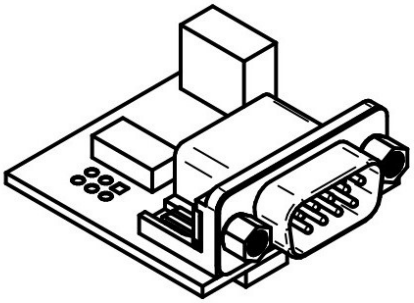
Pin	Color	Description
1	red	+5 V
2	white	USB-
3	green	USB+
4	black	Host GND
5	black	SHIELD

3.3 Dimensions









3.4 Installation

CPC-USB/FDembedded may be connected to a free internal 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/FDembedded.

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

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/FDembedded 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.

3.5 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	
CPC-USB/FD	is in development
CPC-USB/FDembedded	is in development

To request the source code for FD interfaces please contact support@ems-wuensche.com.

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. 125 kBaud:

```
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/FDembedded has 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 FCC Conformity

Declaration of Conformity

The manufacturer

EMS Dr. Thomas Wünsche e.K.
Sonnenhang 3
85304 Ilmmünster
Germany

hereby declares, that the following product:

Name	Article Number
CPC-USB/FDembedded	10-08-502-xx

has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.

Ilmmünster, 10.08.2022

Dr. Thomas Wünsche

EMS Thomas Wünsche

4.4 CE Conformity

Declaration of Conformity

CE

The manufacturer

EMS Dr. Thomas Wünsche e.K.
Sonnenhang 3
DE - 85304 Ilmmünster

hereby declares, that the following product:

Name	Article Number
CPC-USB/FDembedded	10-08-502-xx

meet the requirements of the following standards:

Electromagnetic Immunity

DIN EN 55032:2022-08 VDE 0878-32:2022-08 – Electromagnetic compatibility of multimedia equipment – Immunity requirements (CISPR 32:2015 + COR1:2016 + A1:2019); German version EN 55032:2015 + AC:2016 + A11:2020 + A1:2020

Electromagnetic Emission

DIN EN 55035/A11:2022-06 VDE 0878-35/A11:2022-06 – Electromagnetic compatibility of multimedia equipment – Emission Requirements; German version EN 55035:2017/A11:2020

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, 21.05.24

Dr. Thomas Wünsche

EMS Thomas Wünsche