# PCAN-MicroMod FD Digital 1/2

## User Manual

# Relevant products

| Product designation | Model | Part no. |
|---|---|---|
| PCAN-MicroMod FD Digital 1 | | IPEH-003083 |
| PCAN-MicroMod FD Digital 2 | | IPEH-003084 |
| PCAN-MicroMod FD Configuration | Configuration software for Windows | |

# Imprint



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Document version 1.2.0 (2021-01-19)
Major changes in this document are listed in Appendix C on page 27.

# Contents

# 1 Introduction

The PCAN-MicroMod FD plug-in board can be purchased together with ready-to-use motherboards that provide peripherals for specific requirements. For the connection of CAN, I/O, and power supply, spring terminal connectors are used.

The motherboard PCAN-MicroMod FD Analog 1 puts the emphasis on analog inputs and outputs which are provided with appropriate protective circuitry. The digital outputs of Digital 1 are equipped with low-side switches and those of Digital 2 with high-side switches.

The PCAN-MicroMod FD is configured using the supplied Windows software. In addition to simple I/O mapping to CAN IDs, function blocks are also available for processing the data. The configuration created on the computer is transferred via the CAN bus to the PCAN-MicroMod FD which then runs as an independent CAN node. Multiple modules can be configured independently on a CAN bus.

## 1.1 Properties at a Glance

### Motherboard in General

- Board with plugged on PCAN-MicroMod FD
- Aluminum casing with spring terminal connectors
- Operating voltage 8 to 30 V
- Extended operating temperature range from −40 to 85 °C (−40 to 185 °F)

- High-speed CAN connection (ISO 11898-2)
  - Complies with CAN specifications 2.0 A/B and FD
  - CAN bit rates from 20 kbit/s up to 1 Mbit/s
  - CAN FD bit rates for the data field (max. 64 bytes) from 20 kbit/s up to 10 Mbit/s
  - CAN termination switchable
- 1 analog input for voltage monitoring up to 30 V, resolution 12 bits
- 2 frequency outputs
  - Low-side switches
  - Adjustable frequency range from 0 to 20 kHz
- Completely configurable using the Windows program PCAN-MicroMod FD Configuration
- 4-bit rotary coding switch for setting the module ID

## I/O Motherboards Digital 1 and Digital 2

- 8 digital inputs
  - Pull-up, pull-down, or open (configurable)
- 8 digital outputs
  - Digital 1: Low-side switches
  - Digital 2: High-side switches
  - PWM mode: adjustable frequency range 0 to 20 kHz
- 3 analog inputs:
  - Resolution 12 bits
  - Measuring range 0 to 10 V

## 1.2 Operation Requirements

- Power supply in the range of 8 to 30 V DC (connection via 10-pole spring terminal strip)

For transfer of the configuration and for a firmware update (both via CAN):

- Windows 10, 8.1 (32/64-Bit)
- PC-CAN interface from PEAK-System (CAN FD capability recommended)
- CAN cabling between the CAN interface and the PCAN-MicroMod FD Digital 1/2 with proper termination (120 Ω on each end of the CAN bus)

> **Note:** The transfer of the configuration and a firmware update are done with CAN 2.0 messages. For this reason, all PC-CAN interfaces from PEAK-System work in principle for this purpose. We recommend the use of CAN-FD-capable interfaces in order to activate the necessary operation modes of the PCAN-MicroMod FD Digital 1/2 also during CAN FD operation in a simple way.

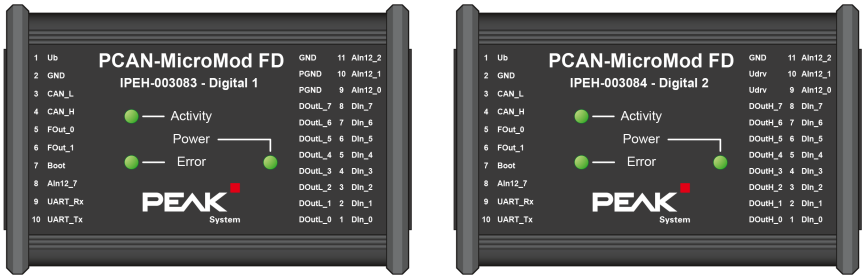
## 1.3 Scope of Supply

- PCAN-MicroMod FD
- Motherboard in aluminum casing
- One mating connector each for both connections
- PCAN-MicroMod FD Configuration for Windows
- Manual in PDF format

# 2 Connectors

The motherboard has two connector sockets.

| Position on casing | Function | Type | Mating connector type |
|---|---|---|---|
| Left | Basic connectivity | 10-pole, single-row, 3.81 mm pitch | Phoenix Contact FMC 1,5/10-ST-3,81 |
| Right | I/O | 22-pole, double-row, 3.5 mm pitch | Phoenix Contact DFMC 1,5/11-ST-3,5 |




Top view PCAN-MicroMod FD Digital 1/2 with pin assignment

## 2.1 Basic Connectivity (left connector)


Connector left 10-pole

| Pin | Identifier | Function | Comment |
|---|---|---|---|
| 1 | Ub | Voltage supply 8 - 30 V DC | *Power* LED is on when supply is present. |
| 2 | GND | Common Ground | |

| Pin | Identifier | Function | Comment |
|---|---|---|---|
| 3 | CAN_L | High-speed CAN connection (ISO 11898-2) | Internal termination resistor 120 Ω can be activated.<br>See 4.2 *Activate Internal CAN Bus Termination* on page 13. |
| 4 | CAN_H | | |
| 5 | Fout_0 | Frequency outputs (up to 10 kHz) | |
| 6 | Fout_1 | | |
| 7 | Boot | Start the CAN bootloader for a firmware update via CAN<br>(High-active, connection to Ub during the start-up of the motherboard) | *Activity* LED quickly blinks orange when CAN bootloader is active |
| 8 | AIn12_7 | Analog input 7 (0 - 30 V, resolution 12 bits) | General tasks, e.g. voltage monitoring or threshold switch |
| 9 | UART_Rx | Serial RS-232 interface | Corrently no use |
| 10 | UART_Tx | | |

For the startup of the PCAN-MicroMod FD Digital 1/2 it is sufficient to connect a voltage source to pins 1 and 2. The configuration of the PCAN-MicroMod FD Digital 1/2 is done via the CAN bus being connected to pins 3 and 4. Read more in 5 *Configuration Software* on page 15.

## 2.2 I/O (right connector)


Right connector 2 x 11 terminals

## Device version Digital 1

| Function | A | Pin | B | Function |
|---|---|---|---|---|
| Ground | GND | 11 | AIn12_2 | Analog inputs<br>Resolution 12 bits<br>Voltage range 0 … 10 V |
| Power Ground for digital outputs | PGND | 10 | AIn12_1 | |
| | PGND | 9 | AIn12_0 | |
| Digital outputs (low-side switches, max. 35 V on load)<br>Static state or PWM mode configurable for each | DOutL_7 | 8 | DIn_7 | Digital inputs<br>Pull-up/Pull-down/Open configurable for each |
| | DOutL_6 | 7 | DIn_6 | |
| | DOutL_5 | 6 | DIn_5 | |
| | DOutL_4 | 5 | DIn_4 | |
| | DOutL_3 | 4 | DIn_3 | |
| | DOutL_2 | 3 | DIn_2 | |
| | DOutL_1 | 2 | DIn_1 | |
| | DOutL_0 | 1 | DIn_0 | |

## Device version Digital 2

| Function | A | Pin | B | Function |
|---|---|---|---|---|
| Ground | GND | 11 | AIn12_2 | Analog inputs<br>Resolution 12 bits<br>Voltage range 0 … 10 V |
| Supply input for digital outputs (5.5 … 30 V) | Udrv | 10 | AIn12_1 | |
| | Udrv | 9 | AIn12_0 | |
| Digital outputs (high-side switches)<br>Static state or PWM mode configurable for each | DOutH_7 | 8 | DIn_7 | Digital inputs<br>Pull-up/Pull-down/Open configurable for each |
| | DOutH_6 | 7 | DIn_6 | |
| | DOutH_5 | 6 | DIn_5 | |
| | DOutH_4 | 5 | DIn_4 | |
| | DOutH_3 | 4 | DIn_3 | |
| | DOutH_2 | 3 | DIn_2 | |
| | DOutH_1 | 2 | DIn_1 | |
| | DOutH_0 | 1 | DIn_0 | |

# 3 Status LEDs


LEDs on the PCAN-MicroMod FD Digital 1/2

| LED | LED indication | Device status | Comment |
|---|---|---|---|
| Activity | Green blinking (1 Hz) | Normal operation | |
| | Green faster blinking (2 Hz) | No configuration with the set module ID | The PCAN-MicroMod FD is ready for receiving a configuration with 500 kbit/s. |
| | Orange quick blinking (4 Hz) | CAN bootloader active | Ready for transfer of new firmware.* |
| | Red blinking | Configuration invalid | Specific parameters of the transmitted configuration are not supported, for example the bitrate |
| | Red on | No valid firmware* | |
| Power | Green on | Supply voltage present | |
| Error | No function | | |

* See also 6 *Firmware Update* on page 17.

# 4 Optional Hardware Settings

Two settings for special cases can be defined on the circuit board of the PCAN-MicroMod FD Digital 1/2:

- Several MicroMod-FD-based devices are to be configured on the same bus: 4.1 *Set Device ID* below
- The PCAN-MicroMod FD Digital 1/2 is to be used on one end of a CAN bus that is not fully terminated (for example, when two CAN nodes are connected directly): 4.2 *Activate Internal CAN Bus Termination* on page 13

## 4.1 Set Device ID

If you use several devices with PCAN-MicroMod FD on a single CAN bus and want to configure them there, a unique device ID must be assigned to each PCAN-MicroMod FD, so the configuration program can distinguish the modules. This is done by a rotary switch with 16 positions (0 to F, hexadecimal) on the board.

The device ID of a PCAN-MicroMod FD does not have an effect on the CAN communication.

**Note:** On a can bus, up to 16 PCAN-MicroMod FD can be configured. The operation of more than 16 modules is possible, as long as you do not want to configure them on that bus.

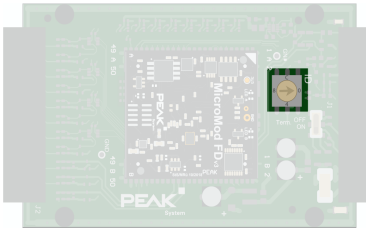
To open the casing and remove the circuit board:

**Attention!** Electrostatic discharge (ESD) can damage or destroy components on the circuit board. Take precautions to avoid ESD when handling the circuit board.

1. Remove the mating connectors from the device.
2. On one connection side of the casing, remove the two screws to the right and left of the connector and remove the plate including the rubber sleeve.
3. Pull the board out of the side of the casing.
4. For later assembly, proceed in reverse order.

Do the following to set the device ID:

1. Set the rotary switch next to the 10-pole connector J1 to the desired device ID (0 to 15, with positions A to F corresponding to numbers 10 to 15).



**Note:** A changed device ID only takes effect after the PCAN-MicroMod FD Digital 1/2 has been restarted.

## 4.2 Activate Internal CAN Bus Termination

For correct termination of a High-speed CAN bus (ISO 11898-2), a 120-ohm resistor must be inserted at both bus ends between the CAN-High and CAN-Low lines. If the PCAN-MicroMod FD Digital 1/2 is to be connected to one end of the High-speed CAN bus, the internal termination can be activated to take the termination on this side of the CAN bus. This is done with a switch on the board. For this you have to remove it from the casing.

**Tip:** We recommend terminating the CAN cabling directly, for example with termination resistors. This allows CAN nodes to be flexibly connected to the bus.

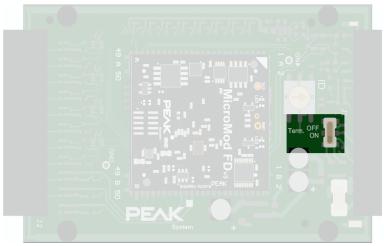
➥ To open the casing and remove the circuit board:

**Attention!** Electrostatic discharge (ESD) can damage or destroy components on the circuit board. Take precautions to avoid ESD when handling the circuit board.

1. Remove the mating connectors from the device.
2. On one connection side of the casing, remove the two screws to the right and left of the connector and remove the plate including the rubber sleeve.
3. Pull the board out of the side of the casing.
4. For later assembly, proceed in reverse order.

Do the following to activate the internal termination:

1. Set the slide switch next to the 10-pole connector J1 to the “ON” position.



# 5 Configuration Software

With the configuration program PCAN-MicroMod FD Configuration for Windows, you can create, edit, and then transfer configurations via CAN to one or more CAN nodes with PCAN-MicroMod FD (for example the PCAN-MicroMod FD Digital 1/2).

## 5.1 System Requirements Configuration Transmission

- Windows 10, 8.1 (32/64-Bit)
- PC-CAN interface from PEAK-System (CAN FD capability recommended)
- CAN cabling between the CAN interface and the PCAN-MicroMod FD Digital 1/2 with proper termination (120 Ω on each end of the CAN bus)

## 5.2 Downloading and Installing the Configuration Program

The software package for installation of PCAN-MicroMod FD Configuration is freely available on our website.

➥ Steps of the software installation:

1. Download the software package for PCAN-MicroMod FD Configuration from our website. Go to the corresponding entry on the following download page: www.peak-system.com/quick/DL-Software-E
2. Open the downloaded file `PCAN-MicroMod-FD-Configuration.zip`.

   The contents of the ZIP file is shown.

3. Launch the contained file `PcanMicroModFd.exe` and confirm occurring prompts to run and to “make changes on this computer”.
4. Follow the instructions of the installation program.

You can find further information about the use of the program PCAN-MicroMod FD Configuration in the help which you can invoke in the program (for example with the F1 key).

# 6 Firmware Update

The PCAN-MicroMod FD Digital 1/2 (called MicroMod FD device in this chapter) can receive a firmware update via CAN. This is done with the Windows program PEAK-Flash.

Go through the following sections for a firmware update.

## 6.1 System Requirements Firmware Update

- Windows 10, 8.1 (32/64-Bit)
- PC-CAN interface from PEAK-System (CAN FD capability recommended)
- CAN cabling between the CAN interface and the PCAN-MicroMod FD Digital 1/2 with proper termination (120 Ω on each end of the CAN bus)

## 6.2 Flash Software Preparation

With the PEAK-Flash software for Windows, it is possible to update the firmware of our hardware products. This is done via a CAN connection. The software package is freely available on our website.

➥ Do the following to setup PEAK-Flash:

1. Download the software package for PEAK-Flash from our Website. Go to the corresponding entry on the following download page: www.peak-system.com/quick/DL-Software-E

2. Unpack the downloaded `PEAK-Flash.zip` file to an arbitrary target directory on your Windows computer.

   The `PEAK-Flash.exe` file in the target directory is the executable to be used later.

3. [Optional] On the Windows desktop, create a link to `PEAK-Flash.exe` for easier access to the program later.

## 6.3 Update Procedure

Do the following to start the firmware update:

1. Power up the MicroMod FD device.
2. On Windows, start `PEAK-Flash.exe`.

   Panel 1 of PEAK-Flash with general information is shown.

3. Click on *Next*.

   Panel 2 *Select Hardware* of PEAK-Flash is shown.

4. Select *Modules connected to the CAN bus*.
5. From the list *Channels of connected CAN hardware*, select the CAN interface that establishes the connection to the CAN bus.
6. From the *Bit rate* list, select 500 kbit/s (usually pre-selected).
7. Click on *Detect*.

   After a few seconds, a new entry with the name of the MicroMod FD device is shown in the field below, including the current module ID and firmware version.

8. Click on *Next*.

   Panel 3 *Select Firmware* of PEAK-Flash is shown.

9. Leave *Embedded Firmware* selected it it is suitable for the firmware update.

   Alternatively:

   Select *Firmware File* and then browse for the `*.bin` file to be flashed.

10. Click on *Next* and check the provided information on panel 4 of PEAK-Flash.
11. Click on *Start* and observe the log output.

    During the flash process the Run LED on the MicroMod FD device is blinking quickly in orange color. The flash process is running for about 30 seconds.

12. In PEAK-Flash, Click on *Reset Module*.

    The MicroMod FD device is now ready for use with the new firmware.

## 6.4 Activate Flash Mode by Hardware

If the MicroMod FD device cannot be set to Flash mode via PEAK-Flash, this can be done alternatively by hardware.

Do the following to activate the flash mode by hardware:

1. Disconnect the left 10-pin mating connector for the basic supply.
2. Make a connection between pin 1 *Ub* and pin 7 *Boot* on the mating connector.
3. Reconnect the mating connector to the MicroMod FD device and thus also reconnect the power supply.

   The *Activity* LED blinks quickly orange and indicates that the flash mode for CAN is active.

4. After utilizing the Flash mode, remove the connection between pins 1 and 7 so that the MicroMod FD device runs in normal operation mode after a restart.

# 7 Technical Specifications

| **Digital Inputs** | |
|---|---|
| Count | 8 |
| Connectors | DIn_0 … DIn_7 |
| Input voltage maximum | +50 V |
| Input impedance | 69 kΩ (without Pull-up or Pull-down) |
| Input circuitry | Set per input by configuration:<br>- Open<br>- Pull-up: 4.7 kΩ to supply voltage<br>- Pull-down: 4.7 kΩ to ground |
| Switching thresholds<br>Low → High | > 5.8 V typ. (4.5 V – 7.5 V) |
| Switching thresholds<br>High → Low | < 3.5 V typ. (2.2 V – 4.5 V) |
| Low-pass | $f_g$ = 3 kHz |

| **Digital Outputs** | **Digital 1** | **Digital 2** |
|---|---|---|
| Count | 8 | 8 |
| Connectors | DOutL_0 … DOutL_7 | DoutH_0 … DOutH_7 |
| Type | Low-side switch | High-side switch |
| Driver chip | Infineon AUIPS2052G | STMicroelectronics VN800PS-E |
| Voltage | 35 V maximum on load | 5.5 … 30 V (input) |
| Output current nominal | 0.9 A | 0.7 A |
| Output current maximum (current limiting) | 1.2 A minimum<br>1.8 A typical<br>3.0 A maximum | 2.0 A |
| PWM mode | Frequency range 0 to 20 kHz<br>PWM resolution determined by internal timer with 10 MHz (e.g. 0.1 % at 10 kHz) | |

### Frequency Outputs

| | |
|---|---|
| Count | 2 |
| Connectors | FOut_0 … FOut_1 |
| Frequency maximum | 10 kHz |
| Type | Low-side switch |
| Driver chip | Infineon AUIPS2052G |
| Voltage maximum | 35 V on load |
| Output current nominal | 0.9 A |
| Output current maximum (current limiting) | 1.2 A minimum<br>1.8 A typical<br>3.0 A maximum |

### Analog Inputs 12 Bit

| | |
|---|---|
| Count | 3 (see also separate input AIn12_7) |
| Resolution A/D converter | 12 Bit |
| Connectors | AIn12_0 … AIn12_2 |
| Input voltage maximum | 33 V |
| Measuring range | 0 – 10 V |
| Measuring resolution (per LSB) | 2.44 mV |
| Input impedance | 6.7 kΩ |
| Measuring accuracy | ± 0.2 %<br>± 2 LSB |
| Low-pass | $f_g$ = 340 Hz |
| Sample rate | 1 ms (independent of CAN communication) |

### Analog Input AIn12_7

| | |
|---|---|
| Resolution A/D converter | 12 Bit |
| Input voltage maximum | 50 V |
| Measuring range | 0 – 30 V |
| Measuring resolution (per LSB) | 7.32 mV |
| Input impedance | 20 kΩ |
| Measuring accuracy | ± 0.2 %<br>± 2 LSB |
| Low-pass | $f_g$ = 340 Hz |
| Sample rate | 1 ms (independent of CAN communication) |

### CAN

| | | | |
|---|---|---|---|
| Protocols | CAN FD ISO 11898-1:2015, CAN 2.0 A/B | | |
| Physical transmission | ISO 11989-2 (High-speed CAN) | | |
| Transceiver | Microchip MCP2558FD | | |
| CAN bitrates | 20 kbit/s – 1 Mbit/s | | |
| CAN FD bitrates | 20 kbit/s – 10 Mbit/s | | |
| Supported clock frequencies | 20 MHz, 40 MHz, 80 MHz | | |
| Supported bit timing values | | Nominal | Data |
| | Prescaler (BRP) | 1 – 512 | 1 – 32 |
| | Time Segment 1 (TSEG1) | 1 – 256 | 1 – 32 |
| | Time Segment 2 (TSEG2) | 1 – 128 | 1 – 16 |
| | Synch. Jump Width (SJW) | 1 – 128 | 1 – 16 |
| Galvanic isolation | none | | |
| Termination | switchable on board (120 Ω between CAN-High and CAN-Low) | | |
| Electric strength | ±20 V | | |
| CAN ID reserved for configuration transfer | 7E7h | | |

### CAN Bootloader

| | |
|---|---|
| Connector | Boot |
| Activation | High-active (switching threshold 1.7 V) during reset |

### Serial RS-232 Interface

| | |
|---|---|
| Use | Currently no use |
| Connectors | UART_Rx, UART_Tx |
| Bit rates | max. 38,400 Baud |
| Signal level max. | ±15 V |

### Power Supply

| | |
|---|---|
| Operating voltage Ub | 8 – 30 V DC, 12 V nominal |
| Current consumption | max. 100 mA, typ. 45 mA at 12 V w/o load |

### Measures

| | |
|---|---|
| Casing dimensions | Without mating connectors: 87 x 58 x 28 mm<br>With mating connectors: 121 x 58 x 28 mm<br>See also Appendix B *Dimension Drawings* on page 26 |
| Weight | Without mating connectors: 115 g<br>With mating connectors: 135 g |

### Connectors

| | |
|---|---|
| Type | Spring terminal blocks |
| Mating connector for basic connectivity (left) | Phoenix Contact FMC 1,5/10-ST-3,81 (10-pole, single-row, 3.81 mm pitch) |
| Mating connector for I/O (right) | Phoenix Contact DFMC 1,5/11-ST-3,5 (22-pole, double-row, 3.5 mm pitch) |

### Environment

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

| Conformity | |
|---|---|
| RoHS | EU directive 2011/65/EU (RoHS 2)<br>EU directive 2015/863/EU (amended list of restricted substances)<br>DIN EN IEC 63000:2019-05;VDE 0042-12:2019-05 |
| EMC | EU directive 2014/30/EU<br>DIN EN 61326-1:2013-07;VDE 0843-20-1:2013-07 |

# Appendix A CE Certificate

## EU Declaration of Conformity

This declaration applies to the following product:

Product name: **PCAN-MicroMod FD Digital 1/2**

Item number(s): **IPEH-003083/84**

Manufacturer: PEAK-System Technik GmbH
Otto-Roehm-Strasse 69
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;VDE 0042-12:2019-05**
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016); German version EN IEC 63000:2018

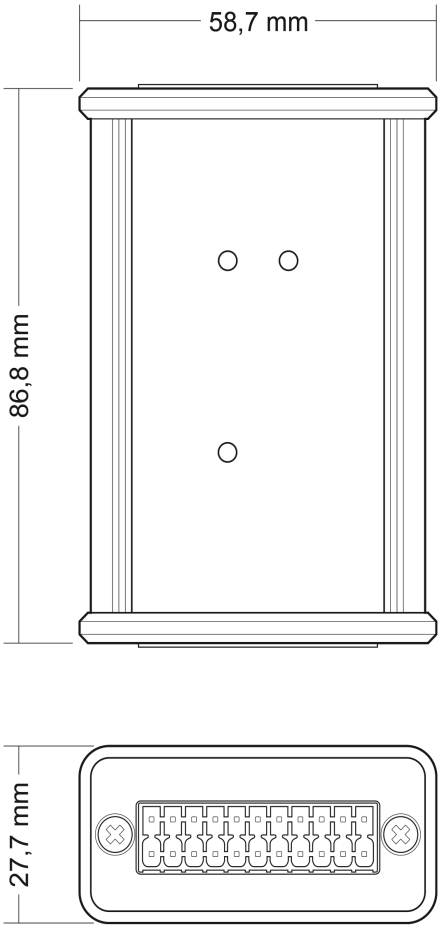
**EU Directive 2014/30/EU (Electromagnetic Compatibility)**

**DIN EN 61326-1:2013-07;VDE 0843-20-1:2013-07**
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2012); German version EN 61326-1:2013

Darmstadt, 5 August 2020

Uwe Wilhelm, Managing Director

# Appendix B Dimension Drawings




Dimension drawing with top view and side view.
The scale of the drawings differs from an 1-to-1 representation.

# Appendix C Changelog User Manual

This section lists major User Manual changes.

1.2.0

- Included software is provided online (Product DVD is discontinued), refers to descriptions for configuration software (on page 15) and for firmware update (on page 17)
- Digital 2: Voltage specification for High-side switch supply changed from a maximum of 36 V to 5.5 ... 30 V (on page 1)

1.1.0

- Common pin assignment table for the product pair Digital 1 and Digital 2 divided into one each (on page 8)
- Added technical specifications for the analog inputs (on page 20)
- No more support from PEAK-System for Windows 7
- Firmware update procedure with the software tool PEAK-Flash for Windows (no longer PCAN-Flash) (on page 17)
- Conformity adaptation RoHS (on page 25):
  - Directive 2015/863/EU added
  - DIN EN IEC 63000 instead of DIN EN 50581

1.0.0

Initial release