PCAN-MicroMod FD Analog 1

User Manual

PEAK
System

Relevant Products

Product name	Model	Part number
PCAN-MicroMod FD Analog 1		IPEH-003087
PCAN-MicroMod FD Configuration	Configuration software for Windows	

Imprint

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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 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 channel (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 switch
  - Adjustable frequency range 0 to 20 kHz
- Completely configurable using the Windows program PCAN-MicroMod FD Configuration
- 4-bit rotary encoder switch for setting the module ID (for configuration transfer)

I/O Analog 1 Motherboard

- 8 analog inputs
  - Resolution 16 bits
  - Measuring range adjustable: ±2.5 V, ±5 V, ±10 V, ±20 V
- 4 analog inputs
  - Resolution 12 bits
  - Measuring range from 0 to 10 V
- 4 analog outputs
  - Resolution 12 bits
  - Voltage range adjustable: 0 to 5 V or 0 to 10 V
- 4 digital inputs
  - Pull-up or Pull-down configurable

1.2 Operation Requirements

- Voltage source 8 to 30 V DC (connection via 10-pole spring terminal strip)

For transfer of the configuration to the MicroMod FD via CAN:

- Operating system Windows 10, 8.1, 7 (32/64-bit)
- PC-CAN interface from PEAK-System

- CAN cabling between the CAN interface and the PCAN-MicroMod FD Analog 1 with proper termination (120 Ω on each end of the CAN bus)

> **Note:** The transfer of the configuration is 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 configuration mode of the PCAN-MicroMod FD Analog 1 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.

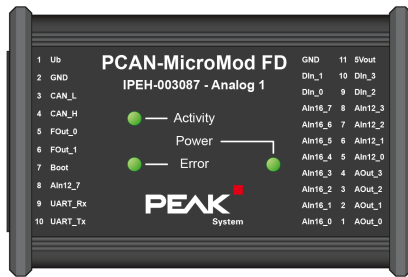| Position on casing	Function	Type	Mating connector type
Left	Basic connectivity	10-pole, single-row, 3.81 mm pitch	Phoenix Contact FMC 1,5/10-ST-3,81
Right	I/O	22-pole, double-row, 3.5 mm pitch	Phoenix Contact DFMC 1,5/11-ST-3,5

Figure 1: Top view PCAN-MicroMod FD Analog 1 with pin assignment

2.1 Basic Connectivity (left connector)

Figure 2: 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. 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 boot loader for a firmware update via CAN (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	Currently no use
10	UART_Tx		

For the startup of the PCAN-MicroMod FD Analog 1 it is sufficient to connect a voltage source to pins 1 und 2. The configuration of the PCAN-MicroMod FD Analog 1 is done viar 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)

Figure 3: Right connector 2 x 11 terminals

Function	A	Pin	B	Function
Ground	GND	11	5Vout	5-Volt supply for external devices (max. 100 mA)
Digital inputs	DIn_1	10	DIn_3	Digital inputs
	DIn_0	9	DIn_2	

Function	A	Pin	B	Function
	AIn16_7	8	AIn12_3	
	AIn16_6	7	AIn12_2	Analog inputs
	AIn16_5	6	AIn12_1	Resolution: 12 bits
Analog inputs	AIn16_4	5	AIn12_0	Measuring range: 0 – 10 V
Resolution: 16 bits	AIn16_3	4	AOut_3	
Measuring ranges:	AIn16_2	3	AOut_2	Analog outputs
±2,5 V, ±5 V, ±10 V, ±20 V	AIn16_1	2	AOut_1	Resolution: 12 bits
	AIn16_0	1	AOut_0	Voltage range: 0 - 10 V

2.3   Measuring Range Adjustment of the Analog Inputs

The measuring range of each analog input with 16-bit resolution (AIn16) can be set in 4 steps by configuration:

- ±2.5 V
- ±5 V
- ±10 V
- ±20 V

The measuring range of the analog inputs with 12-bit resolution (AIn12) is fixed at 10 V (except AIn12_7: 30 V) and cannot be changed.
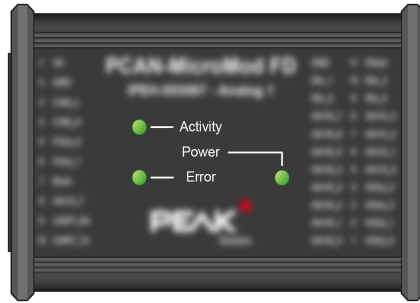
3 Status LEDs

Figure 4: LEDs on the PCAN-MicroMod FD Analog 1

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 16.

4 Optional Hardware Settings

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

- Several MicroMod-FD-based devices are to be configured on the same bus:
  4.1 *Set Device ID* below
- The PCAN-MicroMod FD Analog 1 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 <u>and</u> 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).
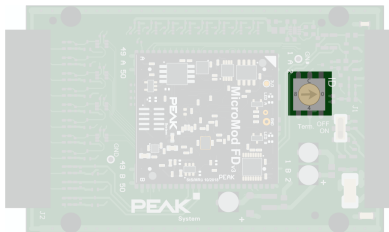
> **Note:** A changed device ID only takes effect after the PCAN-MicroMod FD Analog 1 has been restarted.

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 Analog 1 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.
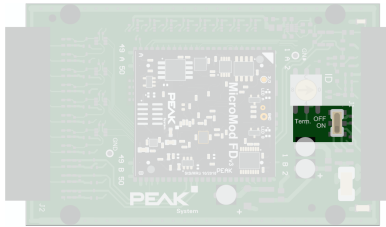
5 Configuration Software

With the enclosed configuration software PCAN-MicroMod FD Configuration for Windows, you can create, edit, and then transmit configurations via CAN to one or more CAN nodes with PCAN-MicroMod FD (for example the PCAN-MicroMod FD Analog 1).

5.1 Prerequisites for the Configuration Transfer

- Windows 10, 8.1, 7 (32/64-bit)
- PC-CAN interface from PEAK-System, e.g. PCAN-USB FD
- CAN bus connection between the CAN node with PCAN-MicroMod FD and the PC-CAN interface

5.2 Installing the Configuration Program

The installation program for PCAN-MicroMod FD Configuration is located on the supplied storage medium.

Steps of the software installation:

1. Start the navigation program `Intro.exe` (on the storage medium).
2. Klick on *English > Tools*.
3. In the list, scroll to the entry *PCAN-MicroMod FD Configuration*. Klick on *Install* there.
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 Analog 1 can receive a firmware update via CAN. This is done with the Windows program PCAN-Flash, located on the supplied storage medium.

Go through the following sections for a firmware update.

6.1 System Requirements

- Operating system Windows 10, 8.1, 7 (32/64-bit)
- PC-CAN interface from PEAK-System
- CAN cabling between the PC-CAN interface and the PCAN-MicroMod FD Analog 1 with proper termination (120 Ω on each end of the CAN bus).

6.2 Preparing the Software

PCAN-Flash is used for the transfer of the firmware via CAN. It is located on the supplied storage medium in the following directory:
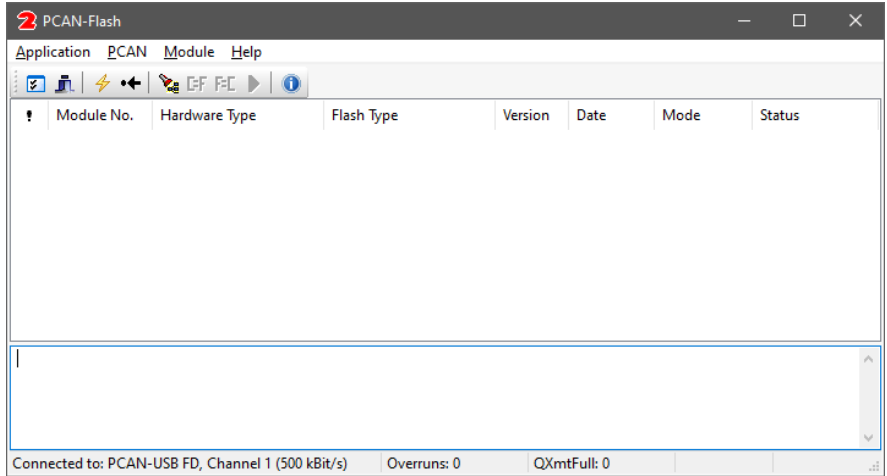
```
\Tools\PCAN-Flash
```

Copy the directory onto a storage medium of your computer.

6.3   Sending the Firmware
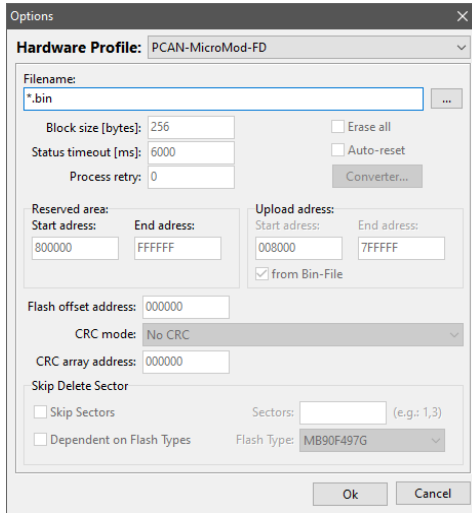
Do the following to update the firmware:

1. Start the program `PcanFlash.exe`.


2. Select *Application > Option* ⚡.

   The corresponding dialog window appears.

3. From the *Hardware Profile* dropdown list, select the *PCAN-MicroMod FD* entry.
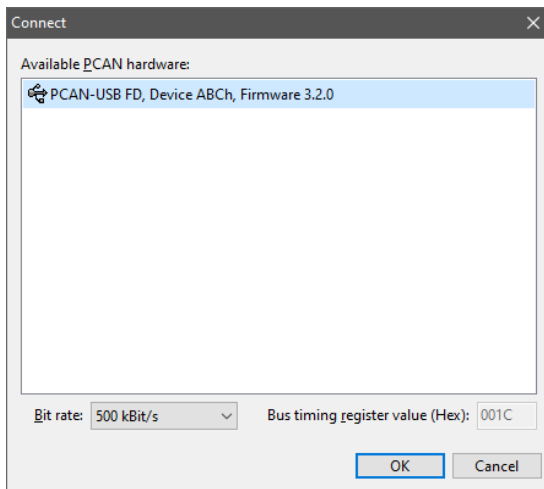

4. Click on dots button (…) next to the *File name* field in order to select the desired firmware file (`*.bin`) for the update.

5. Close the dialog box with *Ok*.

6. Make sure that the PCAN-Flash program is connected with 500 kbit/s to the available CAN interface at the computer.
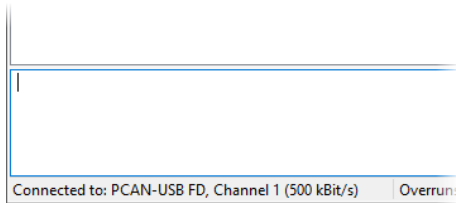
If not, select *PCAN > Connect* ⚡ in order to change the selection in the according dialog box.

7. Select *Module > Detect* 🔍 in order to detect the PCAN-MicroMod FD being connected to the CAN bus. The main window shows a corresponding entry.
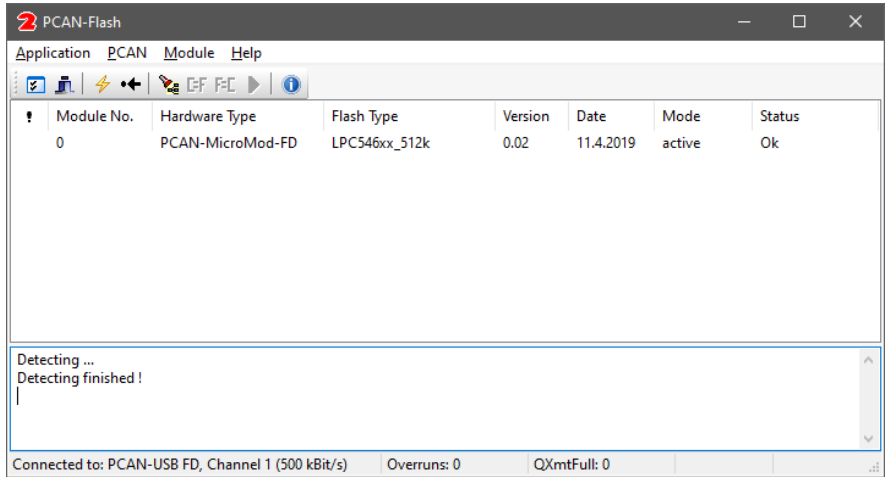
8. Select the entry for the PCAN-MicroMod FD.

9. Select *Module > Activate* ⊏F in order to activate the flash mode of the PCAN-MicroMod FD Analog 1.

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

10. Select *Module > Program* ▷ in order to start the update process.

    It was successful if in the status panel the last message to appear is "Flashing of module(s) finished!".

11. Restart the PCAN-MicroMod FD Analog 1 by briefly interrupting the power supply.

6.4 Activate Flash Mode by Hardware

If the PCAN-MicroMod FD Analog 1 cannot be set to flash mode by PCAN-Flash, this can be alternatively done 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* at the mating connector.

3. Reconnect the mating connector to the PCAN-MicroMod FD Analog 1 and thus also reconnect the power supply.

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

7 Technical Specifications

Analog inputs 12 bit

Count	5	
Resolution A/D converter	12 bit	
Connectors	AIn12_0 … AIn12_3	AIn12_7
Input voltage maximum	33 V	50 V
Measuring range	0 – 10 V	0 – 30 V
Measuring resolution (per LSB)	2.44 mV	7.32 mV
Measurement accuracy	±0.2 % ±2 LSB	
Input impedance	6.7 kΩ	
Low-pass	f_c = 340 Hz	

Analog inputs 16 bit

Count	8			
Resolution A/D converter	16 bit			
Connectors	AIn16_0 … AIn16_7			
Input voltage maximum	±26 V			
Measuring ranges (adjustable via software)	±2.5 V	±5 V	±10 V	±20 V
Measuring resolution (per LSB)	76 µV	153 µV	305 µV	644 µV
Measurement accuracy	±0.2 % ±2 LSB	±0.2 % ±2 LSB	±0.2 % ±2 LSB	±0.5 % ±2 LSB
Input impedance	1 MΩ	1 MΩ	1 MΩ	at least 370 kΩ
Low-pass	f_c = 3 kHz			

Analog outputs

Count	4	
Resolution D/A converter	12 bit	
Connectors	AOut_0 … AOut_3	
Voltage ranges (adjustable by configuration)	0 – 5 V	0 – 10 V
Accuracy	±0.3 % ±2.5 mV	±0.2 % ±5 mV
Output current maximum	20 mA	
Protection	Short circuit protection	

Digital inputs

Count	4
Connectors	DIn_0 … DIn_3
Input voltage maximum	+50 V
Input impedance	69 kΩ (without pull-up and pull-down)
Input circuitry	Set per input by configuration: - Open - Pull-up: 4.7 kΩ to supply voltage - Pull-down: 4.7 kΩ to ground
Switching threshold Low → High	> 5.8 V typ. (4.5 V – 7.5 V)
Switching threshold High → Low	< 3.5 V typ. (2.2 V – 4.5 V)
Low-pass	f_c = 3 kHz

Frequency outputs

Count	2
Connectors	FOut_0 + FOut_1
Maximum frequency	10 kHz
Output driver	Low-side switch Infineon AUIPS2052G
Voltage proof	55 V
Output current	0.9 A (constant current)
Protection	Short circuit protection

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		
		Nominal	Data
Supported bit timing values	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)		
Voltage immunity	±20 V		
CAN ID reserved for configuration transfer	7E7h		

CAN bootloader

Connection	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 without load

Measures

Casing measures	Without mating connectors: 87 x 58 x 28 mm With mating connectors: 121 x 58 x 28 mm See also Appendix B *Dimension Drawings* on page 28
Weight	Without mating connectors: 115 g 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

EMC	EU directive 2014/30/EU DIN EN 61326-1:2013-07
RoHS 2	Directive 2011/65/EU DIN EN 50581 VDE 0042-12:2013-02

Appendix A   CE Certificate

EU Declaration of Conformity

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This declaration applies to the following product:

Product name: **PCAN-MicroMod FD Analog 1**

Item number(s):   **IPEH-003087**

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)

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 61326-1:2013-07
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, 12 December 2019

Uwe Wilhelm, Managing Director
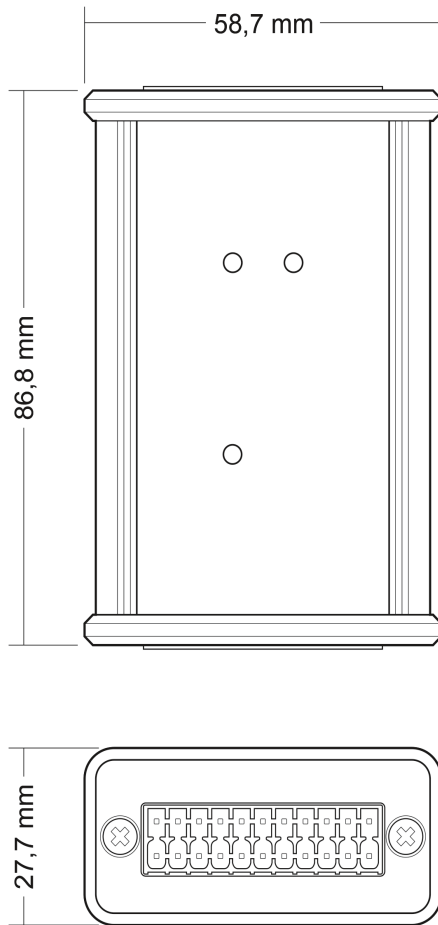
Appendix B   Dimension Drawings

Figure 5: Dimension drawing with top view and side view.
The scale of the drawings differs from an 1-to-1 representation.