

PCAN-MicroMod FD Analog 1

User Manual



Relevant products

Product designation	Model	Part no.
PCAN-MicroMod FD Analog 1		IPEH-003087
PCAN-MicroMod FD Configuration	Configuration software for Windows	

Imprint

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Major changes in this document are listed in Appendix C on page 27.

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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 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 Motherboard Analog 1

- 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 0 to 10 V
- 4 analog outputs
 - Resolution 12 bits
 - Voltage range adjustable: 0 to 5 V, 0 to 10 V
- 4 digital inputs
 - Pull-up or pull-down configurable

1.2 Operation Requirements

- Power supply 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 (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.

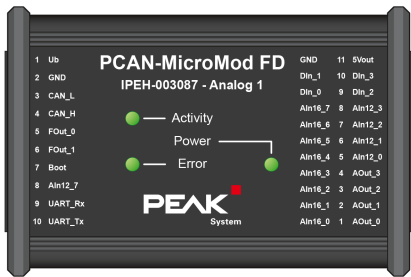
1.3 Scope of Supply

- 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



Top view PCAN-MicroMod FD Analog 1 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. See 4.2 <i>Activate Internal CAN Bus Termination</i> 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 (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 and 2. The configuration of the PCAN-MicroMod FD Analog 1 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

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
Analog inputs Resolution: 16 bits Measuring ranges: ± 2.5 V, ± 5 V, ± 10 V, ± 20 V	Aln16_7	8	Aln12_3	Analog inputs Resolution: 12 bits Measuring range: 0 – 10 V
	Aln16_6	7	Aln12_2	
	Aln16_5	6	Aln12_1	
	Aln16_4	5	Aln12_0	
	Aln16_3	4	AOut_3	
	Aln16_2	3	AOut_2	Analog outputs Resolution: 12 bits Voltage range: 0 – 10 V
	Aln16_1	2	AOut_1	
	Aln16_0	1	AOut_0	

2.3 Measuring Range Adjustment of the Analog Inputs

The measuring range of each analog input with 16-bit resolution (Aln16) 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 (Aln12) is fixed at 10 V (except Aln12_7: 30 V) and cannot be changed.

3 Status LEDs



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 17.

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 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:

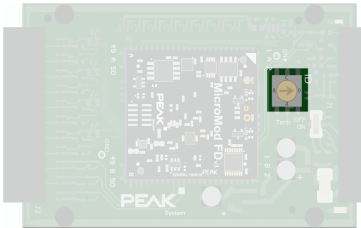


Attention! Electrostatic discharge (ESD) can damage or destroy components on the circuit board. Take precautions to avoid ESD when handling the circuit board.

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 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:

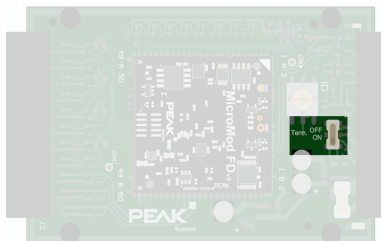


Attention! Electrostatic discharge (ESD) can damage or destroy components on the circuit board. Take precautions to avoid ESD when handling the circuit board.

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 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 Analog 1).

5.1 Prerequisites for the Configuration Transfer

- Windows 10, 8.1 (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 *PCAN-MicroMod FD Configuration* entry. 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 (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

- Operating system Windows 10, 8.1 (32/64-Bit)
- PC CAN interface from PEAK-System
- CAN cabling between the CAN interface and the MicroMod FD device 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 from these places:

- Online on www.peak-system.com in the Support section (recommended for up-to-date version)
- Offline on the supplied data carrier in the `Tools` directory branch

Unpack the downloaded `PEAK-Flash.zip` file to an arbitrary target directory on your Windows computer or copy the `PEAK-Flash` directory from the data carrier. The `PEAK-Flash.exe` file in the target directory is the executable to be used later.

6.3 Update Procedure

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 if 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:

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

Analog Inputs 12 Bit

Count	4 (see also separate input AIn12_7)
Resolution A/D converter	12 bit
Connectors	AIn12_0 ... AIn12_3
Input voltage maximum	33 V
Measuring range	0 – 10 V
Measuring resolution (per LSB)	2.44 mV
Measurement accuracy	± 0.2 % ± 2 LSB
Input impedance	6.7 kΩ
Low-pass	$f_g = 340 \text{ Hz}$
Sample rate	1 ms (independent of CAN communication)

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)	76.294 µV	152.588 µV	305.175 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	370 kΩ minimum
Low-pass	$f_g = 3 \text{ kHz}$			
Sample rate	1 ms (independent of CAN communication)			

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	$\pm 0.3 \%$ $\pm 2.5 \text{ mV}$	$\pm 0.2 \%$ $\pm 5 \text{ mV}$
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 k Ω (without pull-up and pull-down)	
Input circuitry	Set per input by configuration: - Open - Pull-up: 4.7 k Ω to supply voltage - Pull-down: 4.7 k Ω to ground	
Switching thresholds Low → High	> 5.8 V typ. (4.5 V – 7.5 V)	
Switching thresholds High → Low	< 3.5 V typ. (2.2 V – 4.5 V)	
Low-pass	$f_g = 3 \text{ kHz}$	

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

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 k Ω
Measuring accuracy	$\pm 0.2 \%$ ± 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 11899-2 (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	Prescaler (BRP)	Nominal 1 – 512	Data 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 U_b	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
	With mating connectors: 121 x 58 x 28 mm
	See also Appendix B <i>Dimension Drawings</i> on page 26
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

RoHS	EU directive 2011/65/EU (RoHS 2)
	EU directive 2015/863/EU (amended list of restricted substances)
	DIN EN IEC 63000:2019-05;VDE 0042-12:2019-05
EMC	EU directive 2014/30/EU
	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 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) + 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

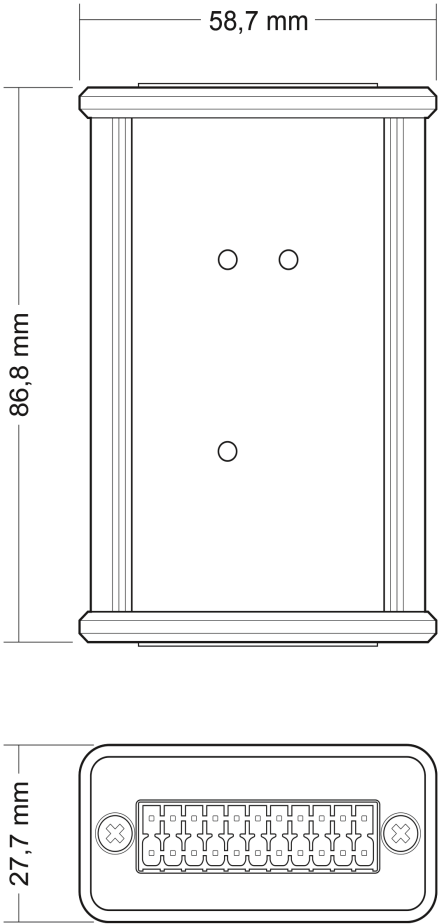
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1:
General requirements (IEC 61326-1:2012); German version EN 61326-1:2013

Darmstadt, 5 August 2020

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

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.

1.1.0

- Sampling rate for analog inputs added in the technical specifications (on page 20)
- Indicated more precise measurement resolution information for the different measuring ranges in the technical specifications in order to achieve a higher calculation accuracy (on page 20)
- Input impedance AIn12_7: 20 kΩ (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

First edition