

# USB Interface Electronics for Spectral Data Acquisition

Product Version 2

8 or 16 KByte Data Buffer / Revision 0 or 1

## PD-USB01V2

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Technology for Spectroscopy

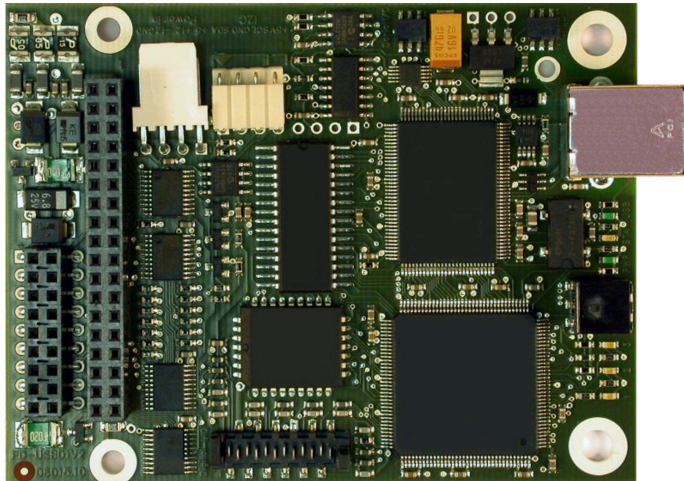
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### Short Description

- § Powerful and compact digital spectral data acquisition controller with USB interface
- § USB 2.0 compliant, **Hi-Speed** or **Full-Speed**
- § Expanded spectral data buffer for improved USB data transfer reliability
- § Front End Electronics can be mounted in sandwich configuration on top of the USB Interface Electronics
- § Up to 4 USB Interface Electronics can be operated in a USB network
- § Input from device: Front End Electronics in /EMB version
- § Output to device: PC with USB port and Windows 2000/XP/Vista
- § External I/O:
  - illumination control
  - scan synchronization
  - universal digital I/O (3 digital outputs and 3 digital inputs)
- § External power supply required

### General

The PD-USB01V2 Interface Electronics is a powerful and compact digital spectral data acquisition controller with a Hi-Speed USB interface. The product is directly compatible to all Front End Electronics (FEE) which comply to tec5 specification 'Interface\_18\*2' (FEEs in version /EMB = 'Embedded').

Using the USB Interface Electronics, the PC is able to control the Front End Electronics and the spectral sen-

sor connected to it. Once parameterized and started by the PC, the data acquisition controller provides a fully autonomous management of the selected readout cycle. During spectral data acquisition the PC is able to perform other tasks.

An integrated I<sup>2</sup>C bus allows additional information transfer between connected electronics (e.g. parameters or coefficients, identification / version).

### PC Requirements

For operation, a PC with a free USB2.0 (recommended) or USB1.1 port and Windows Vista, XP or 2000 is required.

### Power Requirements

The PD-USB01V2 Interface Electronics is a 'self powered USB device'. Thus, a supply voltage of **+5 V<sub>DC</sub>** (typically < 300 mA for PD-USB01V2 board only) for the Interface Electronics has to be provided by an external supply.

#### +5 V<sub>DC</sub> voltage tolerance:

Revision 0: -5%, +10%

Revision 1: ±10%

A revision greater than '0' is marked with a small label on the solder side of the PCB.

Hint for Revision 1: The 3.3 V<sub>DC</sub> operation voltage needed internally is generated from the +5 V<sub>DC</sub> input voltage. So the USB Interface Electronics is able to work with an input voltage level greater than approx. +3.8 V.

**In spite of this fact and in accordance with the above supply voltage specifications, an operating voltage of at least +4.5 V must be applied to assure that interface specifications for (external) components like the Front End Electronics, External I/O and I<sup>2</sup>C bus level are not violated.**

Hint: The ±12 V<sub>DC</sub> supply voltage is not used by the PD-USB01V2 itself but it is only forwarded from the Power connector to the Front End Electronics connector. It has to be applied for configurations with Front End Electronics of type FEE-HS (FEE-CCD), it is not required for FEE-1M (FEE-1M generates all voltages required for its internal use and the sensor electronics from +5 V<sub>DC</sub>). For power consumption of Front End Electronics and sensor units / preamplifiers refer to the components data sheets.

## Driver and AdminTool Installation

The functionality is provided by a WDM driver for Windows 2000/XP/Vista. The installation procedure starts automatically as soon as the USB Interface Electronics is connected to a PC for the first time.

### Driver for Windows 2000/XP/Vista:

After the first connection of the USB Interface Electronics you will be asked for the location of the device driver. Insert the tec5 tools CD into your CD-ROM drive. Select the recommended option and choose CD-ROM drive. Change to directory 'Software & Drivers\Operation Electronics drivers\USB-Card – MultiSpec-Desktop\_USB\Windows 2000-XP-Vista V2 Preliminary' on the CD and continue. Now Windows will install the WDM driver.

The interface ID can be selected using a hex switch.

### AdminTool:

Change to directory 'Software & Drivers\Software-Tools\Admin-Tool' on the 'tec5 tools CD' and execute sdacq32at.exe from this directory. Follow the instructions of the setup program.

## Getting started with AdminTool

Start the test program AdminTool via Start / Programs / tec5 SDACQ function library / SDACQ32 Admin or click on the shortcut icon, if installed. After the program start select the type of your operating electronics 'PD-USB01' from the list. By clicking *Search*, the AdminTool searches for devices of that type attached to your system. If the search process was successful, the message „1 (or more) operating electronics found and opened“ appears. To display the hardware configuration click the button ‚Show Config‘. Sensor parameters may be checked or modified in menu 'Sensors'.

The menu 'Measurement' is intended to verify that the spectral data acquisition works correctly:

- Set integration time (e.g. 30 ms)
- Set number of spectra to average (e.g. 1)
- Set mode (e.g. ‚continuously‘)
- Set delay time between two data acquisitions
- Select display type ‚Table‘ or ‚Chart‘
- Start acquisition with button ‚Get spectra‘
- Stop acquisition with button ‚Stop‘

More detailed information can be found in the 'Help' menu.

## Features / Specifications

### Data Acquisition:

- Software selectable sensor readout cycles (Single Scan, Single Cycle, Continuous Scan, Burst Scan, Sync To Cont Scan)
- Timer controlled integration time
- Continuous data stream via USB during measurement, therefore, continuous data acquisition possible
- Additional spectra data buffer (FIFO 8 or 16 KByte) (16 KByte starting with serial number 379)

### Periphery I/O:

- Integrated illumination control: trigger output for triggering of flash lamps
- Trigger input for external synchronization of spectral data acquisition (e.g. when using a chopper wheel)
- Universal digital I/O: 3 outputs, 3 (latched) inputs

### Miscellaneous:

- Plug & Play: configuration by software
- On board I2C bus for configuration data exchange
- Non volatile memory for configuration data storage

### Interfaces:

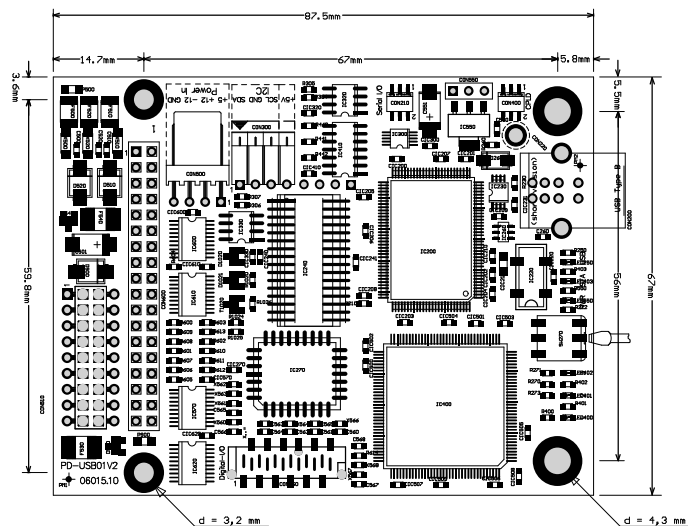
- Interface to Front End Electronics ('Interface\_18\*2' for FEEs in version 'Embedded')
- USB Series 'B' receptacle interface
- External I/O interface for trigger and digital I/O
- Power connector
- I2C Bus connector
- Auxiliary connector

### Environmental conditions:

- Temperature range operating: 0 °C ... +60 °C
- Temperature range storage: -40 °C ... +70 °C
- Humidity (@25°C, non condensing): 10 % ... 90 %

## Design

The USB Interface Electronics is a PCB with the dimensions 87.5 mm x 67 mm (same as FEE).



## Interfaces

On the PCB, there is a 36 pin header connector for direct attachment of the FEE on top of the USB Interface Electronics. The 12 pin MICS 12 External I/O-connector provides control signals for triggering additional devices like flash lamps or synchronization of the readout procedure. Most signals of the External I/O connector can be accessed at the 36 pin connector alternatively (for simplifying system cable connections). The pinout of the first 9 pins of the External I/O connector allows easy conversion to the tec5 standard 9 pin SUB-D connector using a 1:1 ribbon cable.

External I/O connector type: MICS 12

Pin	Input / Output	Signal, Comment
1	Input	Digital Input 1, CMOS
2	Output	Supply voltage output +5V / <500mA (fused)
3	Input	Illumination control voltage input (ICVI)
4	Output	Digital Output 1, CMOS
5	Input	External Scan Trigger Input (ESTI)
6	Output	Digital Output 2, CMOS
7	Input	Digital Input 2, CMOS
8	-	Ground
9	Output	Illumination control output (ICO)
10	-	Ground
11	Output	Digital Output 3, CMOS
12	Input	Digital Input 3, CMOS

Power connector type: Molex KK 7395-4  
(Plug type: KK 6471-4)

Pin	Signal-Type	Signal, Comment
1	Power-I/O	+5 V <sub>DC</sub> , Standard Power Input
2	Power-I/O	+12 V <sub>DC</sub> , Standard Power Input
3	Power-I/O	-12 V <sub>DC</sub> , Standard Power Input
4	Return	Ground

I2C Bus connector type: AMP Quick 0-828549-4 (90°)

Pin	Signal-Type	Signal, Comment
1	I2C-Bidirect.	I2C-SDA, Serial data
2	-	Ground
3	I2C-Bidirect.	SCL, Serial clock
4	Power-Output	+5 V <sub>DC</sub> (*)

Auxiliary connector type: BCS-109-L-D-PE-BE

This connector may be used for connecting to additional electronics modules, which are prepared to be mounted under the PD-USB01V2 (i.e. PSU2). In this case, a socket connector is plugged into the auxiliary connector from the PCBs bottom side.

Pin	Signal-Type	Signal, Comment
1	Power-Output	V <sub>USB</sub> , +5V USB bus voltage (*)
2	-	Reserved (PWR_SW)
3	-	Ground
4	Power-Output	+5V_INTERN (typically +5V <sub>DC</sub> from power connector (*))
5	-	Ground
6	Power-I/O	+5 V <sub>DC</sub> , Alternat. Power Input
7	Power-I/O	+12 V <sub>DC</sub> , Alternat. Power Input
8	Power-I/O	-12 V <sub>DC</sub> , Alternat. Power Input
9	Input	Digital Input 1, CMOS
10	Output	Digital Output 1, CMOS
11	Input	Digital Input 2, CMOS
12	Output	Digital Output 2, CMOS
13	Input	Digital Input 3, CMOS
14	Output	Digital Output 3, CMOS
15	Output	IO_FLASH, internal illumination control, CMOS
16	Input	Illumination control voltage input (ICVI)

17	Output	Illumination control output (ICO)
18	Input	External Scan Trigger Input (ESTI)

(\*): No separate current limitation

Hint: The source for Input Signals (External-I/O / FEE-interface / Auxiliary connector) can be selected by software (Default: FEE-interface).

## Illumination control

The USB Interface Electronics provides two connections for activating a light source (e.g. a flash lamp):

- ICVI: illumination control voltage input and
- ICO: illumination control output.

The voltage range of the ICO signal is either GND to +5V (internal) or GND to ICVI-voltage, if an external source > +6V (24V max) is connected to ICVI. Its output resistance is 500R (internal) or 1000R (external).

The ICO's pulse polarity and operation mode can be controlled by software. In case of output released, alternatively a scan-synchronized pulse (pulse width approx. 60 µs) is generated at the beginning of the integration time window of each data scan directly after the EndOfScanPulse of the previous scan or after the StartScanPulse.

## External Trigger Capabilities

Normally, a sensor scan cycle is triggered by the PC. For synchronizing the sensor readout to an external event the External Scan Trigger Input (ESTI) can be used. Two different modes are available: pulse (active low, falling edge) and slope mode (each slope). The external trigger functions can be controlled by software.

## User Information

### General

The information in this data sheet has been checked carefully. However, no responsibility is assumed for inaccuracies. tec5 reserves the right to make changes to any portion of this document without notice.

Each product is tested carefully before being shipped. If, however, problems should occur while initial operation or during later operation, please first check your specific settings and correct installation (connectors).

### Warranty

The warranty period for this product is 12 months. The warranty begins on the day of delivery. Within the warranty period, tec5 will repair free of charge any faulty functioning of the product resulting from faulty design or defective material. All other claims are excluded, in particular consequential damage.

### Handling

The electronics is partly constructed in CMOS technology and is thus sensitive against electrostatic discharge. Take appropriate precautions whenever handling the component. Please switch off the power before connecting or disconnecting the product.