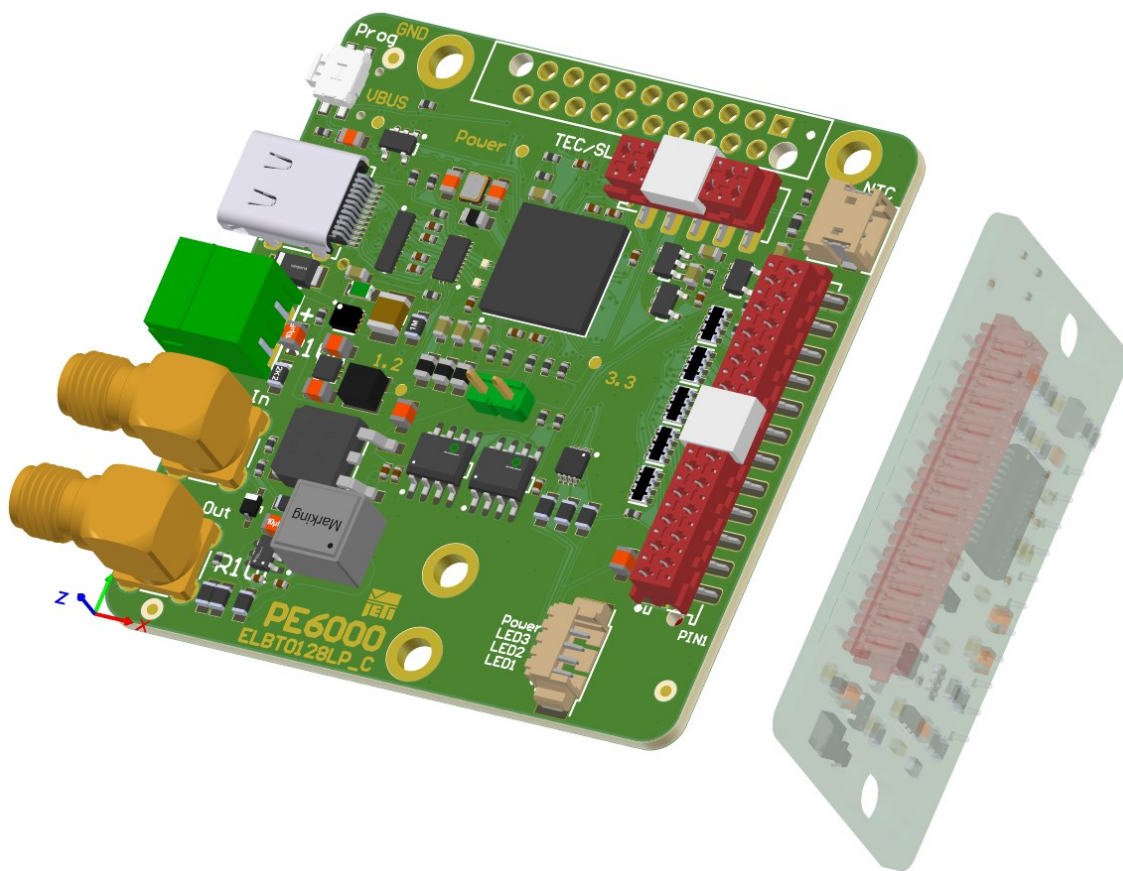


PE6000

USB 3.2 - SuperSpeed Spectrometer Electronics



The **PE6000** electronics combines a fast but low noise analog frontend with an USB3.2 Gen 1 compliant interface for easy operation of various line sensors. This dedicated hardware combination enables maximum data rates at high signal quality, but low costs and power consumption.

It's ideally featured for high-speed sensor readout via USB3.2 SuperSpeed at a reasonable price, small shape, and little heat generation.

Features:

- True **10 MS/s 16-bit Data-Rate, ADC** with programmable offset correction and gain
- **USB 3.2 Gen 1** compliant communication interface with up to 5 Gbit/s
- **<2.5W Power demand** in full speed data streaming mode
- Plug and Play evaluation **Software** for an easy start into custom projects
- **200MHz 32-bit ARM core** for configuration and additional features
- **Firmware**, that can be used in general, or user specific OEM applications
- Possibility of in field programming and **firmware update** by integrated bootloader
- **SCPI like control syntax** for setting of operation parameters, measurement configuration etc.
- Digital **trigger** in- and output LV-TTL signals
- 3 User configurable digital-**Outputs** for status LED's
- **Power supply** via USB or external 6-28 V
- **USB-PD 3A/5V** profile supported
- Stabilized 5 V **power output**
- Compatible with multiple Hamamatsu image-line-sensors
- small PCB **dimensions** of 56x58x14 mm³

Supported Hamamatsu Sensors:

- **G11620** series (InGaAs non-cooled type) 128/256/512 pixels
- **G14714** series (InGaAs) – planned
- **S11639** series (CMOS) – planned

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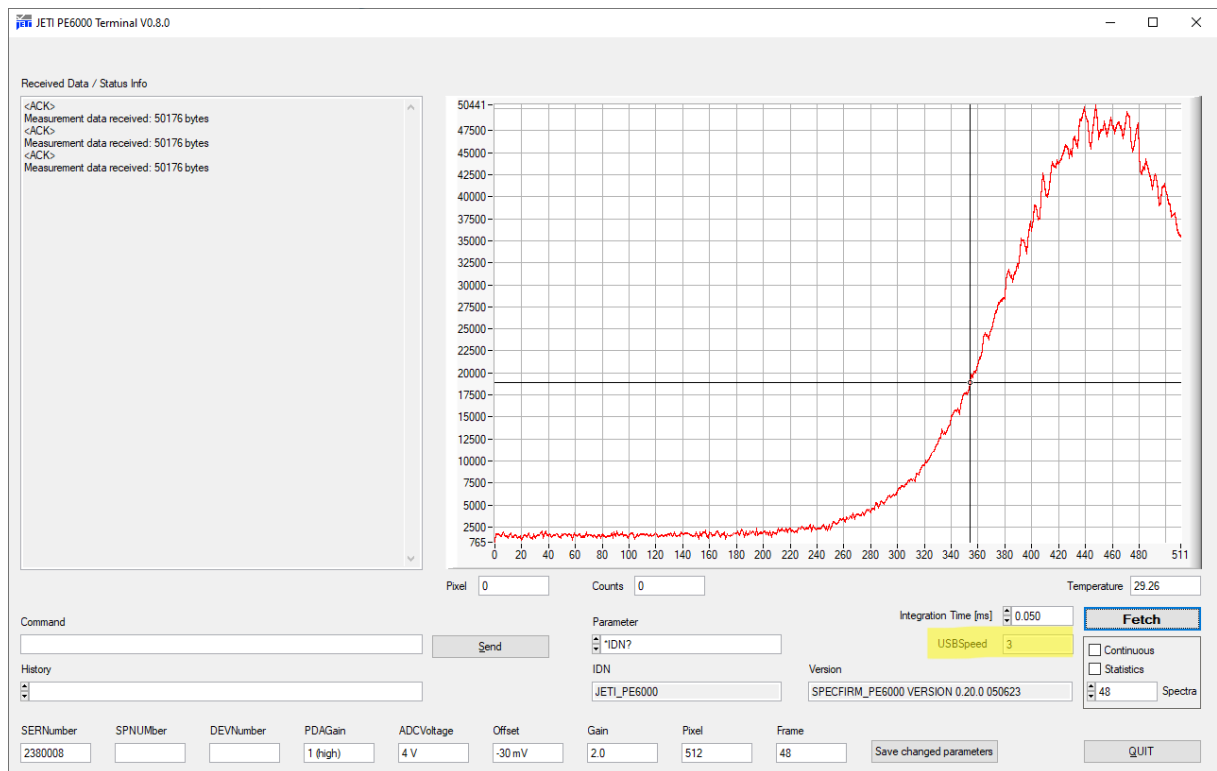
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1. Getting Started with PE6000

Most configurations of PE6000 are sold without sensor, so the first step is mounting the sensor into the electronics socket. Pin1 is always marked by a rectangular pad shape and sometimes additionally with a number “1” close to it. Please follow the instructions of sensor manufacturer to mount the sensor without any damage and make sure to follow all ESD precautions to avoid sensor and electronics malfunction.

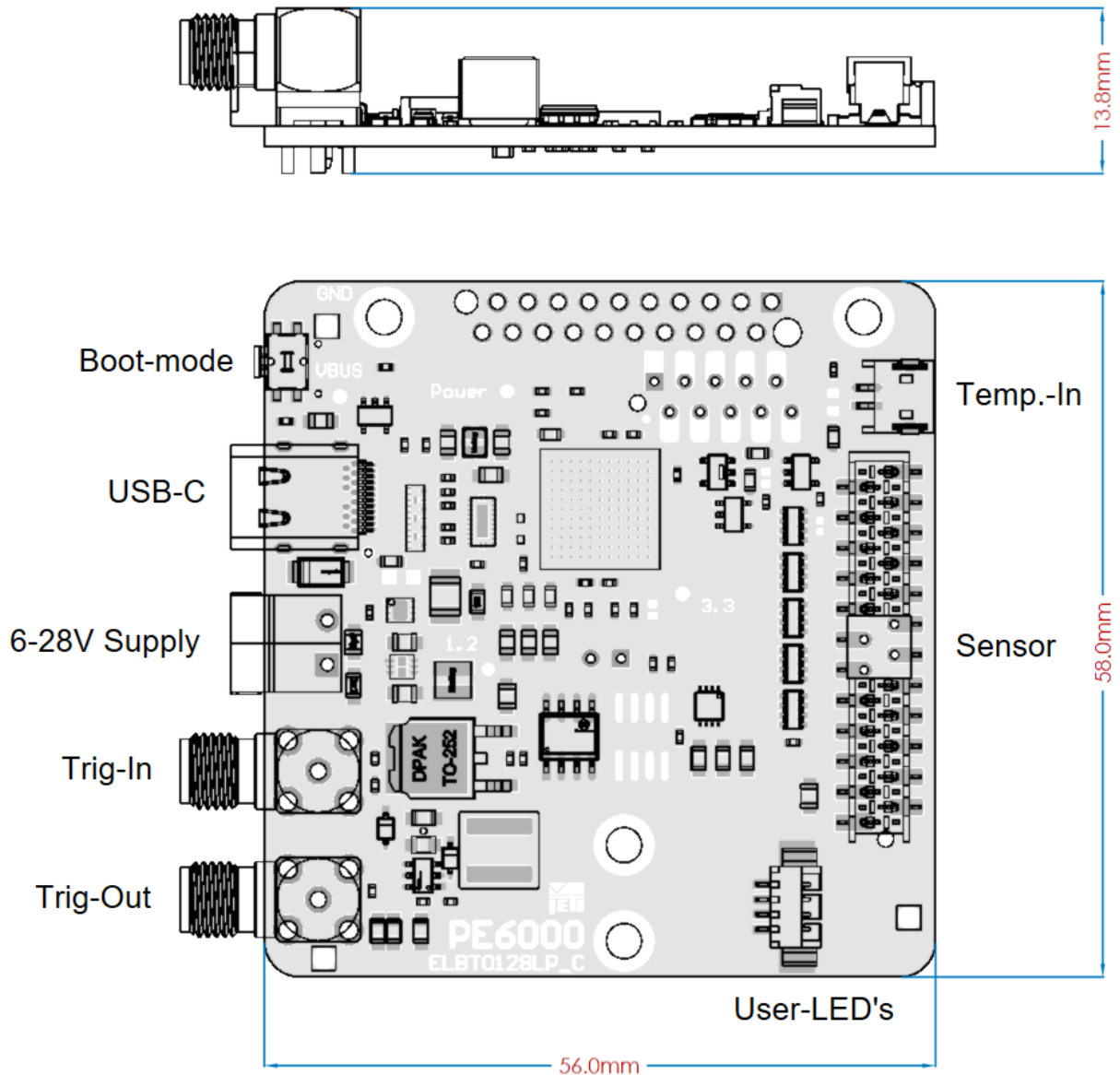
Connect PE6000 with a dedicated USB 3 SuperSpeed Type-C cable to a PC. If necessary, drivers can be found on the USB-Stick included in the prototype set.

Now the electronics will automatically be found at the first start of “JETI PE6000 Terminal” software. Please make sure to work with a proper USB3 SuperSpeed connection by checking the “USBspeed” value to be **“3” as marked below.** First measurements can be performed by pressing the “Fetch” button and parameters can be changed.



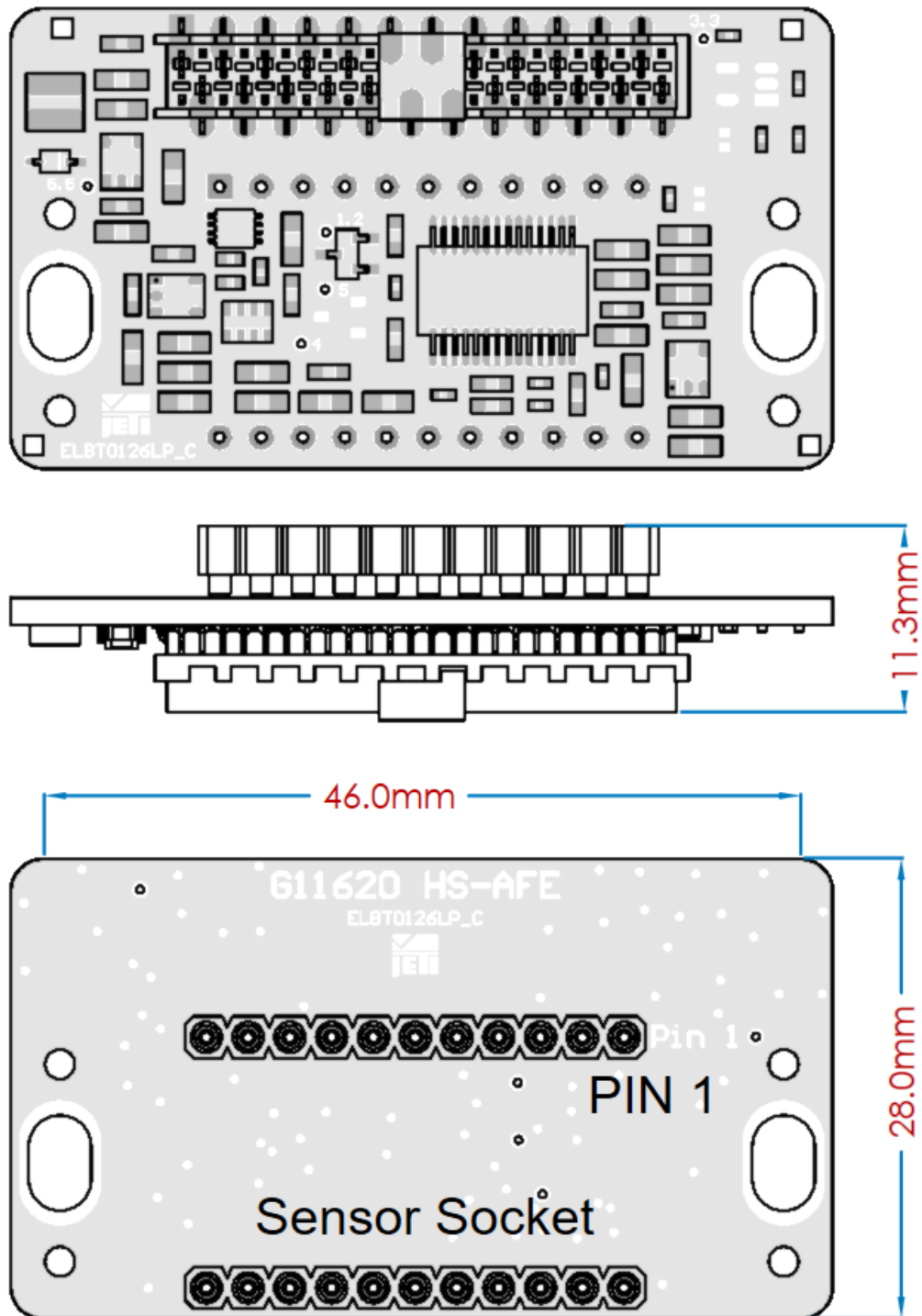
2. Dimensional Drawings

2.1. PE6000



2.2. Sensor PCB (for G11620)

PE6000-Connector



3. Interface descriptions

3.1. USB 3.2 Gen1 SuperSpeed Interface

The PE6000 must be connected with a dedicated **USB 3 SuperSpeed Type-C cable ($\geq 5\text{Gbit/s}$) to achieve full functionality and speed.** Cables with lower data rates will result in malfunction and reduced speed. If you purchased the PE6000 within a prototype set, please use the included cable.

The USB-C connector can be used to power the complete PE6000 and attached sub units, like the TEC-S Add-on electronics, using a USB-PD profile for up to $3\text{A}/5\text{V}$. Please note that the maximal available current depends on your PC's USB-Interface and used cable.

$3\text{A}/5\text{V}$ are only possible if both sides of the cable use USB-C connectors and the used port supports USB-PD.

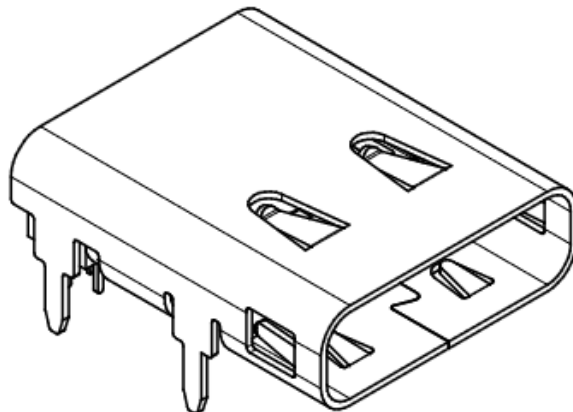
$900\text{mA}/5\text{V}$ are possible on general USB3.x ports, also using other connector types.

$500\text{mA}/5\text{V}$ are possible even on older USB2.0 Ports which are not recommended due to their too slow communication.

The standard configuration of PE6000 without TEC-S add-on board will require less than 500mA of current and will always work USB-Powered.

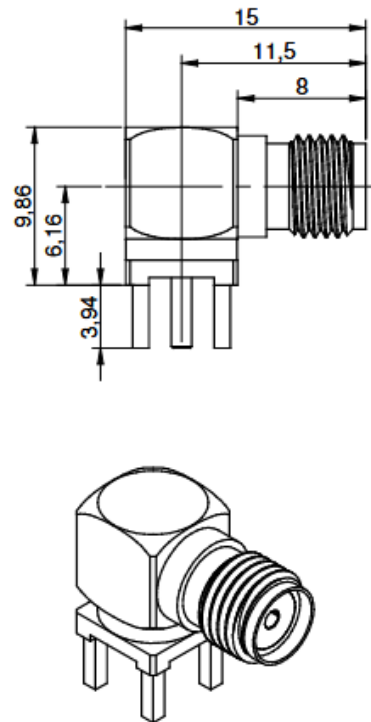
Configurations with higher current demands should be external powered, see chapter 3.3.

The connector in use is a full featured USB3.2 Type C receptacle with SMT and THT components for maximal stability (Würth Elektronik 632723300011).



3.2. Trigger-In/Output

Trigger-Input and Trigger-Output both use a standard SMA coaxial connector from Wuerth Electronics (60311002111526):

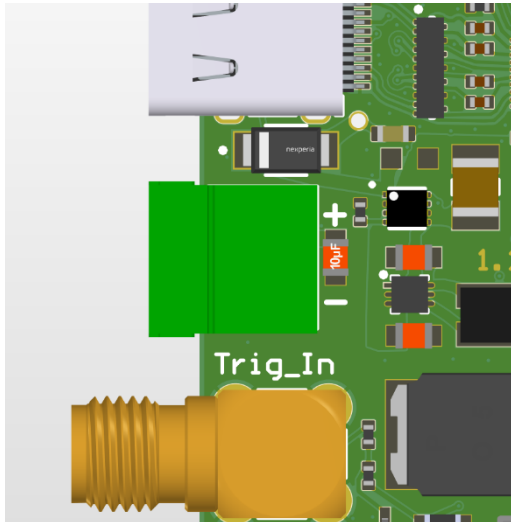


The Trigger-Output Signal runs exactly parallel to the sensor's integration time input. The effective integration time will be slightly delayed, depending on the used sensor. In case of G11620, the effective begin and end of integration time are 5 clocks later which equals $5 \times 100\text{ns} = 500\text{ns}$.

Pin	Name	Signal	Value	Min	Typ	Max	Unit
1	Trig-In	Input	Low	-0.3	0	0.5	V
			High	2.2	3.3	5.5	V
2	Trig-Out	Output	Low	-0.3	0	0.5	V
			High	2.2	3.3	3.5	V

3.3. 6-28V External-Supply-Input

Beside the standard USB power supply, which is described above, an external voltage source can be used. The necessary connector is from Phoenix Contact (MC 1,5/ 2-ST-3,5, Art.: 1840366) and comes included in the prototype set.



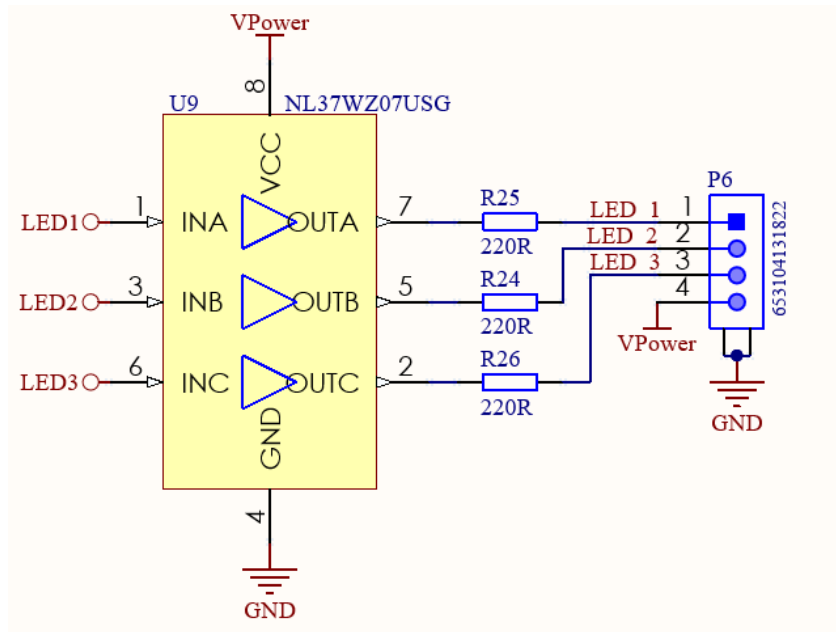
The correct polarity can be checked to be as printed on the PCB.

	Voltage Range	Power	Ripple
minimum requirements (no TEC)	6-32V	3W	$\leq 200\text{mV}$
recommended	6-28V	12W	$\leq 100\text{mV}$

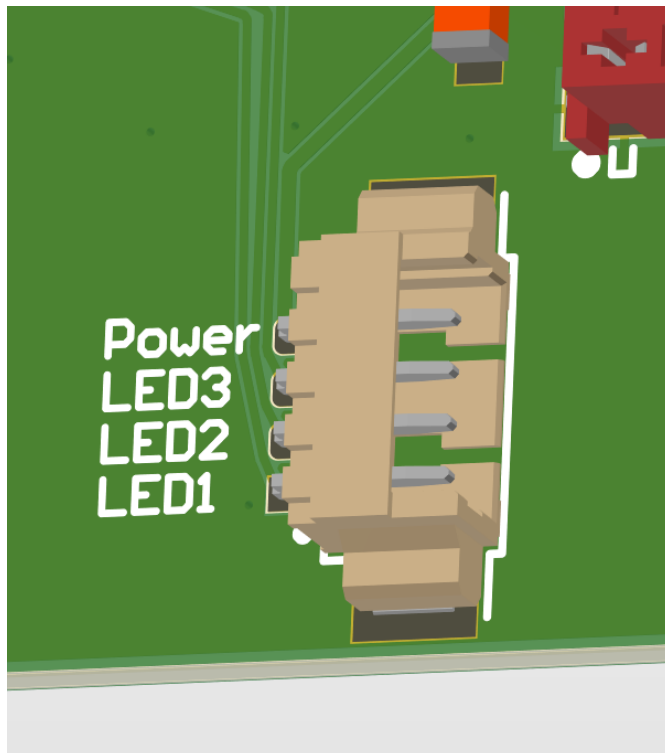
Exceeding the recommended voltage range and ripple may increase the noise of the video signal. More than 3W power are only necessary if the PE6000 electronics is used to power other sub-units e.g. a TEC-S Add-on board.

3.4. User-LED-Outputs

The three signals on User-LED's connector are intended to be used for status LED's and are equipped with an open drain buffer IC to sink up to 24mA via a standard series resistor of 220 Ohm for each channel. The fourth pin "VPower" can be used as an 4.7V power source to directly connect the LED's anodes.



The mating connector is from "Würth Elektronik" (WR-WTB Female Terminal Housing: 653004113322) and is part of the prototype set together with precrimped wires (653153128130).

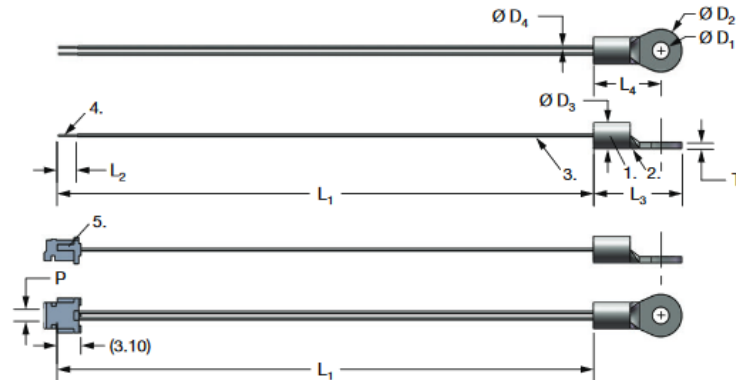


3.5. Temperature Input

The temperature input can be used for application specific compensations or general data logging.

The standard PE6000 version comes with an external 10k NTC temperature sensor (Vishay: NTCALUG03A103GC), to be mounted on any point of interest within the 70mm cable length.

DIMENSIONS in millimeters

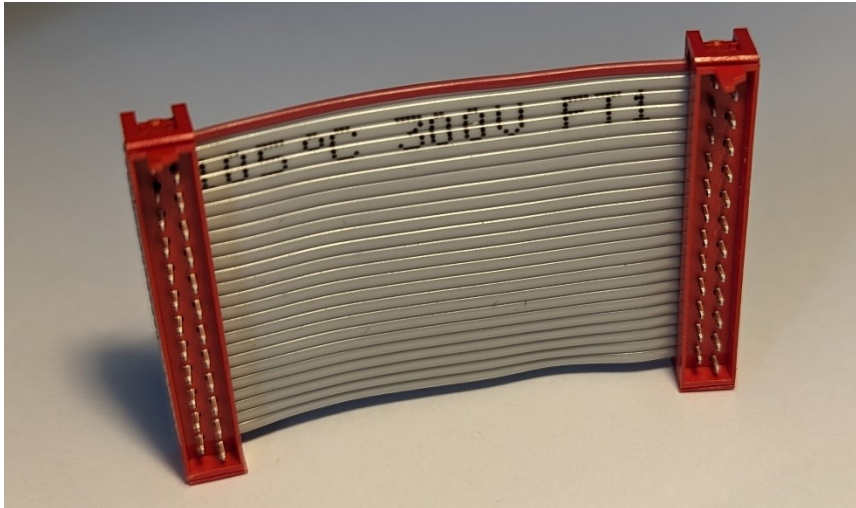


MODEL	L ₁	L ₂	L ₃	L ₄	L ₁ + L ₃ (item without connector)	Ø D ₁	Ø D ₂	Ø D ₃	Ø D ₄	T	PITCH P
NTCALUG03A	70 ± 5	4 ± 1	11.5 ± 0.5	8.8 ± 0.3	81.5 ± 5	2.2 ± 0.3	5.5 ± 0.3	3.4 ± 0.3	0.35 ± 0.1	0.8 ± 0.1	1.5 ± 0.3

An onboard NTC is also available on request.

3.6. Sensor-Interface

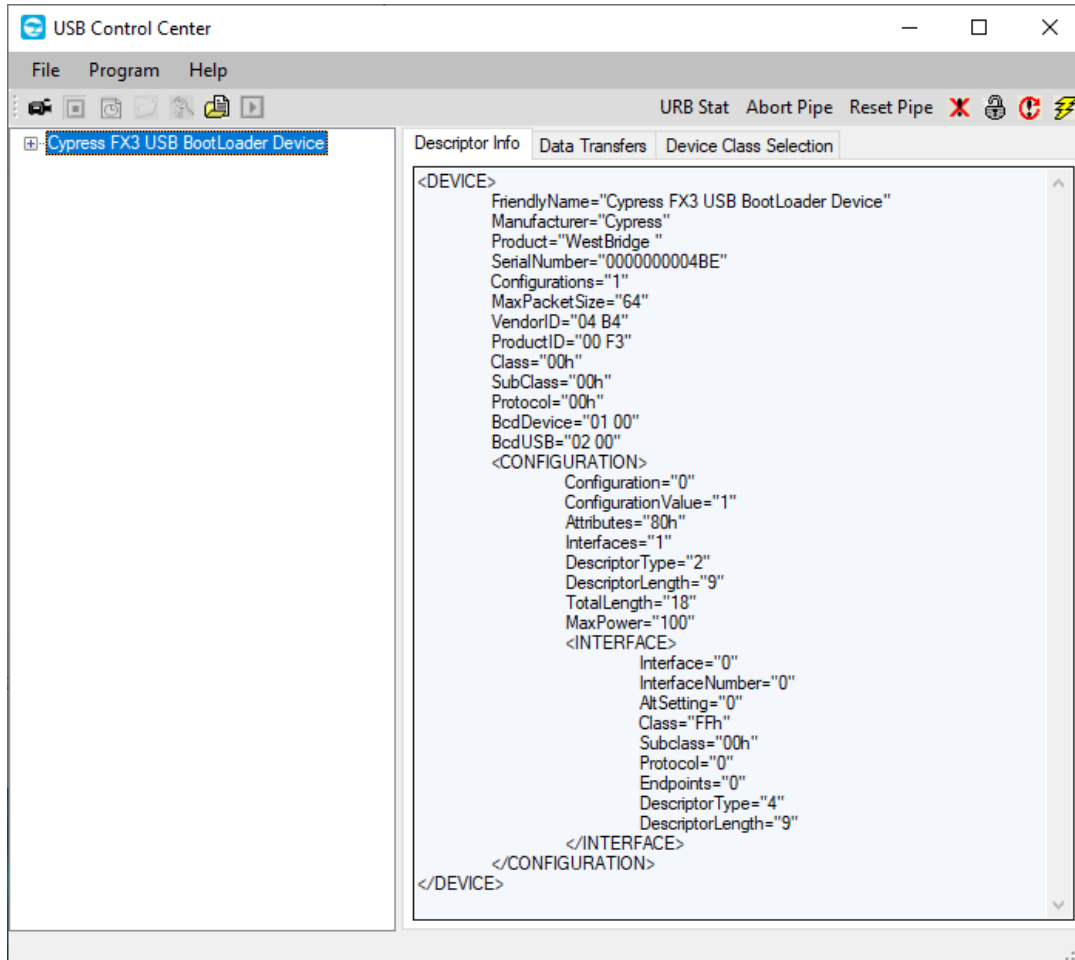
The connection between PE6000 and the Sensor-PCB is established via a 24-pin straight ribbon cable of 50mm length.



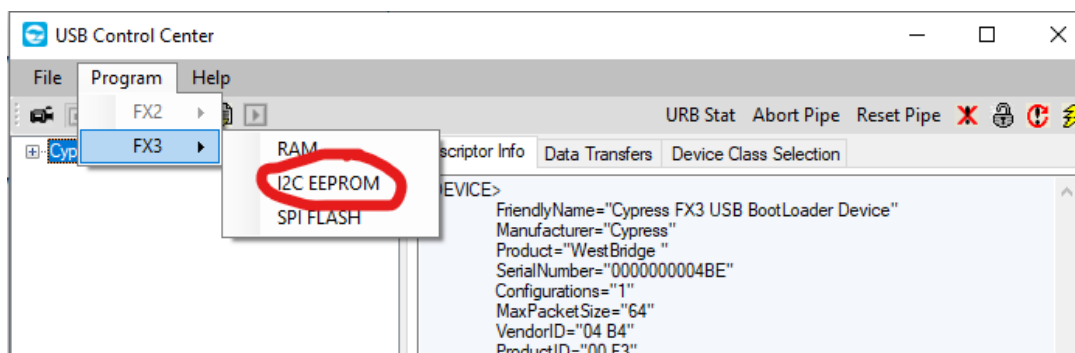
Other cables lengths and connector orientations are possible and should be specified together with your order, or at least 1 week before confirmed shipping date.

4. Firmware Update

Press the “Boot-mode” push button during power up to enter the boot via USB mode. The electronics should now be found as “Cypress FX3 USB BootLoader Device” in the Cypress “USB Control Center” Software as shown below:



Choose Program -> FX3 -> I2C EEPROM and navigate to the desired firmware image file (e.g. “SPECFIRM_PE6000_V0.20.0.img”



Opening the file will start the firmware programming. Avoid power cycling or any other disturbances until the programming succeeded.

Power-cycle to start with the updated firmware.

5. Service and Support

In case of any questions or technical problems please contact:

JETI Technische Instrumente GmbH Göschwitzer Strasse 48 D-07745 Jena Tel.: +49 3641 23292 00 Fax: +49 3641 23292 01 E-mail: support@jeti.com Internet: www.jeti.com
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August, 2023