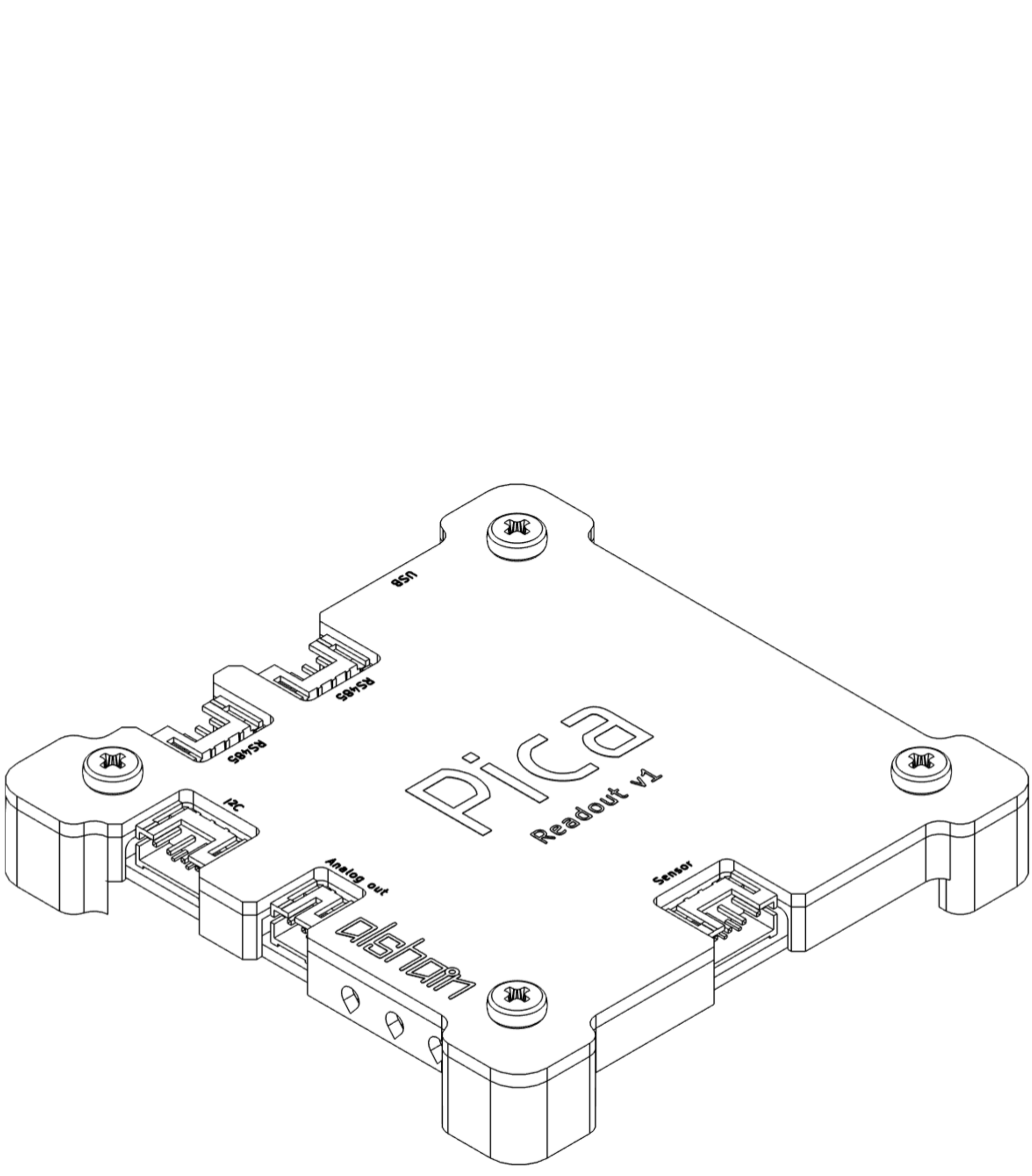
Pica

Readout v1



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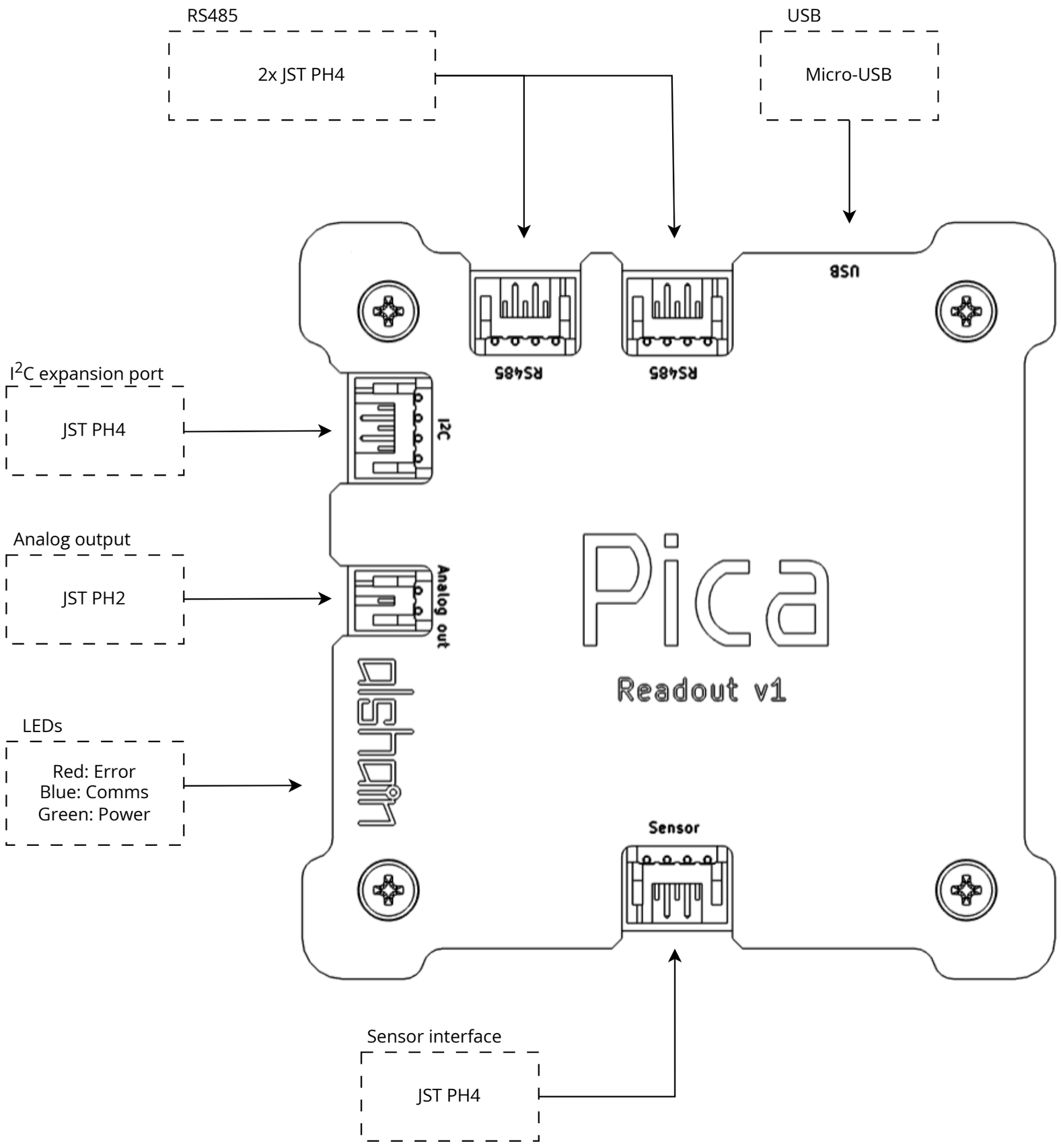
Assembled and designed in Finland, EU

Revision (a) 2026-03-11

Specifications

Footprint:	75 x 75 x 13 mm, weight 45 g
Power supply:	5 V, 30 mA peak when using standard sensor head, 15 mA when idling
Connectivity:	USB (virtual serial port), RS485 using ADAPT @ 460800 baud
Sensor interface, input:	0 .. 3.3 V with 16 bit ADC with 4th order digital lowpass filter
Sensor interface, ranges:	±1.024 V, ±0.512 V and ±0.256 V with 3.3 V 12 bit offset DAC
Sensor interface, drive:	0 .. 3.3 V with 12 bit resolution
Analog output:	0 .. 3.3 V or 4-20 mA (depeding on the model), resolution: 800 µV and 5 µA
Typical temperature offset:	-90 µV/K (when using standard sensor head)



Connector layout

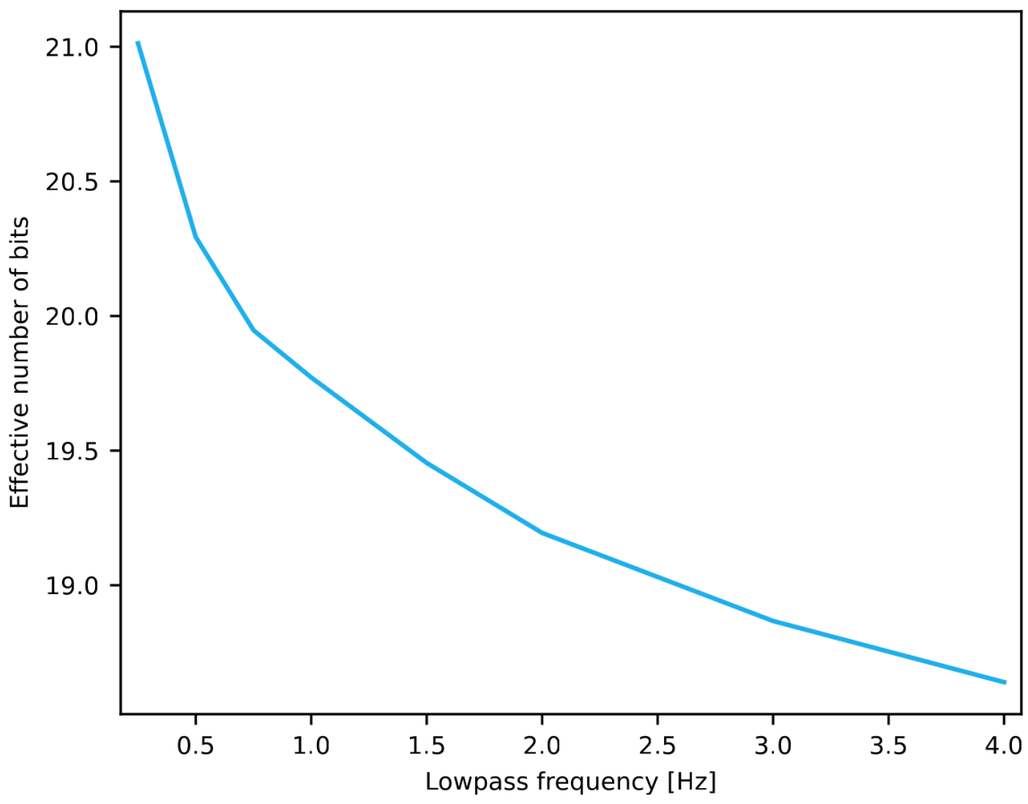
Sensor heads

Pica sensor heads are connected to Pica readout via sensor connector port (see above) and are sold separately.

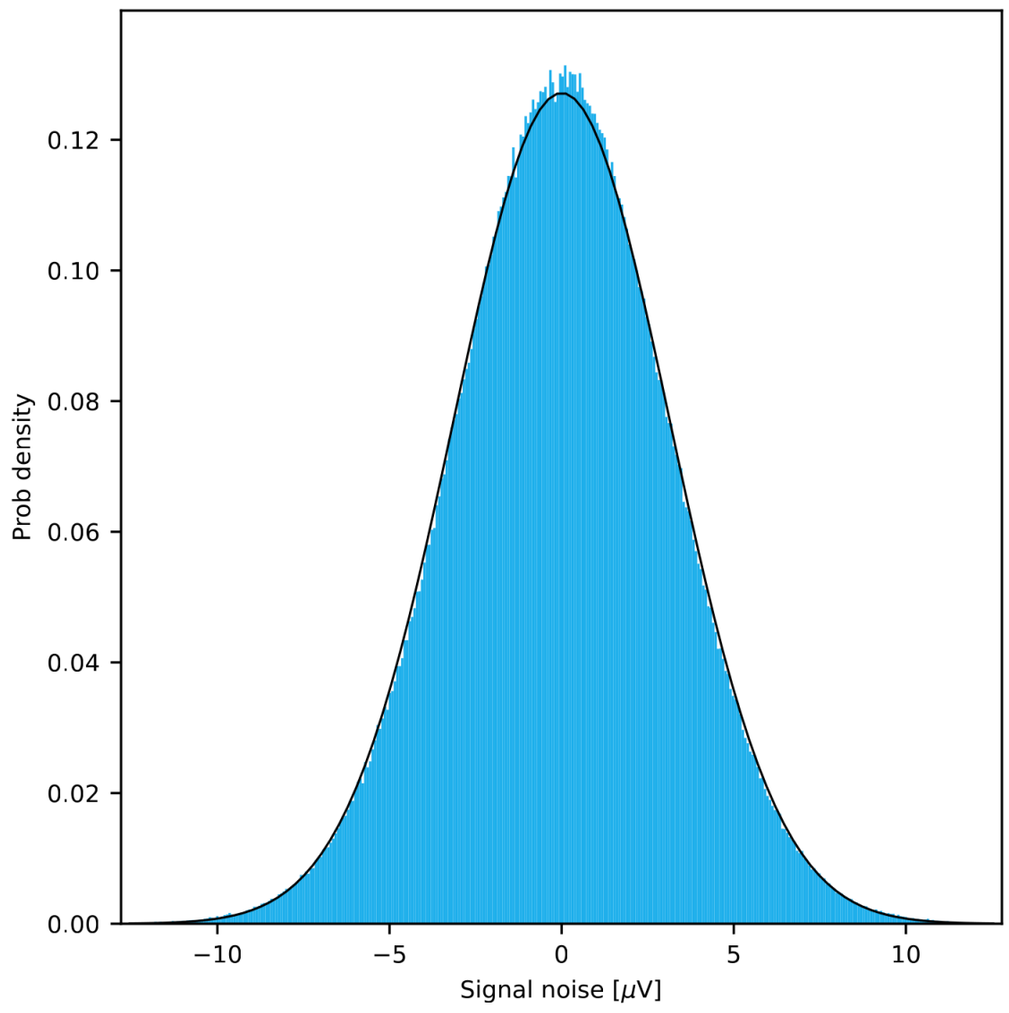
Sensor heads are self-contained units. They consist of a light emitter and a photodiode, along with drive and amplification circuitry. Wavelength used is dependent on the sensor head model.

Performance

Noise

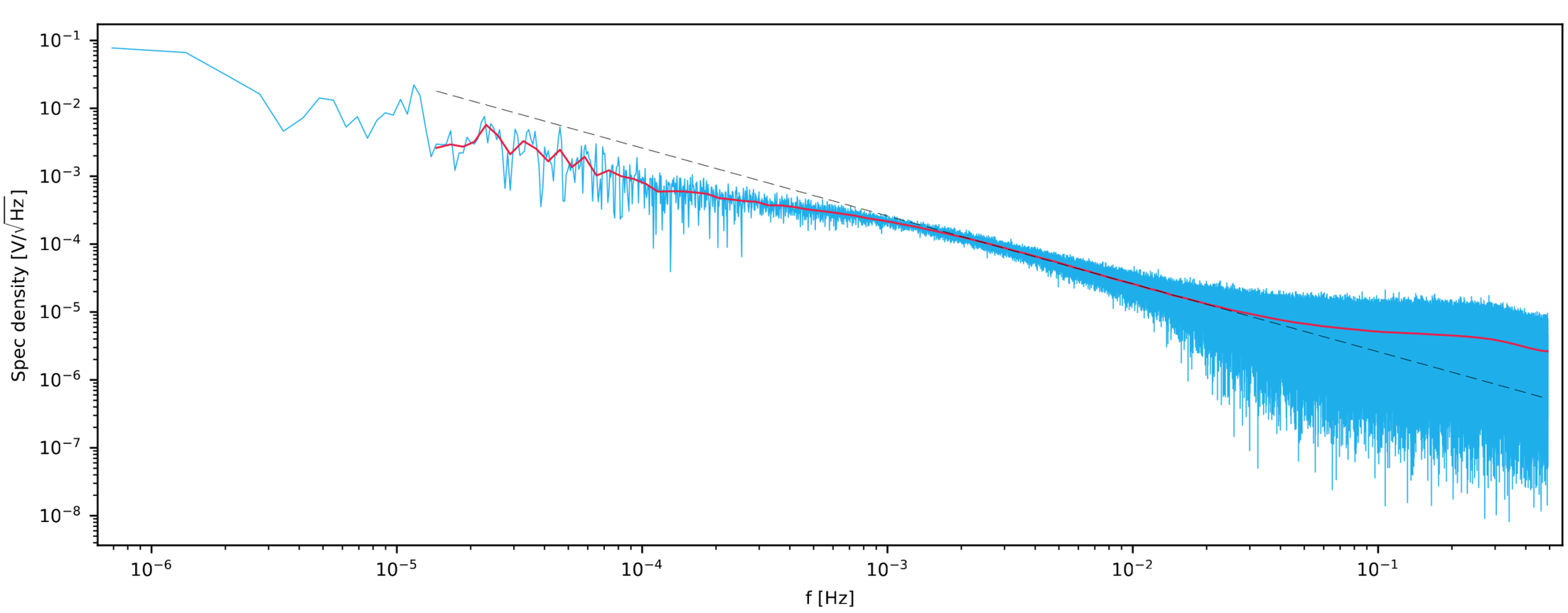


Effect of lowpass filtering to noise-free resolution



Distribution of random deviation on a static target

Long-term stability

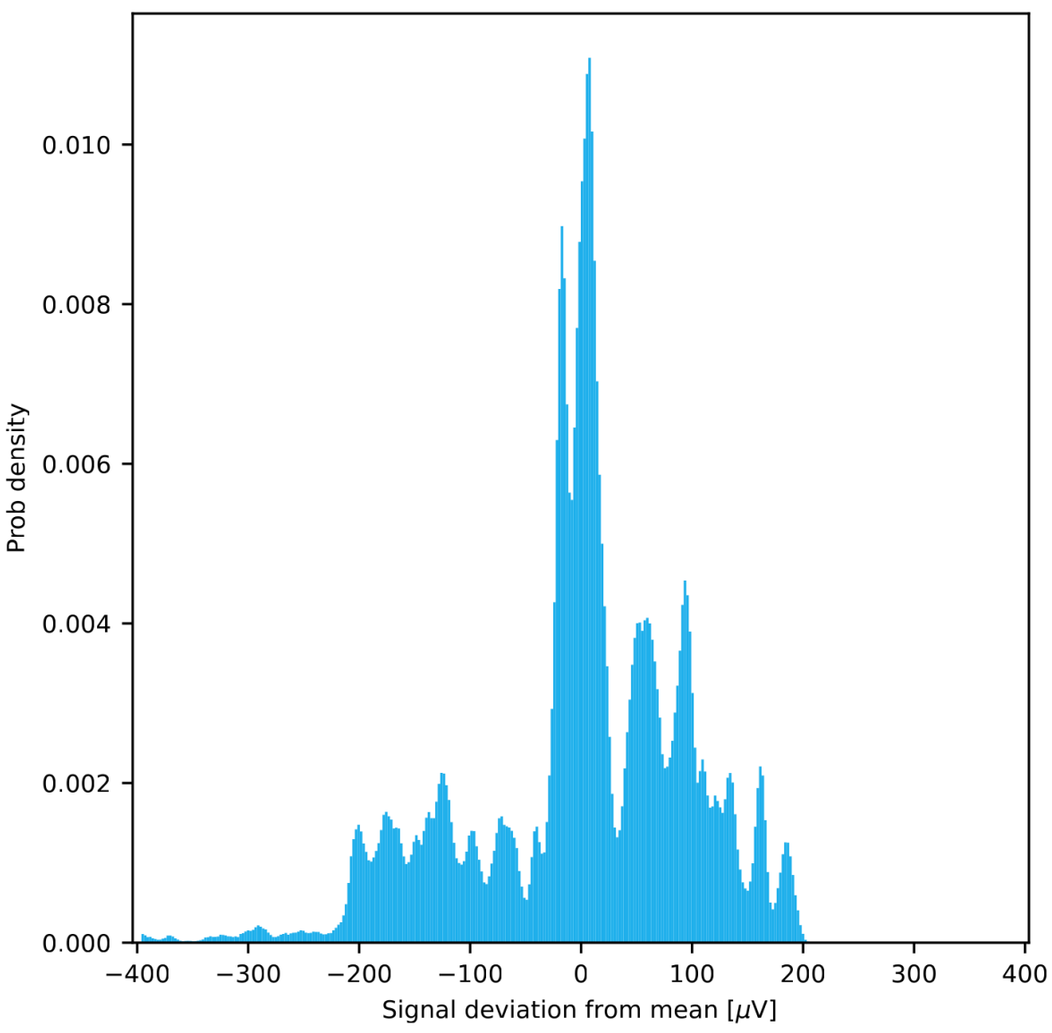


Spectral long-term stability over 15 days of continuous measurement of a static target

Blue: Spectral density of time series (level of signal fluctuations over a period given by frequency f)

Red: Smoothed average of the spectrum

Black dashed: 1/f reference model fitted at 5 mHz (1/f knee point at 20 mHz)



Distribution of signal deviation over 15 days of continuous measurement of a static target

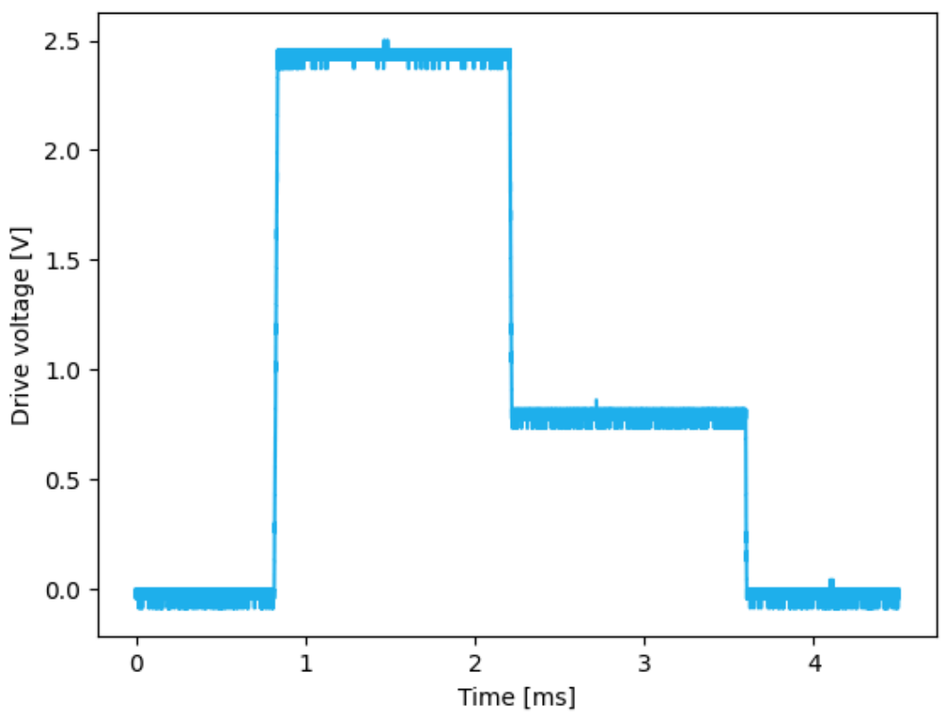
Measurement procedure

Pica readout utilises a two step staircase pulse to drive the sensor head source to compensate for environmental contributions to signal, i.e. ambient light, and measurement nonlinearities.

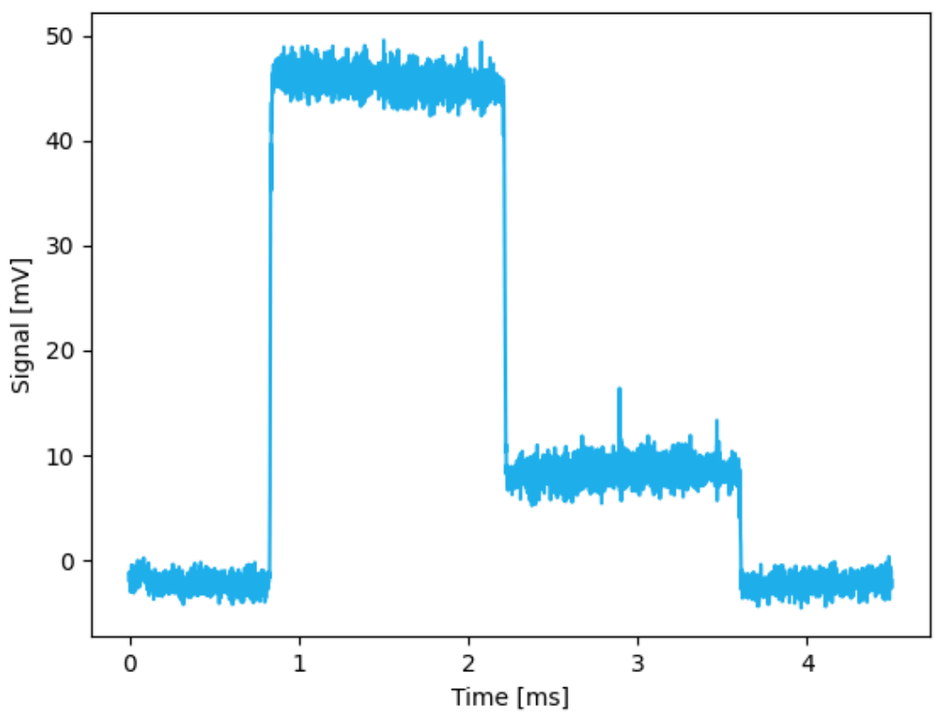
The pulse step heights are programmable with 12 bit resolution.

Steps are fixed to 1.4 ms (total pulse length 2.8 ms) and pulse repeat rate is 212 Hz.

Measurement is done by measuring amplitude differences of steps in pulses, which is then fed into digital 4th order lowpass filter to remove undesired higher frequencies (from mixing, pumping, bubbles etc.).

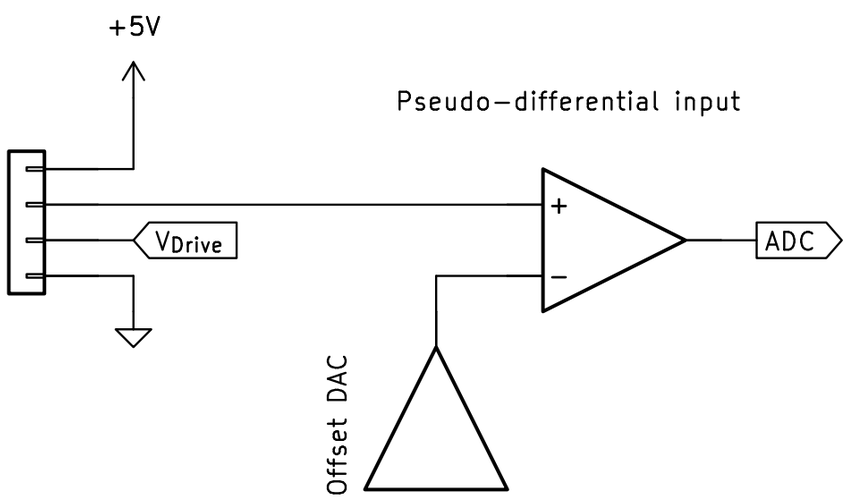


Default voltage pulse driven to the sensor head



Output voltage of a sensor head

Offset DAC and input circuitry



Schematic representation of input circuitry. Offset DAC can be used to compensate for large signal offsets.