

# Datasheet (preliminary)



## micro spectrometers

### Description

Laphtec micro spectrometers offer cutting-edge capabilities and lab-grade performance in an exceptionally compact form factor. Ideal for integration into space-constrained applications, but also as a stand-alone device. Full spectral analysis with high signal-to-noise ratio and excellent optical resolution.

### Applications

Light analysis  
Color measurement  
Quality control  
Process control and monitoring  
Environmental analysis  
System integration

### Features

- Wavelength range configurable between 350 and 1080 nm
- 1024 px backside illuminated CCD
- 3.9k full spectral acquisitions per second
- 16-bit ADC
- USB 2.0 and UART communication
- 1 trigger input and 1 sync output
- 2 GPIO pins for flexible control
- Ultra compact form factor
- Optical input via modular fiber connector

## Specifications

### Absolute Maximum Ratings

| Parameter             | Symbol    | Conditions                          | Min. | Max. | Unit |
|-----------------------|-----------|-------------------------------------|------|------|------|
| Supply Voltage        | $V_{DD}$  | —                                   | -0.5 | +5.5 | V    |
| Input Voltage         | $V_I$     | UART, TRIG,<br>SYNC<br>$V_{DD} = 0$ | -0.3 | +5.5 | V    |
|                       |           | I/O Pins<br>$V_{DD} = 0$            | -0.3 | +0.3 |      |
|                       |           | $V_{DD} = 5$                        | -0.3 | +5.5 |      |
| Storage Temperature   | $T_{STG}$ | —                                   | -20  | +70  | °C   |
| Operating Temperature | $T_{OP}$  | Non-condensing                      | 0    | +50  | °C   |

Do not operate or store in corrosive or high-humidity atmospheric conditions.

### Optical Specifications

$V_{DD} = +5V$ ,  $T_{amb} = 25\text{ °C}$ , unless otherwise specified.

| Parameter                | Symbol                 | Conditions         | Min.    | Typ.   | Max. | Unit  |
|--------------------------|------------------------|--------------------|---------|--------|------|-------|
| Response Range           | $R_\lambda$            | —                  | 350     |        | 1080 | nm    |
| Bandwidth                | $B_\lambda$            | —                  | —       | 250    | —    | nm    |
| Resolution               | $\Delta\lambda_{FWHM}$ | —                  | —       | < 5    | —    | nm    |
| Wavelength Accuracy      | —                      | —                  | —       | ?      | —    | nm    |
| Thermal Wavelength Drift | —                      | —                  | —       | ?      | —    | nm/K  |
| Pixel Count              | —                      | —                  | —       | 1024   | —    | pixel |
| Numerical Aperture       | NA                     | —                  | —       | 0.22   | —    | —     |
| Dynamic Range            | DR                     | Single acquisition | —       | 1500:1 | —    | —     |
| Signal-to-Noise Ratio    | SNR                    | —                  | —       | 1000:1 | —    | —     |
| Stray Light              | SL                     | —                  | —       | ?      | —    | %     |
| Exposure Time            | $T_{EXP}$              | —                  | 1 $\mu$ | —      | 60   | s     |

## Electrical Specifications

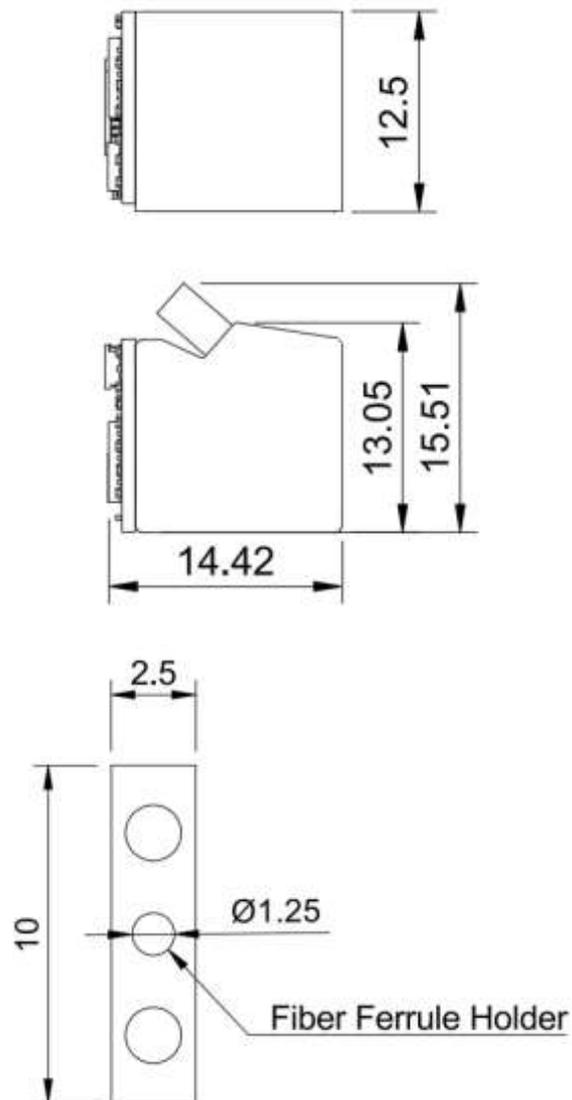
$V_{DD} = +5V$ ,  $T_{amb} = 25\text{ °C}$ , unless otherwise specified.

| Parameter        | Symbol      | Conditions   | Min. | Typ.  | Max.     | Unit    |
|------------------|-------------|--------------|------|-------|----------|---------|
| Supply Voltage   | $V_{DD}$    | —            | +4.0 | +5.0  | +5.5     | V       |
| Input Voltage    | $V_I$       | ?            | -0.3 | ?     | ?        | V       |
| Supply Current   | $I_i$       | —            | —    | —     | 250      | mA      |
| A/D Resolution   | —           | —            | —    | 16    | —        | Bit     |
| A/D Sample Rate  | —           | —            | —    | —     | 4        | MSa/s   |
| A/D Readout Time | —           | Whole Sensor | —    | 256   | —        | $\mu$ s |
| UART Baud Rate   | $BR_{UART}$ | —            | 300  | 57600 | 21250000 | —       |

## Mechanical Specifications

| Parameter               | Symbol         | Conditions  | Typ.             | Unit |
|-------------------------|----------------|-------------|------------------|------|
| Weight                  | M              | —           | ?                | g    |
| Dimensions              | V <sub>i</sub> | (L x W x H) | 14.42x13.05x12.5 | mm   |
| Optical Input Connector | —              | —           | 1.25 mm Ferrule  | —    |

## Technical Drawing



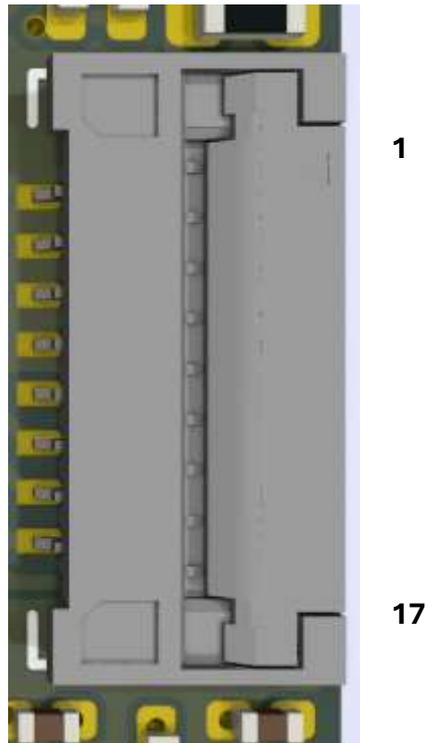
**NOTE:** All dimensions are in mm. 3D CAD files available upon request.

## Auxiliary Connector

The FPC connector on the spectrometer provides different input and output signals such as trigger-I/O and serial communication interfaces such as USB and UART.

The connector on the micro spectrometer is a Molex 502078-1710.

The connector can only be used with a matching FPC Cable, Molex 15014.



The following table describes all the interface pins. Contact Laphtec for custom pinout.

Table 1: Auxiliary Interface Pin Descriptions

| Pin Number | Signal Name | Type | Description                     |
|------------|-------------|------|---------------------------------|
| 1          | VDD         | PWR  | 5 V Power Input                 |
| 2          | GND         | PWR  | Ground                          |
| 3          | TRIG_IN     | I    | Trigger Input                   |
| 4          | GND         | PWR  | Ground                          |
| 5          | SYNC_OUT    | O    | Synchronization Output          |
| 6          | GND         | PWR  | Ground                          |
| 7          | EN          | I    | Power Enable                    |
| 8          | GND         | PWR  | Ground                          |
| 9          | UART_TxD    | O    | Transmitter output for UART     |
| 10         | UART_RxD    | I    | Transmitter Input for UART      |
| 11         | GND         |      | Ground                          |
| 12         | GPIO_1      | I/O  | General Purpose Input or Output |
| 13         | nRESET      | I    | Reset Input (low active)        |
| 14         | GPIO_2      | I/O  | General Purpose Input or Output |
| 15         | GND         | PWR  | Ground                          |
| 16         | USB_DN      | I/O  | USB D- line                     |
| 17         | USB_DP      | I/O  | USB D+ line                     |

## Revision History

### Revision 0.1, July 2024

Initial preliminary datasheet.