

# OPERATING MANUAL

# MPY-RS

HIGH SPEED PYROELECTRIC DETECTOR



## Warranty

This product is warranted to be free from defects for one (1) year from the date of initial purchase. Should such defects occur during this period, WiredSense's sole obligation shall be to repair the defective part or product or replace it with a comparable part at its own discretion. Damage caused by normal wear and tear is not covered by this or any other warranty. WiredSense assumes no liability for accidents, injuries, deaths, losses and other claims in connection with or in consequence of the use of this product. In no event shall WiredSense be liable for incidental or consequential damages in connection with or as a result of the use of this product or any part thereof.

## Service

In case of repair the product must usually be sent in to WiredSense. If you have any questions about product defects, before returning them please contact us by e-mail at [service@wiredsense.com](mailto:service@wiredsense.com).

## Scope of Delivery

- MPY-RS detector
- Threaded detector protection cap (SM05)
- Linear low noise power supply (Thorlabs LDS12B)
- Power cord
- M4 set screw and washer made from PEEK for mounting

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## 1. General information

Pyroelectricity is a property of certain crystalline materials which generate a voltage when their temperature is changed. Thus, in a pyro-electric sensor even tiny temperature changes  $\Delta T$  generate electrical signals that can be further amplified and evaluated electronically. Since the measured signal is proportional to the incident heat, pyroelectric detectors respond in a broad frequency range and can be used for the detection of long wavelength light (MIR, THz) as well as for visible and UV light.

In the detectors of the MPY series, this principle is used for highly sensitive radiation detection. The amplified thermoelectric signal can be evaluated using an analog-to-digital converter, an oscilloscope or a lock-in amplifier.

The MPY-RS contains highly sensitive and fast amplification electronics and the **circuit board may never be touched** because moisture and grease on fingers will deteriorate the performance of the detector. In order to guarantee long-term reliability, we strongly recommend **not to open the rear panel of the detector housing**.

## 2. Handling

### 2.2 Description

The detectors of the MPY-RS-series are shipped with an external linear low-noise power supply (+/-12V) to facilitate long lasting measurements. The power supply is connected to the detector via a M8-connector which is located on the upper panel of the detector. The power supply cable is equipped with the male plug version which is threaded to prevent accidental disconnection of the cable.

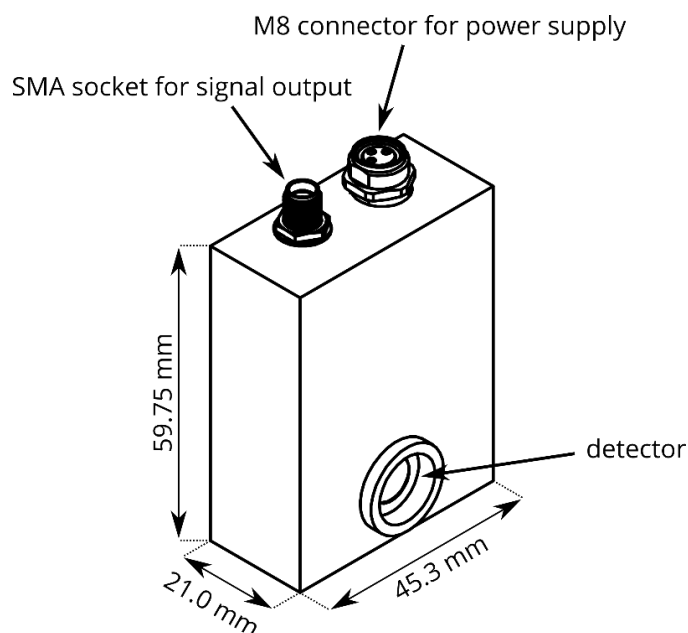


FIGURE 1: SCHEMATIC OF THE DETECTOR MPY-RS

The detector element is protected by an SM05-threaded endcap. The threading specifications for the SM05-thread can be found at the end of this document.

## 2.2 Set-up and connection to the oscilloscope

**Important Notice: Please check that the line voltage, as indicated on the rear of the power supply, matches your local AC mains voltage before plugging the unit it.**

The detectors of the MPY-RS series are activated by switching the power supply to the "I" position (On). Immediately, temperature changes are output as an electrical signal via the SMA connection. A SMA-BNC connector is being shipped with the detector. For optimum decoupling of the detector from electrical ambient noise, the supplied setscrew and washer made of PEEK should be used for mounting.

An oscilloscope should be connected to the MPY-RS detector with an input resistance of 1 M $\Omega$  via a 50 Ohm SMA-cable (not included). Furthermore, the oscilloscope should be triggered on the heat source irradiating the detector (e.g. the laser or chopper).

**Please note that continuous sources cannot be measured as only temperature changes can be detected by the detector. Therefore, a pulsed source or a chopper are necessary.**

Please also note the frequency dependence of the sensitivity (Figure 1). The MPY-RS detector has the highest sensitivity at a signal frequency < 5kHz. Sensitivity decreases strongly at higher frequencies.

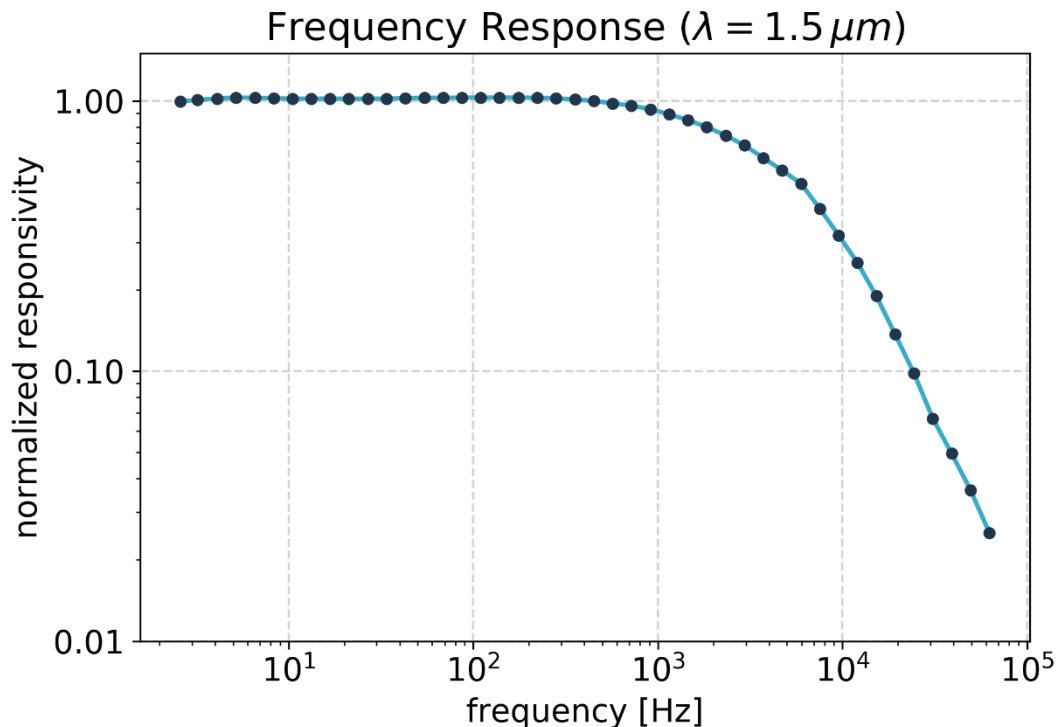


FIGURE 1: FREQUENCY DEPENDENCE OF SENSITIVITY

### 3. Signal analysis

When used with the oscilloscope, an image similar to Figure 3 should appear. A positive change in IR flux is resulting in a positive signal. The amplitude of the signal (peak-to-peak or rms) is proportional to the radiated heat (Figure 4).

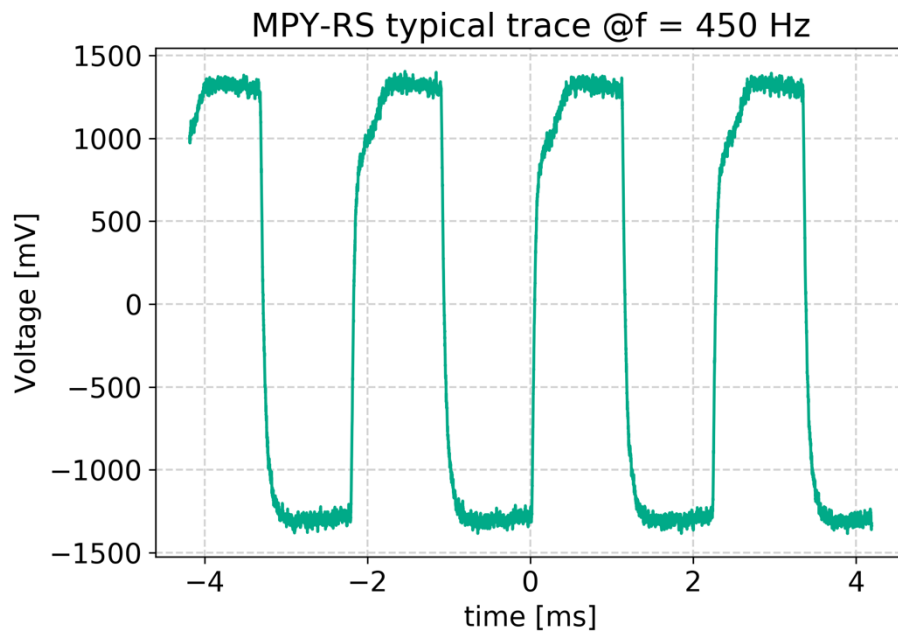


FIGURE 3: TYPICAL OSCILLOSCOPE TRACE OF THE MPY-RS-DETECTOR

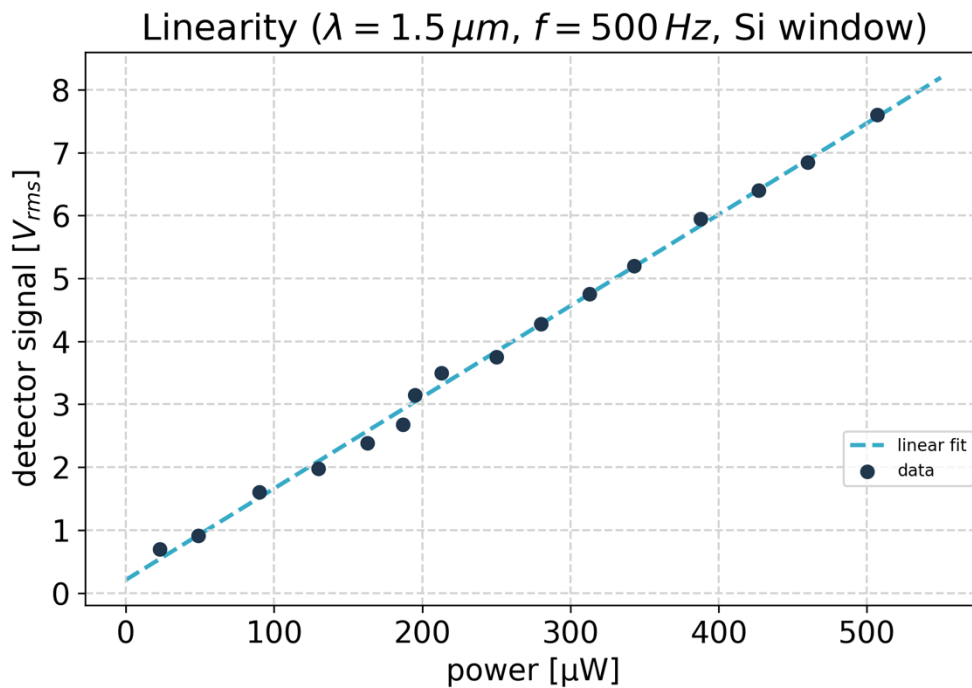


FIGURE 4: LINEARITY OF THE AMPLITUDE SIGNAL VS. INCIDENT POWER

## 4. Problem solving

### 4.1 Only a zero line appears on the oscilloscope

First make sure that the detector power supply is switched on. Check the connection between oscilloscope and detector again with a suitable SMA-cable and set a high-impedance input resistance on the oscilloscope (e.g. 1MΩ). Now switch the oscilloscope to a higher sensitivity (e.g. 5 mV/div). Move your hand up and down in front of the detector in a distance of about 10 cm. The resulting heat change on the detector is sufficient to generate a large signal. If you do not see a signal here, please contact [service@wiredsense.com](mailto:service@wiredsense.com) and describe your problem. We are happy to help!

### 4.2 The oscilloscope trace moves very irregularly with the signal

Especially with high-frequency signals (from 10kHz) and low signal levels, low-frequency thermal influences can interfere with the measurement. For example, if you put your hand near the detector, the signal can be much higher than the signal to be measured. In this case, the AC coupling of the oscilloscope input must be used. If your oscilloscope does not have an AC input, you can use a commercially available high-pass filter between detector and oscilloscope.

## 5. SM05 Threading specifications

External Thread, 0.535"-40.0, UNS-2A		Internal Thread, 0.535"-40.0, UNS-2B	
<i>Max Major Diameter</i>	0.5340"	<i>Min Major Diameter</i>	0.5350"
<i>Min Major Diameter</i>	0.5289"	<i>Min Pitch Diameter</i>	0.5188"
<i>Max Pitch Diameter</i>	0.5178"	<i>Max Pitch Diameter</i>	0.5230"
<i>Min Pitch Diameter</i>	0.5146"	<i>Min Minor Diameter (83.3% of thread)</i>	0.508"
<i>Max Minor Diameter</i>	0.5069"	<i>Max Minor Diameter (64.9% of thread)</i>	0.514"

Further information for SM-threads can be found on the Thorlabs website [www.thorlabs.com](http://www.thorlabs.com)