

PR No3 – 4-QUADRANT PYROELECTRIC RECEIVER

Infrared Detectors



The PR No3 builds on the versatility of the LASER COMPONENTS PR Series of uncooled pyroelectric receivers with a 4-channel, position-sensitive design. This high-speed detector enables precise laser measurements from the ultraviolet (UV) well into the far-infrared (FIR). With a 2.0 mm active area and 980 $\mu\text{m} \times 980 \mu\text{m}$ segment size, it delivers high-resolution detection in applications that typically require cooled detectors.

FEATURES

- / Broadband use – suitable for all lasers in the lab
- / Unique combination of high sensitivity and speed
- / Four individual analog output ports
- / Excellent channel-to-channel uniformity including with noise
- / Quadrants aligned relative to housing
- / Individually calibrated for responsivity and noise over frequency
- / Uncooled operation
- / Excellent uniformity and linearity

APPLICATIONS

- / Real-time beam displacement measurements with 50 kHz -3 dB bandwidth
- / Reference detector for dynamic experiments involving long beam paths or fast pulse-to-pulse fluctuations
- / Hysteresis correction in scanned scenes
- / Tool for application and laser development

VERSIONS

Two versions are available:

- / **Standard: PR No3 IR** – Includes detailed specifications (see datasheet) and supports wavelengths up to 30 μm . It is, in principle, a quad version of the PR No2 IR (typical 50 kHz -3 dB bandwidth).
- / **On special request: PR No3 THz** – Designed for THz applications, featuring an HDPE window for frequencies down to 40 GHz. Compared to the IR version, it offers 10 $\times$ higher responsivity and a -3 dB bandwidth of 8 kHz. It is, in principle, a quad version of the PR No1 THz. It is based on this model due to the typically low output power of THz lasers. Prototypes with detailed characterization are available. However, detailed specifications for the PR No3 THz are not included in this version of the datasheet.

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INFRARED DETECTORS

PR No3 - 4-Quadrant Pyroelectric Receiver



SPECIFICATIONS

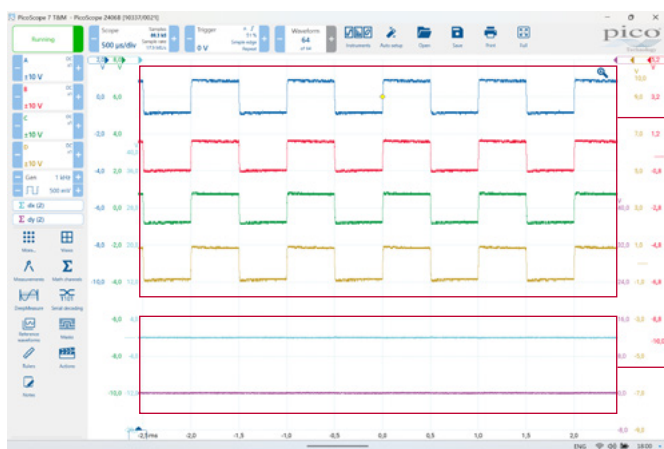
Segment numbering does follow Graph 1, which is displayed on the housing as well. A beam is perfectly aligned in X-direction once the difference among the sums of the »left« signals (1+3) and the »right« signals (2+4) is zero. Y-direction is perfectly aligned once the difference among the sums of the »upper« signals (1+2) and the »lower« signals (3+4) is zero.



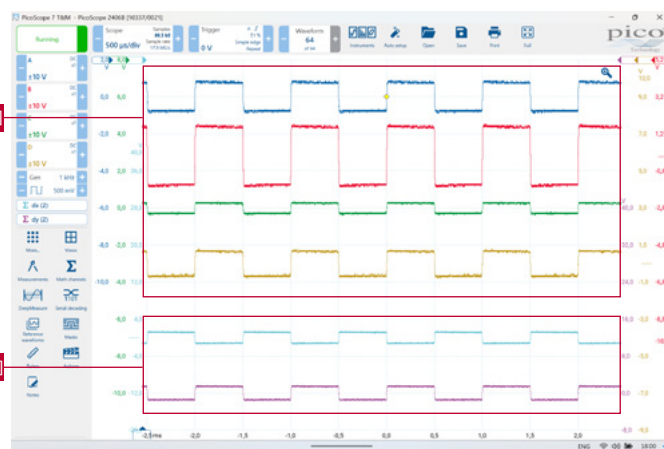
Graph 1

Please note, that the PR No3 centers based on the power rather than the geometric center of the beam.

The two »lab pictures« below illustrate this behavior:



Equal alignment: signal from all 4 channels [a] and corresponding differences [b].



Unequal alignment: signal from all 4 channels [a] and corresponding differences [b].

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Physical Properties

Detection principle	Pyroelectric
Detector material	Black-coated LiTaO ₃
Weight [g]	80
Operating temperature [°C]	-20 to +50
Dimensions (HxBxT) [mm]	93x115x45
Detector window dimensions [mm ²]	5.0x5.0
Active detector area [mm]	Ø 2.0 (separated in 4 quadrants with 40 µm gap)
Thread of detector cap	SM05 (compatible to Thorlabs components)

Electrical Properties

Power supply [V]	±12 (linear low-noise power supply (Thorlabs LDS12B))
Power socket	3-pole, M8
Output socket	SMA (adapter to BNC included)
Output signal	4 x analog (software not included)
Output signal level [V]	-8 to +8

Measuring Properties

Responsivity Typ. [V/W] ^a	6000
Bandwidth (-3 dB) [kHz] ^b	Min. 35, Typ. 50
Frequency range (-20 dB) [kHz] ^c	Typ. 0,001 to >100
Noise equivalent power (NEP) [fW/√Hz] ^a	Typ. 1100
Noise density (rms, f = 20 Hz, BW = 1 Hz, 20 °C) [µV/√Hz]	Typ. 6
Detectivity @ 10 Hz, @ 1 kHz [cm √(Hz)/W] ^a	1.0 x 1E8
Maximum measurable power (f = 1 kHz, KBr window) [mW]	1.5
Damage threshold (max. avg. power density) [mW/cm ²]	>100
Spectral bandwidth	UV to FIR (real bandwidth depends on the window used)
Angular error of x- and y-detector axis relative to package [°]	Typ. 1

^a Measured with broadband black body source at 150 °C, central wavelength $\lambda = 6.8 \mu\text{m}$ and KBr window

^b Further customized bandwidth options up to 200 kHz upon request

^c Detector only responds to signal changes – a chopper is required for true CW applications!

Window Options

KBr window, uncoated	$\lambda = 200 \text{ nm} - 30 \mu\text{m}$
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Further window materials available on request.

Depending on the window material a safety datasheet and handling requirements need to be considered.

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SPECIFICATIONS

Typical Performance

The responsivity and D^* values are measured with a 150 °C blackbody emitter with 6.8 μm peak emission and a detector with a KBr window. The values can change at other wavelengths.

Fig. 1-3 show single channel data. Fig. 4 displays all four channels synchronously, demonstrating excellent channel-to-channel uniformity.

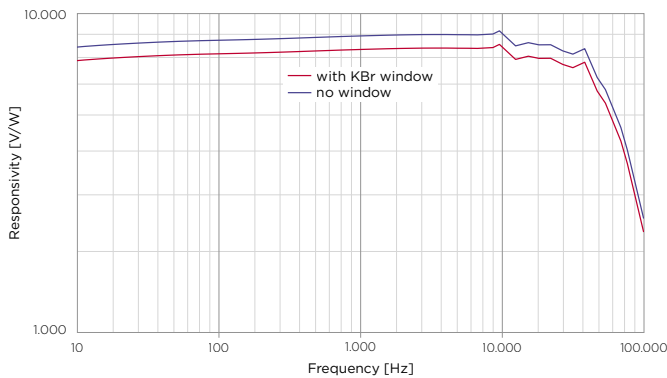


Fig. 1: Frequency Response ($\lambda = 6.8 \mu\text{m}$)

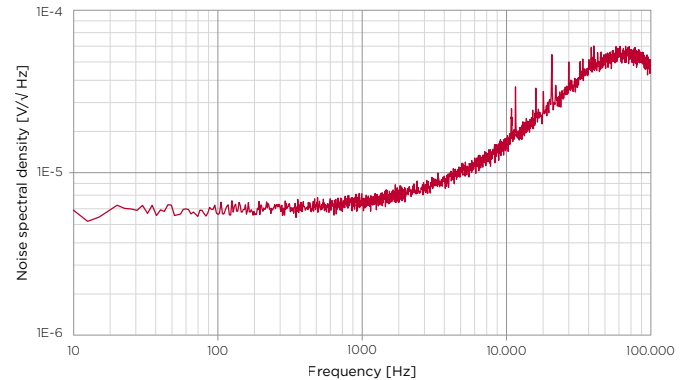


Fig. 2: Dark Noise

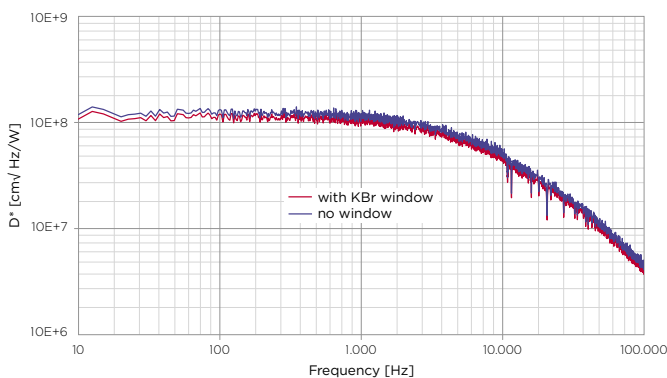


Fig. 3: Detectivity

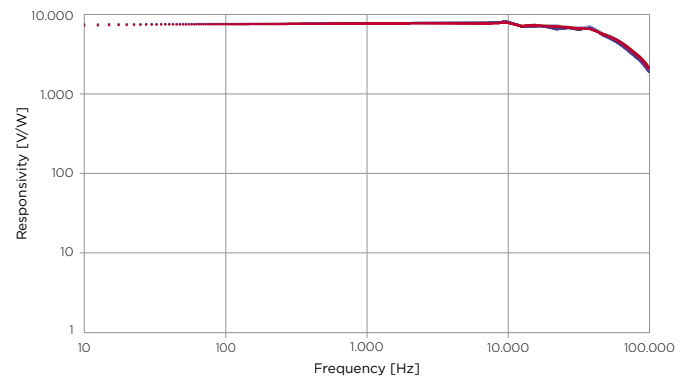


Fig. 4: Frequency Response

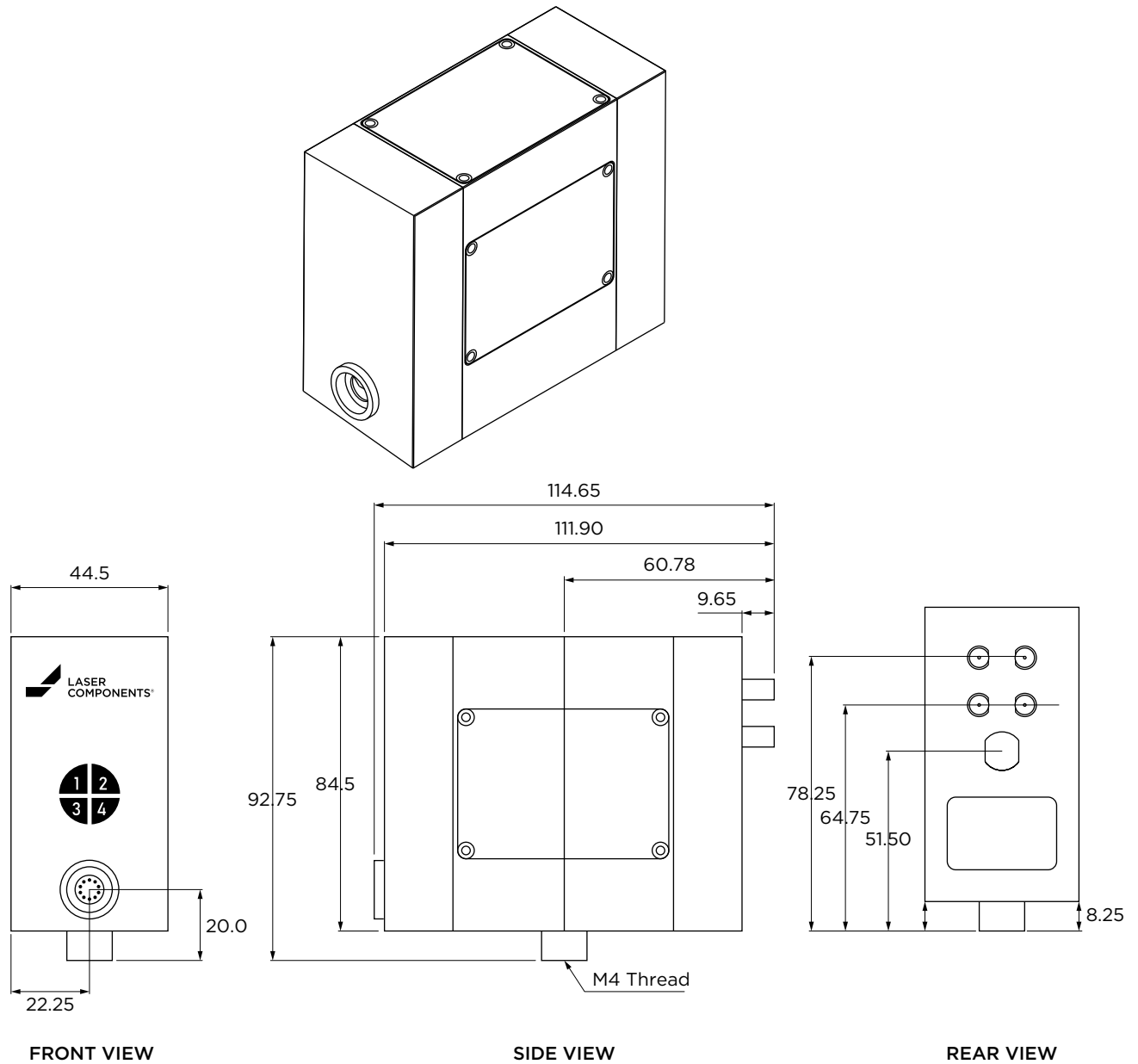
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TECHNICAL DRAWING

Geometric Dimensions



PR No3

Units: mm

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ORDERING INFORMATION

Products can be ordered directly from LASER COMPONENTS or its representatives. For a complete listing of representatives, visit our website at www.lasercomponents.com

Custom designed products are available on request.

SAFETY AND HANDLING INFORMATION

Handling Precautions

Products are subject to the risks normally associated with sensitive electronic devices including static discharge, transients, and overload.

This product was developed in cooperation with Wired Sense GmbH.



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