



**Datasheet**

**FWPR-20-IN**

**Femtowatt Photoreceiver  
with InGaAs-PIN Photodiode**



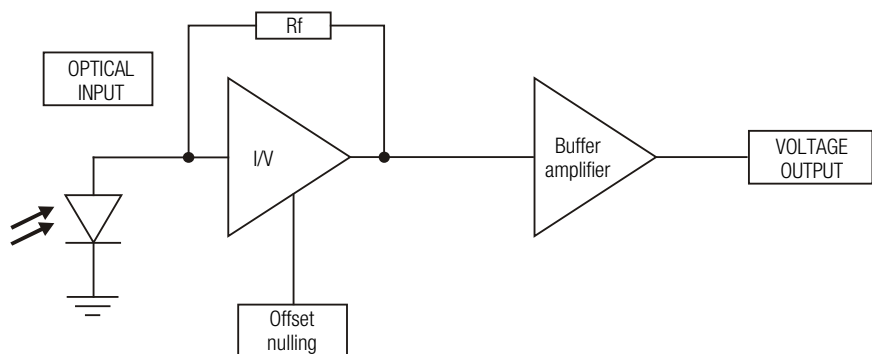
Features

- InGaAs-PIN photodiode, 0.5 mm active diameter
- Ultra low noise, NEP 7.5 fW/√Hz
- Amplifier transimpedance gain  $1 \times 10^{11}$  V/A
- Max. conversion gain  $0.95 \times 10^{11}$  V/W @ 1550 nm
- Spectral range 900 – 1700 nm
- Free-space input 1.035"-40 threaded, Easily convertible to fiber optic input (FC and FSMA) with optionally available screw-on adapters
- UNC 8-32 and M4 tapped holes for mounting on standard posts with metric and imperial thread

Applications

- Fluorescence measurements
- NIR spectroscopy
- Electrophoresis
- Replacement for (liquid nitrogen) cooled Ge photodiodes and avalanche photodiodes (APDs)

Block Diagram



BS01-FWPR\_R03





Intended Use

The FWPR-20-IN photoreceiver consists of an InGaAs photodiode and a subsequent low-noise fixed gain transimpedance amplifier. It is designed for conversion of optical signals in the range from fW to pW into equivalent output voltages. Operation is mostly self-explanatory. If in doubt, consult this document or contact [support@femto.de](mailto:support@femto.de).

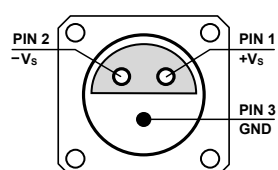
For safe operation, please refer to the damage thresholds specified in the "Absolute Maximum Ratings", "Temperature Range" and "Power Supply" sections of this document.

The operating environment must be free of smoke, dust, grease, oil, condensing moisture, and other contaminants that could affect the operation or performance.

## Femtowatt Photoreceiver with InGaAs-PIN Photodiode

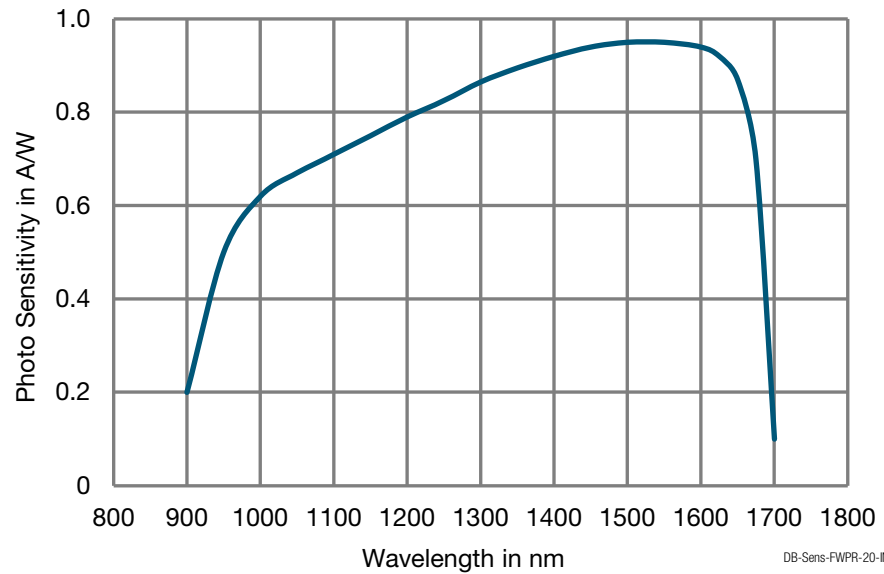
<p>Available Version</p>	<p>FWPR-20-IN-FST</p>  <p>Picture shows 1.035"-40 threaded flange with internally threaded coupler ring (outer diameter 30 mm)</p>	<p>1.035"-40 threaded flange for free space applications, compatible with many optical standard accessories and for use with various types of fiber connector adapters.</p> <p>Optionally available: Fiber adapters PRA-FC, PRA-FCA and PRA-FSMA. The coupling efficiency will depend on fiber type. With the relative large 0.5 mm dia. photodiode installed in the FWPR-20-IN input coupling is not critical. However, standard SM 9/125 fibers (PC or APC) with low numerical aperture (NA) are recommended for ensuring near 100% coupling efficiency.</p>
<p>Related Model</p>	<p>FWPR-20-SI-FST</p>	<p>Si photodiode, 1.1 × 1.1 mm<sup>2</sup>, 320 - 1100 nm free space input, 1.035"-40 threaded flange</p>
<p>Available Accessories</p>	<p>PRA-FC PRA-FCA PRA-FSMA</p>  <p>PRA-PAP</p>  <p>PS-15-25-L</p> 	<p>Fiber-adapter with external 1.035"-40 thread</p> <p>Alternative mounting option: Post adapter plate, easy to mount on FEMTO photoreceiver series OE, FWPR, PWPR, HCA-S and LCA-S</p> <p>Power Supply Input: 100 – 240 VAC Output: ±15 VDC</p>
<p>Specifications</p>	<p>Test conditions</p> <p>Gain</p> <p>Transimpedance gain Gain accuracy Conversion gain</p> <p>Frequency Response</p> <p>Lower cut-off frequency Upper cut-off frequency (-3 dB)</p> <p>Time Response</p> <p>Rise/fall time (10 % – 90 %)</p> <p>Input</p> <p>Noise equivalent power (NEP) Optical saturation power</p> <p>Detector</p> <p>Detector Active area Spectral range Max. sensitivity</p>	<p><math>V_S = \pm 15 \text{ V}</math>, <math>T_A = 25 \text{ }^\circ\text{C}</math>, output load impedance 1 M<math>\Omega</math>, warm-up 20 minutes (min. 10 minutes recommended)</p> <p><math>1.0 \times 10^{11} \text{ V/A}</math> (@ output load <math>\geq 100 \text{ k}\Omega</math>) <math>\pm 1 \%</math> (electrical) <math>0.95 \times 10^{11} \text{ V/W}</math> typ. (@ 1550 nm, output load <math>\geq 100 \text{ k}\Omega</math>)</p> <p>DC 20 Hz (<math>\pm 20 \%</math>)</p> <p>18 ms (<math>\pm 20 \%</math>)</p> <p>7.5 fW/<math>\sqrt{\text{Hz}}</math> (@ 1550 nm, 1 Hz) 110 pW (for linear amplification, @ 1550 nm)</p> <p>InGaAs-PIN photodiode <math>\varnothing 0.5 \text{ mm}</math> 900 – 1700 nm <math>0.95 \text{ A/W}</math> typ. (@ 1550 nm)</p>

## Femtowatt Photoreceiver with InGaAs-PIN Photodiode

Specifications (continued)		
Output	Output voltage range Offset compensation range Output impedance Max. output current Output noise	-1.6 V ... +10 V (@ ≥ 100 kΩ output load) ±1.6 V typ. (adjustable by offset potentiometer) 50 Ω (terminate with ≥ 100 kΩ load) 25 mA (short-circuit proof) 3 mV RMS (20 mV peak-peak) typ. (@ ≥ 100 kΩ load, no signal on detector, measurement bandwidth 8 kHz)
Optical Input Connector	Material FST flange Material FST coupler ring	1.4305 stainless steel, nickel-plated 1.4305 stainless steel, glass bead blasted
Power Supply	Supply voltage Supply current	±15 V (±14.5 V ... ±16.5 V) ±15 mA (depends on operating conditions, recommended power supply capability min. ±50 mA)
Case	Weight Material	203 g (0.45 lbs) incl. coupler ring AlMg3/4.5Mn, nickel-plated
Temperature Range	Storage temperature Operating temperature	-30 °C ... +85 °C 0 °C ... +60 °C
Absolute Maximum Ratings	Optical input power (CW) Power supply voltage	10 mW ±20 V
Connectors	Input  Output  Power supply	1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories  BNC jack (female)  LEMO® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)
		Pin 1: +15 V Pin 2: -15 V Pin 3: GND
Scope of Delivery	FWPR-20-IN-FST, internally threaded coupler ring, LEMO® 3-pin connector, datasheet, transport package	
Ordering Information	FWPR-20-IN-FST	1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories.

# Femtowatt Photoreceiver with InGaAs-PIN Photodiode

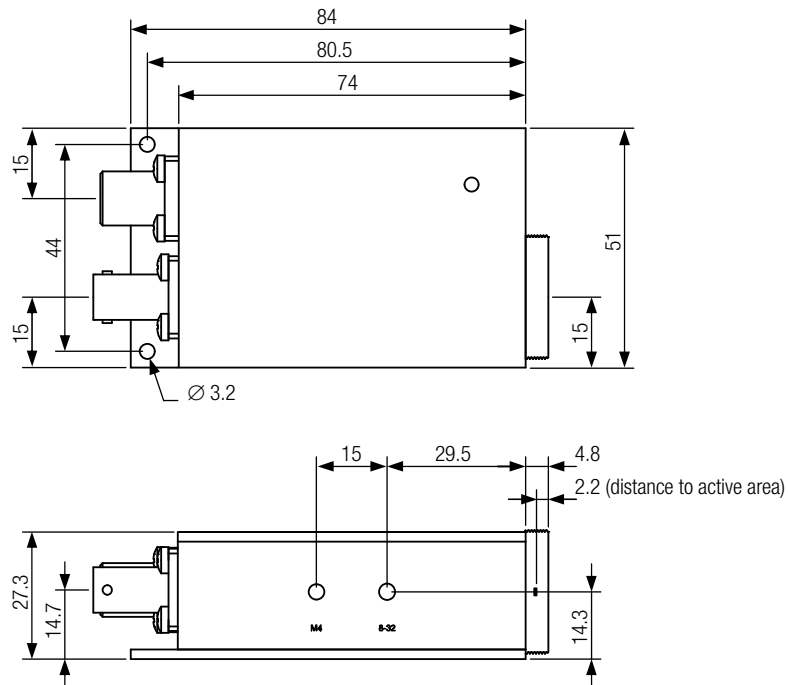
Spectral Response



DB-Sens-FWPR-20-IN\_R01

Dimensions

FWPR-20-IN-FST (1.035"-40 threaded free space input)



FWPR-20-IN-FST\_R2

all dimensions in mm unless otherwise noted

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