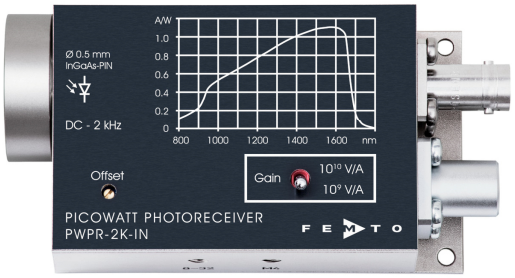
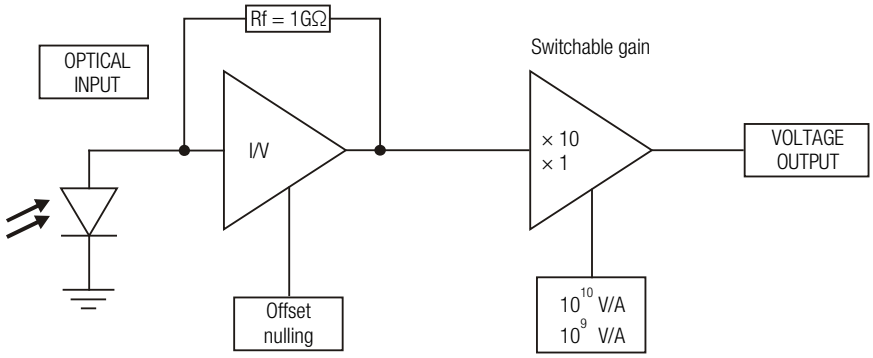
Ultra-Low Noise 2 kHz Photoreceiver with InGaAs-PIN Photodiode



Features	• **InGaAs-PIN photodiode, 0.5 mm active diameter** • **Bandwidth DC – 2 kHz** • **Amplifier transimpedance gain switchable 1.0 × 10^9 V/A, 1.0 × 10^{10} V/A** • **Spectral range 900 – 1700 nm** • **Ultra-low noise, NEP 10 fW/√Hz** • **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	• **Spectroscopy, reflection and transmission measurements** • **Highly sensitive optoelectronic measurements** • **Applications utilizing optical chopper modulation** • **Optical front-end for oscilloscopes, A/D converters and lock-in amplifiers**
Block Diagram	 BS01-PWPR_R01
Intended Use	The PWPR-2K-IN is a ultra-low noise variable gain photoreceiver. It is designed for fast and precise conversion of small optical signals into equivalent output voltages. Operation is mostly self-explanatory. If in doubt, consult this document or contact 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.

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Available Version	PWPR-2K-IN-FST	1.035"-40 threaded flange with internally threaded coupler ring (outer diameter 30 mm) for free space applications, compatible with many optical standard accessories Optionally available: Fiber adapters PRA-FC, PRA-FCA and PRA-FSMA, with the relative large 0.5 mm dia. photodiode installed in the PWPR-2K-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
Related Model	PWPR-2K-SI-FST	Si-PIN, ∅ 1.2 mm, 320 - 1060 nm free space input, 1.035"-40 threaded flange
Available Accessories	PRA-FC PRA-FCA PRA-FSMA	Fiber-adapter with external 1.035"-40 thread (suitable for FST models only)
	PRA-PAP	Alternative mounting option: post adapter plate, easy to mount on FEMTO photoreceiver series OE, FWPR, PWPR, HCA-S and LCA-S
	PS-15-25-L	Power Supply input: 100 – 240 VAC output: ±15 VDC

Specifications	Test conditions	$V_S = \pm 15$ V, $T_A = 25$ °C, output load impedance 1 MΩ, warm-up 20 minutes (min. 10 minutes recommended)
Gain	Transimpedance gain	1.0×10^9 V/A, 1.0×10^{10} V/A, switchable (@ output load ≥ 100 kΩ)
	Gain accuracy	±1 % (electrical)
	Conversion gain	1.1×10^9 V/W, 1.1×10^{10} V/W typ. (@ 1580 nm, output load ≥ 100 kΩ)
Frequency Response	Lower cut-off frequency	DC
	Upper cut-off frequency (–3 dB)	2 kHz
Time Response	Rise/fall time (10 % – 90 %)	165 µs
Input	Input offset current (dark current)	0.6 pA typ.
	Input offset current drift	factor 2 / 10 °C
	Input offset compensation range	±120 pA (adjustable by offset potentiometer)
	Optical saturation power	9.1 nW (@ 10^9 V/A, 1580 nm) 0.91 nW (@ 10^{10} V/A, 1580 nm)
	NEP	10 fW/√Hz (@ 1580 nm, 100 Hz)

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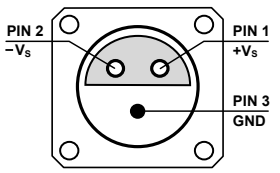
Specifications (continued)		
Detector	Detector	InGaAs-PIN photodiode
	Active area	∅ 0.5 mm
	Spectral range	900 – 1700 nm
	Max. sensitivity	1.1 A/W typ. (@ 1580 nm)
Output	Output voltage range	–1.2 V ... +10 V (@ ≥ 100 kΩ output load)
	Output impedance	50 Ω (terminate with ≥ 100 kΩ load)
	Max. output current	30 mA (short-circuit proof)
	Output noise	0.75 mV RMS (5 mV peak-peak) typ. (@ 10^9 V/A, ≥ 100 kΩ load, no signal on detector, measurement bandwidth 8 KHz)
Optical Input Connector	Material FST flange	1.4305 stainless steel, nickel-plated
	Material FST coupler ring	1.4305 stainless steel, glass bead blasted
Power Supply	Supply voltage	±15 V (±14.5 V ... ±16.5 V)
	Supply current	+32 mA / –25 mA (depends on operating conditions, recommended power supply capability min. ±100 mA)
Case	Weight	220 g (0.49 lbs) PWPR-2K-IN-FST incl. coupler ring
	Material	AlMg4.5Mn, nickel-plated
Temperature Range	Storage temperature	–30 °C ... +85 °C
	Operating temperature	0 °C ... +50 °C
Absolute Maximum Ratings	Optical input power (CW)	10 mW
	Power supply voltage	±20 V
Connectors	Input	1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories
	Output	BNC jack (female)
	Power supply	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	PWPR-2K-IN, internally threaded coupler ring, LEMO® 3-pin connector, datasheet, transport package
Ordering Information	PWPR-2K-IN-FST 1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories

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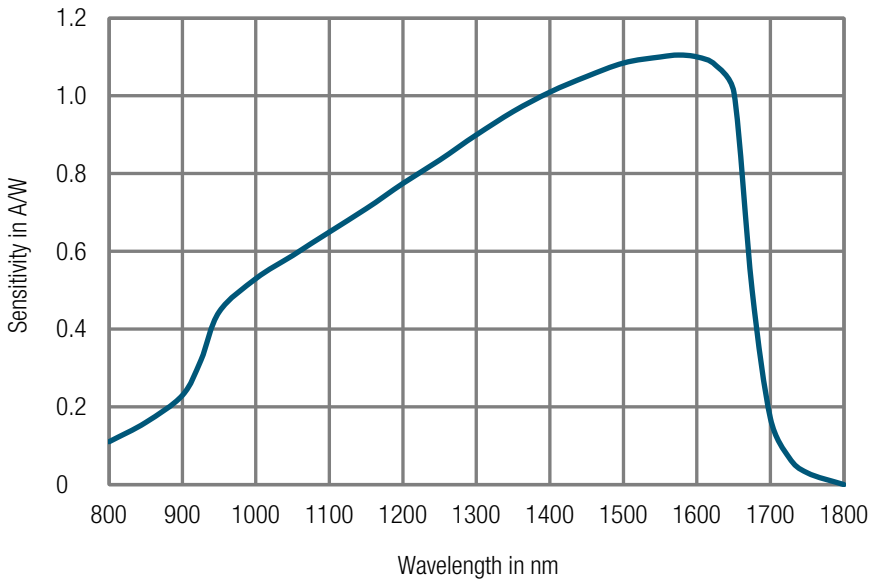
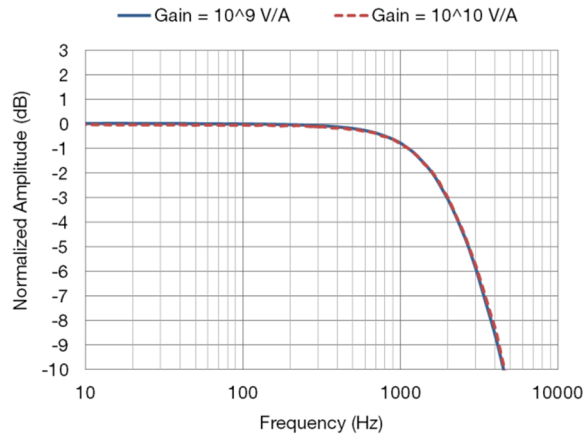
Spectral Responsivity



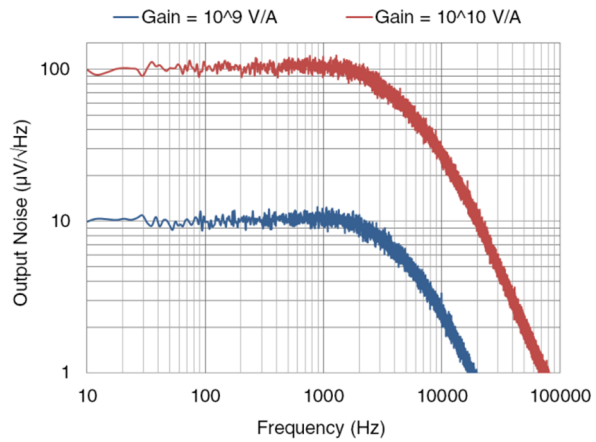
DB-Sens-PWPR-2K-IN_R02

Typical Performance Characteristics

Frequency Response



Output Noise



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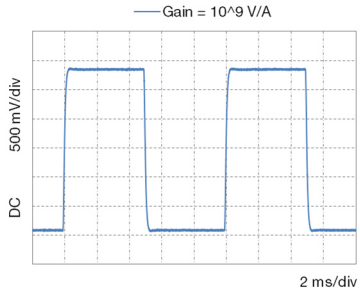
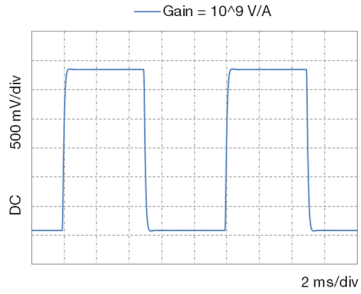
Typical Performance Characteristics (continued)

Step Signal Response @ 2500 pW (p-p, 1550 nm)

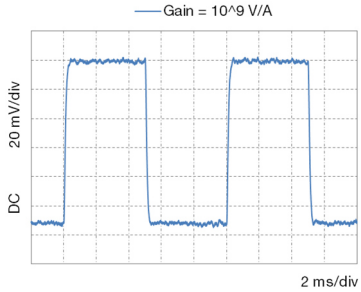


acquisition without averaging

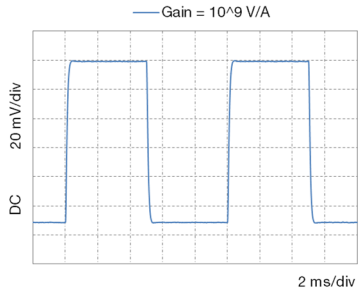


acquisition with 64x averaging

Step Signal Response @ 100 pW (p-p, 1550 nm)

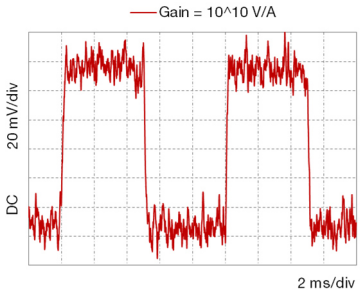


acquisition without averaging

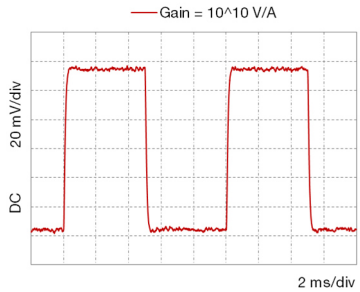


acquisition with 64x averaging

Step Signal Response @ 10 pW (p-p, 1550 nm)



acquisition without averaging



acquisition with 64x averaging

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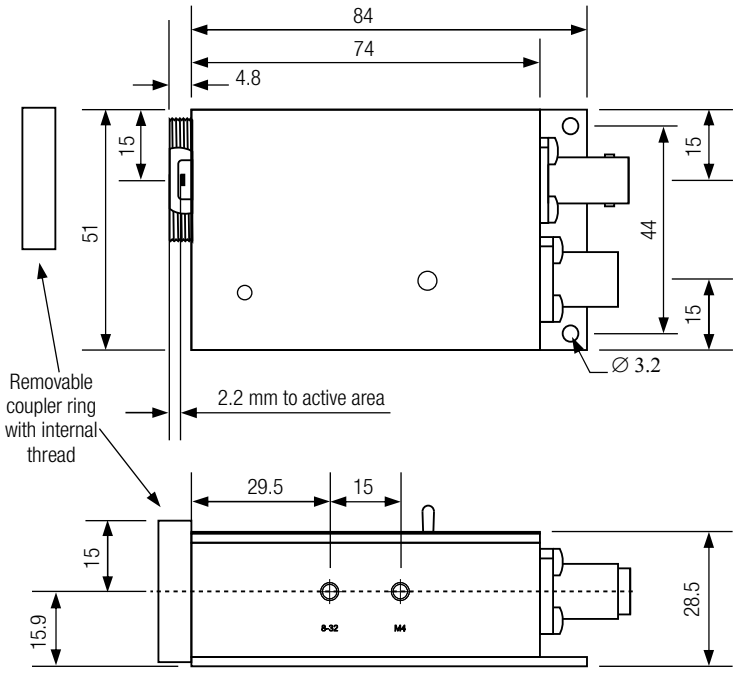
Dimensions

PWPR-2K-IN-FST



DZ-PWPR-2K-FST_R02

all dimensions in mm unless otherwise noted

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