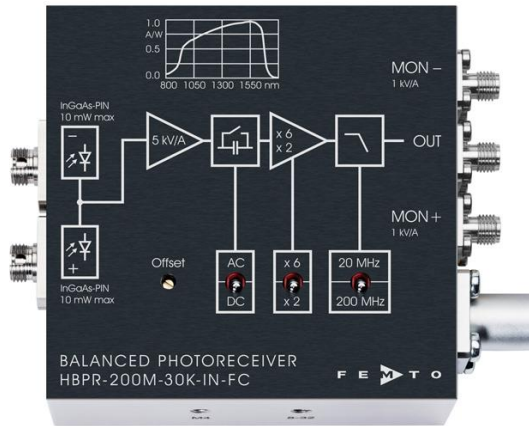


# High-Speed Balanced Photoreceiver



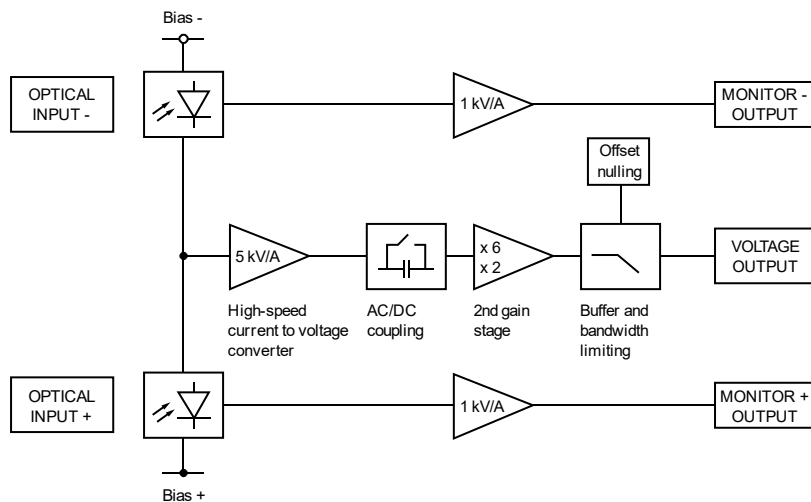
Features

- Bandwidth DC to 200 MHz
- Common-Mode Rejection Ratio (CMRR) 50 dB typ.
- InGaAs-PIN photodiodes
- FC fiber optic inputs
- Spectral range 900 - 1700 nm
- Very low NEP, down to 4.1 pW/√Hz
- Transimpedance gain switchable 10 x 10<sup>3</sup> V/A, 30 x 10<sup>3</sup> V/A
- High dynamic input range up to 2 x 10 mW balanced optical power
- Fast monitor outputs with 10 MHz bandwidth and 1 x 10<sup>3</sup> V/A gain
- Switchable low pass filter for minimizing wideband noise
- UNC 8-32 and M4 tapped holes for mounting on standard posts with metric and imperial thread

Applications

- Spectroscopy
- Heterodyne detection
- Optical coherence tomography (OCT)
- Optical delay measurement
- Differential optical front-end for oscilloscopes, spectrum analyzers, A/D converters and RF lock-in amplifiers

Block Diagram



## High-Speed Balanced Photoreceiver

Available Input Version

HBPR-200M-30K-IN-FC



fix/permanent FC fiber connector for high coupling efficiency, excellent conversion gain accuracy and common mode rejection ratio (CMRR).

Related Models

Various free space or fiber coupled HBPR models, with bandwidth up to 500 MHz, in the spectral range from 320 nm to 1700 nm are available.

Example: FST input



1.035"-40 threaded flange for free space applications, compatible with many optical standard accessories.

See further information and separate datasheets on [www.femto.de](http://www.femto.de)

Available Accessory

PS-15



power supply, input: 100 - 240 VAC, output:  $\pm 15$  VDC, +400/-250 mA

Specifications

Test conditions

$V_S = \pm 15$  V,  $T_A = 25$  °C, signal output terminated with 50  $\Omega$ , Monitor outputs terminated with 1 M $\Omega$

Gain

Transimpedance gain

10 x 10<sup>3</sup> V/A (2<sup>nd</sup> gain x2), 30 x 10<sup>3</sup> V/A (2<sup>nd</sup> gain x6) switchable (@ 50  $\Omega$  load)

Gain accuracy

$\pm 1$  % electrical

Conversion gain

9.5 x 10<sup>3</sup> V/W typ. (@ 2<sup>nd</sup> gain x2, 1550 nm)  
28.5 x 10<sup>3</sup> V/W typ. (@ 2<sup>nd</sup> gain x6, 1550 nm)

Common mode rejection ratio (CMRR)

55 dB typ. (f  $\leq$  100 MHz)  
50 dB typ. (f  $\leq$  200 MHz)

Frequency Response

Lower cut-off frequency

DC / 10 Hz, switchable

Upper cut-off frequency

200 MHz, switchable to 20 MHz

Time Response

Rise/fall time (10 % - 90 %)

1.75 ns  
17.5 ns (low pass filter 20 MHz)

Input

Noise equivalent power (NEP)

minimum 4.1 pW/ $\sqrt{\text{Hz}}$  (@ 1550 nm)  
4.4 pW/ $\sqrt{\text{Hz}}$  (@ 1550 nm, 20 MHz)  
8.7 pW/ $\sqrt{\text{Hz}}$  (@ 1550 nm, 100 MHz)  
13.0 pW/ $\sqrt{\text{Hz}}$  (@ 1550 nm, 200 MHz)

Maximum differential CW power for linear amplification

105  $\mu\text{W}$  (@ 2<sup>nd</sup> gain x2, DC-coupled, 1550 nm)  
35  $\mu\text{W}$  (@ 2<sup>nd</sup> gain x6, DC-coupled, 1550 nm)  
350  $\mu\text{W}$  (@ AC-coupled, 1550 nm)

Max. optical CW balanced power (common mode power)

10 mW (on each photodiode, @ 1550 nm)

Monitor optical saturation power (limited for linear amplification)

10.5 mW (@ 1550 nm)

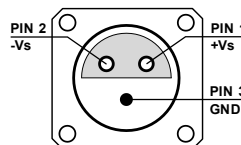
High-Speed Balanced Photoreceiver

Specifications (continued)		
Detector	Detector	InGaAs-PIN photodiode FC fiber connector
	Active area	Ø 80 µm, integrated ball lens suitable for fibers up to 50 µm core diameter
	Spectral range	900 - 1700 nm
	Sensitivity	0.95 A/W typ. (@ 1550 nm)
Signal Output	Output voltage range	±1.0 V (@ 50 Ω load) for linear operation and low harmonic distortion
	Max. output voltage	±2.0 V (@ 50 Ω load)
	Offset voltage compensation	±100 mV typ., adjustable by offset potentiometer
	Output impedance	50 Ω (terminate with 50 Ω load)
	Slew rate	2800 V/µs
	Max. output current	70 mA
	Output return loss S22	-30 dB @ < 100 MHz -20 dB @ < 800 MHz
	Output noise	1.5 mV <sub>RMS</sub> (10 mV <sub>PP</sub> ) (@ 2 <sup>nd</sup> gain x2) 4.4 mV <sub>RMS</sub> (29 mV <sub>PP</sub> ) (@ 2 <sup>nd</sup> gain x6) 0.3 mV <sub>RMS</sub> (1.8 mV <sub>PP</sub> ) typ. (@ 2 <sup>nd</sup> gain x2, BW: 20 MHz) 0.7 mV <sub>RMS</sub> (4.5 mV <sub>PP</sub> ) typ. (@ 2 <sup>nd</sup> gain x6, BW: 20 MHz) (@ 50 Ω load, no signal on detectors, measurement bandwidth 2 GHz)
Monitor Outputs	Monitor output gain	1 x 10 <sup>3</sup> V/A (@ ≥ 100 kΩ load)
	Monitor output voltage range	0 ... +10 V (@ ≥ 100 kΩ load)
	Monitor output impedance	50 Ω (terminate with ≥ 100 kΩ load)
	Monitor output max. output current	30 mA typ.
	Monitor output bandwidth	DC ... 10 MHz
	Monitor output noise	0.6 mV <sub>RMS</sub> (4 mV <sub>PP</sub> ) (@ 100 kΩ load, no signal on detectors, measurement bandwidth 200 MHz)
Power Supply	Supply voltage	±15 V (±14.5 V ... ±16.5 V)
	Supply current	-90 / +120 mA (depends on operating conditions, recommended power supply capability min. ±200 mA)
Case	Weight	350 g (0.77 lbs)
	Material	AlMg3Mn, nickel-plated
Temperature Range	Storage temperature	-40 ... +85 °C
	Operating temperature	0 ... +60 °C
Absolute Maximum Ratings	Max. CW power (averaged)	12 mW (on each photodiode)
	Power supply voltage	±20 V

### High-Speed Balanced Photoreceiver

Connectors

Input FC fiber optic connector (FC/PC and FC/APC compatible)  
 Output SMA 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

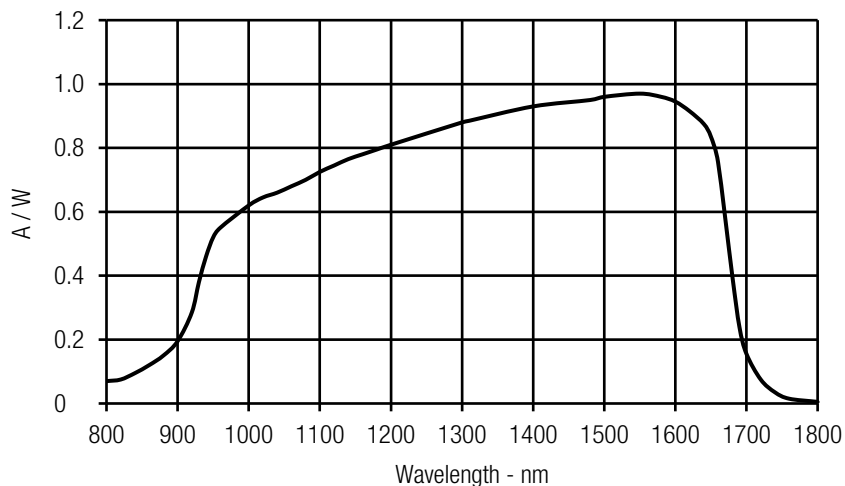
Scope of Delivery

HBPR-200M-30K-IN-FC, Lemo® 3-pin connector, 3 x adapter SMA (male) to BNC (female), datasheet

Ordering Information

HBPR-200M-30K-IN-FC FC fiber optic connector (FC/PC and FC/APC compatible)

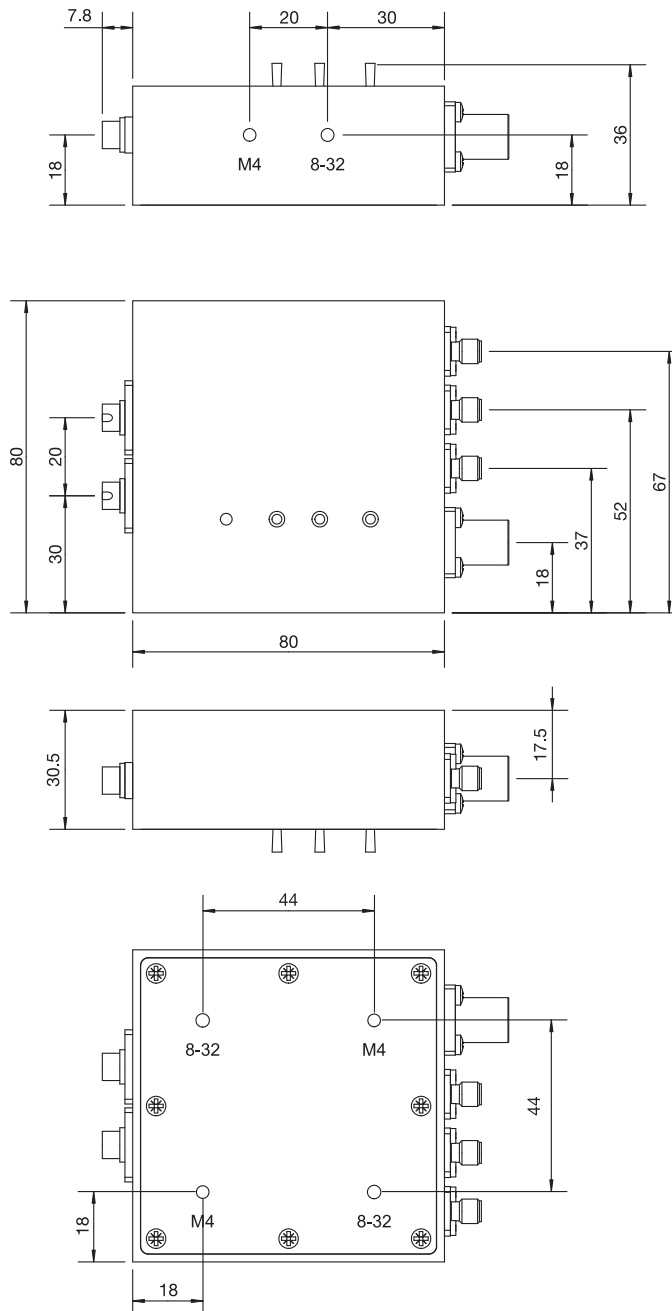
Spectral Responsivity



# High-Speed Balanced Photoreceiver

Dimensions

Case dimensions for HBPR-200M-30K-IN-FC:



All measures in mm unless otherwise noted.

The bottom plate may be rotated to match the appropriate mounting thread to the optical axis by unscrewing the 8 screws.

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