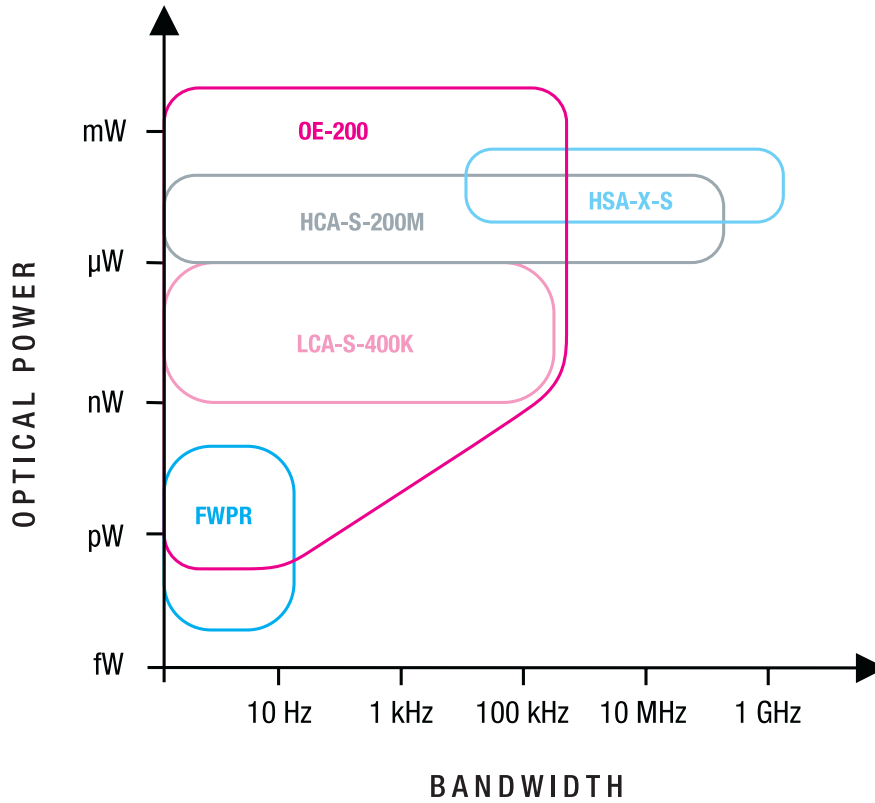


FEMTO[®] PHOTORECEIVER OVERVIEW 2005



S O P H I S T I C A T E D T O O L S F O R S I G N A L R E C O V E R Y

F E M T O[®]



Model	Spectral Range	Calibration Wavelength	Bandwidth (-3 dB)	Min. Rise Time (10% - 90%)	Max. Conversion Gain	Min. NEP
FWPR-20-SI	320 ... 1100 nm	-	DC ... 20 Hz	18 ms	0.6×10^{12} V/W	0.7 fW/√Hz
FWPR-20-IN	900 ... 1700 nm	-	DC ... 20 Hz	18 ms	9.5×10^{10} V/W	7.5 fW/√Hz
LCA-S-400K-SI	400 ... 1100 nm	-	DC ... 400 kHz	1 μs	6.2×10^8 V/W	130 fW/√Hz
LCA-S-400K-IN	900 ... 1700 nm	-	DC ... 400 kHz	1 μs	9.5×10^8 V/W	75 fW/√Hz
OE-200-SI	320 ... 1060 nm	830 nm	DC ... 500 kHz	700 ns	1.0×10^{11} V/W	10 fW/√Hz
OE-200-UV	190 ... 1000 nm	830 nm	DC ... 500 kHz	700 ns	1.0×10^{11} V/W	17 fW/√Hz
OE-200-IN1	900 ... 1700 nm	1300 nm	DC ... 500 kHz	700 ns	1.0×10^{11} V/W	11 fW/√Hz
OE-200-IN2	900 ... 1700 nm	1550 nm	DC ... 500 kHz	700 ns	1.0×10^{11} V/W	10 fW/√Hz
HCA-S-200M-SI	320 ... 1000 nm	-	DC ... 200 MHz	1.8 ns	1.1×10^4 V/W	12 pW/√Hz
HCA-S-200M-IN	900 ... 1700 nm	-	DC ... 200 MHz	1.8 ns	2.0×10^4 V/W	6 pW/√Hz
HSA-X-S-1G4-SI	320 ... 1000 nm	-	10 kHz ... 1.4 GHz	250 ps	2.5×10^3 V/W	26 pW/√Hz
HSA-X-S-2G-IN	850 ... 1700 nm	-	10 kHz ... 2 GHz	180 ps	4.8×10^3 V/W	14 pW/√Hz

Femtowatt Photoreceiver ■ Series FWPR-20



Model FWPR-20-IN
Post holder and post not included

- Ultra Low Noise: Min. NEP 0.7 fW/√Hz Allows Direct Detection down to 50 fW
- When Combined with Optional Lock-In Amplifier Suitable for Detection of Sub-Femtowatt
- Ultra High Gain Amplifier with Transimpedance of up to 10^{12} V/A

- For Fluorescence Measurements, Spectroscopy, Chromatography, Electrophoresis and as Replacement for Photomultiplier Tubes (PMTs) and Avalanche Photodiodes (APDs)

Model	FWPR-20-SI	FWPR-20-IN
Spectral Range	320 ... 1100 nm	900 ... 1700 nm
Bandwidth (-3 dB)	DC ... 20 Hz	DC ... 20 Hz
Rise Time (10% - 90%)	18 ms	18 ms
Transimpedance Gain	1×10^{12} V/A	1×10^{11} V/A
Max. Conversion Gain	0.6×10^{12} V/W (@ 960 nm)	0.95×10^{11} V/W (@ 1550 nm)
Min. NEP	0.7 fW/√Hz (@ 960 nm)	7.5 fW/√Hz (@ 1550 nm)
Saturation Power	18 pW (@ 960 nm)	110 pW (@ 1550 nm)
Detector	Si, 1.1 x 1.1 mm ²	InGaAs PIN, \varnothing 0.5 mm
Input	Free Space, 25 mm \varnothing Flange	
Output	BNC	
Output Voltage	± 10 V (@ 10 k Ω Load)	
Power Requirements	± 15 V, 15 mA typ.	

Threaded M4 and 8-32 holes for mounting on standard posts. 25 mm \varnothing flange compatible with microbench systems. Offset adjustable by trimpot. Fiber optic input optional. Output short-circuit protected. Power supply via 3-pin LEMO, a mating connector is provided with the device. Optional power supply model PS-15 available. For further information please view the datasheet at www.femto.de.

400 kHz Low Noise Photoreceiver ■ Series LCA-S-400K

- Low Noise: Min. NEP 75 fW/√Hz Allows Detection down to 1 nW
- High Gain: Max. 10^7 V/W
- Broad Wavelength Range: 400 to 1700 nm
- For Spectroscopy, General Purpose Opto-Electronic Measurements and as Optical Front-End for Oscilloscopes, A/D Converters and Lock-In Amplifiers

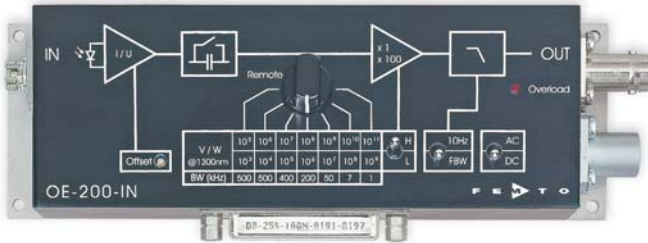
Model	LCA-S-400K-SI	LCA-S-400K-IN
Spectral Range	400 ... 1100 nm	900 ... 1700 nm
Bandwidth (-3 dB)	DC ... 400 kHz	DC ... 400 kHz
Rise Time (10% - 90%)	1 μ s	1 μ s
Transimpedance Gain	1×10^7 V/A	1×10^7 V/A
Max. Conversion Gain	6.2×10^6 V/W (@ 900 nm)	9.5×10^6 V/W (@ 1550 nm)
Min. NEP	130 fW/√Hz (@ 900 nm)	75 fW/√Hz (@ 1550 nm)
Saturation Power	1.6 μ W (@ 900 nm)	1 μ W (@ 1550 nm)
Detector	Si PIN, \varnothing 2.5 mm	InGaAs PIN, \varnothing 0.5 mm
Input	Free Space, 25 mm \varnothing Flange	
Output	BNC	
Output Voltage	± 10 V (@ 10 k Ω Load)	
Power Requirements	± 15 V, 60 mA typ.	

Threaded M4 and 8-32 holes for mounting on standard posts. 25 mm \varnothing flange compatible with microbench systems. Offset adjustable by trimpot. Fiber optic input and AC-coupling optional. Output short-circuit protected. Power supply via 3-pin LEMO, a mating connector is provided with the device. Optional power supply model PS-15 available. For further information please view the datasheet at www.femto.de.



Model LCA-S-400K-SI
Post holder and post not included

Variable Gain Fiber Optic Photoreceiver ■ Series OE-200



Model OE-200-IN

- Variable Gain over 9 Decades Allows Detection of fW to mW
- High Speed: Min. Rise Time 700 ns, Max. Bandwidth 500 kHz
- Wide Dynamic Range: up to 107 dB
- Broad Wavelength Range: 190 to 1700 nm
- NIST Traceable Calibration
- Applications: Fast Optical Power Meter or O/E Converter for the Lab and in Automated Test Systems

Model	OE-200-SI	OE-200-UV	OE-200-IN1	OE-200-IN2
Spectral Range	320 ... 1060 nm	190 ... 1000 nm	900 ... 1700 nm	900 ... 1700 nm
Calibration Wavelength	830 nm	830 nm	1300 nm	1550 nm
Max. Bandwidth (-3 dB)	DC ... 500 kHz	DC ... 500 kHz	DC ... 500 kHz	DC ... 500 kHz
Min. Rise Time (10% - 90%)	700 ns	700 ns	700 ns	700 ns
Conversion Gain Range	10 ³ - 10 ¹¹ V/W	10 ³ - 10 ¹¹ V/W	10 ³ - 10 ¹¹ V/W	10 ³ - 10 ¹¹ V/W
Min. NEP	10 fW/√Hz	17 fW/√Hz	11 fW/√Hz	10 fW/√Hz
Optical Power Input Range	200 fW ... 10 mW -97 dBm ... +10 dBm	400 fW ... 10 mW -94 dBm ... +10 dBm	200 fW ... 10 mW -97 dBm ... +10 dBm	200 fW ... 10 mW -97 dBm ... +10 dBm
Detector	Si PIN, ø 1.2 mm	Si PIN, ø 1.1 x 1.1 mm ²	InGaAs PIN, ø 0.1 mm	InGaAs PIN, ø 0.1 mm
Available Fiber Inputs	FC, ST, SMA	FC, ST, SMA	FC, ST	FC, ST
Output	BNC			
Output Voltage	± 10 V (@ 10 kΩ load)			
Accuracy	Conversion Gain ± 5%, Flatness 0.1 dB, Linearity 1% (P _{opt} < 1 mW)			
Lowpass Filter	Switchable to 10 Hz			
Power Requirements	± 15 V, +150 mA / -100 mA typ.			
Control Interface	5 Opto-Isolated Digital Inputs, TTL/CMOS Compatible, Analog Offset Control Voltage Input			
Case	150 x 55 x 40 mm (L x W x H), Weight 320 g (0.74 lbs)			

Free space optical input optionally available. Offset adjustable by trimpot or external control voltage. LED overload indication. Output short-circuit protected. Power supply via 3-pin LEMO, a mating connector is provided with the device. Optional power supply model PS-15 available. For further information please view the datasheet at www.femto.de.

Power Supply ■ Series PS-15

- Power Supply Compatible with All FEMTO Photoreceivers
- European, US and Asian Version Available
- Short Circuit Protected
- Linear Regulated Design for Low Ripple

Model	PS-15-2-L	PS-15-3-L
Input Voltage	220 - 240 VAC	110 - 130 VAC
Input Plug	Euro Plug, DIN 49464	UL Plug
Output Voltage	± 15 V, + 400 mA, - 250 mA on LEMO Series 1S, 3-pin Plug	
Max. Ripple	20 mV p-p	



Model PS-15-2-L

200 MHz High Speed Photoreceiver ■ Series HCA-S-200M



Model HCA-S-200M-IN
Post holder and post not included

- High Speed: Min. Rise Time 1.8 ns
- Low Noise: Min. NEP 6 pW/√Hz Allows Detection down to 1 μW
- High Gain: Max. 2×10^4 V/W
- Applications: Spectroscopy, Optical Triggering, Fast Pulse and Transient Measurements

Model	HCA-S-200M-SI	HCA-S-200M-IN
Spectral Range	320 ... 1000 nm	900 ... 1700 nm
Bandwidth (-3 dB)	DC ... 200 MHz	DC ... 200 MHz
Rise Time (10% - 90%)	1.8 ns	1.8 ns
Transimpedance Gain	2×10^4 V/A	2×10^4 V/A
Max. Conversion Gain	1.1×10^4 V/W (@ 800 nm)	2×10^4 V/W (@ 1550 nm)
Min. NEP	12 pW/√Hz (@ 800 nm)	6 pW/√Hz (@ 1550 nm)
Saturation Power	70 μW (@ 800 nm)	40 μW (@ 1550 nm)
Detector	Si PIN, Ø 0.8 mm	InGaAs PIN, Ø 0.3 mm
Input	Free Space, 25 mm Ø Flange	
Output	50 Ω, BNC	
Output Voltage	± 0.7 V (@ 50 Ω Load)	
Power Requirements	± 15 V, 85 mA typ.	

Threaded M4 and 8-32 holes for mounting on standard posts. 25 mm Ø flange compatible with microbench systems. Offset adjustable by trimpot. Fiber optic input optional. Output short-circuit protected. Power supply via 3-pin LEMO, a mating connector is provided with the device. Optional power supply model PS-15 available. For further information please view the datasheet at www.femto.de.

2 GHz High Speed Photoreceiver ■ Series HSA-X-S

- High Gain: Max. 4.8×10^3 V/W
- High Speed: Min. Rise Time 180 ps
- Low Noise: Min. NEP 14 pW/√Hz Allows Detection down to 10 μW
- Ideal for Fast Pulse and Transient Measurements

Model	HSA-X-S-1G4-SI	HSA-X-S-2G-IN
Spectral Range	320 ... 1000 nm	850 ... 1700 nm
Bandwidth (-3 dB)	10 kHz ... 1.4 GHz	10 kHz ... 2 GHz
Rise Time (10% - 90%)	250 ps	180 ps
Transimpedance Gain	5×10^3 V/A	5×10^3 V/A
Max. Conversion Gain	2.5×10^3 V/W (@ 760 nm)	4.8×10^3 V/W (@ 1550 nm)
Min. NEP	26 pW/√Hz (@ 760 nm)	14 pW/√Hz (@ 1550 nm)
Saturation Power	400 μW (@ 760 nm)	240 μW (@ 1550 nm)
Detector	Si PIN, eff. Ø 0.8 mm	InGaAs PIN, eff. Ø 0.2 mm
Input	Free Space, 25 mm Ø Flange	
Output	50 Ω, SMA	
Output Voltage	2 V p-p (@ 50 Ω Load)	
Power Requirements	+ 15 V, 130 mA typ.	

Threaded M4 and 8-32 holes for mounting on standard posts. 25 mm Ø flange compatible with microbench systems. Model with fiber optic input or DC monitor output optionally available. Output short-circuit protected. Power supply via 3-pin LEMO, a mating connector is provided with the device. Optional power supply model PS-15 available. For further information please view the datasheet at www.femto.de.



Model HSA-X-S-1G4-SI
Post holder and post not included

This Short Form Catalog has been compiled to provide an overview of the photoreceiver products available from FEMTO®.

Detailed datasheets are available for each product listed here. Please visit the datasheet download service at our web site www.femto.de.

In addition to our photoreceivers we also offer a large variety of signal amplifiers, professional custom-designed modules and complete solutions for measurement systems. Please call us for details.

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