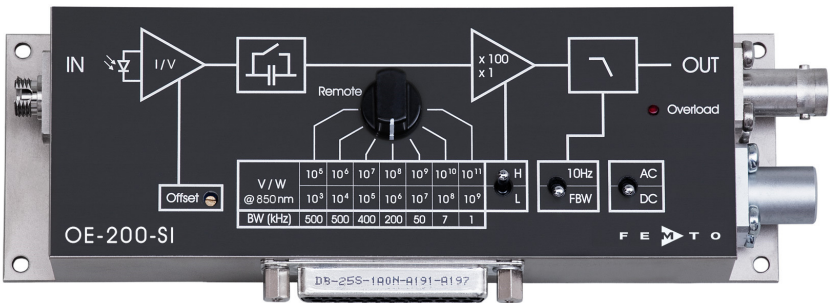


Datasheet

OE-200-SI

Variable Gain Photoreceiver –
Fast Optical Power Meter



The picture shows model OE-200-SI-FC with fiber optic input.

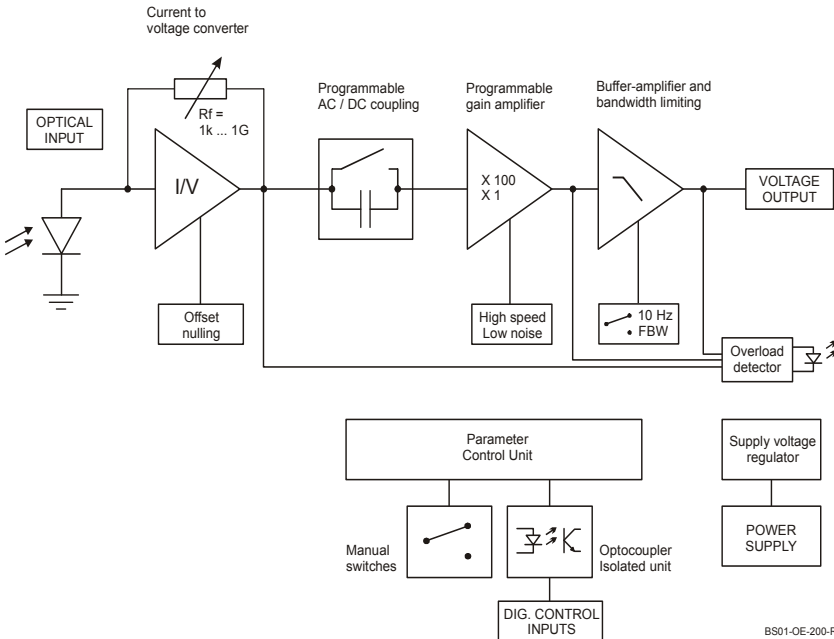
Features

- Si-PIN detector, active diameter 1.2 mm
- Spectral range 320 - 1060 nm
- Very low noise, NEP down to 8 fW/√Hz
- Bandwidth up to 500 kHz
- Conversion gain adjustable from 1 x 10³ up to 1 x 10¹¹ V/W
- Optical free-space input 1.035"-40 threaded, alternatively 25 mm diameter unthreaded
- Fiber optic input available as screw-on adapter (1.035"-40) and as permanently mounted FC-input (for calibrated precision measurements)
- Factory calibrated at 850 nm (fiber optic FC version only)
- Full manual and remote control capability

Applications

- All-purpose very low-noise photoreceiver (O/E converter)
- Time resolved optical pulse and power measurements
- Optical front-end for oscilloscopes, spectrum analyzers, A/D converters and lock-in amplifiers
- Fast fiber optic power meter

Block Diagram



Variable Gain Photoreceiver – Fast Optical Power Meter

Available Versions

OE-200-SI-FST



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.

Optional: Fiber adapters PRA-FC and PRA-FSMA



OE-200-SI-FS



25 mm dia. unthreaded flange for free space applications compatible with many optical standard accessories.

OE-200-SI-FC



fix/permanent FC fiber connector for highest coupling efficiency and best conversion gain accuracy ($\pm 5\%$)

Since illumination conditions with the permanently mounted fiber optic connector are well defined, the FC model is delivered with a factory calibrated conversion gain at 850 nm.

The electro optical conversion gain factors of the FST and FS free space models are set to fit nominally at 850 nm.

Variable Gain Photoreceiver – Fast Optical Power Meter

Related OE-200 Models

@ 850 nm

See separate datasheets for following models on www.femto.de:

OE-200-UV-FST	Si-PIN, 1.1 x 1.1 mm ² , 190 - 1000 nm free space input, 1.035"-40 threaded flange
OE-200-UV-FS	Si-PIN, 1.1 x 1.1 mm ² , 190 - 1000 nm free space input, 25 mm dia. unthreaded flange
OE-200-UV-FC	Si-PIN, 1.1 x 1.1 mm ² , 190 - 1000 nm FC fiber connector (fix/permanent)

@ 1310 nm

OE-200-IN1-FST	InGaAs-PIN, Ø 300 µm, 900 - 1700 nm free space input, 1.035"-40 threaded flange
OE-200-IN1-FS	InGaAs-PIN, Ø 300 µm, 900 - 1700 nm free space input, 25 mm dia. unthreaded flange
OE-200-IN1-FC	InGaAs-PIN, integrated ball lens, 900 - 1700 nm FC fiber connector (fix/permanent)

@ 1550 nm

OE-200-IN2-FST	InGaAs-PIN, Ø 300 µm, 900 - 1700 nm free space input, 1.035"-40 threaded flange
OE-200-IN2-FS	InGaAs-PIN, Ø 300 µm, 900 - 1700 nm free space input, 25 mm dia. unthreaded flange
OE-200-IN2-FC	InGaAs-PIN, integrated ball lens, 900 - 1700 nm FC fiber connector (fix/permanent)

OE-200-S customized versions available on request

Available Accessories

PRA-FSMA
PRA-FC



fiber-adapter with external
1.035"-40 thread

PRA-PAP



post adapter plate,
easy to mount on
FEMTO photoreceiver series OE,
FWPR, PWPR, HCA-S and LCA-S

PS-15-25-L

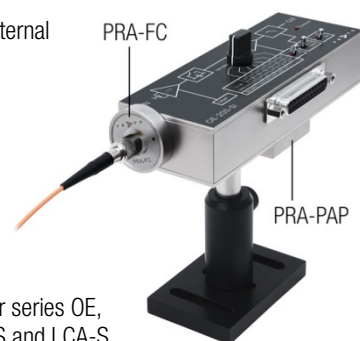


power supply,
input: 100 - 240 VAC,
output: ±15 VDC

LUCI-10



compact digital I/O interface for USB remote control,
supports opto-isolation of amplifier signal path from PC
USB port, 16 digital outputs, 3 opto-isolated digital inputs,
bus-powered operation



Variable Gain Photoreceiver – Fast Optical Power Meter

Specifications	Test conditions	$V_s = \pm 15 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$, output load impedance $1 \text{ M}\Omega$	
Gain	Conversion gain	$1 \times 10^3 \dots 1 \times 10^{11} \text{ V/W}$ (@ 850 nm , output load $\geq 100 \text{ k}\Omega$)	
	Gain accuracy	$\pm 1 \%$ electrical, between settings	
	Conversion gain accuracy	OE-200-SI-FST/FS (@ $P_{\text{OPT}} \leq 2 \text{ mW}$, 850 nm) free space	$\pm 15 \%$ nominal
		OE-200-SI-FST (@ $P_{\text{OPT}} \leq 2 \text{ mW}$, 1550 nm) with fiber adapter (PRA series)	$\pm 15 \%$ nominal
		OE-200-SI-FC (@ $P_{\text{OPT}} \leq 1 \text{ mW}$, 850 nm) fixed fiber input connector	$\pm 5 \%$ guaranteed by factory calibration*
* Factory verified with MM 50/125, FC/APC, NA 0.22 (when using FC/PC fiber connector, coupling efficiency may differ slightly.) Coupling efficiency depends on fiber type.			
	Gain drift	see table below	
Frequency Response	Lower cut-off frequency	DC / 1 Hz , switchable	
	Upper cut-off frequency (-3dB)	up to 500 kHz (see table below), switchable to 10 Hz	
Detector	Detector type	Si-PIN photodiode	
	Active area	$\varnothing 1.2 \text{ mm}$	
	Spectral range	$320 - 1060 \text{ nm}$	
	Sensitivity	0.61 A/W (@ 850 nm)	
		0.64 A/W (@ 900 nm)	
Input	Input offset current (dark current)	2 pA typ.	
	Input offset drift	see table below	
	Input offset compensation range	$\pm 600 \text{ pA}$, adjustable by offset potentiometer or	
		$\pm 400 \text{ pA}$, adjustable by external control voltage	
	Optical CW saturation power	see table below	
	Noise equivalent power (NEP)	see table below	

Variable Gain Photoreceiver – Fast Optical Power Meter

Specifications (continued)

Performance Depending
on Gain Setting

Gain setting (low noise) (V/W)**	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁷	10 ⁸	10 ⁹
Upper cut-off frequency (–3 dB)	500 kHz	500 kHz	400 kHz	200 kHz	50 kHz	7 kHz	1.1 kHz
Rise/fall time (10 % - 90 %)	700 ns	700 ns	900 ns	1.8 µs	7 µs	50 µs	300 µs
NEP (1/√Hz)**	33 pW	3.8 pW	800 fW	240 fW	75 fW	24 fW	8 fW
Measured at	10 kHz	10 kHz	10 kHz	1 kHz	1 kHz	100 Hz	100 Hz
Integr. input noise (RMS)***	39 nW	5 nW	1.3 nW	400 pW	130 pW	17 pW	2.5 pW
Input offset drift (1/°C)**	60 nW	6 nW	0.6 nW	51 pW	5.1 pW	0.8 pW	0.6 pW
Gain drift (1/°C)	0.008%	0.008%	0.008%	0.01%	0.01%	0.01%	0.02%
Optical CW saturation power**	2 mW	1 mW	0.1 mW	10 µW	1 µW	0.1 µW	10 nW

Gain setting (high speed) (V/W)**	10 ⁵	10 ⁶	10 ⁷	10 ⁸	10 ⁹	10 ¹⁰	10 ¹¹
Upper cut-off frequency (–3 dB)	500 kHz	500 kHz	400 kHz	200 kHz	50 kHz	7 kHz	1.1 kHz
Rise/fall time (10 % - 90 %)	700 ns	700 ns	900 ns	1.8 µs	7 µs	50 µs	300 µs
NEP (1/√Hz)**	25 pW	3.5 pW	800 fW	240 fW	76 fW	24 fW	8 fW
Measured at	10 kHz	10 kHz	10 kHz	1 kHz	1 kHz	100 Hz	100 Hz
Integr. input noise (RMS)***	24 nW	3.7 nW	1.1 nW	350 pW	110 pW	16 pW	2.3 pW
Input offset drift (1/°C)**	60 nW	6 nW	0.6 nW	51 pW	5.1 pW	0.8 pW	0.6 pW
Gain drift (1/°C)	0.008%	0.008%	0.008%	0.01%	0.01%	0.01%	0.02%
Optical CW saturation power**	0.1 mW	10 µW	1 µW	0.1 µW	10 nW	1 nW	0.1 nW

** referred to 850 nm

*** The integrated input noise is measured with a shaded input in the full bandwidth ("FBW") setting (referred to 850 nm).

The input referred peak-peak noise can be calculated from the RMS noise as follows:

$$P_{\text{Input noise peak-to-peak}} = P_{\text{Input noise RMS}} \times 6$$

The output noise is given by:

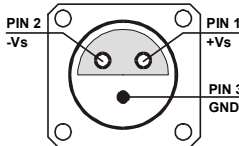
$$U_{\text{Output noise RMS}} = P_{\text{Input noise RMS}} \times \text{gain}$$

$$U_{\text{Output noise peak-to-peak}} = U_{\text{Output noise RMS}} \times 6 = P_{\text{Input noise RMS}} \times \text{gain} \times 6$$

The integrated noise will be reduced considerably by setting the low pass filter to "10 Hz" instead of "FBW". This is especially useful for continuous wave (CW) measurements.

Output	Output voltage range	±10 V (@ ≥100 kΩ output load)
	Max. output current	±30 mA (short-circuit proof)
	Output impedance	50 Ω (terminate with ≥100 kΩ)
Indicator LED	Function	overload
Digital Control	Control input voltage range	LOW bit: –0.8 ... +1.2 V, HIGH bit: +2.3 ... +12 V
	Control input current	0 mA @ 0 V, 1.5 mA @ +5 V, 4.5 mA @ +12 V
	Overload output	nonactive: <0.4 V, @ 0 ... –1 mA active: typ. 5 ... 5.1 V @ 0 ... 2 mA
Ext. Offset Control	Control voltage range	±10 V
	Offset control input impedance	20 kΩ
	Conversion factor	40 pA/V
Power Supply	Supply voltage	±15 V (±14.75 ... ±16.5 V)
	Supply current	+110/–80 mA (depends on operating conditions, recommended power supply capability min. ±200 mA)
	Stabilized power supply output	±12 V, max. 50 mA, +5 V, max. 30 mA
Case	Weight	360 g (0.79 lb)
	Material	AlMg4.5Mn, nickel-plated
Temperature Range	Storage temperature	–40 ... +80 °C
	Operating temperature	0 ... +60 °C

Variable Gain Photoreceiver – Fast Optical Power Meter

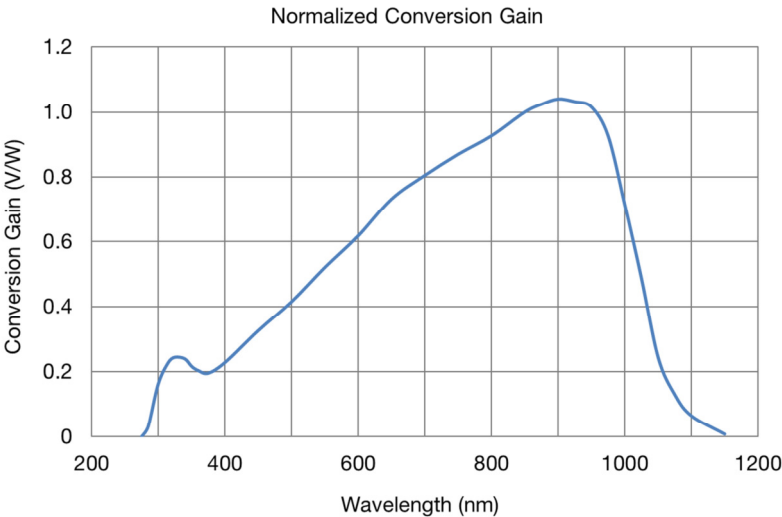
Absolute Maximum Ratings	Optical input power (CW) Digital control input voltage Analog control input voltage Power supply voltage	20 mW –5 V/+16 V relative to digital ground DGND (pin 9) ±15 V relative to analog ground AGND (pin 3) ±20 V
Connectors	Input OE-200-SI-FST 1.035"-40 threaded flange for free space applications OE-200-SI-FS 25 mm unthreaded flange for free space applications OE-200-SI-FC FC fiber optic connector 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  Control port Sub-D 25-pin, female, qual. class 2 Pin 1: +12 V (stabilized power supply output) Pin 2: –12 V (stabilized power supply output) Pin 3: AGND (analog ground for pins 1 - 8) Pin 4: +5 V (stabilized power supply output) Pin 5: overload output: HIGH = overload (referred to pin 3) Pin 6: signal output (connected to BNC) Pin 7: NC Pin 8: input offset control voltage Pin 9: DGND (ground for digital control pins 10 - 14) Pin 10: digital control input: gain, LSB Pin 11: digital control input: gain Pin 12: digital control input: gain, MSB Pin 13: digital control input: AC/DC Pin 14: digital control input: high speed / low noise Pin 15 - 25: NC	
Scope of Delivery	OE-200-SI, internally threaded coupler ring (FST version only), Lemo® 3-pin connector, datasheet, transport package	

Variable Gain Photoreceiver –
Fast Optical Power Meter

Remote Control Operation

General	Remote control input bits are opto-isolated and connected by a logical OR function to the local switch settings. For remote control set the corresponding local switches to “Remote”, “AC” and “H” and select the desired setting via a bit code at the corresponding digital inputs. Mixed operation, e.g. local AC/DC setting and remote controlled gain setting, is also possible. The switch setting “FBW / 10 Hz” of the low pass signal filter is not remote controllable.				
Gain setting	Low noise Gain (V/W) Pin 14=HIGH	High speed Gain (V/W) Pin 14=LOW	Pin 12 MSB	Pin 11	Pin 10 LSB
	10 ³	10 ⁵	LOW	LOW	LOW
	10 ⁴	10 ⁶	LOW	LOW	HIGH
	10 ⁵	10 ⁷	LOW	HIGH	LOW
	10 ⁶	10 ⁸	LOW	HIGH	HIGH
	10 ⁷	10 ⁹	HIGH	LOW	LOW
	10 ⁸	10 ¹⁰	HIGH	LOW	HIGH
	10 ⁹	10 ¹¹	HIGH	HIGH	LOW
Gain settling time	<150 ms				
AC/DC setting	Coupling	Pin 13			
	AC	LOW			
	DC	HIGH			

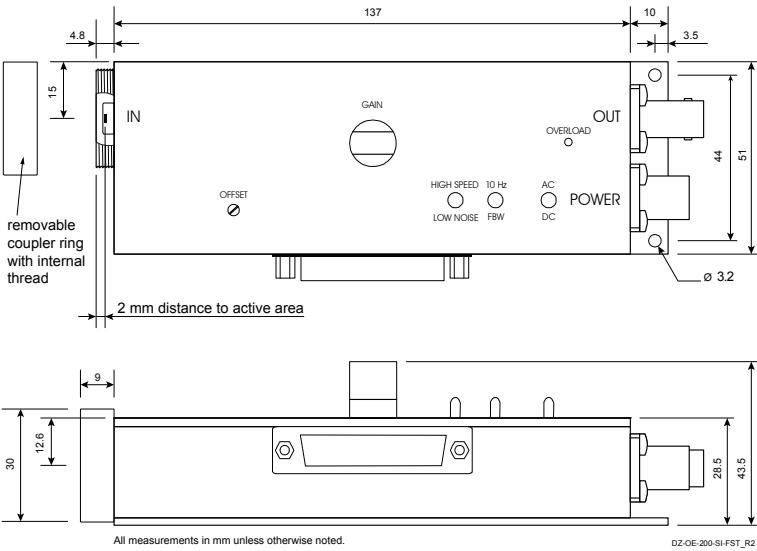
Conversion Gain



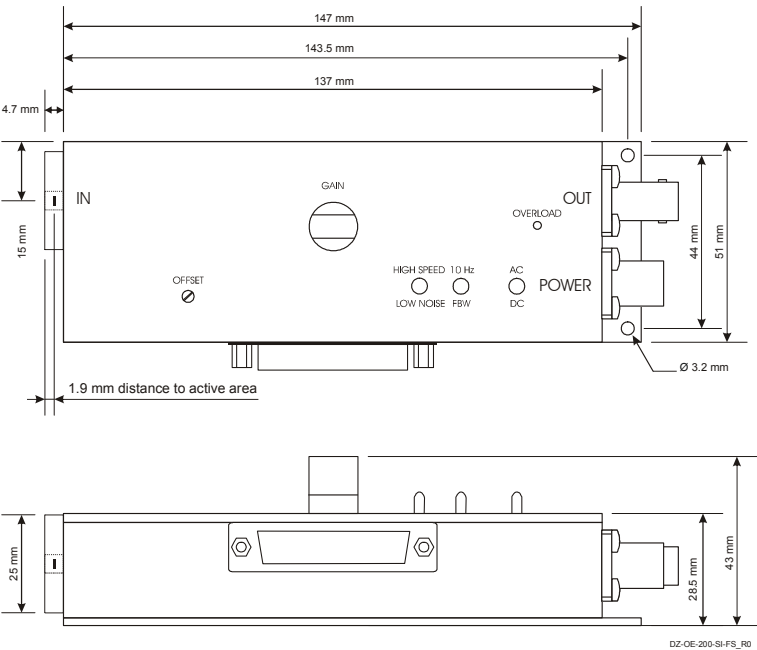
Variable Gain Photoreceiver –
Fast Optical Power Meter

Dimensions

OE-200-SI-FST (1.035"-40 threaded free space input):



OE-200-SI-FS (25 mm dia. unthreaded free space input):

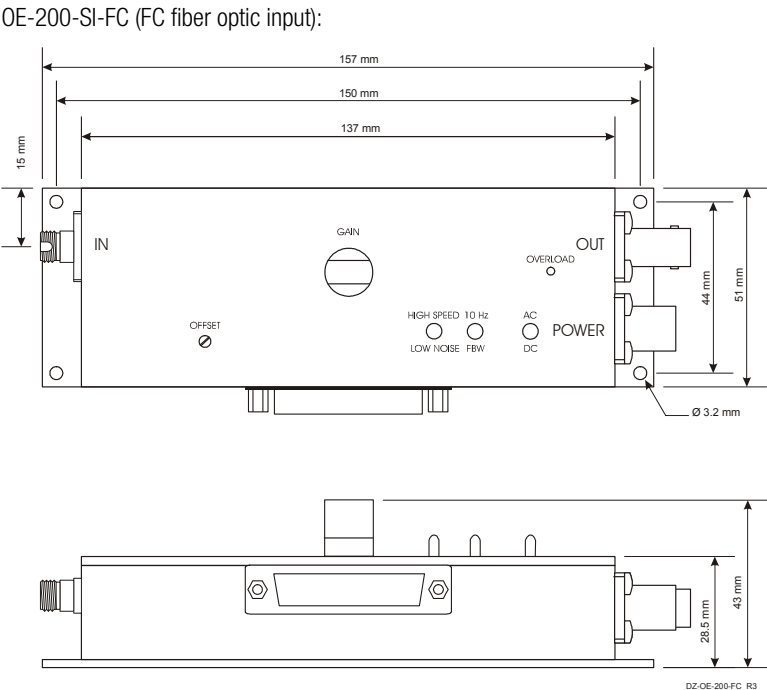


Datasheet

OE-200-SI

Variable Gain Photoreceiver –
Fast Optical Power Meter

Dimensions (continued)



FEMTO Messtechnik GmbH
Klosterstr. 64
10179 Berlin · Germany
Phone: +49 30 280 4711-0
Fax: +49 30 280 4711-11
Email: info@femto.de
www.femto.de

Specifications are subject to change without notice. Information provided herein is believed to be accurate and reliable. However, no responsibility is assumed by FEMTO Messtechnik GmbH for its use, nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of FEMTO Messtechnik GmbH. Product names mentioned may also be trademarks used here for identification purposes only.

© by FEMTO Messtechnik GmbH · Printed in Germany