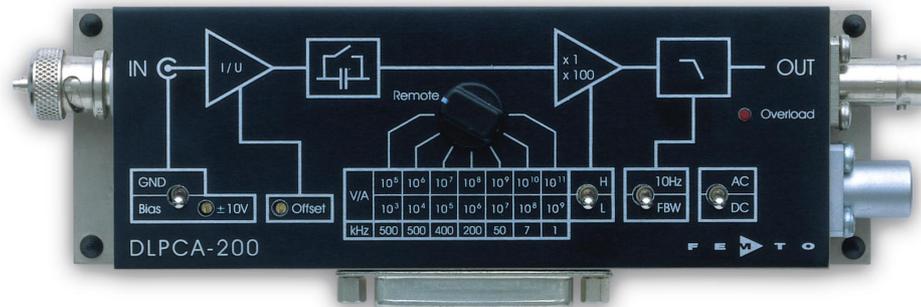


Variable-Gain Low-Noise Current Amplifier

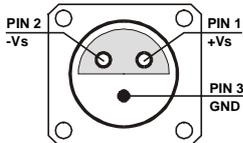


<p>Features</p>	<ul style="list-style-type: none"> • Transimpedance (Gain) switchable from 1×10^3 to 1×10^{11} V/A • Bandwidth DC / 1 Hz ... 500 kHz • Bandwidth switchable to DC ... 10 Hz, for Low-Noise DC Measurements • Bandwidth independent of Detector-Capacitance (up to 1 nF) • BIAS-Voltage adjustable • Protection against ± 3 kV Transients • Local and Remote Control
<p>Applications</p>	<ul style="list-style-type: none"> • Photodiode- and Photomultiplier-Amplifier • Scanning Tunneling Microscopy (STM) • Spectroscopy • Charge-Amplifier • Ionisation Detectors • Preamplifier for Lock-Ins, A/D-Converters, etc.
<p>Block Diagram</p>	

Variable-Gain Low-Noise Current Amplifier

Specifications	<i>Test Conditions</i>	<i>V_s = ± 15 V, T_a = 25°C</i>							
Gain	Transimpedance	1 x 10 ³ ... 1 x 10 ¹¹ V/A							
	Gain Accuracy	± 1 %							
	Gain Drift	See Table							
Frequency Response	Lower Cut-Off Frequency	DC / 1 Hz							
	Upper Cut-Off Frequency	Up to 500 kHz (See Table), switchable to 10 Hz							
	Gain Flatness	± 0.1 dB							
Input	Equ. Input Noise Current	See Table (Value per √Hz, @ 100 Hz)							
	Equ. Input Noise Voltage	4 nV/√Hz (@ 100 Hz)							
	Input Offset Current Drift	See Table							
	Input Bias Current	1 pA							
	Max. Input Current	See Table (Value for linear Amplification)							
	Input Offset Compensation	Adjustable by Offset-Trimmer and external Control Voltage, Max. Value see Table							
Performance depending on Gain Setting	Gain Setting (Low Noise)	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	45 kHz	7 kHz	1.2 kHz	
	Rise / Fall Time (10% - 90%)	700 ns	700 ns	900 ns	1.8 μs	8 μs	50 μs	300 μs	
	Equ. Input Noise Current (/ $\sqrt{\text{Hz}}$)	20 pA	2.3 pA	460 fA	130 fA	43 fA	13 fA	4.3 fA	
	Offset Current Drift (/°C)	30 nA	3 nA	0.3 nA	27 pA	2.5 pA	0.2 pA	60 fA	
	Gain Drift (/°C)	0.008%	0.008%	0.008%	0.01%	0.01%	0.01%	0.02%	
	Max. Input Current (±)	10 mA	1 mA	0.1 mA	10 μA	1 μA	0.1 μA	10 nA	
	Max. Input Offset Compensat. (±)	100 μA	10 μA	1 μA	0.1 μA	10 nA	1 nA	0.1 nA	
	DC Input Impedance (// 5 pF)	50 Ω	50 Ω	50 Ω	60 Ω	150 Ω	1 kΩ	10 kΩ	
	Gain setting (High Speed)	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	45 kHz	7 kHz	1.2 kHz	
	Rise / Fall Time (10% - 90%)	700 ns	700 ns	900 ns	1.8 μs	8 μs	50 μs	300 μs	
	Equ. Input Noise Current (/ $\sqrt{\text{Hz}}$)	13 pA	1.8 pA	450 fA	130 fA	43 fA	13 fA	4.3 fA	
	Offset Current Drift (/°C)	30 nA	3 nA	0.3 nA	27 pA	2.5 pA	0.2 pA	60 fA	
	Gain Drift (/°C)	0.008%	0.008%	0.008%	0.01%	0.01%	0.01%	0.02%	
	Max. Input Current (±)	100 μA	10 μA	1 μA	0.1 μA	10 nA	1 nA	0.1 nA	
	Max. Input Offset Compensation	100 μA	10 μA	1 μA	0.1 μA	10 nA	1 nA	0.1 nA	
	DC Input Impedance (// 5 pF)	50 Ω	50 Ω	50 Ω	60 Ω	150 Ω	1 kΩ	10 kΩ	
	Output	Output Voltage	± 10 V (@10 kΩ Load)						
		Output Impedance	50 Ω						
Max. Output Current		± 30 mA							
Detector Bias	Bias Voltage Range	± 10 V, max. 22 mA, switchable to GND							
Indicator LED	Function	Overload							
Digital Control	Control Input Voltage Range	Low: - 0.8 ... + 1.2 V, High: 2.3 ... + 12 V							
	Control Input Current	0 mA @ 0V, 1.5 mA @ + 5 V, 4.5 mA @ + 12V							
	Overload Output	Non Active: 0 V , max. -1 mA, Active: 5.1 V, max. 7 mA							
Ext. Offset Control	Control Voltage Range	± 10 V							
	Offset Control Input Impedance	20 kΩ							

Variable-Gain Low-Noise Current Amplifier

Power Supply	Supply Voltage $\pm 15\text{ V}$ Supply Current $+ 150 / -100\text{ mA}$ Stabilized Power Supply Output $\pm 12\text{ V}$, max. 150 mA, + 5V, max. 50 mA
Case	Weight 320 gr. (0.74 lbs) Material AlMg4.5Mn, nickel-plated
Temperature Range	Storage Temperature $-40 \dots +100\text{ }^\circ\text{C}$ Operating Temperature $0 \dots +60\text{ }^\circ\text{C}$
Absolute Maximum Ratings	Signal Input Voltage $-16\text{ V} / + 12\text{ V}$ Transient Input Voltage $\pm 3\text{ kV}$ (from 200 pF Source) Control Input Voltage $- 5\text{ V} / + 16\text{ V}$ Power Supply Voltage $\pm 22\text{ V}$
Connectors	Input BNC, Isolated Output BNC Power Supply LEMO Series 1S, 3-pin fixed Socket Pin 1: + 15V Pin 2: - 15V Pin 3: GND <div style="text-align: center;">  </div> Control Port Sub-D 25-pin, female, Qual. Class 2 Pin 1: +12V (Stabilized Power Supply Output) Pin 2: -12V (Stabilized Power Supply Output) Pin 3: AGND (Analog Ground) Pin 4: +5V (Stabilized Power Supply Output) Pin 5: Digital Output: Overload Pin 6: Signal Output (connected to BNC) Pin 7: NC Pin 8: Input Offset Control Voltage Pin 9: DGND (Ground for Digital Control Pin 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

Variable-Gain Low-Noise Current Amplifier

Remote Control Operation

General

Remote Control Input Bits are opto-isolated and connected by logical OR to local switch setting. For remote control, set the corresponding local switch to "Remote", "AC" or "H" (High Speed) and select the wanted setting via a bit-code at the corresponding digital inputs. Mixed operation, e.g. local gain setting and remote controlled AC/DC setting, is also possible.

Switch settings "FBW / 10 Hz" and "Bias / GND" are not remote controllable.

Gain Setting

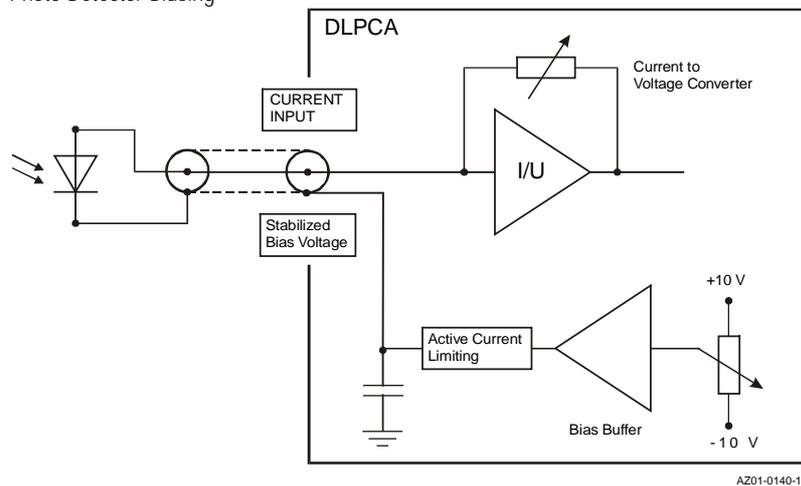
Low Noise Gain (V/A) Pin 14=High	High Speed Gain (V/A) Pin 14=Low	Pin 10 LSB	Pin 11	Pin 12 MSB
10^3	10^5	Low	Low	Low
10^4	10^6	High	Low	Low
10^5	10^7	Low	High	Low
10^6	10^8	High	High	Low
10^7	10^9	Low	Low	High
10^8	10^{10}	High	Low	High
10^9	10^{11}	Low	High	High

AC/DC Setting

Coupling	Pin 13
AC	Low
DC	High

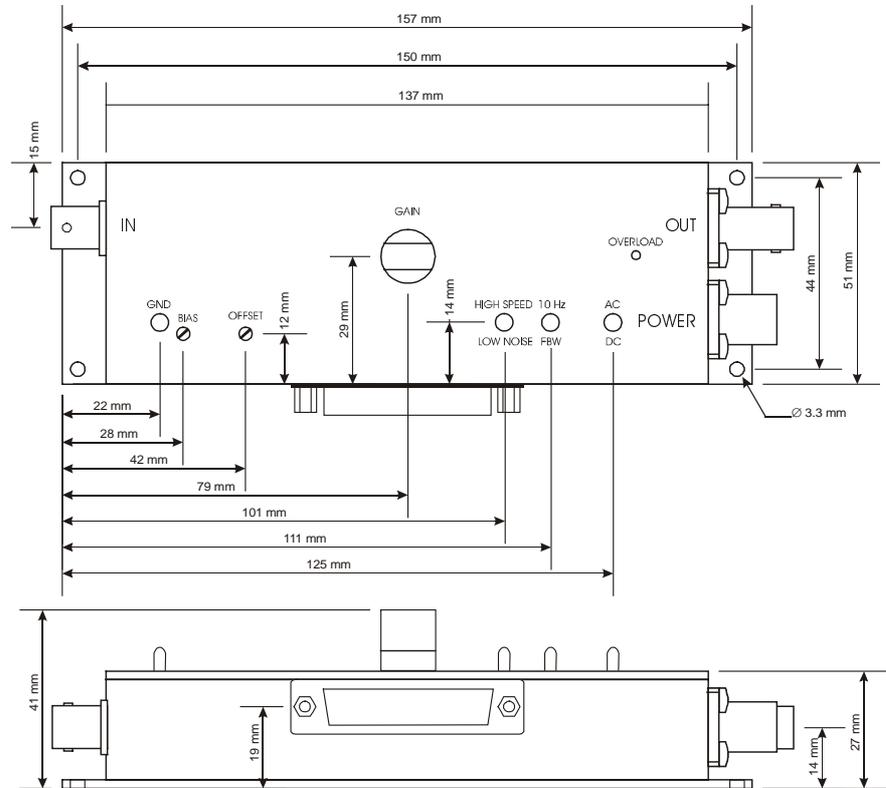
Application Diagram

Photo Detector Biasing



Variable-Gain Low-Noise Current Amplifier

Dimensions



FEMTO Messtechnik GmbH
 Stargarder Str. 7
 D-10437 Berlin · Germany
 Tel.: +49 (0)30 – 4 46 93 86
 Fax: +49 (0)30 – 4 46 93 88
 e-mail: info@femto.de
 http://www.femto.de

Specifications are subject to change without notice. Information furnished 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 granted by implication or otherwise under any 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