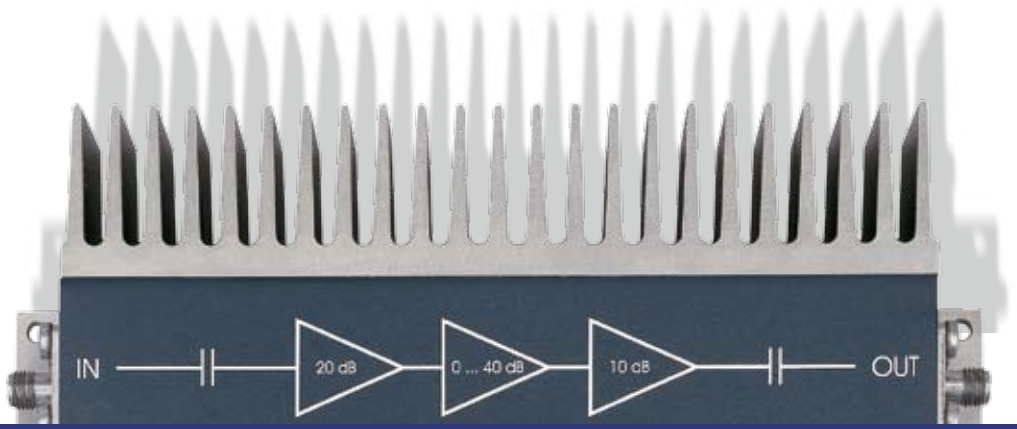
FEMTO® PRODUCT OVERVIEW

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY

FEMTO®



光技術をサポートする
株式会社オプトサイエンス
http://www.optoscience.com

東京本社 〒160-0014 東京都新宿区内藤町１番地 内藤町ビルディング
TEL:03(3356)1064 FAX:03(3356)3466 E-mail:info@optoscience.com
大阪支店 〒532-0011 大阪市淀川区西中島7-7-2 新大阪ビル西館
TEL:06(6305)2064 FAX:06(6305)1030 E-mail:osk@optoscience.com
名古屋営業所 〒450-0002 名古屋市中村区名駅2-37-21 東海ソフトビル
TEL:052(569)6064 FAX:052(569)8064 E-mail:ngo@optoscience.com

FEMTO AMPLIFIER SELECTION GUIDE

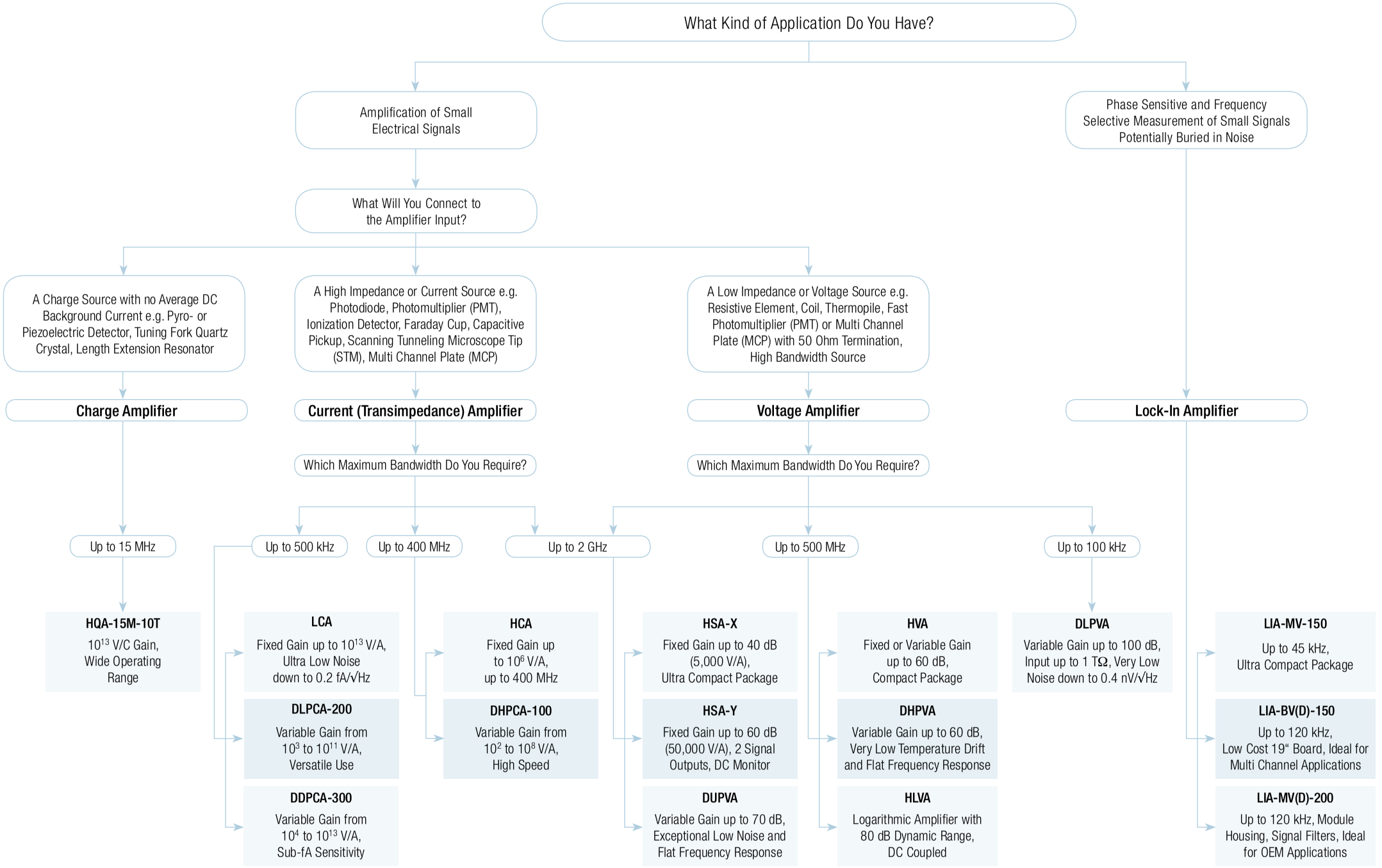


TABLE OF CONTENTS

High Speed Charge Amplifier ■ Model HQA-15M-10T

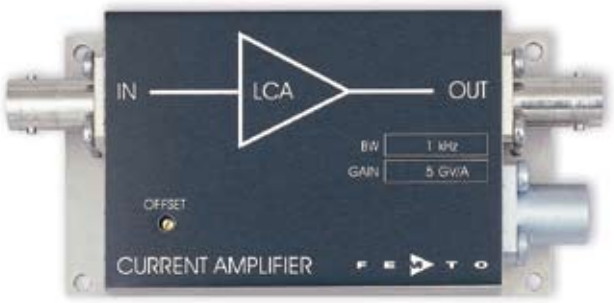
Model HQA-15M-10T

- High Gain of 10 V/pC
- Wide Operating Range from 250 Hz to 15 MHz
- Low Input Noise of 40 x 10^{-21} C/√Hz and 700 pV/√Hz
- Ideal for AC Coupled Charge Sources Like Pyro- and Piezoelectric Detectors, Tuning Fork Quartz Crystals and Length Extension Resonators
- Typical Applications are Atomic Force Microscopy, Optical Measurements and Charged Particle Beam Monitoring

Model	HQA-15M-10T
Charge Gain	10^{13} V/C
Equivalent Current Gain	1.6 x 10^{6} V/A @ 1 MHz Sinusoidal Input Signal
Lower Cut-Off Frequency	250 Hz (AC only)
Upper Cut-Off Frequency	15 MHz
Input Charge Noise	40 x 10^{-21} C/√Hz
Equivalent Input Current Noise	250 fA/√Hz @ 1 MHz Sinusoidal Input Signal
Input Voltage Noise	700 pV/√Hz @ 1 MHz
Input Impedance	1 GΩ // 1 nF
Effective AC Input Impedance	20 Ω @ 1 MHz Sinusoidal Input Signal
Output Performance	10 Vp-p @ ≥ 1 MΩ Load
Power Supply	± 15 V, ± 35 mA Typ.
Case	115 x 60 x 45 mm (L x W x H), Weight 200 g (0.44 lbs)

Maximum recommended source capacitance is 1 nF. Not suited for sources producing an average DC background current. Output short-circuit protected. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Ultra Low Noise Current Amplifiers ■ Series LCA



Series LCA

- Ultra Low Input Noise down to 0.2 fA/√Hz
- Gain up to 10^{13} V/A
- Bandwidth DC up to 400 kHz
- Bandwidth and Gain Independent of Source Capacitance up to 10 nF (1 nF for LCA-400K-10M)
- Compact and Highly Shielded Case for Use Close to the Signal Source
- Ideal for Photodiodes, STMs and Ionization Detectors

Model	- 3 dB Bandwidth (DC ...)	Noise Current	Transimpedance (Gain)	Rise/Fall Time
LCA-2-10T	2 Hz	0.2 fA/√Hz	10^{12} & 10^{13} V/A	200 ms
LCA-30-1T	30 Hz	0.5 fA/√Hz	1 x 10^{12} V/A	12 ms
LCA-30-200G	30 Hz	0.5 fA/√Hz	2 x 10^{11} V/A	12 ms
LCA-200-100G	200 Hz	1.5 fA/√Hz	1 x 10^{11} V/A	2 ms
LCA-200-10G	200 Hz	1.5 fA/√Hz	1 x 10^{10} V/A	2 ms
LCA-1K-5G	1 kHz	3 fA/√Hz	5 x 10^{9} V/A	400 µs
LCA-2K-2G	2 kHz	4.5 fA/√Hz	2 x 10^{9} V/A	200 µs
LCA-4K-1G	4 kHz	6.5 fA/√Hz	1 x 10^{9} V/A	100 µs
LCA-10K-500M	10 kHz	10 fA/√Hz	5 x 10^{8} V/A	40 µs
LCA-20K-200M	20 kHz	14 fA/√Hz	2 x 10^{8} V/A	20 µs
LCA-40K-100M	40 kHz	19 fA/√Hz	1 x 10^{8} V/A	10 µs
LCA-100K-50M	100 kHz	30 fA/√Hz	5 x 10^{7} V/A	4 µs
LCA-200K-20M	200 kHz	40 fA/√Hz	2 x 10^{7} V/A	2 µs
LCA-400K-10M	400 kHz	65 fA/√Hz	1 x 10^{7} V/A	1 µs

Bandwidth and rise/fall times are independent of detector capacitance. Guaranteed and tested up to 10 nF for each amplifier (1 nF for LCA-400K-10M). Output voltage ± 10 V @ ≥ 1 MΩ load. Offset adjustable by trimpot. Output short-circuit protected. Power supply ± 15 V via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

High Speed Current Amplifiers ■ Series HCA

Series HCA

- High Bandwidth from DC up to 400 MHz
- Optimized Models for High Source Capacitance up to 2 nF
- Adjustable Bias Voltage and Offset
- Ideal for Fast and Large Area Photodiodes, PMTs and Ionization Detectors

Model	- 3 dB Bandwith (DC …)	Noise Current	Transimpedance (Gain)	Rise/Fall Time	Max. Detector Capacitance
HCA-1M-1M	1 MHz	270 fA/√Hz	1 x 10^{6} V/A	350 ns	50 pF
HCA-1M-1M-C	1 MHz	3.5 pA/√Hz	1 x 10^{6} V/A	350 ns	2 nF
HCA-2M-1M	2 MHz	340 fA/√Hz	1 x 10^{6} V/A	180 ns	25 pF
HCA-2M-1M-C	2 MHz	3.5 pA/√Hz	1 x 10^{6} V/A	180 ns	1 nF
HCA-4M-500K	4 MHz	490 fA/√Hz	5 x 10^{5} V/A	90 ns	15 pF
HCA-4M-500K-C	4 MHz	3.5 pA/√Hz	5 x 10^{5} V/A	90 ns	500 pF
HCA-10M-100K	10 MHz	1.1 pA/√Hz	1 x 10^{5} V/A	35 ns	15 pF
HCA-10M-100K-C	10 MHz	3.5 pA/√Hz	1 x 10^{5} V/A	35 ns	150 pF
HCA-20M-100K-C	20 MHz	3.5 pA/√Hz	1 x 10^{5} V/A	18 ns	50 pF
HCA-40M-100K-C	40 MHz	3.7 pA/√Hz	1 x 10^{5} V/A	10 ns	30 pF
HCA-100M-50K-C	100 MHz	3.8 pA/√Hz	5 x 10^{4} V/A	3.5 ns	20 pF
HCA-200M-20K-C	200 MHz	4.9 pA/√Hz	2 x 10^{4} V/A	1.9 ns	8 pF
HCA-400M-5K-C	400 MHz	21 pA/√Hz	5 x 10^{3} V/A	1.0 ns	10 pF

The maximum detector capacitance listed above means that up to this value the specified bandwidth (± 15 %) is guaranteed. Larger capacitances are also possible but will influence the bandwidth. Output voltage ± 1.5 V @ 50 Ω load. Offset adjustable by trimpot. Output short-circuit protected. Adjustable bias output (- 12 V ... + 12 V) for biasing photodetectors. Power supply ± 15 V via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Variable Gain Sub Femto Ampere Current Amplifier ■ Model DDPCA-300

Model DDPCA-300

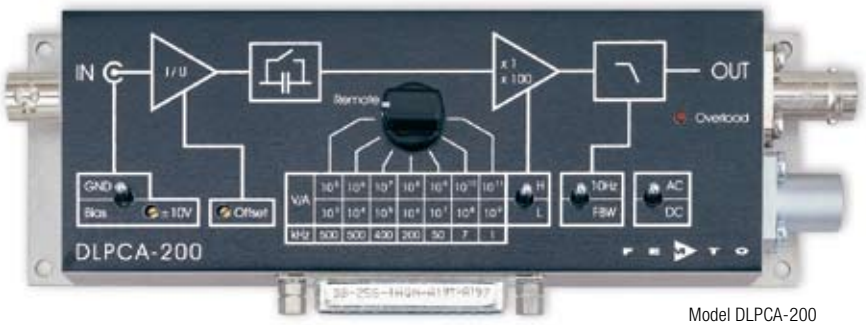
- 0.4 fA Peak-Peak Noise
- Variable Gain over 10 Decades from 10^4 to 10^{13} V/A for Sub-fA to mA Measurements
- Sub-fA Drift
- Optimized for DC to 400 Hz Measurements
- Adjustable Bias Voltage on Input for DUT Biasing
- Manual and Remote Control Operation
- Ideal for I/V Characterization of MOS and JFET Structures, Ultra Low Current and High Resistance Measurements, Quantum and Biotech Experiments, and as Easy to Use Sub Femto Amp Add-on to an Existing Digital Voltmeter or A/D Converter

Model	DDPCA-300									
Transimpedance [V/A]	10^4	10^5	10^6	10^7	10^8	10^9	10^{10}	10^{11}	10^{12}	10^{13}
Bandwidth (-3 dB) [Hz]	400	400	400	400	150	150	20	20	1	1
Rise Time (10% - 90 %)	0.8 ms	0.8 ms	0.8 ms	0.8 ms	2.3 ms	2.3 ms	17 ms	17 ms	350 ms	350 ms
Equ. Input Noise [/√Hz]	45 pA	45 pA	0.45 pA	0.45 pA	15 fA	15 fA	1.3 fA	1.3 fA	0.2 fA	0.2 fA
Low Pass Filter	Switchable to 0.1 Hz, 0.7 Hz or Full Bandwidth									
Output Performance	± 10 V @ ≥ 1 MΩ Load									
Bias Voltage	± 10 V, Adjustable by Trimpot or External Control Voltage, max. 10 mA, Connected to Center Pin of BNC Input Socket									
Power Supply	± 15 V, + 70 mA / - 15 mA Typ.									
Control Interface	4 Opto-Isolated Digital Inputs, TTL/CMOS Compatible, Analog Bias Control Voltage Input									
Case	170 x 60 x 45 mm (L x W x H), Weight 320 g (0.74 lbs)									

Offset adjustable by trimpot. LED overload indication. Input protected against ± 2 kV transients. Output short-circuit protected. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Variable Gain Low Noise Current Amplifier ■ Model DLPCA-200

- Variable Gain over 9 Decades from 10^3 to 10^{11} V/A
- Low Input Noise down to 4 fA/√Hz
- Bandwidth up to 500 kHz
- Adjustable Offset and Bias Voltage
- Switchable AC/DC Coupling and 10 Hz Low Pass Filter for Precise DC Measurements
- Manual and Remote Control Operation
- Designed for Photodetectors, STMs, Ionization Detectors, as Pre-Amplifier for Lock-Ins, A/D Converters and for General Lab Use



Model DLPCA-200

Model	DLPCA-200													
Performance Range	Low Noise							High Speed						
Transimpedance [V/A]	10^3	10^4	10^5	10^6	10^7	10^8	10^9	10^5	10^6	10^7	10^8	10^9	10^{10}	10^{11}
Bandwidth (-3 dB) [kHz]	500	500	400	200	50	7	1.1	500	500	400	200	50	7	1.1
Rise Time (10% - 90 %)	700 ns	700 ns	900 ns	1.8 µs	7 µs	50 µs	300 µs	700 ns	700 ns	900 ns	1.8 µs	7 µs	50 µs	300 µs
Equ. Input Noise [/√Hz]	20 pA	2.3 pA	450 fA	130 fA	43 fA	13 fA	4.3 fA	13 pA	1.8 pA	440 fA	130 fA	43 fA	13 fA	4.3 fA
Low Pass Filter	Switchable to 10 Hz													
Output Performance	± 10 V @ ≥ 1MΩ Load													
Bias Voltage	Adjustable ± 10 V, max. 22 mA, Connected to Shield of BNC Input Socket, Switchable to GND													
Power Supply	± 15 V, + 120 mA / - 80 mA Typ.													
Control Interface	5 Opto-Isolated Digital Inputs, TTL/CMOS Compatible, Analog Offset Control Voltage Input													
Case	170 x 60 x 45 mm (L x W x H), Weight 320 g (0.74 lbs)													

Bandwidth and rise/fall times are independent of detector capacitance up to 1 nF. Offset adjustable by trimpot or external control voltage. LED overload indication. Input protected against ±3 kV transients. Output short-circuit protected. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Variable Gain High Speed Current Amplifier ■ Model DHPCA-100

- Variable Gain over 7 Decades from 10^2 to 10^8 V/A
- Bandwidth up to 200 MHz
- 1.8 ns Minimum Rise Time
- Switchable Signal Filters and AC/DC Coupling
- Adjustable Offset and Bias Voltage
- Manual and Remote Control Operation
- Ideal for Fast Photodetectors, as Pre-Amplifier for Oscilloscopes, RF Lock-Ins and for General Lab Use

Model DHPCA-100

Model	DHPCA-100											
Performance Range	Low Noise						High Speed					
Transimpedance [V/A]	10^2	10^3	10^4	10^5	10^6	10^7	10^3	10^4	10^5	10^6	10^7	10^8
Bandwidth (-3 dB) [MHz]	200	80	14	3.5	1.8	0.22	175	80	14	3.5	1.8	0.22
Rise Time (10% - 90 %)	1.8 ns	4.4 ns	25 ns	0.1 µs	0.2 µs	1.6 µs	2.0 ns	4.4 ns	25 ns	0.1 µs	0.2 µs	1.6 µs
Equ. Input Noise [/√Hz]	200 pA	16 pA	2.1 pA	500 fA	170 fA	60 fA	140 pA	6.0 pA	1.5 pA	450 fA	150 fA	55 fA
Low Pass Filter	Switchable to 1 MHz, 10 MHz or Full Bandwidth											
Output Performance	± 1 V @ 50 Ω Load											
Bias Voltage	Adjustable ± 10 V, max. 22 mA, Connected to Shield of BNC Input Socket, Switchable to GND											
Power Supply	± 15 V, + 110 mA/ - 90 mA Typ.											
Control Interface	7 Opto-Isolated Digital Inputs, TTL/CMOS Compatible, Analog Offset Control Voltage Input											
Case	170 x 60 x 45 mm (L x W x H), Weight 320 g (0.74 lbs)											

Offset adjustable by trimpot or external control voltage. LED overload indication. Input protected against ± 3 kV transients. Output short-circuit protected. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Variable Gain Current Amplifiers ■ Comparison

Model	DDPCA-300	DLPCA-200	DHPCA-100
Gain Range	10^4 – 10^{13} V/A	10^3 – 10^{11} V/A	10^2 – 10^8 V/A
Max. Bandwidth	DC to 400 Hz	DC to 500 kHz	DC to 200 MHz
Min. Rise Time	800 µs	700 ns	1.8 ns
Min. Spectral Noise	0.2 fA/√Hz	4 fA/√Hz	55 fA/√Hz
Min. Integrated Broadband Noise	0.4 fA peak-peak or 0.06 fA rms	200 fA peak-peak or 30 fA rms	500 pA peak-peak or 75 pA rms
Main Differentiator	Sub Femto Ampere Sensitivity	Broad Application Range	MHz Speed
Common Features	Manual and Remote Control Operation Adjustable Offset and Bias Voltage Compact Design for Use Close to the Signal Source Extremely Well Shielded Housing to Avoid Noise Pick-Up		

Variable Gain 100 kHz Voltage Amplifiers ■ Series DLPVA-100

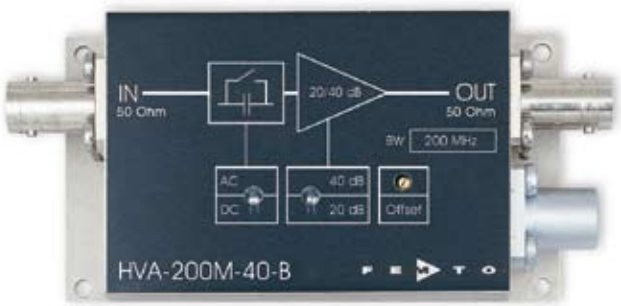
- Low Input Noise down to 400 pV/√Hz
- Variable Gain up to 100 dB (x 100,000)
- Single Ended or Differential Input with Common Mode Rejection (CMRR) up to 120 dB
- High Input Impedance up to 1 TΩ
- For Amplification of Low Frequency Signals from Low to Medium Impedance Sources

Model DLPVA-100-B-S

Model	DLPVA-100-BUN-S	DLPVA-100-BLN-S	DLPVA-100-B-S	DLPVA-100-B-D	DLPVA 100-F-S	DLPVA-100-F-D
Input stage	Single Ended, Bipolar	Single Ended, Bipolar	Single Ended, Bipolar	True Differential, Bipolar	Single Ended, FET	True Differential, FET
Input	1 kΩ, BNC	1 MΩ, BNC	1 MΩ, BNC	1 MΩ, LEMO	1 TΩ, BNC	1 TΩ, LEMO
Lower Cut-Off Frequency	1.5 Hz (AC only)	DC/1.5 Hz	DC/1.5 Hz	DC/1.5 Hz	DC/1.5 Hz	DC/1.5 Hz
Upper Cut-Off Frequency	1/100 kHz	1/100 kHz	1/100 kHz	1/100 kHz	1/100 kHz	1/100 kHz
Gain	40/60/80/100 dB	40/60/80/100 dB	20/40/60/80 dB	20/40/60/80 dB	20/40/60/80 dB	20/40/60/80 dB
Input Noise Voltage	0.4 nV/√Hz	0.7 nV/√Hz	2.4 nV/√Hz	3.6 nV/√Hz	5.5 nV/√Hz	6.9 nV/√Hz
Input Voltage Drift	–	0.5 µV/°C	0.7 µV/°C	0.7 µV/°C	1.3 µV/°C	1.3 µV/°C
CMRR	–	–	–	120 dB Max.	–	120 dB Max.
Output	50 Ω, BNC	50 Ω, BNC	50 Ω, BNC	50 Ω, BNC	50 Ω, BNC	50 Ω, BNC
Output Voltage	± 10 V @ ≥ 1 MΩ	± 10 V @ ≥ 1 MΩ	± 10 V @ ≥ 1 MΩ	± 10 V @ ≥ 1 MΩ	± 10 V @ ≥ 1 MΩ	± 10 V @ ≥ 1 MΩ
Control Interface	TTL/CMOS,Opto-Isolated	TTL/CMOS,Opto-Isolated	TTL/CMOS,Opto-Isolated	TTL/CMOS,Opto-Isolated	TTL/CMOS,Opto-Isolated	TTL/CMOS,Opto-Isolated

Offset adjustable by trimpot or external analog control voltage. LED gain setting and overload indication. Output short-circuit protected. Power supply ± 15 V via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Wideband Voltage Amplifiers ■ Series HVA



Model HVA-200M-40-B

- Bandwidth DC up to 500 MHz
- Switchable Gain up to 60 dB (x 1,000)
- Very Low Noise down to 0.9 nV/√Hz
- True DC Coupling Allows Accurate Amplification of Digital Codes and Transients with Long Decay Time (No Baseline Shift or Signal Over/Under-Shoots)
- Ideal as Pre-Amplifier for Oscilloscopes and Transient Recorders, and for Time-Resolved Pulse and Transient Measurements

Model	HVA-10M-60-B	HVA-10M-60-F	HVA-200M-40-B	HVA-200M-40-F	HVA-500M-20-B
Lower Cut-Off Frequency	DC/1 kHz	DC/1 Hz	DC/1 kHz	DC/1 Hz	DC
Upper Cut-Off Frequency	10 MHz	10 MHz	200 MHz	200 MHz	500 MHz
Input Impedance	50 Ω, BNC	1 MΩ, BNC	50 Ω, BNC	1 MΩ, BNC	50 Ω, BNC
Gain	40/60 dB	40/60 dB	20/40 dB	20/40 dB	20 dB
Input Noise Voltage	0.9 nV/√Hz	4.7 nV/√Hz	1.2 nV/√Hz	4.5 nV/√Hz	3.0 nV/√Hz
Input Voltage Drift	1 µV/°C	2 µV/°C	1 µV/°C	5 µV/°C	10 µV/°C
Output Voltage	± 3.5 V @ 50 Ω	± 3.5 V @ 50 Ω	± 1 V @ 50 Ω	± 1 V @ 50 Ω	± 1 V @ 50 Ω

Output: 50 Ω, BNC. Offset adjustable by trimpot. Output short-circuit protected. Power supply ± 15 V via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Variable Gain 100/200 MHz Voltage Amplifiers ■ Series DHPVA

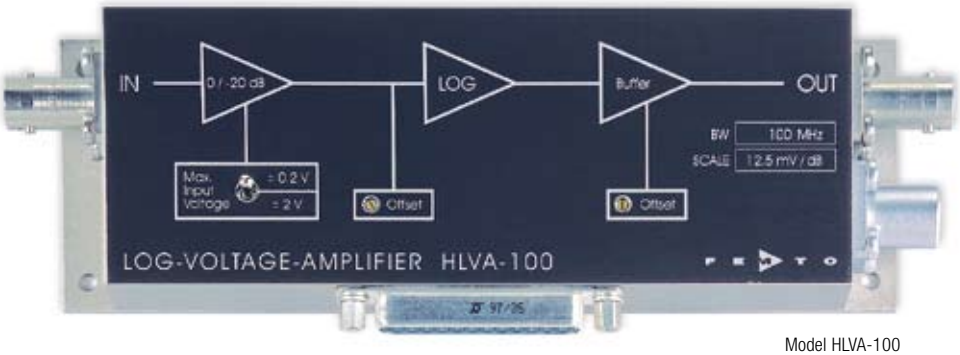
Model DHPVA-200

Model	DHPVA-100	DHPVA-200
Lower Cut-Off Frequency	DC/10 Hz	DC/10 Hz
Upper Cut-Off Frequency	10/100 MHz, Switchable	20/200 MHz, Switchable
Gain	10/20/30/40/50/60 dB	10/20/30/40/50/60 dB
Gain Accuracy	± 0.3 dB	± 0.3 dB
Input Noise Voltage	2.5 nV/√Hz	2.5 nV/√Hz
Input Voltage Drift	0.6 µV/°C	0.6 µV/°C
Input/Output	50 Ω, BNC	50 Ω, BNC
Output Voltage (Power)	± 1 V (+10 dBm) @ 50 Ω Load	± 1 V (+10 dBm) @ 50 Ω Load
Monitor Output	DC - 100 kHz	DC - 100 kHz
Control Interface	TTL/CMOS, Opto-Isolated	TTL/CMOS, Opto-Isolated

Bandwidth and rise/fall times are independent of gain setting – guaranteed and 100% tested. Offset adjustable by trimpot or external analog control voltage. LED gain setting indication. Output short-circuit protected. Power supply ±15V via 3-pin-LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

- Variable Gain from 10 dB to 60 dB (x 3 to x 1,000)
- Bandwidth DC to 200 MHz for all Gain Settings
- Exceptional Low DC Drift of just 0.6 µV/°C
- Switchable AC/DC Coupling
- Adjustable Offset
- Ideal as Pre-Amplifier for Oscilloscopes, A/D Converters and Transient Recorders

Logarithmic Wideband Voltage Amplifier ■ Model HLVA-100



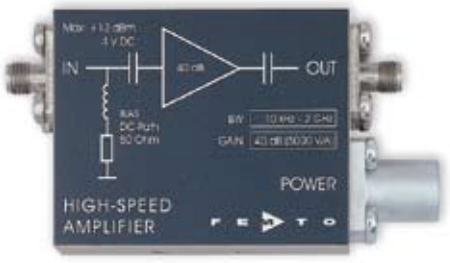
Model HLVA-100

Model	HLVA-100
Input Voltage Range	Switchable, ± 20 µV … ± 200 mV and ± 200 µV … ± 2 V
Dynamic Range	Typ. 60 dB (for Accurate Amplitude Measurement), Max. 80 dB (Signal Detection)
Scaling	12.5 mV/dB, 250 mV/Decade @ 50 Ω Load
Linearity	± 1 dB (for Pulse of Min. 20 ns Pulse Width)
Signal Path	DC Coupled, Rectifying
Input Noise Voltage	2 nV/√Hz
Input Voltage Drift	0.6 µV/°C
Input/Output	50 Ω, BNC
Rise/Fall Time	5 ns @ 40 dB Step
Output Voltage Range	+ 50 … + 1,075 mV Typ. @ 50 Ω Load (if Output Is Adjusted to 1 V at 100 mV Input)
Offset Voltage Range	± 2.5 mV on Input, ± 500 mV on Output
Control Interface	TTL/CMOS, Opto-Isolated

Offset adjustable by trimpot or external control voltage. Power supply ± 15 V via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

- Wide Dynamic Range up to 80 dB
- 5 ns Rise/Fall Time @ 40 dB Step
- Switchable Input Range
- DC Coupled, Rectifying Input
- 2 nV/√Hz Input Noise
- Integrated Sample & Hold Baseline Correction
- Typical Applications: LIDAR Systems, Signal Compression, Time-Resolved Pulse and Transient Measurements

High Speed GHz Amplifiers ■ Series HSA-X



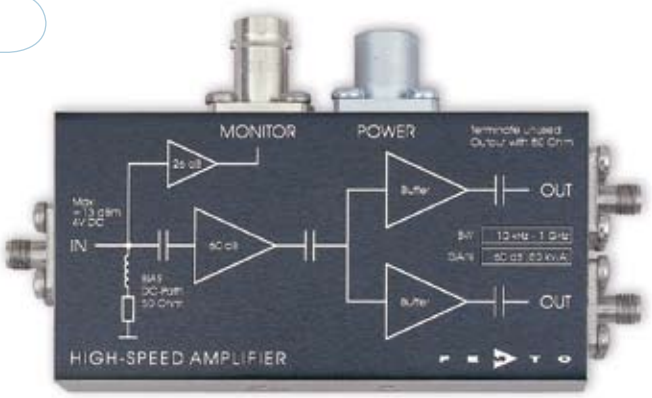
Model HSA-X-2-40

- Bandwidth 10 kHz up to 2 GHz
- Fixed Gain of 20 or 40 dB (x 10 or x 100)
- Very Low Input Noise down to 330 pV/√Hz (6.6 pA/√Hz)
- Integrated DC Path for Easy Operation with Fast Photodiodes
- Ultra Compact Package for Use Close to the Signal Source
- Designed for High Speed Photodiodes, APDs, PMTs and as Pre-Amplifier for Fast Oscilloscopes and Transient Recorders

Model	HSA-X-2-20	HSA-X-2-40	HSA-X-1-40
Lower Cut-Off Frequency	10 kHz	10 kHz	10 kHz
Upper Cut-Off Frequency	2 GHz	2 GHz	1.1 GHz
Rise/Fall Time (10% - 90%)	180 ps	180 ps	320 ps
Gain/Transimpedance	20 dB / 500 V/A	40 dB / 5,000 V/A	40 dB / 5,000 V/A
Input Noise	650 pV/√Hz (13 pA/√Hz)	670 pV/√Hz (13 pA/√Hz)	330 pV/√Hz (6.6 pA/√Hz)
Input VSWR	1.1	1.1	1.3
Output Voltage	1.9 Vp-p (@ 50 Ω Load)	1.9 Vp-p (@ 50 Ω Load)	2 Vp-p (@ 50 Ω Load)
Input/Output	50 Ω, SMA	50 Ω, SMA	50 Ω, SMA
Power Supply	+ 15 V, + 85 mA Typ.	+ 15 V, + 125 mA Typ.	+ 15 V, + 120 mA Typ.
Case	80 x 45 x 25 mm (L x W x H), Weight 100 g (0.23 lbs)		

Integrated DC Path. 8-32 and M4 mounting threads. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

High Speed GHz Amplifiers ■ Series HSA-Y



Model HSA-Y-1-60

- Bandwidth 10 kHz up to 2 GHz
- Fixed Gain of 20, 40 or 60 dB (x 10, x 100 or x 1,000)
- Very Low Input Noise down to 330 pV/√Hz (6.6 pA/√Hz)
- Two Identical Signal Outputs to Avoid External HF Signal Splitters
- Additional DC Monitor Output for Measuring Low Frequency Background
- Integrated DC Path for Easy Operation with Fast Photodiodes
- Designed for High Speed Photodiodes, APDs, PMTs and as Pre-Amplifier for Fast Oscilloscopes and Transient Recorders

Model	HSA-Y-2-20	HSA-Y-2-40	HSA-Y-1-40	HSA-Y-1-60
Lower Cut-Off Frequency	10 kHz	10 kHz	10 kHz	10 kHz
Upper Cut-Off Frequency	2 GHz	1.9 GHz	1.1 GHz	1.1 GHz
Rise/Fall Time (10% - 90%)	180 ps	185 ps	320 ps	320 ps
Gain/ Transimpedance	20 dB / 500 V/A	40 dB / 5,000 V/A	40 dB / 5,000 V/A	60 dB / 50,000 V/A
Input Noise	680 pV/√Hz (14 pA/√Hz)	650 pV/√Hz (13 pA/√Hz)	330 pV/√Hz (6.6 pA/√Hz)	330 pV/√Hz (6.6 pA/√Hz)
Input VSWR	1.15	1.2	1.45	1.4
Input	50 Ω, SMA	50 Ω, SMA	50 Ω, SMA	50 Ω, SMA
Signal Output	Two Identical Signal Outputs, 50 Ω, SMA, Output Voltage 2 Vp-p (@ 50 Ω Load)			
Monitor Output	Gain 1,000 V/A, Output Voltage: +/- 10 V (@ ≥ 1 MΩ Load), Bandwidth: DC – 100 kHz, BNC			
Power Supply	± 15 V, + 190 mA / - 10 mA Typ.			
Case	110 x 70 x 25 mm (L x W x H), Weight 180 g (0.41 lbs)			

Integrated DC Path. 8-32 and M4 mounting threads. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Variable Gain GHz Amplifiers ■ Series DUPVA

Model DUPVA-1-70

- Bandwidth 1 kHz to 1 GHz for all Gain Settings
- Variable Gain from 20 dB to 70 dB (x 10 to x 3,000)
- Very Low Input Noise of 330 pV/√Hz
- Exceptional Gain Flatness of ± 0.15 dB
- Ideal as Broadband Pre-Amplifier for Oscilloscopes and Transient Recorders

Model	DUPVA-1-60	DUPVA-1-70
Lower Cut-Off Frequency	1 kHz	1 kHz
Upper Cut-Off Frequency	1.2 GHz	1.1 GHz
Rise/Fall Time (10% - 90%)	380 ps	390 ps
Gain	20/30/40/50/60 dB	30/40/50/60/70 dB
Gain Flatness	± 0.15 dB	± 0.15 dB
Input Noise	NF 3.0 dB (450 pV/√Hz)	NF 1.9 dB (330 pV/√Hz)
Output Power	10 dBm (-1 dB Compression)	11 dBm (-1 dB Compression)
Output Voltage	1.7 Vp-p (@ 50 Ω Load)	1.7 Vp-p (@ 50 Ω Load)
Input/Output	50 Ω, SMA	50 Ω, SMA
Power Supply	± 15 V, + 350 mA / - 100 mA Typ.	± 15 V, + 250 mA / - 100 mA Typ.
Monitor Output	DC ... 100 kHz, Monitor Output at D-Sub Connector, Gain x1	
Control Interface	3 Opto-Isolated Digital Inputs, TTL/CMOS Compatible	
Case	165 x 105 x 45 mm (L x W x H), Weight 510 g (1.2 lbs)	

LED gain setting indication. Output short-circuit protected. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Miniature Lock-In Amplifier Modules ■ Series LIA-MV-150

Model LIA-MV-150-S

- Working Frequency up to 45 kHz
- Single Ended or True Differential Voltage and Current Input with Sensitivity down to 3 µV and 3 nA for Full Scale Output
- Phase Shifter 0° to 360°
- Manual and Remote Control Operation
- Ultra Compact Package
- For Laser Stabilization, Spectroscopy, Surface Analysis and Process Control in Scientific and Industrial Applications

Model	LIA-MV-150-S Standard	LIA-MV-150-D True Differential Input
Voltage Input	BNC, Single Ended Instrumentation Amplifier, Noise 12 nV/√Hz	LEMO, True Differential Instrumentation Amplifier, Noise 12 nV/√Hz
Current Input	BNC, Transimpedance Amplifier, Gain 1 kV/A, Noise 13 pA/√Hz	LEMO, Transimpedance Amplifier, Gain 1 kV/A, Noise 13 pA/√Hz
Sensitivity (Full Scale)	Voltage: 3 µV - 100 mV, Switchable in 1-3-10 Steps / Current: 3 nA - 100 µA, Switchable in 1-3-10 Steps	
Gain Accuracy	± 2% for a Sinusoidal Input Signal	
Working Frequency	10 Hz - 45 kHz	
Reference Input	BNC, ± 100 mV to ± 5 V, Switchable to TTL	
Phase	Adjustable 0° - 360°	
Demodulator	55 dB Max. Dynamic Reserve, Square Wave Mixer	
Time Constants	3 ms - 10 s, Switchable in 1-3-10 Steps, Slope Switchable 6 or 12 dB/Octave	
Output	BNC, X (In Phase), ± 10 V Full Scale, Short-Circuit Protected	
Control Interface	16 Opto-Isolated Digital Inputs, TTL/CMOS Compatible, 8 Bit Phase, 4 Bit Time Constant, 4 Bit Sensitivity	
Power Supply	± 15 V, + 100 mA/ - 60 mA Typ.	
Case	170 x 60 x 30 mm (L x W x H), Weight 370 g (0.82 lbs)	

LED overload and unlocked indication. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Lock-In Amplifier Modules ■ Series LIA-MV(D)-200

Model	LIA-MV-200-L Single Phase	LIA-MV-200-H Single Phase	LIA-MVD-200-L Dual Phase	LIA-MVD-200-H Dual Phase
Working Frequency	5 Hz ... 10 kHz	50 Hz ... 120 kHz	5 Hz ... 10 kHz	50 Hz ... 120 kHz
Time Constants	3 ms – 10 s	300 µs – 1 s	3 ms – 10 s	300 µs – 1 s
Outputs	X = In Phase BNC, ± 10 V Full Scale, Short-Circuit Protected		X = In Phase, Y = Quadrature, R = Magnitude	
Sensitivity (Full Scale)	Voltage: 3 µV – 1 V in 1-3-10 Steps / Current: 30 pA – 10 µA in 1-3-10 Steps			
Gain Accuracy	± 2% for a Sinusoidal Input Signal			
Voltage Input	BNC, True Differential Instrumentation Amplifier, Noise 12 nV/√Hz			
Current Input	BNC, Transimpedance Amplifier, Gain 100 kV/A, Noise 0.4 pA/√Hz			
Signal Filter	High Pass 0.2 Hz – 1 kHz and Low Pass 100 Hz – 1 MHz, User Selectable			
Reference Input	BNC, ± 100 mV to ± 5 V, Switchable to TTL			
Phase	Adjustable 0° - 360°			
Demodulator	80 dB Max. Dynamic Reserve, Square Wave Mixer			
Control Interface	16 Opto-Isolated Digital Inputs, TTL/CMOS Compatible			
Case	230 x 105 x 65 mm (L x W x H), Weight 1 kg (2.2 lbs)			

LED overload, unlocked and power indication. Connectors for an optional reference oscillator are inside the module. Power supply ± 15 V via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

Model LIA-MVD-200-H

- Single and Dual Phase Models
- Working Frequency 5 Hz up to 120 kHz
- Various Signal Filters and Configuration Options for Versatile Use
- Manual And Remote Control Operation
- Designed as Alternative to Expensive Desktop Lock-Ins for Use in Spectroscopy, Photonics and Laser Measurements

Single-Board Lock-In Amplifiers ■ Series LIA-BV(D)-150

Model LIA-BVD-150-H with Optional Mounting Kit MK-LIA-2

- Low-Cost 19" Plug-In Board Design
- Single and Dual Phase Models
- Working Frequency 5 Hz up to 120 kHz
- Phase Shifter 0° to 360°
- Voltage and Current Input
- Manual and Remote Control Operation
- Ideal for Multi-Channel, OEM and Cost-Sensitive Applications

Model	LIA-BV-150-L Single Phase	LIA-BV-150-H Single Phase	LIA-BVD-150-L Dual Phase	LIA-BVD-150-H Dual Phase
Working Frequency	5 Hz ... 10 kHz	50 Hz ... 120 kHz	5 Hz ... 10 kHz	50 Hz ... 120 kHz
Time Constants	3 ms – 10 s	300 µs – 1 s	3 ms – 10 s	300 µs – 1 s
Outputs	X = In Phase		X = In Phase, Y = Quadrature, R = Magnitude	
	± 10 V Full Scale, Short-Circuit Protected, Signal Monitor Output			
Sensitivity (Full Scale)	Voltage: 3 µV – 1 V in 1-3-10 Steps / Current: 30 pA – 10 µA in 1-3-10 Steps			
Gain Accuracy	± 2% for a Sinusoidal Input Signal			
Voltage Input	True Differential Instrumentation Amplifier, Noise 12 nV/√Hz			
Current Input	Transimpedance Amplifier, Gain 100 kV/A, Noise 0.4 pA/√Hz			
Signal Filter	High Pass 0.2 Hz – 1 kHz and Low Pass 100 Hz – 1 MHz, User Selectable			
Reference Input	± 100 mV to ± 5 V, Switchable to TTL			
Phase	Adjustable 0° - 360°			
Demodulator	80 dB Max. Dynamic Reserve, Square Wave Mixer			
Control Interface	16 Opto-Isolated Digital Inputs, TTL/CMOS Compatible			
Dimensions	160 x 100 x 20 mm (L x W x H), Weight 100 g (0.22 lbs)			

LED overload, unlocked and power indication. Power supply ± 15 V. Connectors for an optional reference oscillator module are on board. Optional mounting kit MK-LIA-2 available. For further information please view the datasheet at www.femto.de.

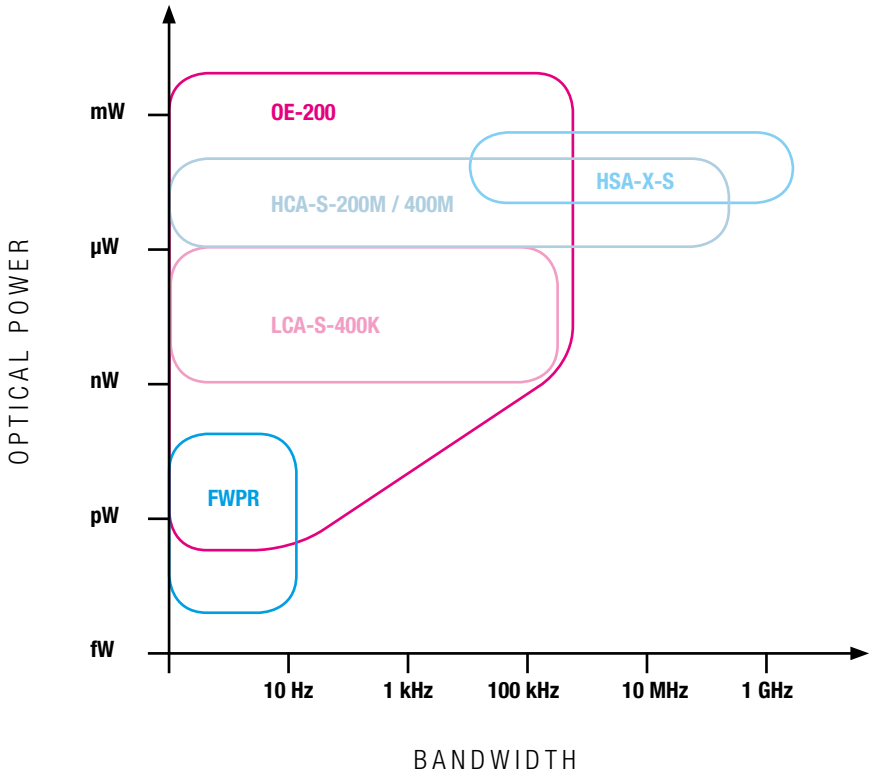
Multi-Channel Lock-In Amplifier Rack ■ Series SC-LIA-S

Model	SC-LIA-S
Case Width	28, 42, 63 or 84 TE
Case Height	3 HE
Channel Count	Min. 3, Max. 10 LIA-BV(D)-150 Boards
Connections	Signal In-/Outputs: BNC; Control Interface: D-Sub 25 (if Installed)
Control Interface	Either Common for All Installed Channels, or Individual for Each Channel, or None
Power Supply	Input Voltage: 230 VAC or 110 VAC, Output Voltage: ± 15 VDC, Linear Regulated
Case	Depending on the Configuration up to ca. 370 mm x 490 mm x 140 mm (L x W x H), Weight up to ca. 8 kg (17 lbs)

- 19" Rack System for Series LIA-BV(D)-150 Lock-In Amplifier Boards
- Different Rack Sizes Suitable for 3 up to 10 Channels
- Optional Interface for Remote Control of the Installed LIA Boards
- Integrated Power Supply
- BNC Sockets for Signal In- and Outputs
- Ideal for Applications Requiring Multi-Channel Lock-In Detection

Model SC-LIA-S

Selection Guide ■ Photoreceivers



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 x 10^{12} V/W	0.7 fW/√Hz
FWPR-20-IN	900 … 1700 nm	-	DC … 20 Hz	18 ms	9.5 x 10^{10} V/W	7.5 fW/√Hz
LCA-S-400K-SI	400 … 1100 nm	-	DC … 400 kHz	1 µs	6.2 x 10^{6} V/W	130 fW/√Hz
LCA-S-400K-IN	900 … 1700 nm	-	DC … 400 kHz	1 µs	9.5 x 10^{6} V/W	75 fW/√Hz
OE-200-SI	320 … 1060 nm	830 nm*	DC … 500 kHz	700 ns	1.0 x 10^{11} V/W	10 fW/√Hz
OE-200-UV	190 … 1000 nm	830 nm*	DC … 500 kHz	700 ns	1.0 x 10^{11} V/W	17 fW/√Hz
OE-200-IN1	900 … 1700 nm	1300 nm*	DC … 500 kHz	700 ns	1.0 x 10^{11} V/W	8 fW/√Hz
OE-200-IN2	900 … 1700 nm	1550 nm*	DC … 500 kHz	700 ns	1.0 x 10^{11} V/W	7 fW/√Hz
HCA-S-200M-SI	320 … 1000 nm	-	DC … 200 MHz	1.8 ns	1.1 x 10^{4} V/W	9.3 pW/√Hz
HCA-S-200M-IN	900 … 1700 nm	-	DC … 200 MHz	1.8 ns	1.9 x 10^{4} V/W	5.4 pW/√Hz
HCA-S-400M-SI	320 … 1000 nm	-	DC … 400 MHz	1.0 ns	2.7 x 10^{3} V/W	40 pW/√Hz
HCA-S-400M-IN	900 … 1700 nm	-	DC … 400 MHz	1.0 ns	4.8 x 10^{3} V/W	24 pW/√Hz
HSA-X-S-1G4-SI	320 … 1000 nm	-	10 kHz … 1.4 GHz	250 ps	2.5 x 10^{3} V/W	26 pW/√Hz
HSA-X-S-2G-IN	900 … 1700 nm	-	10 kHz … 2 GHz	180 ps	4.8 x 10^{3} V/W	14 pW/√Hz

* Optical calibration available for fiber optic models only.

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
- 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 x 10^{12} V/A	1 x 10^{11} V/A
Max. Conversion Gain	0.6 x 10^{12} V/W (@ 960 nm)	0.95 x 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, ø 0.5 mm
Input	Free Space, 25 mm ø Flange	
Output	BNC	
Output Voltage Range	± 10 V @ ≥ 1 MΩ Load	
Power Requirements	± 15 V, ± 15 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 socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

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

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

- Low Noise: Min. NEP 75 fW/√Hz Allows Detection down to 1 nW
- High Gain: Max. 9.5 x 10^6 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 µs	1 µs
Transimpedance Gain	1 x 10^7 V/A	1 x 10^7 V/A
Max. Conversion Gain	6.2 x 10^6 V/W (@ 900 nm)	9.5 x 10^6 V/W (@ 1550 nm)
Min. NEP	130 fW/√Hz (@ 900 nm)	75 fW/√Hz (@ 1550 nm)
Saturation Power	1.6 µW (@ 900 nm)	1 µW (@ 1550 nm)
Detector	Si PIN, ø 2.5 mm	InGaAs PIN, ø 0.5 mm
Input	Free Space, 25 mm ø Flange	
Output	BNC	
Output Voltage Range	± 10 V @ ≥ 1 MΩ Load	
Power Requirements	± 15 V, ± 40 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 and AC-coupling optional. Output short-circuit protected. Power supply via 3-pin LEMO socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

500 kHz Variable Gain Photoreceiver ■ Series OE-200

Model OE-200-IN1

- Variable Gain over 9 Decades Allows Detection of fW to mW
- High Speed: Min. Rise Time 700 ns, Max. Bandwidth 500 kHz
- Low Noise: NEP down to 7 fW/√Hz
- Broad Spectral Range: 190 to 1700 nm
- Optical Calibration for Fiber Optic Models
- Applications: All Purpose Lab Photoreceiver, Fiber Alignment Systems, Fast Power Monitoring, Linearity Measurements over 10 Decades, Industrial Control 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	8 fW/√Hz	7 fW/√Hz
Optical Power Input Range	ca. 100 fW … 2 mW	ca. 200 fW … 2 mW	ca. 100 fW … 2 mW	ca. 100 fW … 2 mW
Detector	Si PIN, ø 1.2 mm	Si PIN, 1.1 x 1.1 mm^2	InGaAs PIN, ø 0.1 mm	InGaAs PIN, ø 0.1 mm
Input	Free Space, FC, SMA	Free Space, FC, SMA	Free Space, FC	Free Space, FC
Output	BNC			
Output Voltage Range	± 10 V @ ≥ 1 MΩ Load			
Accuracy	± 1 % Electrical, ± 5 % Electro Optical for Fiber Optic Models, ± 15 % Electro Optical for Free Space Models			
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	170 x 60 x 45 mm (L x W x H), Weight 320 g (0.74 lbs)			

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

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

- High Speed: Min. Rise Time 1.8 ns
- Low Noise: Min. NEP 5.4 pW/√Hz Allows Detection down to 1 µW
- High Gain: Max. 1.9 x 10^4 V/W
- Applications: Spectroscopy, Optical Triggering, Fast Pulse and Transient Measurements

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

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 x 10^4 V/A	2 x 10^4 V/A
Max. Conversion Gain	1.1 x 10^4 V/W (@ 800 nm)	1.9 x 10^4 V/W (@ 1550 nm)
Min. NEP	9.3 pW/√Hz (@ 800 nm)	5.4 pW/√Hz (@ 1550 nm)
Saturation Power	110 µW (@ 800 nm)	60 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 Range	± 1.7 V @ 50 Ω Load	
Power Requirements	± 15 V, ± 60 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 socket. A mating connector is provided with the device. Optional power supply PS-15 available. For further information please view the datasheet at www.femto.de.

400 MHz High Speed Photoreceiver ■ Series HCA-S-400M

Model HCA-S-400M-SI
Post holder and post not included

- High Speed: Min. Rise Time 1 ns
- High Gain: Max. 4.8 x 10^3 V/W
- DC Coupling for Precise Pulse Response
- Applications: Spectroscopy, Optical Triggering, Fast Pulse and Transient Measurements

Model	HCA-S-400M-SI	HCA-S-400M-IN
Spectral Range	320 … 1000 nm	900 … 1700 nm
Bandwidth (-3 dB)	DC … 400 MHz	DC … 400 MHz
Rise Time (10% - 90%)	1.0 ns	1.0 ns
Transimpedance Gain	5 x 10^3 V/A	5 x 10^3 V/A
Max. Conversion Gain	2.7 x 10^3 V/W	4.8 x 10^3 V/W
Min. NEP	40 pW/√Hz (@ 800 nm)	24 pW/√Hz (@ 1550 nm)
Saturation Power	400 µW (@ 800 nm)	200 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 Range	± 1.5 V @ 50 Ω Load	
Power Requirements	± 15 V, ± 55 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 socket. A mating connector is provided with the device. Optional power supply 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 x 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 Optical Measurements

Model	HSA-X-S-1G4-SI	HSA-X-S-2G-IN
Spectral Range	320 … 1000 nm	900 … 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 x 10^3 V/A	5 x 10^3 V/A
Max. Conversion Gain	2.5 x 10^3 V/W (@ 760 nm)	4.8 x 10^3 V/W (@ 1550 nm)
Min. NEP	26 pW/√Hz (@ 760 nm)	14 pW/√Hz (@ 1550 nm)
AC 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 Range	2 Vp-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 socket. A mating connector is provided with the device. Optional power supply 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

Power Supply ■ Series PS-15

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

Model	PS-15-2-L	PS-15-3-L
Input Voltage	210 - 250 VAC	100 - 135 VAC
Input Plug	Euro Plug, DIN 49464	UL Plug
Output Voltage	± 15 V, + 400 mA, - 250 mA on LEMO Series 1S, 3-Pin Plug	
Ripple	20 mVp-p Typ.	

Model PS-15-2-L

USB Control Interface ■ Model LUCI-10

Model LUCI-10

- Digital I/O Interface for USB Remote Control of FEMTO Amplifiers
- Supports Opto-Isolation of Amplifier Signal Path from PC USB Port
- Bus-Powered Operation
- System Driver and Application Software Included
- LabVIEW VI's for Easy Integration in LabVIEW Environment
- Ideal for Remote Control of FEMTO Amplifiers in Automated Systems and Measurement Setups

Model	LUCI-10
Bus Interface	USB 2.0 Compatible
Control Interface	16 Digital Output Lines, 3 Opto-Isolated Digital Input Lines
Connector	USB Typ A, D-Sub, Male (25 Pins)
Software	System Driver (.dll) Compatible with C/C++, LabVIEW Library, GUI

For further information please view the datasheet at www.femto.de.

LabVIEW Library

GUI Frontpanel

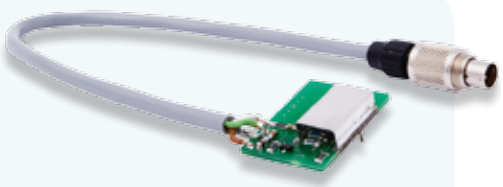
In addition to our large variety of standard products we offer professional custom-designed modules and complete solutions for measurement systems. Here are some examples of previous work. Please contact us for details.

OEM Solutions with Cost and Size Optimized Design

Small-Sized Photodetectors

Balanced Photoreceivers

Dual Channel Amplifiers



Miniature Pick-Up Electronics

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

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

FEMTO Messtechnik GmbH
Paul-Lincke-Ufer 34 · D-10999 Berlin / Germany
Telephone: +49 (0) 30 / 446 93 86
Fax: +49 (0) 30 / 446 93 88
e-mail: info@femto.de · http://www.femto.de