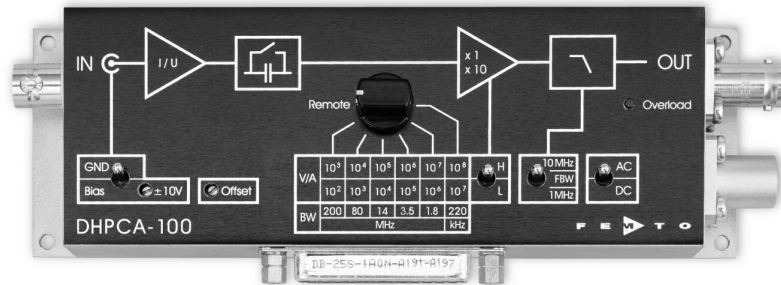




Datasheet

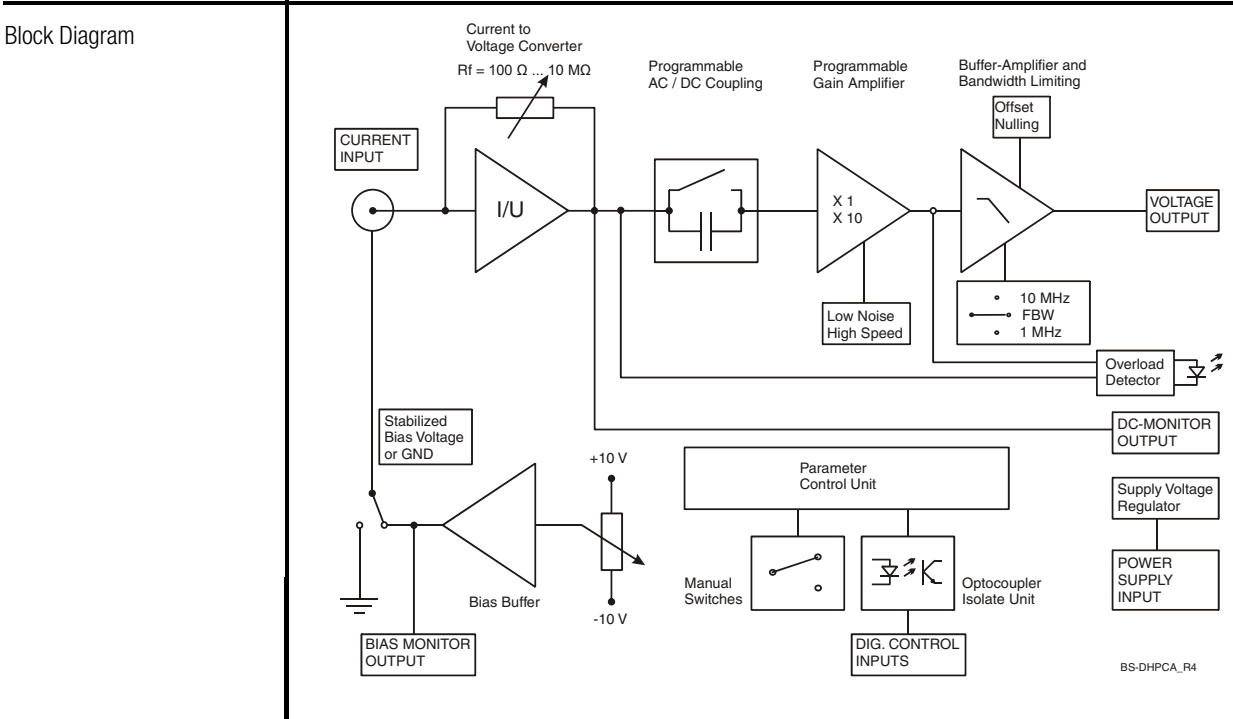
DHPCA-100

Variable Gain High Speed Current Amplifier



Features	<ul style="list-style-type: none"> • Transimpedance (Gain) Switchable from 1×10^2 to 1×10^8 V/A • Bandwidth from DC up to 200 MHz • Upper Cut-Off Frequency Switchable to 1 MHz, 10 MHz or Full Bandwidth • Switchable AC/DC Coupling • Adjustable Bias Voltage for Use with External Photo Detectors • Input Protection Against ± 1.5 kV Transients • Local and Remote Control of All Main Functions
----------	--

Applications	<ul style="list-style-type: none"> • Photodiode and Photomultiplier Amplifier • Spectroscopy • Beam Monitoring for Particle Accelerators / Synchrotrons • Ionisation Detectors • Preamplifier for A/D-Converters, HF Lock-Ins, etc.
--------------	---



Variable Gain High Speed Current Amplifier

Specifications	<i>Test Conditions</i>	<i>V_s = ± 15 V, T_a = 25°C</i>					
Gain	Transimpedance	$1 \times 10^2 \dots 1 \times 10^8$ V/A					
	Gain Accuracy	$\pm 1\%$					
Frequency Response	Lower Cut-Off Frequency	DC / 100 Hz, switchable					
	Upper Cut-Off Frequency	dependent on gain setting up to 200 MHz (see table below), switchable to 10 MHz or 1 MHz					
Input	Equ. Input Noise Current	see table below					
	Equ. Input Noise Voltage	typ. 2.8 nV/ $\sqrt{\text{Hz}}$					
	Input Bias Current	typ. 20 pA					
Performance depending on Gain Setting	Gain Setting (Low Noise) (V/A)	10^2	10^3	10^4	10^5	10^6	10^7
	Upper Cut-Off Frequency (-3 dB)	200 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
	Rise / Fall Time (10% - 90%)	1.8 ns	4.4 ns	25 ns	0.1 μ s	0.2 μ s	1.6 μ s
	Input Noise Current Density ($\sqrt{\text{Hz}}$)	200 pA	16 pA	2.1 pA	500 fA	170 fA	60 fA
	measured at	1 MHz	1 MHz	1 MHz	10 kHz	10 kHz	10 kHz
	Integr. Input Noise Current (rms)*	2.2 μ A	270 nA	33 nA	5.4 nA	1.1 nA	140 pA
	Max. Input Current (\pm)	10 mA	1 mA	0.1 mA	10 μ A	1 μ A	0.1 μ A
	DC Input Impedance	50 Ω	50 Ω	60 Ω	100 Ω	1 k Ω	10 k Ω
	Gain setting (High Speed) (V/A)	10^3	10^4	10^5	10^6	10^7	10^8
	Upper Cut-Off Frequency (-3 dB)	175 MHz	80 MHz	14 MHz	3.5 MHz	1.8 MHz	220 kHz
	Rise / Fall Time (10% - 90%)	2.0 ns	4.4 ns	25 ns	0.1 μ s	0.2 μ s	1.6 μ s
	Input Noise Current Density ($\sqrt{\text{Hz}}$)	140 pA	6.0 pA	1.5 pA	450 fA	150 fA	55 fA
	measured at	1 MHz	1 MHz	1 MHz	10 kHz	10 kHz	10 kHz
	Integr. Input Noise Current (rms)*	1.5 μ A	230 nA	30 nA	5.3 nA	1.1 nA	140 pA
	Max. Input Current (\pm)	1 mA	0.1 mA	10 μ A	1 μ A	0.1 μ A	10 nA
DC Input Impedance	50 Ω	50 Ω	60 Ω	100 Ω	1 k Ω	10 k Ω	

* The integrated input noise is measured with an open but shielded amplifier input in the full bandwidth ("FBW") setting. The input referred peak-peak noise can be calculated from the rms noise as follows:

$$I_{\text{peak-peak}} = I_{\text{rms}} \times 6$$

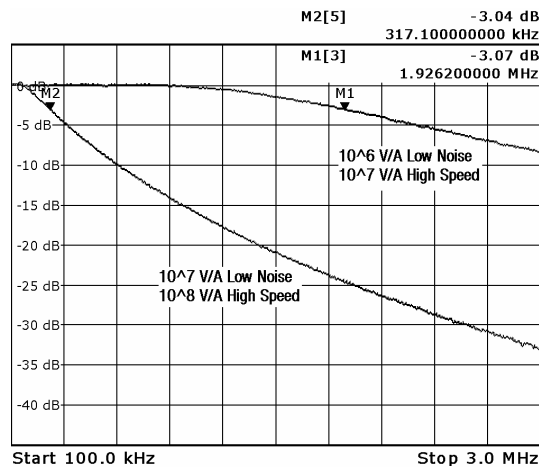
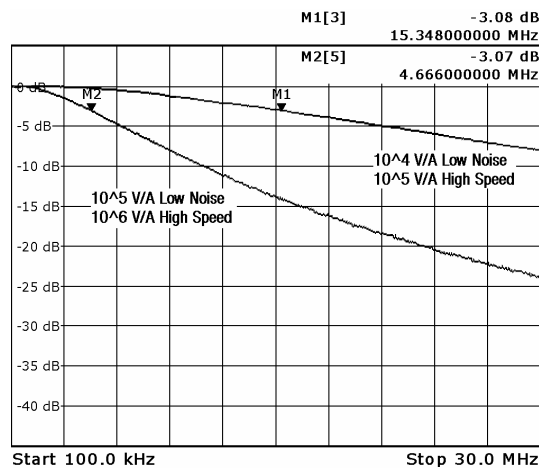
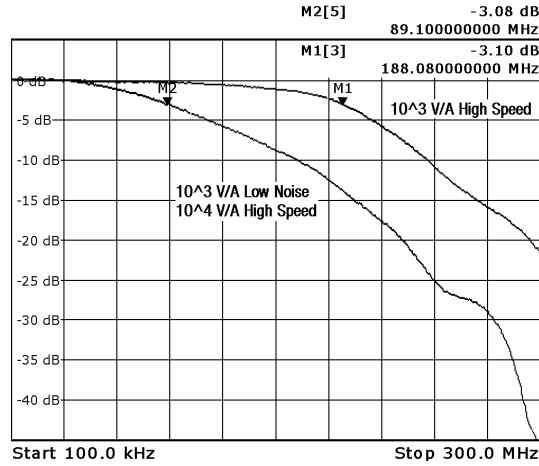
The output noise is given by: $U_{\text{peak-peak}} = I_{\text{peak-peak}} \times \text{Gain}$

Upper cut-off frequencies and equivalent input noise currents given in this table are typical values only which will depend on the source capacitance. Keep the source capacitance as low as possible by using short cables at the input to achieve best possible bandwidth and noise performance. For the dependence of the upper cut-off frequencies on the source capacitance please see the diagrams on the next page.

Variable Gain High Speed Current Amplifier

Specifications (continued)

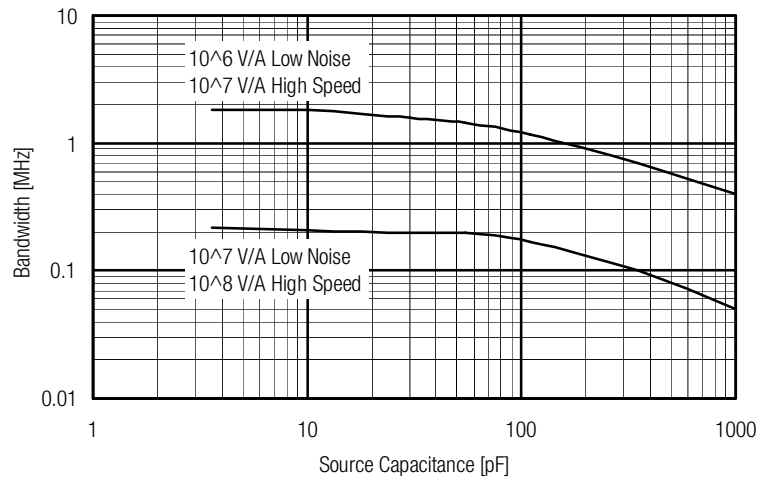
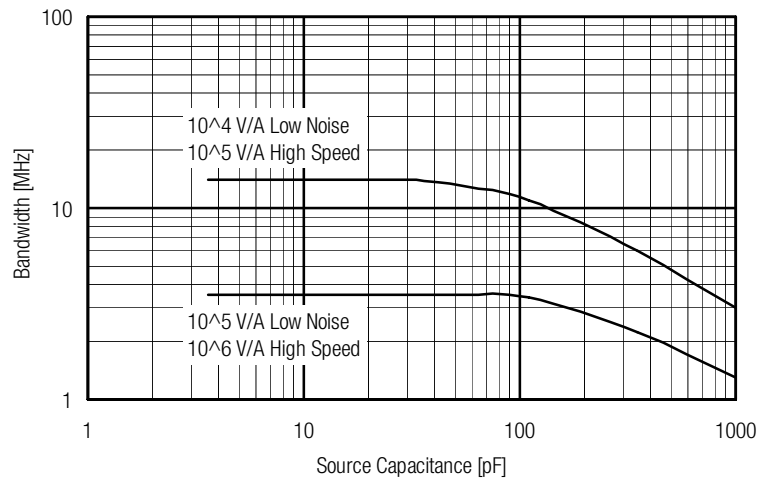
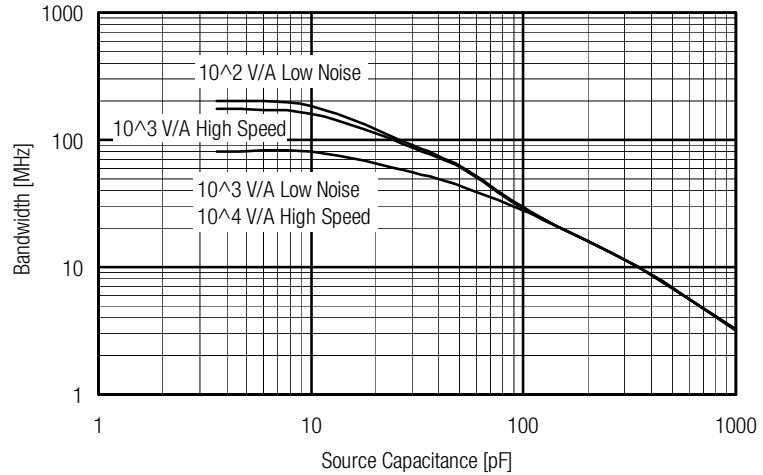
Frequency Response Plots



Variable Gain High Speed Current Amplifier

Specifications (continued)

Dependence of Upper Cut-Off Frequency on Source Capacitance

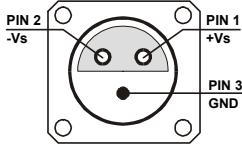


Variable Gain High Speed Current Amplifier

Specifications (continued)

Output	Output Voltage Range	± 1 V (@ 50 Ω load), for linear amplification	
	Output Impedance	50 Ω (designed for 50 Ω load)	
	Slew Rate	1,000 V/μs	
	Max. Output Current	± 40 mA	
	Output Offset Compensation	adjustable by offset trimpot and external control voltage, output offset compensation range min. ± 100 mV	
DC Monitor Output	Monitor Output Gain	Mode	Monitor Gain
		low noise	gain setting divided by -1
		high speed	gain setting divided by -10
	Monitor Output Polarity	inverting	
	Monitor Output Voltage Range	± 1 V (@ ≥ 1 MΩ load)	
Detector Bias	Monitor Output Bandwidth	DC ... 1 kHz	
	Monitor Output Impedance	1 kΩ (designed for ≥ 1 MΩ load)	
	Bias Voltage Range	± 10 V, max. 22 mA, connected to shield of BNC input socket, adjustable by trimpot, switchable to GND	
	Warning	A bias current of 20 mA may destroy sensitive detectors. Please pay attention to the correct polarity and careful adjustment of the bias voltage to protect your detector. Put the bias switch to GND (ground) if you do not want to use the internal bias voltage. The positive and the negative supply voltage of the amplifier must be switched "on" and "off" simultaneously in order to avoid overvoltage at the bias output.	
	Bias Voltage Monitor Output	Description	The signal at the bias voltage monitor output (pin 7 of the Sub-D control socket) is identical to the detector bias voltage present on the shield of the input BNC socket. By monitoring the signal on pin 7 the desired bias voltage can be adjusted through the bias trimpot. Even if the bias switch is set to "GND", the bias voltage can be monitored and set to the desired value.
Monitor Output Polarity		non-inverting	
Monitor Output Voltage Range		± 10 V (@ ≥ 1 MΩ load)	
Monitor Output Impedance		1 kΩ (designed for ≥ 1 MΩ load)	
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	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	15 kΩ	
Power Supply	Supply Voltage	± 15 V	
	Supply Current	typ. + 110 / - 90 mA (depends on operating conditions, recommended power supply capability min. ± 200 mA)	
	Stabilized Power Supply Output	± 12 V, max. 50 mA, + 5 V, max. 150 mA	

Datasheet**DHPCA-100****Variable Gain
High Speed Current Amplifier**

Specifications (continued)		
Case	Weight Material	320 g (0.74 lb.) AlMg4.5Mn, nickel-plated
Temperature Range	Storage Temperature Operating Temperature	- 40 ... + 100 °C 0 ... + 60 °C
Absolute Maximum Ratings	Signal Input Voltage Transient Input Voltage Control Input Voltage Power Supply Voltage	± 5 V ± 1.5 kV (out of a 1 nF source) - 5 V / + 16 V ± 20 V
Connectors	Input Output Detector Bias Output Power Supply	BNC, isolated BNC shield of input BNC LEMO series 1S, 3-pin fixed socket Pin 1: + 15V Pin 2: - 15V 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) Pin 4: + 5 V (stabilized power supply output) Pin 5: digital output: overload Pin 6: DC monitor output Pin 7: bias monitor output Pin 8: output offset control voltage input Pin 9: DGND (ground for digital control pins 10 - 16) 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 mode Pin 15: upper cut-off frequency limit 10 MHz Pin 16: upper cut-off frequency limit 1 MHz PIN 17-25 NC

Variable Gain High Speed Current Amplifier

Remote Control Operation

General

Remote control input pins 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", "DC", "L" (low noise mode) and "FBW", 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.

Switch setting "Bias / GND" is not remote controllable.

Gain Setting

Low Noise Pin 14=LOW Gain (V/A)	High Speed Pin 14=HIGH Gain (V/A)	Pin 12 MSB	Pin 11	Pin 10 LSB
10^2	10^3	LOW	LOW	LOW
10^3	10^4	LOW	LOW	HIGH
10^4	10^5	LOW	HIGH	LOW
10^5	10^6	LOW	HIGH	HIGH
10^6	10^7	HIGH	LOW	LOW
10^7	10^8	HIGH	LOW	HIGH

AC/DC Setting

Coupling	Pin 13
DC	LOW
AC	HIGH

Low Pass Filter Setting

Upper Cut-Off Frequ. Limit	Pin 15	Pin 16
full bandwidth	LOW	LOW
10 MHz	HIGH	LOW
1 MHz	LOW	HIGH

High Speed / Low Noise Setting

Mode	Pin 14
low noise mode	LOW
high speed mode	HIGH

Variable Gain High Speed Current Amplifier

Application Diagrams

Photo Detector Biasing through Internal Bias Voltage Source

Set bias switch to "Bias". The photodiode is biased through the amplifier with the bias voltage applied to the shield of the isolated BNC input socket. The photodiode should be mounted in a metal case. For optimum shielding the metal case has to be isolated from the photodiode but connected to the housing of the DHPCA-100.

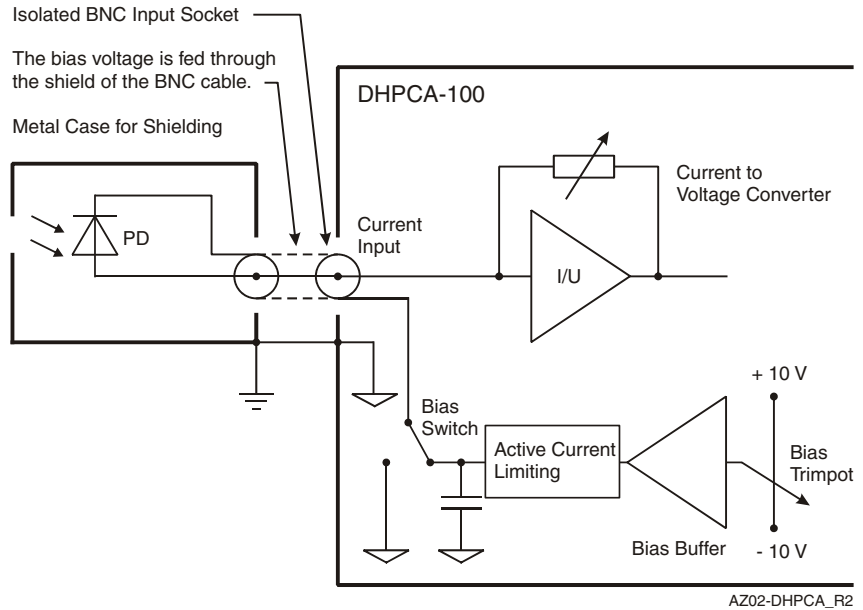
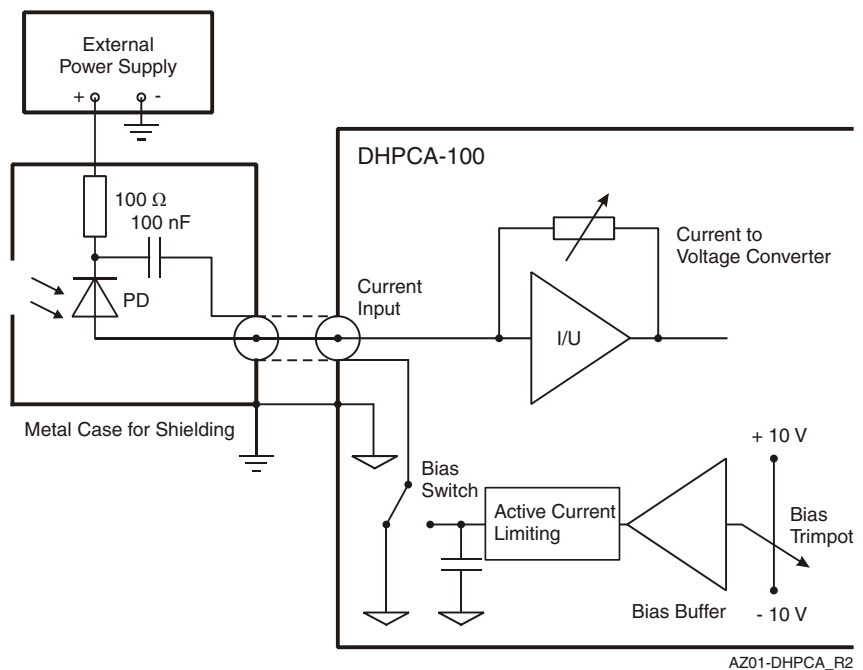


Photo Detector Biasing through External Voltage Source

Set bias switch to "GND". The photodiode is biased through an external voltage source. The shield of the isolated BNC input socket is internally set to amplifier GND. The photodiode should be mounted in a metal case. For optimum shielding the metal case has to be isolated from the photodiode but connected to the housing of the DHPCA-100.

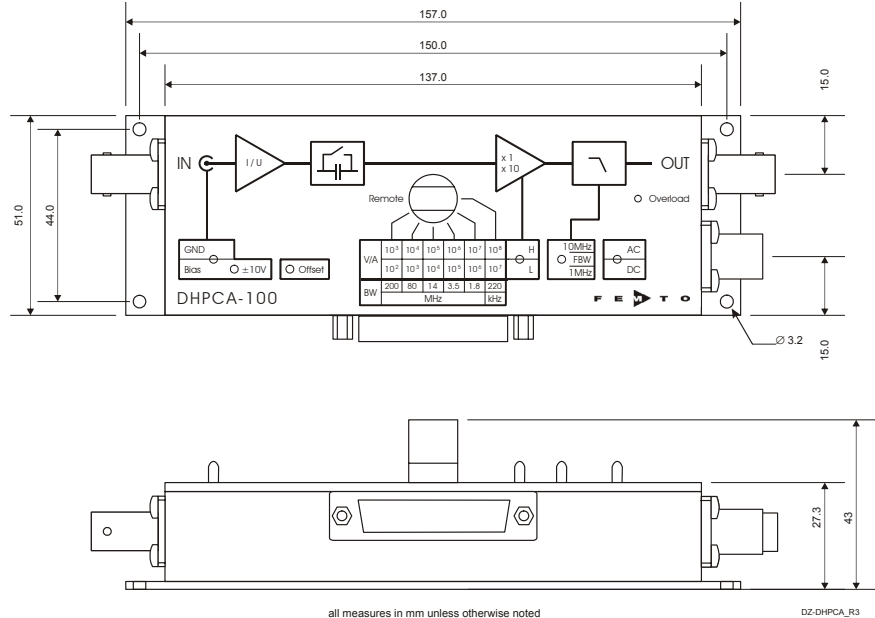


Datasheet

DHPCA-100

Variable Gain High Speed Current Amplifier

Dimensions



FEMTO Messtechnik GmbH
 Klosterstr. 64
 D-10179 Berlin · Germany
 Tel.: +49-(0)30-280 4711-0
 Fax: +49-(0)30-280 4711-11
 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

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY





Datasheet

LUCI-10

USB to D-Sub Control Interface for FEMTO Amplifiers



<p>Features</p>	<ul style="list-style-type: none"> • Compact Digital I/O Interface for USB Remote Control of FEMTO Amplifiers • Supports Opto-Isolation of Amplifier Signal Path from PC USB Port • 16 Digital Outputs, 3 Opto-Isolated Digital Inputs • Bus-Powered Operation • System Driver, Application Software and VI's for use with LabVIEW™ Included 				
<p>Applications</p>	<ul style="list-style-type: none"> • Remote Control of FEMTO® Amplifiers and Photoreceivers Directly from a PC 				
<p>Block Diagram</p>	<p style="text-align: right; font-size: small;">BS-LUCI-10_R1</p>				
<p>Hardware Specifications</p>	<table border="0"> <tr> <td style="vertical-align: top;">General Characteristics</td> <td> <p>Bus Interface: USB 2.0 (full-speed)</p> <p>Digital I/O Channels: 16 output lines, 3 opto-isolated input lines</p> <p>Supply: PC USB port, + 5 V, typ. 100 mA, bus-powered (no auxiliary power supply required)</p> <p>Connectors: USB type A, D-Sub, 25 pin, male</p> <p>Cable: AWG 28, length 1.8 m</p> </td> </tr> <tr> <td style="vertical-align: top;">Output</td> <td> <p>Number of Channels: 16 output lines, supporting opto-isolation inside FEMTO amplifiers and photoreceivers</p> <p>Output Voltage Range: LOW bit: 0 ... + 0.5 V (@ 0 ... 2 mA output current), HIGH bit: + 4 ... + 5.5 V (@ 0 ... 2 mA output current)</p> <p>Max. Current Writing Rate: 6 mA per channel, max. 800 operations per second</p> </td> </tr> </table>	General Characteristics	<p>Bus Interface: USB 2.0 (full-speed)</p> <p>Digital I/O Channels: 16 output lines, 3 opto-isolated input lines</p> <p>Supply: PC USB port, + 5 V, typ. 100 mA, bus-powered (no auxiliary power supply required)</p> <p>Connectors: USB type A, D-Sub, 25 pin, male</p> <p>Cable: AWG 28, length 1.8 m</p>	Output	<p>Number of Channels: 16 output lines, supporting opto-isolation inside FEMTO amplifiers and photoreceivers</p> <p>Output Voltage Range: LOW bit: 0 ... + 0.5 V (@ 0 ... 2 mA output current), HIGH bit: + 4 ... + 5.5 V (@ 0 ... 2 mA output current)</p> <p>Max. Current Writing Rate: 6 mA per channel, max. 800 operations per second</p>
General Characteristics	<p>Bus Interface: USB 2.0 (full-speed)</p> <p>Digital I/O Channels: 16 output lines, 3 opto-isolated input lines</p> <p>Supply: PC USB port, + 5 V, typ. 100 mA, bus-powered (no auxiliary power supply required)</p> <p>Connectors: USB type A, D-Sub, 25 pin, male</p> <p>Cable: AWG 28, length 1.8 m</p>				
Output	<p>Number of Channels: 16 output lines, supporting opto-isolation inside FEMTO amplifiers and photoreceivers</p> <p>Output Voltage Range: LOW bit: 0 ... + 0.5 V (@ 0 ... 2 mA output current), HIGH bit: + 4 ... + 5.5 V (@ 0 ... 2 mA output current)</p> <p>Max. Current Writing Rate: 6 mA per channel, max. 800 operations per second</p>				

Datasheet**LUCI-10****USB to D-Sub Control Interface
for FEMTO Amplifiers**

Input	Number of Channels	3 opto-isolated input lines
	Input Voltage Range	LOW bit: - 20 ... + 1.5 V HIGH bit: + 3 ... + 20 V
Power Supply	Switching Current	1 mA typ. @ 5 V
	Reading Rate	max. 400 operations per second
Case	USB Port, Bus Powered	+ 4.5 ... + 5.5 V DC
	Active Current	max. 200 mA / typ. 100 mA
	Suspend Current	< 0.5 mA (standby mode of Windows®)
Temperature Range	D-Sub Case	metal hood (EMI/RFI shielding), with jack screws
	Weight	130 g (0.3 lb.)
	Material	zinc die-cast, nickel plated
Absolute Maximum Ratings	Storage Temperature	- 40 ... + 100 °C
	Operating Temperature	0 ... + 50 °C
Connectors	Max. Voltage at Input	+/- 30 V
	Max. Short Circuit Output Current	+/- 20 mA per channel, 200 mA total
	Max. Isolation Voltage	+/- 60 V (Input Ground to Output Ground)
Device Port	D-Sub, 25 pin, male	
	Pin 1:	NC
PC Port	Pin 2:	NC
	Pin 3:	GND (IN)
	Pin 4:	NC
	Pin 5:	Digital IN
	Pin 6:	Digital IN
	Pin 7:	Digital IN
	Pin 8:	NC
	Pin 9:	GND (OUT)
	Pin 10:	Digital OUT Low Byte, LSB
	Pin 11:	Digital OUT Low Byte
	Pin 12:	Digital OUT Low Byte
	Pin 13:	Digital OUT Low Byte
	Pin 14:	Digital OUT Low Byte
	Pin 15:	Digital OUT Low Byte
	Pin 16:	Digital OUT Low Byte
	Pin 17:	Digital OUT Low Byte, MSB
	Pin 18:	Digital OUT High Byte, LSB
	Pin 19:	Digital OUT High Byte
	Pin 20:	Digital OUT High Byte
	Pin 21:	Digital OUT High Byte
	Pin 22:	Digital OUT High Byte
	Pin 23:	Digital OUT High Byte
	Pin 24:	Digital OUT High Byte
	Pin 25:	Digital OUT High Byte, MSB
USB type A		

USB to D-Sub Control Interface for FEMTO Amplifiers

Software Specifications

Software
(included on CD)

Device Driver	dynamic link library (DLL) for integration in Microsoft Windows [®] operating system for use with C/C++, LabWindows [™] /CVI [™] or LabVIEW [™]
Application Software	GUI (graphical user interface) programs for simple remote control of FEMTO amplifiers and photoreceivers provided as executable programs and LabVIEW projects
LabVIEW Programs	sample programs to control and test the LUCI-10 hardware (including front panel and block diagram)
LabVIEW Library	special VI toolkit for integration in LabVIEW development environment

Note: A National Instruments LabVIEW[™] license is not included in this software package. For use of the GUI application programs the LabVIEW Run-Time Engine is required. If not detected on the host PC during the installation process the LabVIEW Run-Time Engine will be installed automatically from the CD.

System Requirements

Operating System	Microsoft Windows XP with Service Pack 2, or higher
Processor	Intel Pentium III or AMD Athlon, or better
System Memory	512 MB of RAM, or more
Hard Disk Space	about 200 MB
Interface Port	USB 1.1 or USB 2.0
Supported FEMTO Modules	any standard FEMTO amplifier or photoreceiver with 25 pin D-Sub socket, except model HLVA-100

Optional Requirements

For development of own application programs an additional development environment like LabVIEW Version 8 (or higher) or C/C++ is required.

Legal Notice

LabVIEW, CVI, National Instruments and NI are trademarks of National Instruments. Neither FEMTO Messtechnik GmbH, nor any software programs or other goods or services offered by FEMTO Messtechnik GmbH, are affiliated with, endorsed by, or sponsored by National Instruments.

The mark LabWindows is used under a license from Microsoft Corporation.

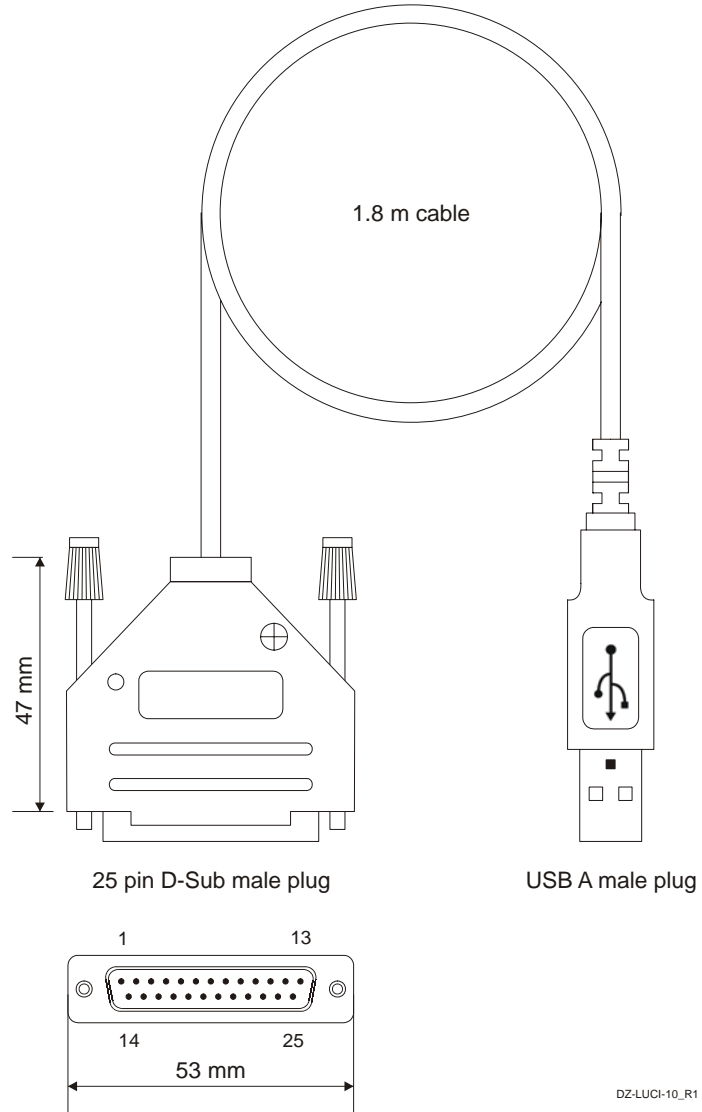
Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

FEMTO and the FEMTO logo are trademarks or registered trademarks of FEMTO Messtechnik GmbH in Germany, the U.S. and/or other countries.

Product and company names mentioned may also be trademarks or trade names of their respective companies used here for identification purposes only.

**USB to D-Sub Control Interface
for FEMTO Amplifiers**

Dimensions



FEMTO Messtechnik GmbH
Paul-Lincke-Ufer 34
D-10999 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