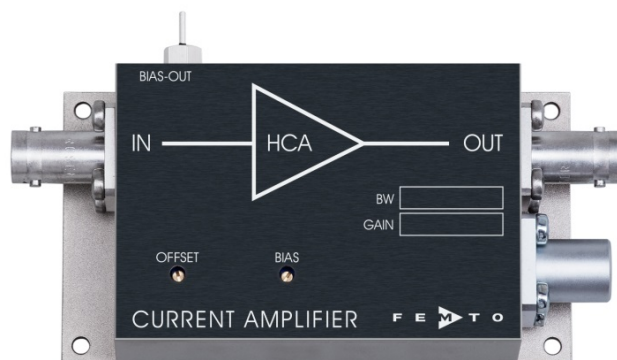


# High-Speed Current Amplifier



<p>Features</p>	<ul style="list-style-type: none"> <li>• <b>Bandwidth DC ... 100 MHz</b></li> <li>• <b>Transimpedance (Gain) <math>5 \times 10^4</math> V/A</b></li> <li>• <b>Suitable for High Source Capacitance up to 20 pF</b></li> <li>• <b>Low Equivalent Input Noise Current of 3.8 pA/<math>\sqrt{\text{Hz}}</math></b></li> </ul>																																																											
<p>Applications</p>	<ul style="list-style-type: none"> <li>• <b>Photodiode and Photomultiplier Amplifier</b></li> <li>• <b>Spectroscopy</b></li> <li>• <b>Charge Amplifier</b></li> <li>• <b>Ionisation Detectors</b></li> <li>• <b>Preamplifier for Lock-Ins, A/D Converters, etc.</b></li> </ul>																																																											
<p>Specifications</p>	<table border="0"> <tr> <td>Test Conditions</td> <td colspan="2"><math>V_s = \pm 15</math> V, <math>T_a = 25^\circ\text{C}</math></td> </tr> <tr> <td rowspan="2">Gain</td> <td>Transimpedance</td> <td><math>5 \times 10^4</math> V/A (@ 50 <math>\Omega</math> load)</td> </tr> <tr> <td>Gain Accuracy</td> <td><math>\pm 2</math> %</td> </tr> <tr> <td rowspan="5">Frequency Response</td> <td>Lower Cut-Off Frequency</td> <td>DC</td> </tr> <tr> <td rowspan="2">Upper Cut-Off Frequency (- 3 dB)</td> <td>100 MHz</td> <td>(<math>\pm 10</math> %, @ <math>C_{\text{source}}</math> 2 to 10 pF)</td> </tr> <tr> <td>80 MHz</td> <td>(<math>\pm 10</math> %, @ <math>C_{\text{source}}</math> 11 to 20 pF)</td> </tr> <tr> <td>Max. Source Capacitance</td> <td>20 pF</td> <td>(incl. cable, e.g. typical coax cable 1 pF/cm)</td> </tr> <tr> <td rowspan="2">Rise / Fall Time (10 % - 90 %)</td> <td>3.4 ns</td> <td>(@ <math>C_{\text{source}}</math> 2 to 10 pF)</td> </tr> <tr> <td>4.0 ns</td> <td>(@ <math>C_{\text{source}}</math> 11 to 20 pF)</td> </tr> <tr> <td>Gain Flatness</td> <td colspan="2"><math>\pm 0.3</math> dB</td> </tr> <tr> <td rowspan="10">Input</td> <td>Equ. Input Noise Current</td> <td>3.8 pA/<math>\sqrt{\text{Hz}}</math> (@ 10 MHz)</td> </tr> <tr> <td>Equ. Input Noise Voltage</td> <td>0.9 nV/<math>\sqrt{\text{Hz}}</math> (@ 10 MHz)</td> </tr> <tr> <td>Equ. Integrated Noise</td> <td>0.6 <math>\mu\text{A}</math> peak-peak</td> </tr> <tr> <td>Input Bias Current</td> <td>12 <math>\mu\text{A}</math> typ.</td> </tr> <tr> <td>Input Bias Current Drift</td> <td>3 nA / <math>^\circ\text{C}</math></td> </tr> <tr> <td>Offset Current Compensation</td> <td><math>\pm 40</math> <math>\mu\text{A}</math> adjustable by offset trimpot</td> </tr> <tr> <td>Input Current Range</td> <td><math>\pm 30</math> <math>\mu\text{A}</math> (for linear amplification)</td> </tr> <tr> <td>Input Offset Voltage</td> <td>&lt; 1 mV</td> </tr> <tr> <td>DC Input Impedance</td> <td>56 <math>\Omega</math> (virtual) // 5 pF</td> </tr> <tr> <td rowspan="3">Output</td> <td>Output Voltage Range</td> <td><math>\pm 1.5</math> V (@ 50 <math>\Omega</math> load) for linear operation and low harmonic distortion</td> </tr> <tr> <td>Max. Output Voltage Range</td> <td><math>\pm 1.7</math> V (@ 50 <math>\Omega</math> load)</td> </tr> <tr> <td>Output Impedance</td> <td>50 <math>\Omega</math> (terminate with 50 <math>\Omega</math> load for best performance)</td> </tr> <tr> <td rowspan="2">Bias Output</td> <td>Bias Output Voltage Range</td> <td><math>\pm 12</math> V, adjustable by bias trimpot</td> </tr> <tr> <td>Bias Output Impedance</td> <td>10 k<math>\Omega</math> // 1 <math>\mu\text{F}</math></td> </tr> </table>		Test Conditions	$V_s = \pm 15$ V, $T_a = 25^\circ\text{C}$		Gain	Transimpedance	$5 \times 10^4$ V/A (@ 50 $\Omega$ load)	Gain Accuracy	$\pm 2$ %	Frequency Response	Lower Cut-Off Frequency	DC	Upper Cut-Off Frequency (- 3 dB)	100 MHz	( $\pm 10$ %, @ $C_{\text{source}}$ 2 to 10 pF)	80 MHz	( $\pm 10$ %, @ $C_{\text{source}}$ 11 to 20 pF)	Max. Source Capacitance	20 pF	(incl. cable, e.g. typical coax cable 1 pF/cm)	Rise / Fall Time (10 % - 90 %)	3.4 ns	(@ $C_{\text{source}}$ 2 to 10 pF)	4.0 ns	(@ $C_{\text{source}}$ 11 to 20 pF)	Gain Flatness	$\pm 0.3$ dB		Input	Equ. Input Noise Current	3.8 pA/ $\sqrt{\text{Hz}}$ (@ 10 MHz)	Equ. Input Noise Voltage	0.9 nV/ $\sqrt{\text{Hz}}$ (@ 10 MHz)	Equ. Integrated Noise	0.6 $\mu\text{A}$ peak-peak	Input Bias Current	12 $\mu\text{A}$ typ.	Input Bias Current Drift	3 nA / $^\circ\text{C}$	Offset Current Compensation	$\pm 40$ $\mu\text{A}$ adjustable by offset trimpot	Input Current Range	$\pm 30$ $\mu\text{A}$ (for linear amplification)	Input Offset Voltage	< 1 mV	DC Input Impedance	56 $\Omega$ (virtual) // 5 pF	Output	Output Voltage Range	$\pm 1.5$ V (@ 50 $\Omega$ load) for linear operation and low harmonic distortion	Max. Output Voltage Range	$\pm 1.7$ V (@ 50 $\Omega$ load)	Output Impedance	50 $\Omega$ (terminate with 50 $\Omega$ load for best performance)	Bias Output	Bias Output Voltage Range	$\pm 12$ V, adjustable by bias trimpot	Bias Output Impedance	10 k $\Omega$ // 1 $\mu\text{F}$
Test Conditions	$V_s = \pm 15$ V, $T_a = 25^\circ\text{C}$																																																											
Gain	Transimpedance	$5 \times 10^4$ V/A (@ 50 $\Omega$ load)																																																										
	Gain Accuracy	$\pm 2$ %																																																										
Frequency Response	Lower Cut-Off Frequency	DC																																																										
	Upper Cut-Off Frequency (- 3 dB)	100 MHz	( $\pm 10$ %, @ $C_{\text{source}}$ 2 to 10 pF)																																																									
		80 MHz	( $\pm 10$ %, @ $C_{\text{source}}$ 11 to 20 pF)																																																									
	Max. Source Capacitance	20 pF	(incl. cable, e.g. typical coax cable 1 pF/cm)																																																									
	Rise / Fall Time (10 % - 90 %)	3.4 ns	(@ $C_{\text{source}}$ 2 to 10 pF)																																																									
4.0 ns		(@ $C_{\text{source}}$ 11 to 20 pF)																																																										
Gain Flatness	$\pm 0.3$ dB																																																											
Input	Equ. Input Noise Current	3.8 pA/ $\sqrt{\text{Hz}}$ (@ 10 MHz)																																																										
	Equ. Input Noise Voltage	0.9 nV/ $\sqrt{\text{Hz}}$ (@ 10 MHz)																																																										
	Equ. Integrated Noise	0.6 $\mu\text{A}$ peak-peak																																																										
	Input Bias Current	12 $\mu\text{A}$ typ.																																																										
	Input Bias Current Drift	3 nA / $^\circ\text{C}$																																																										
	Offset Current Compensation	$\pm 40$ $\mu\text{A}$ adjustable by offset trimpot																																																										
	Input Current Range	$\pm 30$ $\mu\text{A}$ (for linear amplification)																																																										
	Input Offset Voltage	< 1 mV																																																										
	DC Input Impedance	56 $\Omega$ (virtual) // 5 pF																																																										
	Output	Output Voltage Range	$\pm 1.5$ V (@ 50 $\Omega$ load) for linear operation and low harmonic distortion																																																									
Max. Output Voltage Range		$\pm 1.7$ V (@ 50 $\Omega$ load)																																																										
Output Impedance		50 $\Omega$ (terminate with 50 $\Omega$ load for best performance)																																																										
Bias Output	Bias Output Voltage Range	$\pm 12$ V, adjustable by bias trimpot																																																										
	Bias Output Impedance	10 k $\Omega$ // 1 $\mu\text{F}$																																																										

## High-Speed Current Amplifier

Specifications (continued)

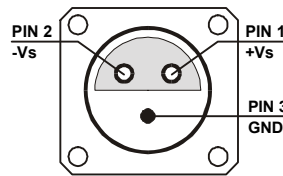
Power Supply	Supply Voltage	$\pm 15\text{ V}$
	Supply Current	$\pm 50\text{ mA typ.}$ (depends on operating conditions, recommended power supply capability minimum $\pm 150\text{ mA}$ )
Case	Weight	210 g (0.5 lbs)
	Material	AlMg4.5Mn, nickel-plated
Temperature Range	Storage Temperature	$-40 \dots +100\text{ }^\circ\text{C}$
	Operating Temperature	$0 \dots +60\text{ }^\circ\text{C}$

Absolute Maximum Ratings

Input Voltage	$\pm 5\text{ V}$
Power Supply Voltage	$\pm 22\text{ V}$

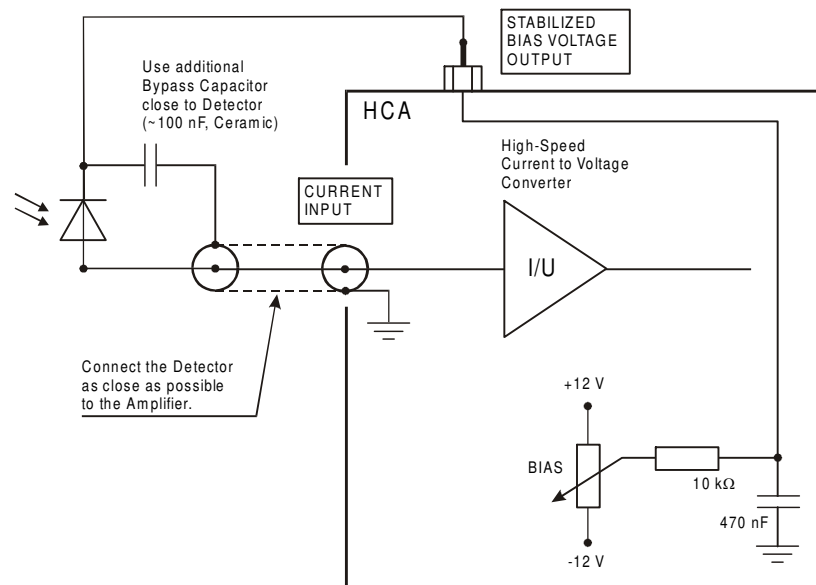
Connectors

Input	BNC
Output	BNC
Power Supply	LEMO series 1S, 3-pin fixed socket
	Pin 1: $+15\text{ V}$
	Pin 2: $-15\text{ V}$
	Pin 3: GND



Application Diagrams

Photo Detector Biasing in Photoconductive Mode:  
Best choice for high speed applications and optimum signal to noise performance.

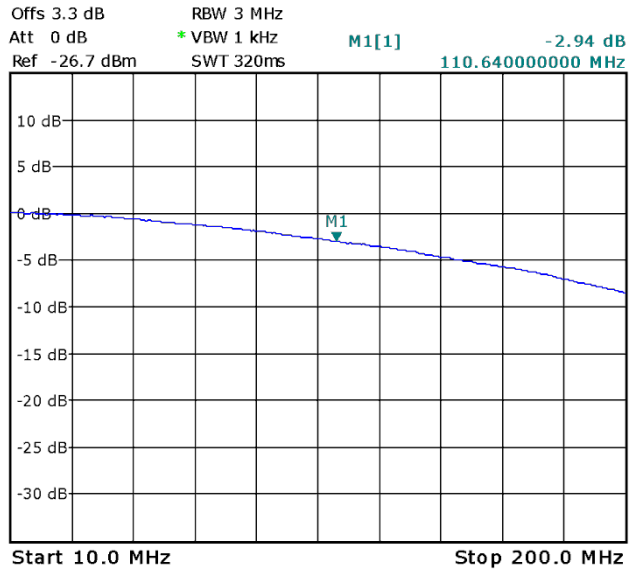


AZ01-0201-20

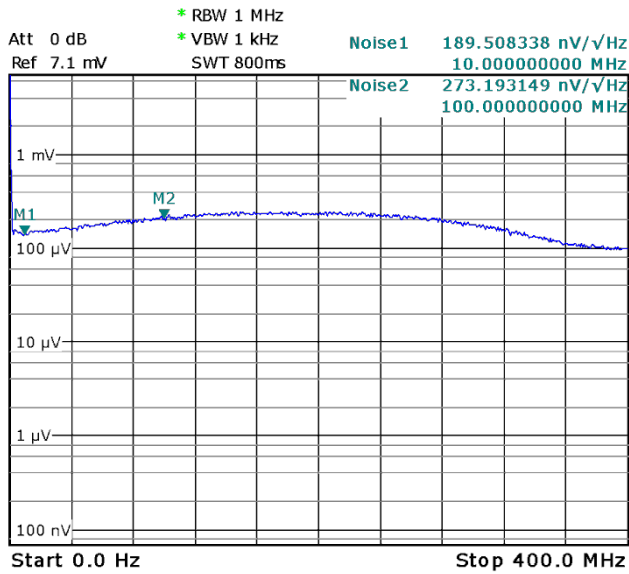
# High-Speed Current Amplifier

Typical Performance Characteristics

## Frequency Response



## Noise Spectrum



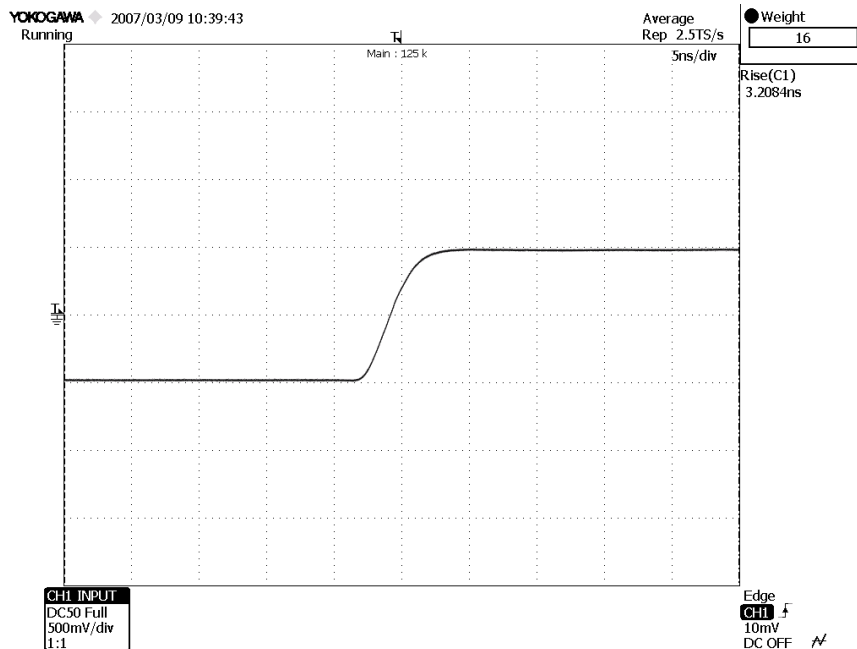
Note: Spectral noise data is measured at the amplifier output with open but shielded input. To determine the spectral input noise divide the measured output noise by the amplifier gain of  $5 \times 10^4$  V/A, i.e.:

Marker	Frequency	Output Noise	Resulting Input Noise
1	10 MHz	190 nV/√Hz	3.8 pA/√Hz
2	100 MHz	273 nV/√Hz	5.5 pA/√Hz

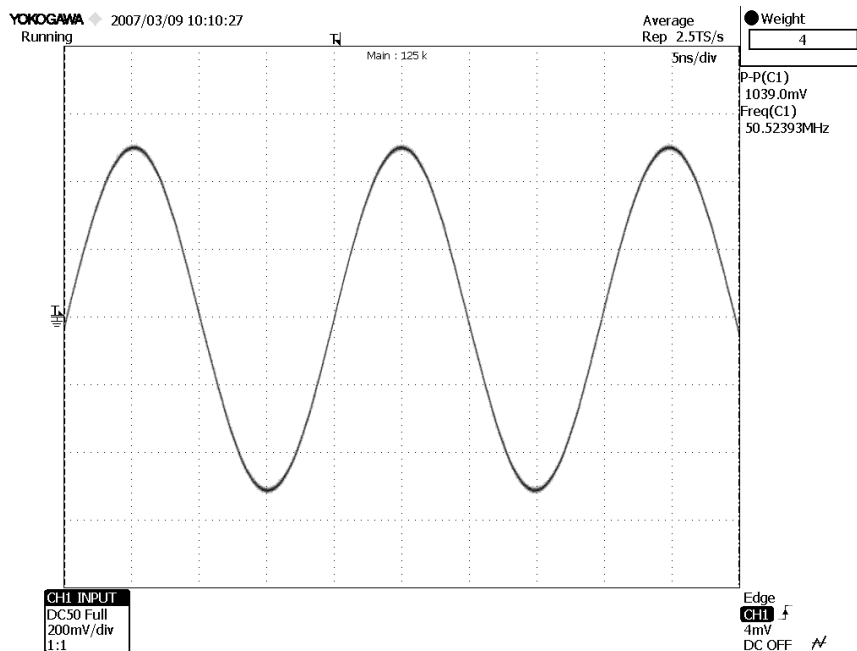
# High-Speed Current Amplifier

Typical Performance Characteristics (continued)

Pulse Response to Square Wave Input Signal (with 16 times averaging)



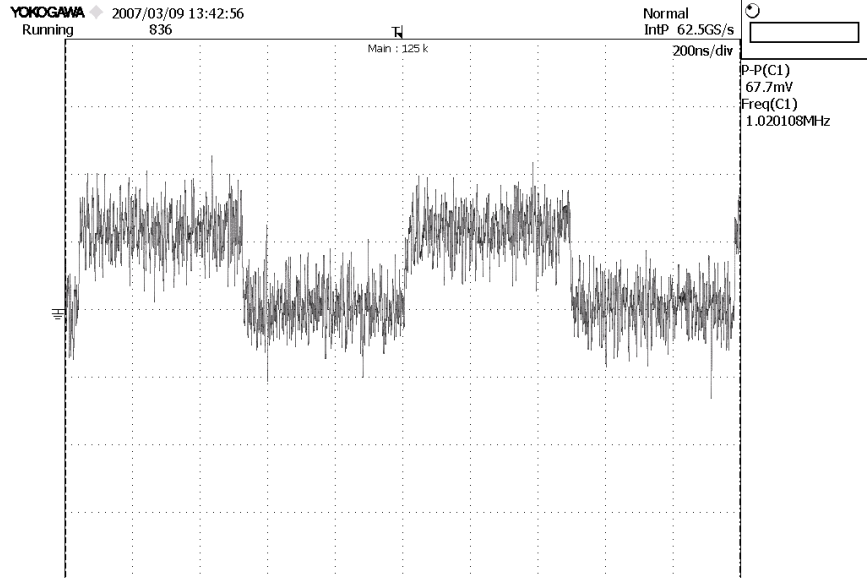
Large Signal Response output signal for 50 MHz, 20  $\mu$ A peak-peak input signal (with 4 times averaging)



# High-Speed Current Amplifier

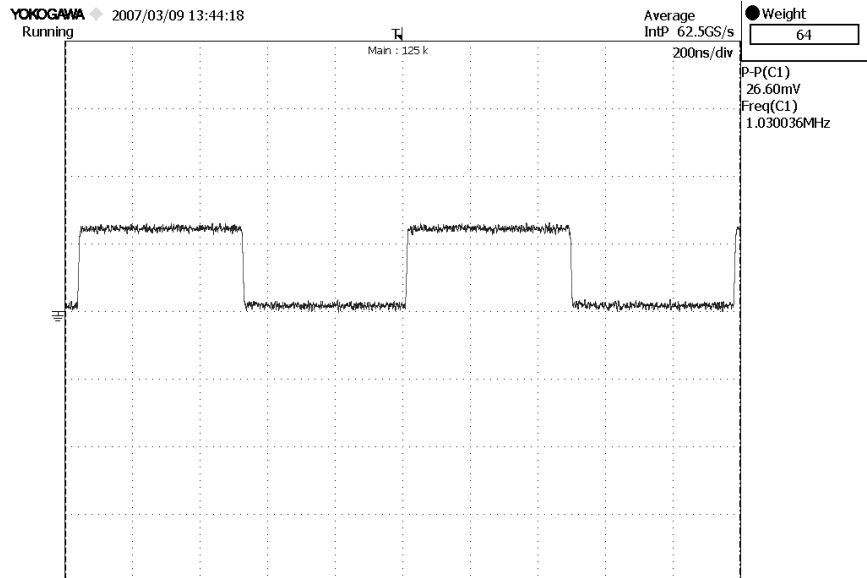
Typical Performance Characteristics (continued)

Small Signal Response  
output signal for 1 MHz, 500 nA peak-peak square wave input signal (without (top) and with 64 times averaging (bottom))



CH1 INPUT  
DC50 Full  
20.0mV/div  
1:1

Edge CH2 f  
130mV  
DC OFF

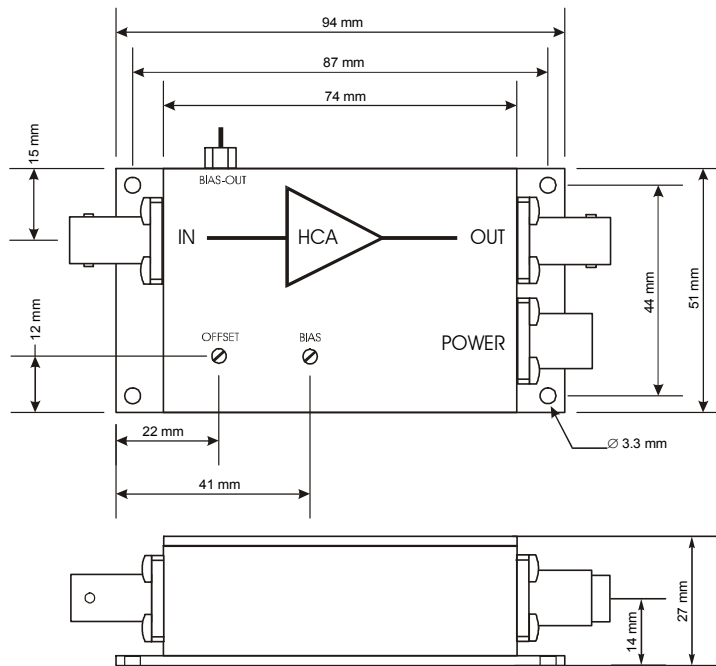


CH1 INPUT  
DC50 Full  
20.0mV/div  
1:1

Edge CH2 f  
130mV  
DC OFF

High-Speed Current Amplifier

Dimensions



DZ01-0201-22

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