P-9202 Current to Voltage Amplifier

- © **Single Channel Amplifiers for Laboratory Use or System Integration**
- © **Current to Voltage Converter**
- © **Low Offset Voltage for Photovoltaic Mode Operation**
- © **High Gain and High Speed Optimized Models**
- © **Eight Manually or Remote Controlled Gain Ranges**
- © **Simple Operation**
- © **Metal Shielded Package**
- © **Remote Control Interface with Opto-Coupler**
- © **AC operation**

Associated Parts / Service:
Chapter Detector Heads
Chapter Integrating Spheres
Chapter Calibration

Photodiodes (Si, InGaAs, Ge) generate current signals with an intensity that correlates to a wide dynamic range linear to the incident optical radiation.
This linear function is only achieved if the photodiodes are operated in the photovoltaic mode, which means almost in a short circuit condition.
In an open circuit configuration the photodiode would offer a voltage signal with a nearly logarithm characteristic.
The practical use of photodiodes requires amplifiers which offer the following features:

- current-to-voltage conversion
- lowest offset voltage for 'ideal' short circuit condition
- large dynamic range
- high gain for high sensitivity
- short slew rate for fast measurements.

Gigahertz-Optik's **P-9202 Amplifiers** offer optimum performance when used with state-of-the-art photodiodes. These amplifiers feature careful design of the input stage using high quality photocurrent amplifiers, the use of reed relays for switching between the high impedance amplification ranges and a remote control interface isolated by opto-couplers.
Due to its superior electronic and mechanical stability, the P-9202 series, originally designed for laboratory use, have found their way into industrial OEM applications.

Three standard versions are offered, differing in maximum sensitivity and bandwidth:

P-9202-4 Fast

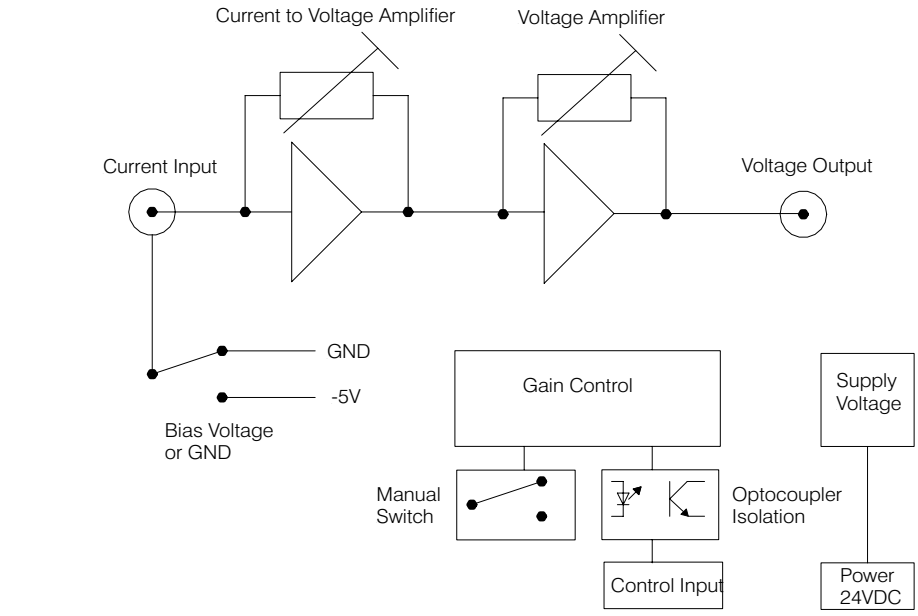
Amplifier offers an 8-step switch-able sensitivity range from 300 nA/V to 1 μA/V and a nearly constant slew-rate of 1 μs in all gain ranges. Photodiodes can be operated in photovoltaic or photodiode mode (-5 V bias voltage). Useful in applications with need for high bandwidth up to 330 kHz or short, 1 μs rise time.

P-9202-5 Universal

Amplifier offers an 8-step switch-able sensitivity range from 100 pA/V to 1 mA/V and variable, gain dependent slew-rate. Photodiodes can be operated in photovoltaic or photodiode mode (0.5 V bias voltage). This model is suitable for use as a pre-amplifier for lock-in amplifier to extend their measurement range.

P-9202-6 High-sensitive

Amplifier with an 8-step switch-able sensitivity range from **10 pA/V!** to 100 μA/V and variable, gain dependent slew-rates. This model is suited to applications involving very low signals from the photodiodes starting in the 10 femto ampere (0.01 pA) range.
Each amplifier is AC operated with an external power unit sup-



P-9202 Specifications & Ordering Instruction

Specifications

Limits:

max. input voltage:	+/-12 V
max. signal input current:	+/-5 mA
max. output current:	+/-5 mA
max. output voltage:	+/-9 V
Supply voltage:	min. 12 V, max. 24 V (80 mA)
Remote input voltage:	+5 V (25 mA)
Operating temperature:	+5 °C to +40 °C (+41 °F to +104 °F)

Technical data:

Housing:	Aluminum
Dimensions:	105 mm x 80 mm x 45 mm (4.1 in x 3.2 in x 1.8 in)
Weight:	approx. 400 g (0.9 lb)
Signal input:	BNC socket
Signal output:	BNC socket
Power supply:	24 V/80 mA, 2 pin FRIWO connector

Remote interface: D-SUB 9-pin (socket terminal strip)

Remote interface pin-out:
PIN 1: remote central point
PIN 2: Ranges 7/8
PIN 3: Ranges 5/6
PIN 4: Ranges 3/4
PIN 5: Ranges 1/2
PIN 6: Ground
PIN 7: Signal output (R_{out}=1 kΩ)
PIN 8: Remote COMMON
PIN 9: Not connected

Parts Supplied: amplifier, plug-in AC power supply unit (220 V/50 Hz, 24 VDC/80 mA)

Range Specifications

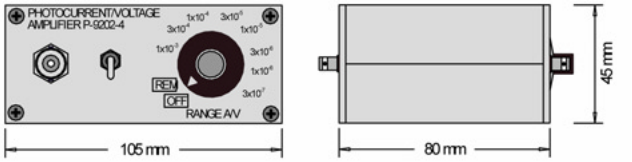
Model	Gain Stage	Sensitivity	Slew Rate	Error ± of Reading	Noise Voltage
P-9202-4	1	1 mA/V	1 µs	0.2 % +/-2 mV	1 mV p-p
	2	300 µA/V	1 µs	0.2 % +/-5 mV	1 mV p-p
	3	100 µA/V	1 µs	0.2 % +/-2 mV	1 mV p-p
	4	30 µA/V	1 µs	0.2 % +/-5 mV	1 mV p-p
	5	10 µA/V	1 µs	0.2 % +/-2 mV	1 mV p-p
	6	3 µA/V	1 µs	0.2 % +/-5 mV	3 mV p-p
	7	1 µA/V	3 µs	0.2 % +/-2 mV	3 mV p-p
	8	300 nA/V	3 µs	0.2 % +/-5 mV	10 mV p-p
P-9202-5	1	1 mA/V	5 µs	0.2 % +/-1 mV	1 mV p-p
	2	100 µA/V	5 µs	0.2 % +/-1 mV	1 mV p-p
	3	10 µA/V	30 µs	0.2 % +/-1 mV	1 mV p-p
	4	1 µA/V	30 µs	0.2 % +/-1 mV	1 mV p-p
	5	100 nA/V	500 µs	0.2 % +/-1 mV	1 mV p-p
	6	10 nA/V	500 µs	0.2 % +/-1 mV	2 mV p-p
	7	1 nA/V	20 ms	0.7 % +/-1 mV	1 mV p-p
	8	100 pA/V	20 ms	0.7 % +/-1 mV	4 mV p-p
P-9202-6	1	100 µA/V	25 ms	0.2 % +/-1 mV	0.5 mV eff
	2	10 µA/V	25 ms	0.2 % +/-1 mV	0.5 mV eff
	3	1 µA/V	250 ms	0.2 % +/-1 mV	0.5 mV eff
	4	100 nA/V	250 ms	0.2 % +/-1 mV	0.5 mV eff
	5	10 nA/V	250 ms	0.5 % +/-1 mV	0.5 mV eff
	6	1 nA/V	250 ms	0.5 % +/-1 mV	0.5 mV eff
	7	100 pA/V	2.5 s	1 % +/-1 mV	0.5 mV eff
	8	10 pA/V	2.5 s	1 % +/-1 mV	0.5 mV eff

Amplifier Input Specifications

Model	Max. Bias Current	Bias Voltage	Offset Voltage Drift	Input Impedance
P-9202-4	5 pA	0 V or –5 V [1]	1 µV/°C	Virtual short circuit
P-9202-5	2 pA	0 V or –5 V [1]	1 µV/°C	
P-9202-6	0.2 pA	-	5 µV/°C	

1) on the outer contact of the BNC signal input socket

Dimensions



Calculation of the Input Noise Voltage

Noise voltage

Input noise voltage

$$N_{eff\,(\sqrt{Hz})} = \frac{N_{p-p} * \sqrt{t_{(10-90)} * 1{,}5} * sensitivity\,(A/V)}{6} \left(A/\sqrt{Hz}\right)$$

Ordering Information	
P-9202-4	Amplifier, 300 nA/V to 1 mA/V. Including external power supply
P-9202-5	Amplifier, 100 pA/V to 1 mA/V. Including external power supply
P-9202-6	Amplifier, 10 pA/V to 100 µA/V. Including external power supply