

User's Guide

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HP 1146A AC/DC Oscilloscope Current Probe

Receiving Your Shipment

Upon receiving your shipment, check that the contents agree with the packing slip. If anything is missing, contact your nearest Hewlett-Packard Sales Office. If the shipment was damaged, contact the carrier, then contact the nearest Hewlett-Packard Sales Office.

Packaging

The HP 1146A AC/DC Current Oscilloscope Probe is shipped with a separate battery (not installed) and a User's Guide.

WARNING



- Connect the probe to the oscilloscope or voltage measuring instrument before clamping the probe around a conductor.
- Never use the probe on circuits rated higher than 600 V or with float voltage greater than 600 V.
- Never leave the probe clamped around a conductor while it is not connected to an oscilloscope or voltage measuring instrument.
- Carefully center the conductor inside the probe jaws and ascertain that the probe is perpendicular to the conductor before closing the jaws.
- Avoid, if possible, the proximity of other conductors which may create noise.
- Check the magnetic mating surfaces of the probe jaws; these should be free of dirt, rust, or other foreign matter.
- Do not use a probe which is cracked, damaged or has defective leads.



This symbol signifies that the HP 1146A AC/DC Oscilloscope Current Probe is protected by double or reinforced insulation. Only use specified replacement parts when servicing the instrument.



This symbol signifies CAUTION! and requests that the user refer to the user manual before using the instrument.

Description

The HP 1146A AC/DC Current Oscilloscope Probe expands oscilloscope applications in industrial, automotive or power environments, and is ideal for analysis and measurement of distorted current waveforms and harmonics. The probe permits accurate display and measurement of currents from 100 mA to 100 A rms, DC to 100 kHz without breaking into the circuit. The probe uses Hall effect technology to measure AC and DC signals. The probe connects directly to an oscilloscope through a 2 meter coaxial cable with an insulated BNC.

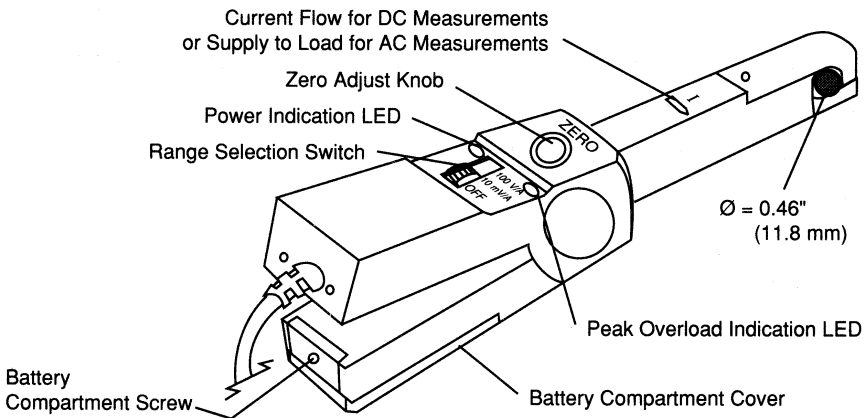
Compatibility

The HP 1146A AC/DC Current Oscilloscope Probe is compatible with any analog or digital oscilloscope or other voltage measuring instrument which has the following features:

- BNC input connector.
- Range capable of displaying 0.2 to 0.5 V per division.
- Minimum input impedance of 1 M Ω .

Control and Connector Identification

Figure 1



Specifications

Electrical Specifications

Current Range 100 mV/A: 100 mA to 10 A peak
10 mV/A: 1 to 100 A peak

Output Signal 1000 mV peak max

AC current accuracy (After calibration and for one year)
(zero probe before making measurement)

Range	Accuracy
100 mV/A (50 mA to 10 A peak)	3% of reading ± 50 mA
10 mV/A (500 mA to 40 A peak)	4% of reading ± 50 mA
10 mV/A (40 A to 100 A peak)	15% max at 100A

Phase Shift¹ < 1° from dc to 65 Hz on 10 mV/A
< 1.5° from dc to 65 Hz on 100 mV/A

Frequency Range DC to 100 kHz (-3dB with current derating)

Noise Range 10 mV/A: 480 μ V
Range 100 mV/A: 3 mV

Slew Rate Range 10 mV/A: 20 mV/ μ s
Range 100 mV/A: 0.3 V/ μ s

Load Impedance >1 M Ω / 100 pF

Insertion Impedance (50/60 Hz) 100 mV/A: 0.01 Ω
10 mV/A: 0.01 Ω

Rise or Fall time Range 100 mV/A: 3 μ s
Range 10 mV/A: 4 μ s



Working Voltage 600 Vrms max.

Common mode voltage 600 Vrms max.

Influence of adjacent conductor <0.2 mA/A AC

Influence of conductor position in jaw 0.5% of reading at 1 kHz

Battery 9 V alkaline (NEDA 1604A, IEC 6LR61)

Low battery green LED when ≥ 6.5 V

Overload indication red LED indicates input greater than the selected range.

Typical Consumption 8.6 mA

Battery Life 55 hours typical

¹ Reference conditions 23 °C \pm 5 ° C, 20 to 75% relative humidity, DC to 1 kHz, probe zeroed, 1 minute warmup, batteries at 9 V \pm 0.1 V, external magnetic field <40 A/m, no DC component, no external current carrying conductor, 1 M Ω / 100 pF load, conductor centered in jaw.

Environmental Specifications

Operating Temperature 0° to 50°C (32° to 122°F)

Storage Temperature -30° to 80°C (-22° to 176°F)

Temperature Influence <0.2% per °C

Operating Relative Humidity

10° to 30 °C: 85 ±5% RH (without condensation)

40° to 50 °C: 45 ±5% RH (without condensation)

Altitude Operating: 0 to 2000 m
Non operating: 0 to 12,000 m

Mechanical Specifications

Zero Adjustment 20 turn potentiometer

Maximum cable diameter 0.46" (11.8 mm)

Case Protection IP20 per IEC 529

Drop Test 1.0 m on 38 mm of oak on concrete; test according to IEC 1010

Mechanical Shock 100 G; test per IEC 68-2-27)

Vibration Test per IEC 68-2-6, frequency range 10 Hz to 55 Hz, amplitude 0.15 mm

Handle Lexan® 920A, UL 94 V2

Dimensions 9.09 x 1.42 x 2.64" (231 x 36 x 67mm)

Weight 11.6 oz (330 g) with battery

Color light gray

Output lead insulated coaxial cable with insulated BNC connector

Cable length 6.5 foot (2m)

Safety Specifications

- Double insulation or reinforced insulation between primary or secondary and outer case of the handle, per IEC 1010.
- 600 V category III, Pollution: 2.
- 300 V category IV, Pollution: 2.
- 5550 V 50/60 Hz between primary or secondary and the outer case of the handle.
- 3250V 50/60 Hz between primary and secondary.

Electromagnetic compatibility



EN 50081-1 Class B

ISM 1-A

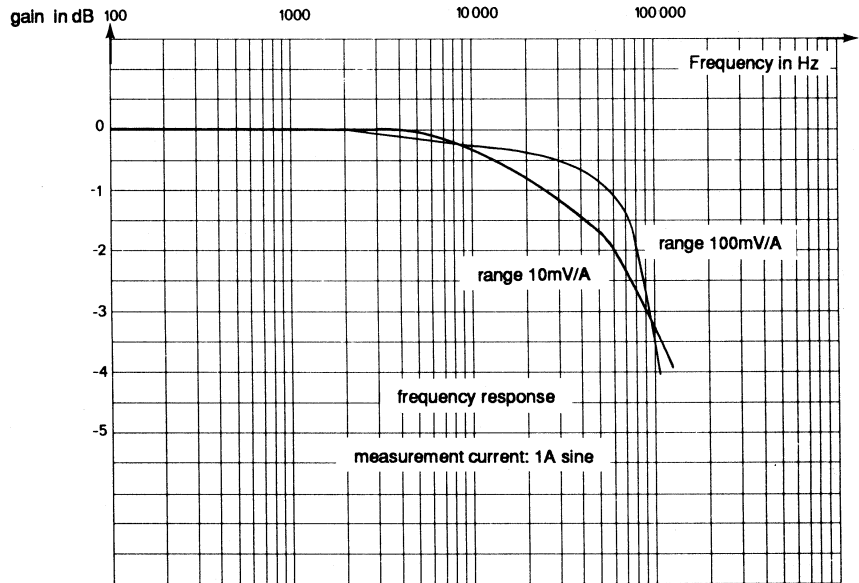
EN 50082-2 Electrostatic discharge IEC 1000-4-2

Radiated Field IEC 1000-4-3

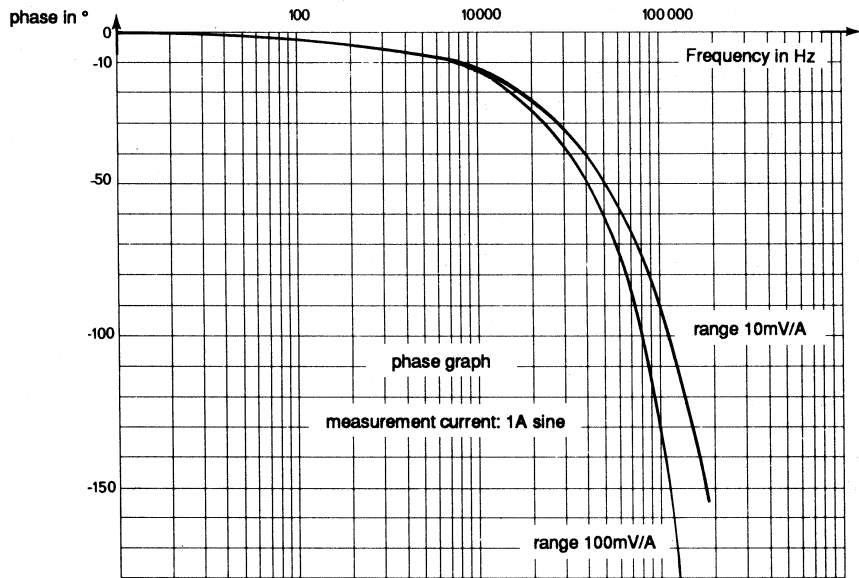
Fast transients IEC 1000-4-4

Magnetic Field at 50/60 Hz IEC 1000-4-8

Typical Response Curves

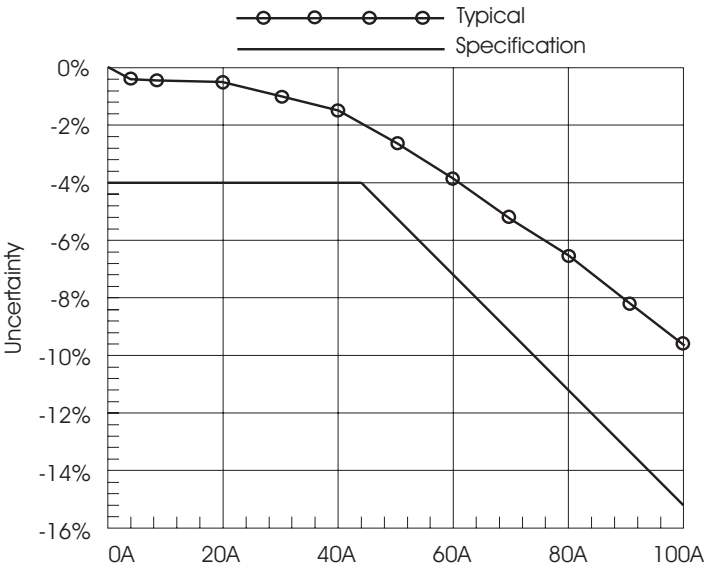


Frequency



Phase Shift

Linearity for a DC signal Range 10 mV/A



Accuracy

Operation

Zero Adjustment

The probe has a zero adjustment which should be adjusted before measurement. Alternatively, you may "zero" with the oscilloscope instead.

Current Measurement

Connect the current probe to the proper input channel on the oscilloscope. Begin with the least sensitive range on the current probe (10 mV/A). Select the 0.5 V/Division range on your oscilloscope. Clamp the probe on the conductor to be measured and read the current flowing directly on your oscilloscope.

You may also use your oscilloscope to amplify the signal while using the 100 mV/A probe range (which offers the best accuracy and least phase shift).

Important

It is possible to change the range on the current probe without removing the probe from the current carrying conductor, but it is important to remember not to exceed the permissible peak ratings of 1000 mV peak or 2000 mV peak to peak maximum. The peak ratings by range are: 10 A peak on the 100 mV/A range, 100 A peak on the 10 mV/A range.

Battery Indication (Green LED)

The probe has a battery condition LED. To ensure proper readings with your current probe, be sure that the green LED is lit during measurement. If not, replace the 9 V battery.

Peak Overload (OL) Indication (Red LED)

The HP 1146A offers an overload indicator. If the red LED illuminates during measurement, this indicates that the peak value exceeds the instrument response level and that the output is distorted. Switch the probe to a higher range if possible.

Maintenance

Be sure that mating surfaces of the jaw are free of dirt or foreign matter. If they are rusted, gently clean with a soft, lightly oiled cloth. Do not leave excessive oil residue.

Battery Replacement

When the probe is turned on, the green battery indication LED should light up. If not, replace the 9 V battery (see Figure 1). To replace the battery, disconnect the probe from the circuit and the oscilloscope. Turn the probe "OFF". Unscrew the battery compartment screw and pull out the battery compartment cover. Replace the battery and put the cover back on. Do not replace the battery while probe is in use.

Calibration

To guarantee that your instrument complies with the factory specifications, we recommend that the HP 1146A AC/DC Oscilloscope Current Probe be submitted to our factory service at one year intervals for recalibration, or as required by other standards.

Technical Assistance

If you are experiencing any technical problems, or require assistance with the proper application of this instrument, in the United States please call our tollfree hotline at 1-800-452-4844, or call your local Hewlett-Packard Sales Representative.



HP Part Number 01146-92000