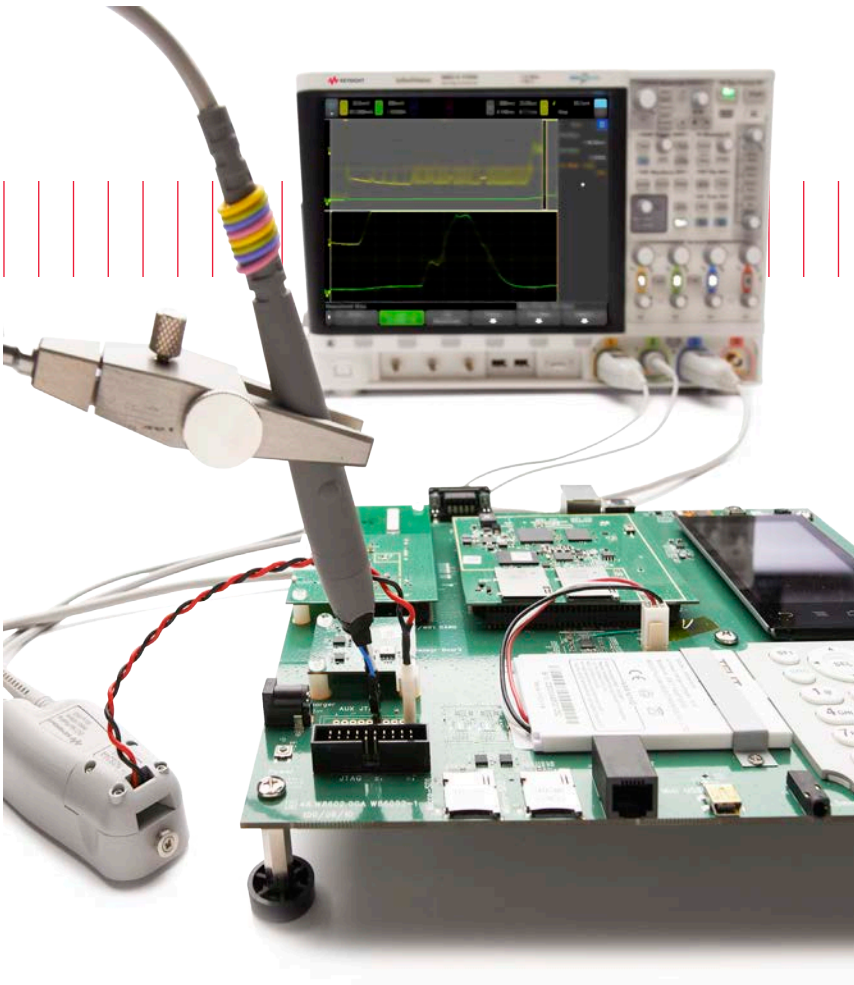


# Keysight Technologies

## InfiniiVision Oscilloscope Probes and Accessories

For 1000 X-, 2000 X-, 3000A/T X-, 4000 X-, 6000 X-, 5000, 6000, and 7000 Series

Selection Guide



## Clamp-on Current Probes

- Up to 150 MHz bandwidth and 500 Arms current measurement range
- Hybrid technology to measure ac and dc
- Compatible with 1 M $\Omega$  scope input

### Accurate current measurements without breaking the circuit

Compatible with any scope or voltage measuring instruments with BNC input, the 1146B and N2780B Series current probes offer accurate and reliable solutions for measuring dc and ac currents. The probes use a hybrid technology that includes a Hall effect sensor that senses the dc current, and a current transformer that senses the ac current, making it unnecessary to make an electrical connection to the circuit.

#### 1146B 100 kHz current probe

The 1146B ac/dc current probe provides accurate display and measurement of currents from 100 mA to 100 Arms, dc to 100 kHz, without breaking into the circuit. A battery level indicator and overload indicator help ensure proper readings. It connects directly to the scope through a 2-m coaxial cable with an insulated BNC.



1147B 50-MHz current probe with AutoProbe interface



N2893A 100-MHz current probe with AutoProbe interface



N7026A 150-MHz high sensitivity current probe with AutoProbe interface



1146B 100-kHz current probe



N2780B Series current probes with N2779A power supply

#### 1147B/N2893A/N7026A 50-MHz/100-MHz/150-MHz current probe with AutoProbe interface

The 1147B/N2893A/N7026A have wide bandwidth ranges, from DC to 50-MHz/100-MHz/150-MHz. The probes offer flat frequency response across the entire bandwidth range, low noise (2.5 mArms for 1147B/N2893A, 250  $\mu$ Arms for N7026A) and low circuit insertion loss.

These three current probes are compatible with the AutoProbe interface, which completely configures the oscilloscope for the probe. AutoProbe can be found on the InfiniiVision 3000T X-, 4000 X-, and 6000 X-Series. Probe power is provided by the scope. The N2893A and N7026A uniquely provide auto demagnetization and offset elimination feature when used in conjunction with InfiniiVision or Infiniium oscilloscopes.

#### N2780B/81B/82B/83B/83L 2-MHz/10-MHz/50-MHz/100-MHz current probes

The N2780B Series current probes are high bandwidth, active current probes, featuring flat bandwidth, low noise (2.5 mArms) and low circuit insertion loss. In conjunction with the power supply (model N2779A), these probes can be used with any oscilloscope having a high-impedance BNC input. The companion power supply N2779A (3 x 12 Vdc output) lets you connect up to any three N2780B-83B current probes to a single power supply.

The N2783L 80 MHz current probe offers a 5-m long cable, which allows you to reach DUTs over long distances very easily. Other than the bandwidth performance, the N2783A and N2783L have the same electrical performance. The N2783L also requires the N2779A power supply to power the probe.



## Clamp-on Current Probes (Continued)

### N7026A high sensitivity clamp-on current probe

#### 1 mA/div sensitivity

The N7026A is the Keysight's highest sensitivity clamp-on current probe. It has up to 5x lower noise than our other clamp-on current probes with 0.1V/A output voltage rate. This enables you to measure down to 1 mA/div with much higher accuracy. The N7026A, when used with an InfiniiVision or Infiniium oscilloscope, provides highly-accurate, low current waveforms for improved debug and analysis.

#### Wide input range

It also has a wide input range, up to 30 Arms or 40 Apk. To achieve the widest input range, you must use the external AC power adapter that comes with the probe. Without the external power adapter, you can achieve up to a 5 Arms or 5 Apeak input range. The oscilloscope will automatically synchronize with the corresponding power source when inserting or removing the AC adapter. In either case, a degauss operation will occur.

#### Degaussing made easy

For accurate measurement with a clamp-on current probe, degaussing and eliminating the offset error is critical. A degauss button is included in the design of this probe. One push of the button will perform a degauss operation. Pushing and holding the button for > 2 sec will perform a degauss and autozero the DC offset. Whenever you are using the degauss button, the current sensor should be locked with no current flowing. Alternatively, the same operation can be performed from the oscilloscope GUI.



Improved noise floor of the N7026A (yellow trace) over the N2893A (green trace)



N7026A current probe



## Clamp-on Current Probes (Continued)

### Characteristics of the 1146B current probe

Bandwidth <sup>1</sup>	dc to 100 kHz (–3 dB)
Current range <sup>1</sup>	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 <sup>1</sup>	
Range	100 mV/A (50 mA to 10 A peak)
Accuracy	3% of reading ± 50 mA
Range	10 mV/A (500 mA to 40 A peak)
Accuracy	4% of reading ± 50 mA
Range	10 mV/A (40 A to 100 A peak)
Accuracy	(40 A to 100 A peak) 15% max at 100 A
Noise	Range 10 mV/A: 480 µV Range 100 mV/A: 3 mV
Insertion impedance	0.01 Ω (50/60 Hz)
Maximum working voltage	600 Vrms CAT II or 300 Vrms CAT III
Maximum common mode voltage	600 Vrms CAT II or 300 Vrms CAT III
Influence of adjacent conductor	< 0.2 mA/A AC
Influence of conductor position	< 0.2 mA/A AC
Battery	9 V alkaline (NEDA 1604A, IEC 6LR61)
Low battery	Green LED on when ≤ 6.5 V
Battery life	55 hours typical

Note: Reference conditions 23 ± 5 °C, (73.4 ± 41 °C) 20 to 75% relative humidity, dc to 1 kHz, probe zeroed, 1-minute warmup, batteries at 9 V + 0.1 V, external magnetic field < 40 A/m, no dc component, no external current carrying conductor, 1 MΩ/100 pF load, conductor centered in jaw.

1. Characteristics marked with asterisks are specified performance. Others are typical characteristics.

### Characteristics of N2780B Series current probes

Bandwidth (–3 dB)	dc to 2 MHz (N2780B) dc to 10 MHz (N2781B) dc to 50 MHz (N2782B) dc to 80 MHz (N2783L) dc to 100 MHz (N2783A)
Maximum current (continuous)	500 A (N2780B) 150 A (N2781B) 30 A (N2782B/83B/83L)
Maximum peak current (non-continuous)	700 A peak (N2780B) 300 A peak (N2781B) 50 A peak (N2782B/83B/83L)
Maximum input voltage	300 V CAT I (N2782B/83B/83L) 300 V CAT III, 600 V CAT II (N2780B/81B)
Output voltage rate	0.01 V/A (N2780B/81B) 0.1 V/A (N2782B/83B/83L)
Amplitude accuracy	± 1.0 % rdg ± 500 mA (N2780B) ± 1.0 % rdg ± 100 mA (N2781B) ± 1.0 % rdg ± 10 mA (N2782B) ± 1.0 % rdg ± 10 mA (N2783B/83L)

### Ordering information for Keysight current probes

1146B	100-kHz current probe
1147B	50-MHz current probe with AutoProbe interface
N2893A	100-MHz current probe with AutoProbe interface
N7026A	150-MHz high sensitivity current probe with AutoProbe interface
N2780B	2-MHz current probe
N2781B	10-MHz current probe
N2782B	50-MHz current probe
N2783L	80-MHz current probe with 5-m long cable
N2783B	100-MHz current probe
N2779A	3-channel power supply for N2780B/81B/82B/83B/83L

For more information about the N2780B Series current probes, refer to the Keysight N2780B Series current probe data sheet, literature number 5989-6432EN.



## Clamp-on Current Probes (Continued)

### Characteristics of the 1147B/N2893A/N7026A current probes

	<b>1147B/N2893A</b>	<b>N7026A</b>
Bandwidth (-3 dB)	DC to 50 MHz (1147B) DC to 100 MHz (N2893A)	DC to 150 MHz
Rise time (calculated, 10% to 90%)	7 nsec ( $Tr = 0.35/BW$ )	2.67 nsec ( $Tr = 0.4/BW$ )
Maximum current (continuous)	15 Apeak, 15 ADC, 10 Arms 30 Apeak, 30 ADC, 24 Arms (when one probe is used with InfiniiVision 3000XT, 5000/6000/7000 scope)	30 ADC, 30 Arms (with external power adapter) 5 ADC, 5 Arms (without external power adapter)
Maximum peak current (non-continuous) (for pulse-widths $\leq 10 \mu s$ )	30 Apeak 32 Apeak (when one probe is used with InfiniiVision 3000XT, 5000/6000/7000 scope)	40 Apeak (when using external AC power adapter) 15 Apeak (without using external power adapter)
Output voltage rate	0.1 V/A	1 V/A and 0.2 V/A, automatically switched by the oscilloscope
Minimum oscilloscope vertical scale	10 mA/div	1 mA/div
Amplitude accuracy	$\pm 1\%$ rdg, $\pm 10$ mA (DC or 45 to 66 Hz, rated current)	$\pm 1\%$ rdg. $\pm 5$ mA to 30 Arms (including calibration scale factor of oscilloscope measured at DC or 45 to 66 Hz)
Noise	$\leq 2.5$ mArms (for 20 MHz bandwidth measuring instrument)	$\leq 250 \mu$ Arms (for 20 MHz bandwidth measuring instrument)
Temperature coefficient for sensitivity	$\pm 2\%$ or less (within a range of 0 to 40 °C or 32 to 104 °F)	
Effect of external magnetic fields	Equivalent to a maximum of 20 mA (in a DC to 60 Hz, 400 A/m magnetic field)	
Maximum rated power	3 VA (with rated current)	
Maximum input voltage	300 V CAT I	
Diameter of measurable conductors	5 mm dia. (0.2 in dia.)	
Probe interface	AutoProbe interface (1 M $\Omega$ terminated)	
Cable lengths	Approx. 1.5 m (59.0 in)	
Maximum number of probes supported	2 (3000XT, 5000/6000/7000)	2 (3000XT, 5000/6000/7000 without external power adapter)
	4 (4000X, 6000X)	4 (3000XT, 5000/6000/7000 with external power adapter)
		4 (4000X, 6000X)

