

Power Meters

E-Series and 8480 Series Power Sensors

E4412A
E4413A
E9300A
E9300B
E9300H
E9301A
E9301B
E9301H
E9304A

- Operates with the E4418A/B, E4419A/B, E4416A and E4417A power meters
- Wide dynamic range, -70 to +44 dBm, sensor dependent
- Frequency range, 9 kHz to 26.5 GHz, sensor dependent
- Fast measurement speed (up to 200 readings per second, over the GPIB, with the E4418A/B power meter)
- Calibration factors, linearity and temperature compensation data stored in EEPROM



Examples of E-Series Power Sensors

E-Series Power Sensors (E4412A, E4413A and E9300 range)

The E-series diode power sensors are wide dynamic range (90 dB maximum) which operate with the EPM and EPM-P series of power meters.

The E4412A and E4413A sensors are designed for providing power measurements on continuous wave (CW) signals over the range -70 to +20 dBm, whereas the E9300 family of power sensors measure the average power of RF and microwave signals, regardless of modulation format, over an 80 dB maximum range.

8480 Power Sensor Family

The 8480 power sensors are designed for use with the E4418A/B, E4419A/B, 435B, 436A, 437B, 438A, 70100A and E1416A power meters. These thermocouple and diode power sensors provide extraordinary accuracy, stability, and SWR over a wide range of frequencies (100 kHz to 110 GHz) and power levels (-70 to +44 dBm).

E Series Specifications

Model/Frequency Range	Power Range	Maximum Power	Connector Type
E4412A 10 MHz to 18 GHz	100 pW to 100 mW (-70 to +20 dBm)	200 mW (+23 dBm)	Type-N (m)
E4413A 50 MHz to 26.5 GHz	100 pW to 100 mW (-70 to +20 dBm)	200 mW (+23 dBm)	APC-3.5mm (m)
E9300A 10 MHz to 18 GHz	1 nW to 100 mW (-60 to +20 dBm)	320 mW (+25 dBm) avg. 2W (+33 dBm) peak (<10 μsec)	Type-N (m)
E9301A 10 MHz to 6 GHz	1 nW to 100 mW (-60 to +20 dBm)	320 mW (+25 dBm) avg. 2W (+33 dBm) peak (<10 μsec)	Type-N (m)
E9304A 9 kHz to 6 GHz	1 nW to 100 mW (-60 to +20 dBm)	320 mW (+25 dBm) avg. 2W (+33 dBm) peak (<10 μsec)	Type-N (m)
E9300B 10 MHz to 18 GHz	1 μW to 25 W (-30 to +44 dBm)	0°C to 35°C: 30 W avg. 35°C to 55°C: 20 W avg. <6 GHz: 500 W peak >6 GHz: 125 W peak 500 W μs per pulse	Type-N (m)
E9301B 10 MHz to 6 GHz	1 μW to 25 W (-30 to +44 dBm)	0°C to 35°C: 30 W avg. 35°C to 55°C: 20 W avg. <6 GHz: 500 W peak 500 W μs per pulse	Type-N (m)
E9300H 10 MHz to 18 GHz	10 nW to 1 W (-50 to +30 dBm)	3.16 W avg. 100 W peak 100 W μs per pulse	Type-N (m)
E9301H 10 MHz to 6 GHz	10 nW to 1 W (-50 to +30 dBm)	3.16 W avg. 100 W peak 100 W μs per pulse	Type-N (m)

Best SWR in the Industry

Mismatch uncertainty is usually the largest single source of error in power measurements. The 8480 power sensor family gives you extremely low SWR even at mm-wave frequencies. For example, the W8486A power sensor has a specified SWR of less than 1.08:1 over its entire 75 to 110 GHz frequency range. This low SWR translates into minimum mismatch uncertainty and optimum measurement accuracy.

Accurate Calibration and Traceability

Each power sensor in the 8480 family is individually calibrated and traceable to the U.S. National Institute of Standards and Technology (NIST, formerly NBS). The uncertainty in this calibration factor is your link to NIST. The cal factor measurement system used by Standards Lab provides you with minimum cal factor uncertainty.

Millimeter-Wave Sensor Calibration

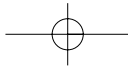
A 50 MHz calibration port is included in Agilent waveguide power sensors for calibration with the power meter. This calibration provides traceability to NIST at millimeter-wave frequencies, and it eliminates the uncertainties due to temperature changes and the variance in making measurements with different meter/sensor combinations.

Key Literature

- EPM Power Meter Brochure, p/n 5965-6380E
- E9300 Sensors Product Overview, p/n 5968-4960E
- Technical Specifications, p/n 5965-6382E
- Configuration Guide, p/n 5965-6381E
- Application Note 64-1B, p/n 5965-6630E
- Application Note 64-4B, p/n 5965-8167E

Ordering Information

- E4412A** CW Power Sensor (10 MHz to 18 GHz)
- E4413A** CW Power Sensor (50 MHz to 26.5 GHz)
- E9300A** Average Power Sensor (10 MHz to 18 GHz)
- E9301A** Average Power Sensor (10 MHz to 6 GHz)
- E9304A** Average Power Sensor (9 kHz to 6 GHz)
- E9300B** Average Power Sensor (10 MHz to 18 GHz)
- E9301B** Average Power Sensor (10 MHz to 6 GHz)
- E9300H** Average Power Sensor (10 MHz to 18 GHz)
- E9301H** Average Power Sensor (10 MHz to 6 GHz)



8480 Series Specifications

Model	Frequency range	Maximum SWR	Power linearity ¹	Maximum power	Connector type	Weight	
25 Watt Sensors 1 mW to 25 W (0 to +44 dBm)							
8481B	10 MHz to 18 GHz	10 MHz to 2 GHz: 1.10 2 to 12.4 GHz: 1.18	+35 to +44 dBm; ±4%	0° to 35° C: 30 W avg ² 35° to 55° C: 25 W avg	Type-N(m)	Net 0.8 kg (1.75 lb) Shipping 1.5 kg (3.25 lb)	
8482B	100 kHz to 4.2 GHz	12.4 to 18 GHz: 1.28 100 kHz to 2 GHz: 1.10 2 to 4.2 GHz: 1.18		0.01 to 5.8 GHz: 500 W pk 5.8 to 18 GHz: 125 W pk 500 W-µs per pulse	Type-N(m)		
3 Watt Sensors 100 µW to 3 W (-10 to +35 dBm)							
8481H	10 MHz to 18 GHz	10 MHz to 8 GHz: 1.20 8 to 12.4 GHz: 1.25 12.4 to 18 GHz: 1.30	+25 to +35 dBm; ±5%	3.5 W avg, 100 W pk 100 W-µs per pulse	Type-N(m)	Net 0.2 kg (0.38 lb) Shipping 0.5 kg (1 lb)	
8482H	100 kHz to 4.2 GHz	100 kHz to 4.2 GHz: 1.20			Type-N(m)		
100 mW Sensors 1 µW to 100 mW (-30 to +20 dBm)							
8485A	50 MHz to 26.5 GHz	50 to 100 MHz: 1.15 100 MHz to 2 GHz: 1.10 2 to 2.4 GHz: 1.15 12.4 to 18 GHz: 1.20 18 to 26.5 GHz: 1.25	+10 to +20 dBm; +2, -4%	300 m W avg, 15 W pk 30 W-µs per pulse	APC-3.5 mm (m)	Net 0.2 kg (0.38 lb) Shipping 0.5 kg (1 lb)	
Option 033	50 MHz to 33 GHz	26.5 to 33 GHz: 1.40					
8481A	10 MHz to 18 GHz	10 to 30 MHz: 1.40 30 to 50 MHz: 1.18 50 MHz to 2 GHz: 1.10 2 to 12.4 GHz: 1.18 12.4 to 18 GHz: 1.28			Type-N(m)		
8482A	100 kHz to 4.2 GHz	100 to 300 kHz: 1.60 0.3 to 1 MHz: 1.20 1 MHz to 2 GHz: 1.10 2 to 4.2 GHz: 1.30			Type-N(m)		
8483A (75 Ω)	100 kHz to 2 GHz	100 to 600 kHz: 1.80 600 kHz to 2 GHz: 1.18		300 mW avg, 10 W pk	Type-N(m) 75 Ω		
R8486A	26.5 to 40 GHz	1.4	+10 to +20 dBm; +2, -4%	300 mW avg, 15 W pk 30 W-µs per pulse	Waveguide Flange UG-599/U	Net 0.26 kg (0.53 lb) Shipping 0.66 kg (1.3 lb)	
Q8486A	33 to 50 GHz	1.5			Waveguide Flange UG-383/U		
V8486A	50 to 75 GHz	1.04	+10 to +20 dBm; ±2%	200mV avg 40 W pk 10 us pulse	Waveguide Flange UG-385/U	Net 0.4 kg (0.91 lb) Shipping 1 kg (2.11 lb)	
W8486A	75 to 110 GHz	1.08	-30 to +10 dBm <±1%	0.5% duty cycle 200 mW avg 40 W peak	Waveguide Flange UG-387/U	Net 0.4 kg (0.9 lb) Shipping 1.0 kg (2.1 lb)	
8487A	50 MHz to 50 GHz	50 to 100 MHz: 1.15 100 MHz to 2 GHz: 1.10 2 to 12.4 GHz: 1.15 12.4 to 18 GHz: 1.20 18 to 26.5 GHz: 1.25 26.5 to 40 GHz: 1.30 40 to 50 GHz: 1.50	+10 to +20 dBm; +2, -4%	300 mW avg, 15 W pk 30 W-µs per pulse	2.4 mm (m)	Net 0.14 kg (0.28 lb) Shipping 0.5 kg (1 lb)	
High Sensitivity Sensors 100 pW to 10 µW (-70 to -20 dBm)							
8481D^{3,4}	10 MHz to 18 GHz	10 to 30 MHz: 1.40 30 MHz to 4 GHz: 1.15 4 to 10 GHz: 1.20 10 to 15 GHz: 1.30 15 to 18 GHz: 1.35	-30 to -20 dBm; ±1%	100 mW avg 100 mW pk	Type-N(m)	Net 0.18 kg (0.41 lb) Shipping 0.9 kg (2 lb)	
8485D³	50 MHz to 26.5 GHz	0.05 to 0.1 GHz: 1.19 0.1 to 4 GHz: 1.15 4 to 12 GHz: 1.19 12 to 18 GHz: 1.25 18 to 26.5 GHz: 1.29	-30 to -20 dBm; ±2%	100 mW avg 100 mW pk	APC-3.5 mm (m)	Net 0.2 kg (0.38 lb) Shipping 0.5 kg (1 lb)	
Option 033	50 MHz to 33 GHz	26.5 to 33 GHz: 1.35					
8487D³	50 MHz to 50 GHz	0.05 to 0.1 GHz: 1.19 0.1 to 2 GHz: 1.15 2 to 12.4 GHz: 1.20 12.4 to 18 GHz: 1.29 18 to 34 GHz: 1.37 34 to 40 GHz: 1.61 40 to 50 GHz: 1.89	-30 to -20 dBm; ±2%	100 mW avg 100 mW pk	2.4 mm (m)	Shipping 0.5 kg (1 lb) Net 0.2 kg (0.38 lb)	
R8486D³	26.5 to 40 GHz	1.4	-30 to -25 dBm; ±3%	100 mW avg or pk 40 Vdc max	Waveguide Flange UG-599/U	Net 0.26 kg (0.53 lb) Shipping 0.66 kg (1.3 lb)	
Q8486D³	33 to 50 GHz	1.4	-25 to -20 dBm; ±5%		Waveguide Flange UG-383/U		

¹ Negligible deviation except for those power ranges noted.

² For pulses greater than 30 W the maximum average power (P_{avg}) is limited by the energy per pulse (E) in W-µs according to P_{avg}=30-0.02E.

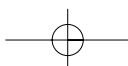
³ Includes 11708A 30 dB attenuator for calibrating against a 0 dBm, 50 MHz power reference. 11708A is factory set to 30 dB ±0.05 dB at 50 MHz, traceable to NIST. SWR <1.05 at 50 MHz.

⁴ This sensor directly replaces the popular 8484A power sensor.

Indicates QuickShip availability.

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8481A
8481B
8481D
8481H
8482A
8482B
8482H
8483A
8485A
8485D
R8486A
Q8486A
R8486D
Q8486D
W8486A
8487A
8487D