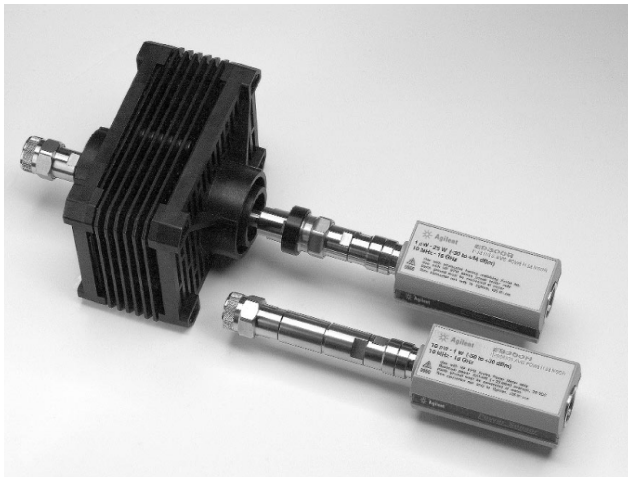
Agilent E9300 Power Sensors

E-Series

Technical Overview





Wide dynamic range. Multiple modulation formats. One sensor.

Whether you design, manufacture, or maintain RF and microwave communication equipment, you know the importance of making accurate average power measurements. With communications moving to higher modulation bandwidths and new types of signal format, you may find yourself buying multiple sensors to cover the varying power and bandwidth requirements of each modulation format.

The Agilent Technologies E-series E9300 power sensors simplify your measurement equipment requirement and save you time and money, as well. Used with the Agilent E4418 (single-channel) and E4419 (dual-channel) EPM series power meters, these new sensors can measure the average power of RF and microwave signals, regardless of the modulation format, over a wide 80 dB dynamic range (sensor dependent).

Agilent Technologies

Wide dynamic range. Multiple modulation formats. One sensor.

Now you can use a single power sensor to measure complex digital modulation formats—including those used in today's wireless communication, satellite, and cable TV systems—at both low and high power levels. The same E-series power sensor also measures multi-tone and continuous-wave (CW) signals.

There are currently seven E9300 sensors available, operating from 9 kHz to 18 GHz and -60 to +44 dBm:

E9300A	10 MHz to 18 GHz	-60 to +20 dBm
E9300B	10 MHz to 18 GHz	-30 to +44 dBm
E9300H	10 MHz to 18 GHz	-50 to +30 dBm
E9301A	10 MHz to 6 GHz	-60 to +20 dBm
E9301B	10 MHz to 6 GHz	-30 to +44 dBm
E9301H	10 MHz to 6 GHz	-50 to +30 dBm
E9304A	9 kHz to 6 GHz	-60 to +20 dBm

A special option E9304A[1] is available to cover the frequency range 9 kHz to 18 GHz (E9304A special option H18). Measurements are fast—up to 200 readings per second—accurate, and repeatable.

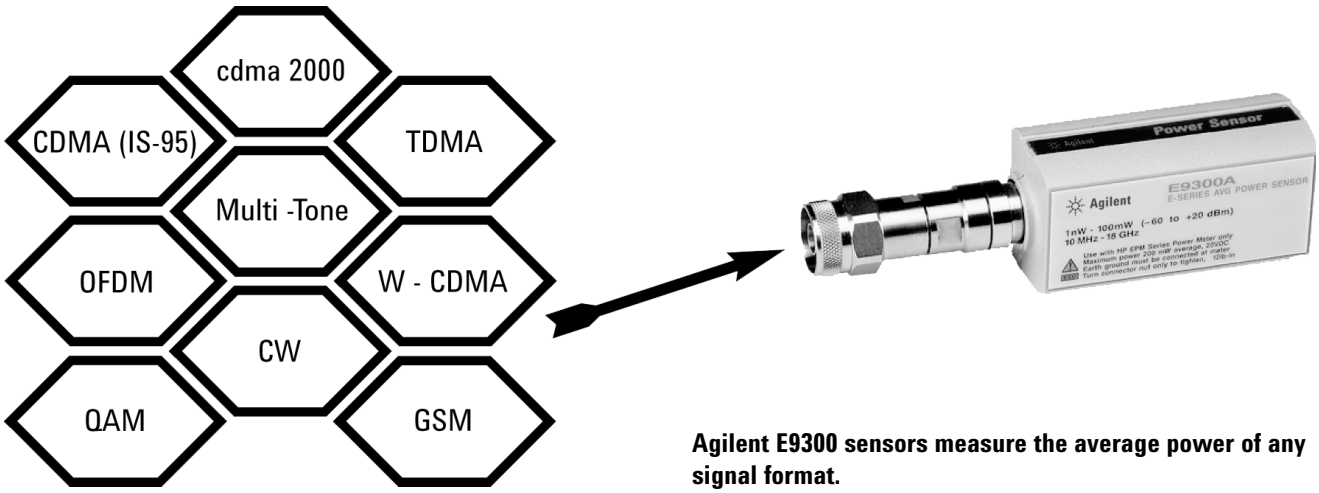
E9300 power sensors are bandwidth independent, so you do not have to worry about matching sensor bandwidth to the modulation format of your signal under test. Simply connect the power sensor to the test signal and begin measuring.

With all this capability, you can standardize on one power sensor for all of your average power measurement applications, eliminating the need to change sensors during measurement tasks and minimizing the cost of equipment.

Ideal for all your applications

- R&D and manufacturing of RF and microwave components for satellite, wireless, and terrestrial communication systems
- High-volume, automated functional test of mobile phones, cable TV and video components, consumer electronics and automotive manufacturing
- EMC measurements to CISPR[2] requirements (E9304A)
- Maintenance and repair of radio links for terrestrial and satellite communications from VLF to microwave, cable TV head-ends and broadcast TV transmitters
- Aerospace and defense R&D manufacturing, and service

1. The E9304A sensor is DC coupled and has a 5 V DC damage level. All other E9300 sensors are AC coupled and have a 20 V DC damage level specification.
2. Comite International Special des Perturbations Radioelectriques

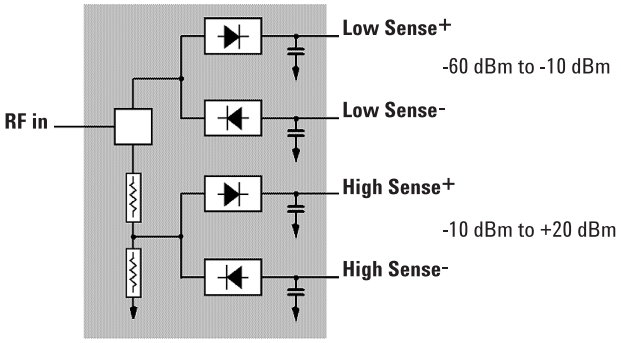


Agilent E9300 sensors measure the average power of any signal format.

Designed for accuracy

The Agilent E-series E9300 power sensors employ a patented, diode-attenuator-diode topology that ensures the accuracy and repeatability of measurements across the sensors' full -60 to +20 dBm dynamic range. This technique has the advantage of always using diodes in their square-law region, where the output current and voltages respond accurately to different modulation formats.

Each E9300 sensor has two measurements paths, one for high power between -10 and +20 dBm and one for lower power between -60 and -10 dBm. The sensor switches between power ranges quickly and automatically, thus providing the benefit of two power sensors in one.



Simplified Block Diagram of Diode-Attenuator-Diode Topology (power levels for "A" suffix sensors)

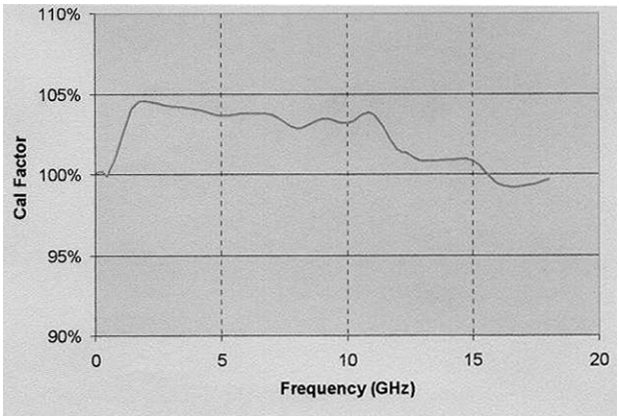
High-power measurement of signals with large crest factors

With a high maximum power specification of +25 dBm and peak power of +33 dBm (<10 microseconds duration), the E9300 sensors can handle the large crest factors typical of the newest signal modulation formats, such as orthogonal-frequency-division multiplexing (OFDM) and wideband CDMA, whilst maximizing the dynamic range.

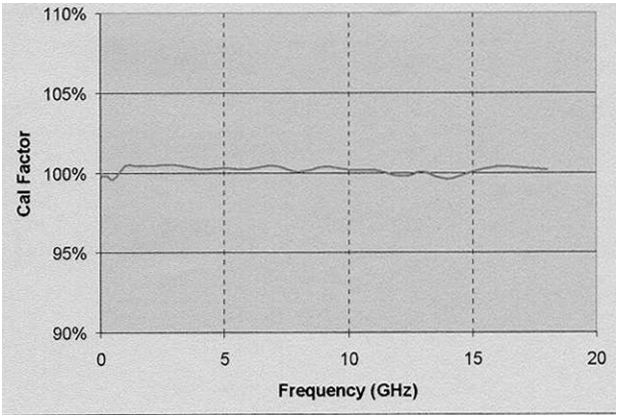
Designed for accuracy

Flat calibration factors

Amplifier intermodulation distortion measurements usually employ two-tone or multi-tone test signals. These test signals may be hundreds of MHz apart, which poses a problem because you must choose a single calibration factor point. The E9300 power sensors have exceptionally flat calibration factors across their entire frequency range, which allows you to select an appropriate calibration factor for your measurement, even when the test signals used are widely spaced in frequency.



High power path calibration factor



Low power path calibration factor

Low measurement uncertainty

In power measurement, the largest errors are often caused by sensor and source mismatch. The E-series E9300 power sensors provide exceptionally low standing-wave-ratio (SWR). For example, SWR is 1.15 from 10 MHz to 2 GHz over 25 ± 100C. Low SWR means that mismatch uncertainty has been minimized and measurement accuracy improved.

Another common source of error during power measurement is due to harmonics of the signal that is intended to be measured. Previous wide dynamic range sensors incurred up to +/-0.9 dB error when measuring signals with harmonics as low as -20 dBc. The E9300 power sensors give the average power level for all of the signals input to it, no matter their in-band harmonic content. Another form of harmonic error in diode based power measurements is when harmonics are generated by high power signals incident on the sensor, and these signals can then be reflected back to the device under test. The design of the E9300 power sensors results in low harmonic generation when compared to other wide dynamic range sensors in use today. This design minimizes stray-signal reflections and helps ensure the accuracy of high power measurements.

Fast, accurate measurements with EPM-series power meters

The E-series E9300 power sensors work with the Agilent EPM-series E4418 single-channel and E4419 dual-channel power meters. These meters provide accurate and repeatable power measurements, fast measurement speeds, and an easy-to-use interface for many power applications. “B” versions of these power meters offer RS-232 and RS-422 serial interfaces for PC connectivity and an internal, rechargeable battery option for field use. The EPM series power meters come with a standard 1-year global warranty.

E4418A or E4419A models require a simple hardware and firmware upgrade to operate with the E9300 power sensors. The hardware and firmware upgrade can be performed at a local Agilent Technologies service center or at the customer site. Firmware upgrade information is accessed from the World Wide Web, free of charge, at www.tmo.agilent.com/tmo/datasheets/English/E4418B.html (or E4419B.html). Click on the Related Info tab then follow the firmware downloading instructions.

E4418B or E4419B models with the prefix US3847 or GB3841 require only a firmware upgrade. Again this can be carried out at a Agilent Technologies service center or on-site. Information is available from the URL given above.

For more information on hardware and firmware upgrades, contact your Agilent Technologies sales representative or local Agilent Technologies service center.

More information

For more information about the E-series E9300 power sensors and EPM series power meters, visit our website at www.tm.agilent.com

Or ask your Agilent Technologies sales representative for any of the following literature:

EPM Series Power Meter, E-Series and 8480 Series Power Sensor, Data Sheet	5965-6382E
EPM Series Power Meters, Brochure	5965-6380E
Fundamentals of RF and Microwave Power Measurements, Application Note 64-1	5965-6630E
4 Steps for Making Better Power Measurements Simple, Appliction Note 64-4	5965-8167E

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