

Keysight Technologies

# N8480 Series Thermocouple Power Sensors

Data Sheet



## Introduction

The Keysight Technologies, Inc. N8480 Series thermocouple power sensors are amongst the most accurate and reliable sensors, plus they include EEPROM, and extended frequency and power ranges.

### Accurate, repeatable measurements

Here's how: Excellent linearity (1% approximately) and noise specifications. The sensors' low SWR further enhances accuracy by minimizing mismatch uncertainty. These sensors also come with dual-range power for greater sensitivity to fluctuating signals. With high accuracy and stability, the N8480 helps you test confidently, faster.

### Calibration-easy testing

During test, calibrating your sensor is an essential step. Minimizing the time this step takes is essential. The N8480 sensor eliminates cumbersome keying-in of the calibration factor (CF), eliminates manual input errors, and saves you time and effort. CF, linearity, and temperature corrections are all stored in the sensors' EEPROM—auto-downloaded on calibration. The N8480 Series streamlines the calibration procedure making overall testing faster and more efficient.

### One sensor, WIDEST range

Pick an N8480 sensor—any one—and you'll see how its wide dynamic range equips you for various applications: metrology labs, radar, mobile radio, TDMA, GSM, W-CDMA, and WiMAX™, among others. With up to 55 dBm wide dynamic range, the N8480 Series offers you the widest thermocouple sensor power range in the industry.

### System integration can be difficult, but not with the N8480

The N8480 Series sensors are backward compatible with the Keysight leading range of power meters, including the P-Series, EPM-P Series, and EPM Series. All that's needed is a simple firmware upgrade that's downloadable for free from the Website.

All SCPI codes used on the E-Series sensors are re-usable on the N8480, including most of the codes used on the 8480 Series. When migrating code from the 8480 Series, Option CFT <sup>1</sup> will allow SCPI codes to behave much like they do on the 8480 Series.

## Features

- High accuracy with excellent linearity and noise specifications
- Wide dynamic range in a single sensor
- Auto-download of calibration factor and corrections from EEPROM
- Option CFT provides full-code compatibility between sensors and the 8480 Series (excluding the N8488A)
- Broad compatibility with existing power meters: P-Series (N1911A/12A), EPM-P Series (E4416A/17A), and EPM Series (N1913A/14A, E4418B/19B)

1. Option CFT is not available for the N8488A power sensor.

## Specification Definitions

There are two types of product specifications:

- Warranted specifications
- Characteristic specifications

### Warranted specifications

Warranted specifications are covered by the product warranty and apply over 0 to 55 °C, unless otherwise noted. Warranted specifications include measurement uncertainty calculated with 95% confidence.

### Characteristic specifications

Characteristic specifications are not warranted. They describe product performance that is useful in the application of the power sensors by giving typical, but non-warranted performance parameters. These characteristics are shown in italics or denoted as “typical,” “nominal” or “approximate.”

Characteristic information is representative of the product. In many cases, it may also be supplemental to a warranted specification.

Characteristic specifications are not verified on all power sensors. The types of characteristic specifications can be placed in two groups:

- The first group of characteristic types describes ‘attributes’ common to all products of a given model or option. Examples of characteristics that describe attributes are product weight and 50-Ω input Type-N connector. In these examples, product weight is an *approximate* value and a 50-Ω input is *nominal*. These two terms are most widely used when describing a product’s attributes.
- The second group of characteristic types describes ‘statistically’ the aggregate performance of the population of products. These characteristics describe the expected behavior of the population of products. They do not guarantee the performance of any individual product. No measurement uncertainty value is accounted for in the specification. These specifications are referred to as typical.

### Conditions

The power meter and power sensor meet their specifications when:

- Stored for a minimum of two hours at a stable temperature within the operating temperature range and turned on for at least 30 minutes
- The power meter and power sensor are within their recommended calibration periods
- Used in accordance to the information provided in the power meter’s user’s guide

## Performance Characteristics

Specifications stated hereon refer to all N8480 Series power sensors, unless otherwise stated. The term "standard" refers to all N8480 Series sensors except Option CFT.

### Frequency and dynamic power range

Sensor option	Sensor model	Frequency range	Dynamic power range	
Standard	N8481A	10 MHz to 18 GHz	-35 to +20 dBm	
	N8482A	100 kHz to 6 GHz		
	N8485A	10 MHz to 26.5 GHz		
	N8485A - Option 33	10 MHz to 33 GHz		
	N8487A	50 MHz to 50 GHz		
	N8488A	10 MHz to 67 GHz, 67 GHz to 70 GHz		
	N8486AR	26.5 to 40 GHz		
	N8486AQ	33 to 50 GHz		
	N8481B	10 MHz to 18 GHz		-5 to +44 dBm
	N8482B	100 kHz to 6 GHz		
Option CFT	N8481A	10 MHz to 18 GHz	-30 to +20 dBm	
	N8482A	100 kHz to 6 GHz		
	N8485A	10 MHz to 26.5 GHz		
	N8485A - Option 33	10 MHz to 33 GHz		
	N8487A	50 MHz to 50 GHz		
	N8486AR	26.5 to 40 GHz		
	N8486AQ	33 to 50 GHz		
	N8481B	10 MHz to 18 GHz		0 to +44 dBm
	N8482B	100 kHz to 6 GHz		
	N8481H	10 MHz to 18 GHz		-10 to +35 dBm
N8482H	100 kHz to 6 GHz			

### Damage level

Sensor model	Damage level (average power)	Damage level (peak power)		
N8481A	+25 dBm	15 W/2 $\mu$ s		
N8482A				
N8485A				
N8487A				
N8488A				
N8486AR				
N8486AQ				
N8481B			+49 dBm	500 W/1 $\mu$ s
N8482B				
N8481H			+40 dBm	100 W/1 $\mu$ s
N8482H				

## Performance Characteristics (continued)

### Maximum SWR<sup>1</sup>

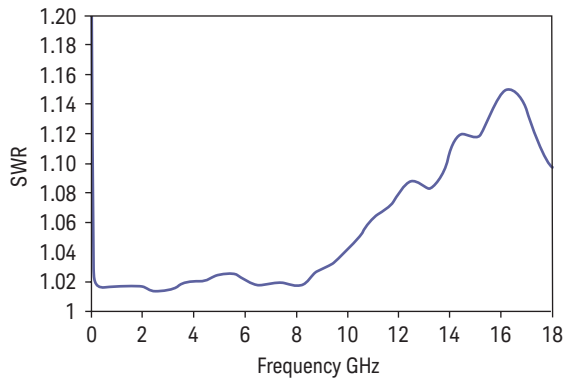
Sensor model	Frequency band	Maximum SWR	
		25 ± 10 °C	0 to 55 °C
N8481A	10 to 30 MHz	1.37	1.57
	30 to 50 MHz	1.14	1.16
	50 MHz to 2 GHz	1.08	1.11
	2 to 12.4 GHz	1.16	1.16
	12.4 to 18 GHz	1.23	1.25
N8482A	100 to 300 kHz	1.54	1.57
	300 kHz to 1 MHz	1.17	1.17
	1 MHz to 2 GHz	1.06	1.06
	2 to 6 GHz	1.07	1.08
N8485A	10 to 50 MHz	1.33	1.53
	50 to 100 MHz	1.08	1.11
	100 MHz to 2 GHz	1.05	1.07
	2 to 12.4 GHz	1.14	1.14
	12.4 to 18 GHz	1.19	1.20
	18 to 26.5 GHz	1.26	1.28
	26.5 to 33 GHz <sup>2</sup>	1.32	1.36
N8487A	50 to 100 MHz	1.08	1.10
	100 MHz to 2 GHz	1.05	1.07
	2 to 12.4 GHz	1.10	1.10
	12.4 to 18 GHz	1.16	1.16
	18 to 26.5 GHz	1.22	1.22
	26.5 to 40 GHz	1.30	1.30
	40 to 50 GHz	1.34	1.33
N8488A	10 to 100 MHz	1.08	1.08
	100 MHz to 2.4 GHz	1.08	1.08
	2.4 to 12.4 GHz	1.10	1.10
	12.4 to 18 GHz	1.12	1.14
	18 to 26.5 GHz	1.21	1.23
	26.5 to 40 GHz	1.30	1.31
	40 to 67 GHz	1.46	1.47
	67 to 70 GHz	1.48	1.50
N8486AR	50 MHz <sup>3</sup>	1.17	1.20
	26.5 to 40 GHz	1.40	1.40
N8486AQ	50 MHz <sup>3</sup>	1.17	1.20
	33 to 50 GHz	1.50	1.50
N8481B	10 MHz to 2 GHz	1.09	1.10
	2 to 12.4 GHz	1.14	1.18
	12.4 to 18 GHz	1.23	1.28
N8482B	100 kHz to 2 GHz	1.08	1.10
	2 to 6 GHz	1.16	1.18
N8481H	10 MHz to 8 GHz	1.16	1.16
	8 to 12.4 GHz	1.22	1.22
	12.4 to 18 GHz	1.32	1.41
N8482H	100 kHz to 6 GHz	1.13	1.14

1. For overlapping frequency points, refer to the lower SWR specification.

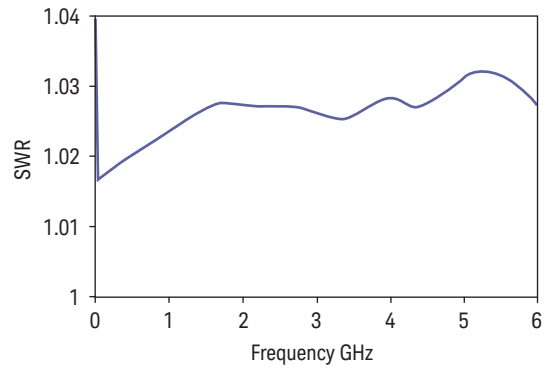
2. Only applicable for N8485A Option 033.

3. SWR for 50 MHz calibration port. Type-N (m) coaxial connector is used in the 50 MHz calibration.

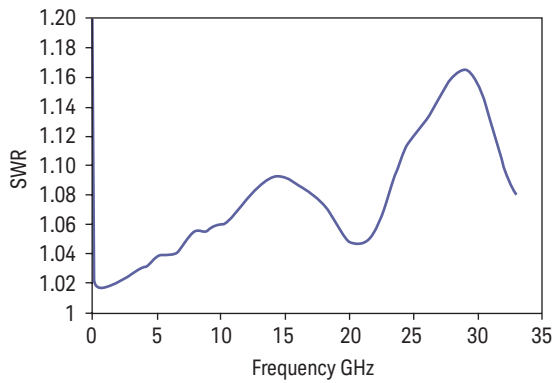
## Performance Characteristics (continued)



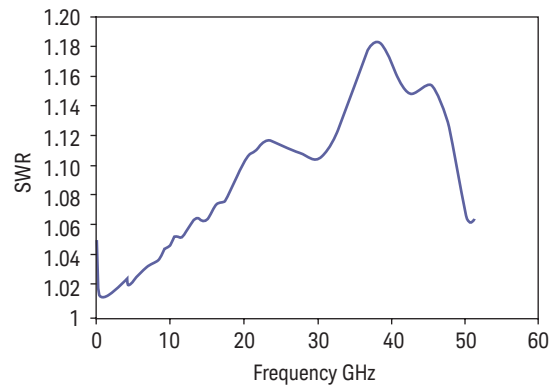
Typical SWR, 10 MHz to 18 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8481A sensor



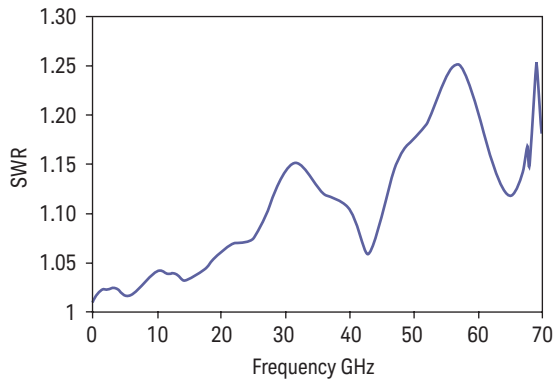
Typical SWR, 100 kHz to 6 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8482A sensor



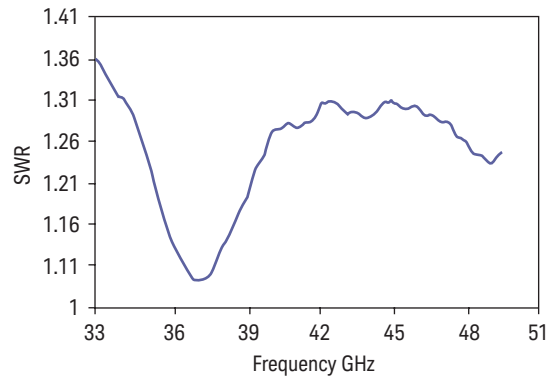
Typical SWR, 10 MHz to 26.5 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8485A sensor



Typical SWR, 50 MHz to 50 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8487A power sensor

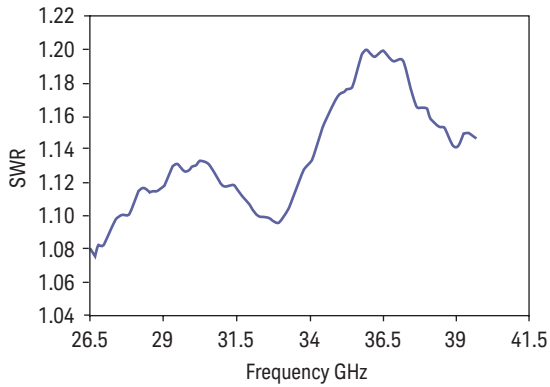


Typical SWR, 10 MHz to 70 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8488A power sensor

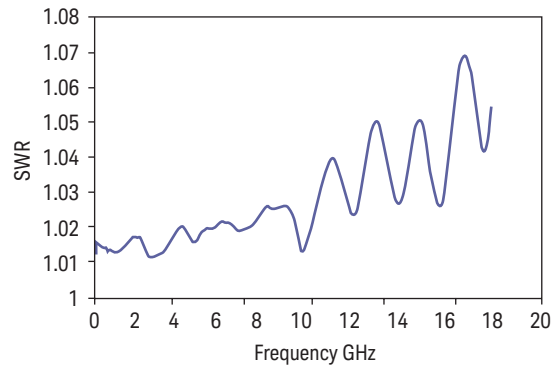


Typical SWR, 33 to 50 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8486AQ power sensor

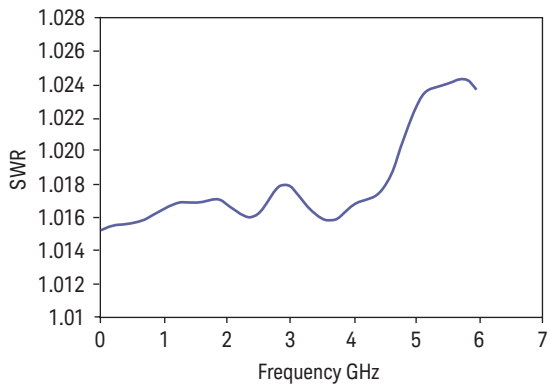
## Performance Characteristics (continued)



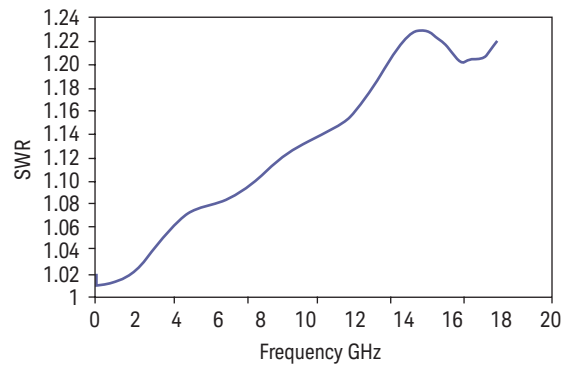
Typical SWR, 26.5 to 40 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8486AR power sensor



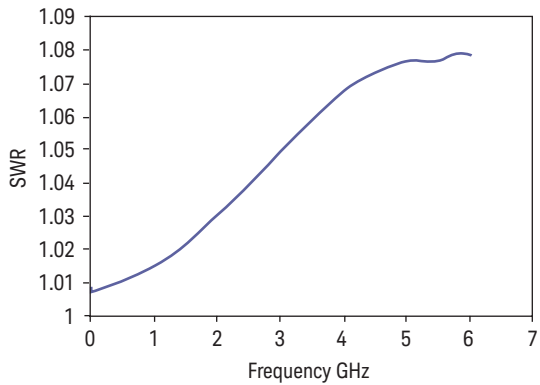
Typical SWR, 10 MHz to 18 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8481B power sensor



Typical SWR, 100 kHz to 6 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8482B power sensor



Typical SWR, 10 MHz to 18 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8481H power sensor



Typical SWR, 100 kHz to 6 GHz ( $25 \pm 10^\circ\text{C}$ ) for N8482H power sensor

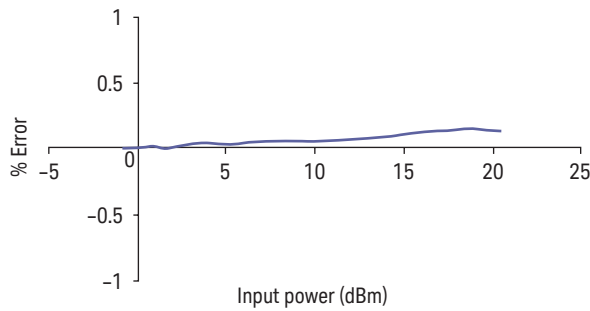
## Performance Characteristics (continued)

### Power linearity<sup>1</sup>

The N8480 Series power sensors' linearity is negligible except for the power range specified in the table below.

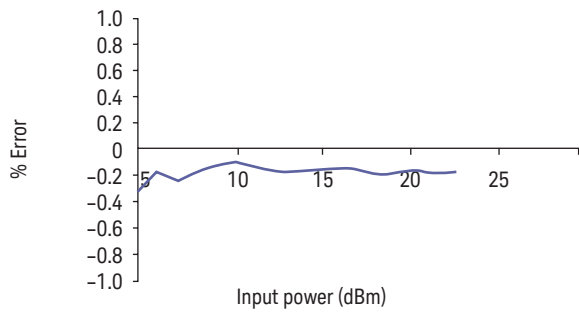
Sensor model	Power range	Linearity (25 ± 10 °C)	Linearity (0 to 55 °C)
N8481A, N8482A, N8485A, N8487A, N8488A, N8486AR, N8486AQ	-1 to < +15 dBm	± 0.52%	± 0.80%
	+15 to +20 dBm	± 0.80%	± 1.90%
N8481B, N8482B	+29 to < +39 dBm	± 0.52%	± 0.80%
	+39 to +44 dBm	± 1.66%	± 2.75%
N8481H, N8482H	+17 to < +30 dBm	± 0.77%	± 1.05%
	+30 to +35 dBm	± 2.84%	± 3.93%

1. After zero and calibration at ambient environment conditions



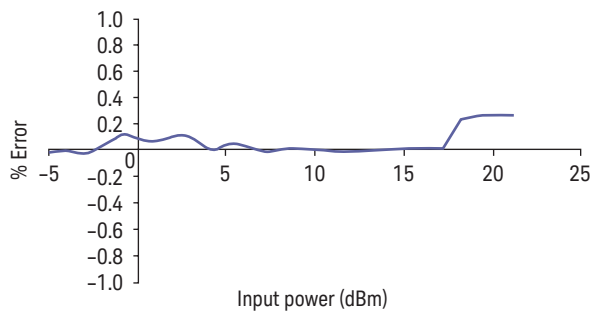
Power level	Measurement uncertainty
-1 to +20 dBm	± 0.35%

Typical N8481A/2A/5A/7A/8A and N8486AR/AQ power linearity at 25 °C, after zero and calibration with associated measurement uncertainty



Power level	Measurement uncertainty
29 to 40 dBm	± 0.35%
40 to 44 dBm	± 1.21%

Typical N8481B/2B power linearity at 25 °C, after zero and calibration with associated measurement uncertainty



Power level	Measurement uncertainty
17 to 30 dBm	± 0.60%
30 to 35 dBm	± 2.39%

Typical N8481H/2H power linearity at 25 °C, after zero and calibration with associated measurement uncertainty



## Performance Characteristics (continued)

### Zero set, zero drift and measurement noise

Sensor model	Sensor option	Range	Conditions (RH) <sup>1</sup>	Zero set <sup>4</sup>	Zero drift <sup>2,4</sup>	Measurement noise <sup>3,4</sup>
N8481A, N8482A, N8485A, N8487A, N8486AR, N8486AQ	Standard	Upper	up to 70%	± 63 nW	< ± 7 nW	< 114 nW
		Lower	up to 70 %	± 25 nW	< ± 3 nW	< 80 nW
	Option CFT	N/A <sup>5</sup>	up to 70%	± 63 nW	< ± 7 nW	< 114 nW
N8488A	Standard	Upper	up to 70%	± 63 nW	< ± 7 nW	< 114 nW
		Lower	up to 70 %	± 25 nW	< ± 3 nW	< 80 nW
	Option CFT	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>
N8481B, N8482B	Standard	Upper	up to 70%	± 63 μW	< ± 7 μW	< 114 μW
		Lower	up to 70 %	± 25 μW	< ± 3 μW	< 80 μW
	Option CFT	N/A <sup>5</sup>	up to 70%	± 63 μW	< ± 7 μW	< 114 μW
N8481H, N8482H	Standard	Upper	up to 70%	± 63 μW	< ± 0.7 μW	< 11.4 μW
		Lower	up to 70 %	± 2.5 μW	< ± 0.3 μW	< 8 μW
	Option CFT	N/A <sup>5</sup>	up to 70%	± 6.3 μW	< ± 0.7 μW	< 11.4 μW

1. RH is the abbreviation for relative humidity.
2. Average hourly drift, at constant temperature. If there is an abrupt change of temperature, it is strongly recommended to perform zeroing or waiting for 30 minutes before taking the measurement.
3. The number of averages at 16 for normal mode and 32 for x2 mode, at a constant temperature, measured over one-minute interval and two standard deviations.
4. The zero set, zero drift, and measurement noise specifications are tested at 50 MHz.
5. N/A is the abbreviation for "not applicable."

### Effects of averaging on noise

Averaging over 1 to 1024 readings is available for reducing noise. The table below provides the measurement noise for a particular sensor with the number of averages set at 16 (for normal mode) and 32 (for x2 mode). Use the noise multiplier, for the appropriate mode (normal or x2) and number of averages, to determine the total measurement noise value.

Example:

N8481A power sensor, normal mode, number of averages = 4

Measurement noise calculation:

$$< 80 \text{ nW} \times 2.75 = < 220 \text{ nW}$$

Number of averages	1	2	4	8	16	32	64	128	256	512	1024
<b>Noise multiplier</b>											
Normal mode	5.5	3.89	2.75	1.94	1	0.85	0.61	0.49	0.34	0.24	0.17
x2 mode	6.5	4.6	3.25	2.3	1.63	1	0.72	0.57	0.41	0.29	0.2

## Performance Characteristics (continued)

### Switching point

The N8480 Series power sensors (excluding Option CFT) have two measurement ranges: a lower power range and an upper power range. The power meter automatically selects the proper power level range. To avoid unnecessary switching when the power level is near the switch point, switching point hysteresis has been added.

### N8481A/82A/85A/87A/88A and N8486AQ/AR power sensors

This hysteresis causes the lower power range to remain selected until approximately  $-0.5$  dBm as the power level is increased. Above this power, the upper power range is selected.

Likewise, the upper power range remains selected until approximately  $-1.5$  dBm as the signal level decreases. Below this power, the lower power range is selected.

### N8481B/82B power sensors

This hysteresis causes the lower power range to remain selected until approximately  $29.5$  dBm as the power level is increased. Above this power, the upper power range is selected.

Likewise, the upper power range remains selected until approximately  $28.5$  dBm as the signal level decreases. Below this power, the lower power range is selected.

### N8481H/82H power sensors

This hysteresis causes the lower power range to remain selected until approximately  $17.5$  dBm as the power level is increased. Above this power, the upper power range is selected.

Likewise, the upper power range remains selected until approximately  $16.5$  dBm as the signal level decreases. Below this power, the lower power range is selected.

### Power range in range setting

Sensor	Range setting	Lower range	Upper range
N8481A/82A/85A/87A/88A and N8486AQ/AR excluding Option CFT	AUTO (default)	$-35$ to $-1$ dBm	$-1$ to $+20$ dBm
	LOWER	$-35$ to $-1$ dBm	–
	UPPER <sup>1</sup>	–	$-30$ to $+20$ dBm
N8481B/82B excluding Option CFT	AUTO (default)	$-5$ to $+29$ dBm	$+29$ to $+44$ dBm
	LOWER	$-5$ to $+29$ dBm	–
	UPPER <sup>1</sup>	–	$0$ to $+44$ dBm
N8481H/82H excluding Option CFT	AUTO (default)	$-15$ to $+17$ dBm	$+17$ to $+35$ dBm
	LOWER	$-15$ to $+17$ dBm	–
	UPPER <sup>1</sup>	–	$-10$ to $+35$ dBm

1. Recommended for pulse signals measurement with period of more than one second

## Performance Characteristics (continued)

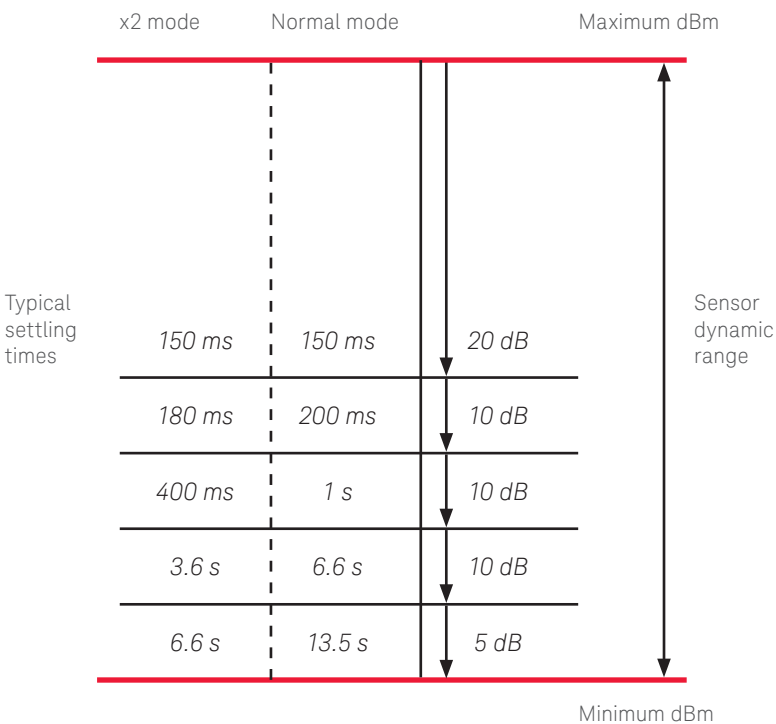
### Settling time<sup>1</sup>

Manual filter, 10-dB decreasing power step for normal and x2 modes (not across switching point)

Number of averages	1	2	4	8	16	32	64	128	256	512	1024
Settling time (s)											
Normal speed	0.15	0.2	0.3	0.5	1.1	1.9	3.4	6.6	13	27	57
x2 speed	0.15	0.18	0.22	0.35	0.55	1.1	1.9	3.5	6.9	14.5	33

1. Settling time: 0 to 99% settled readings over the GPIB

Auto filter, default resolution, 10-dB decreasing power step for normal and x2 modes (not across switching point)



### Calibration factor and reflection coefficient

Calibration factor (CF) and reflection coefficient (Rho) data are unique to each sensor. The CF corrects for the frequency response of the sensor. The Keysight EPM Series, EPM-P Series, and P-Series power meters automatically read the CF data stored in the sensor's EEPROM and use it to make the corrections.

The reflection coefficient (Rho or  $\rho$ ) relates to the SWR according to the following formula:

$$SWR = \frac{1 + \rho}{1 - \rho}$$

Typical measurement uncertainties of the calibration factor (CF) are listed in the following table. There is only one set of CF data used for both the high and low range of each sensor. The typical measurement uncertainty data listed in the table is meant to help users on the measurement uncertainty estimation. These values are only a guideline and are not to be used in any accurate uncertainty calculations. For accurate measurement uncertainty values, please refer to the measurement report<sup>1</sup> of the specific sensor.

1. Only applicable with the purchase of Option 1A7 or Option A6J

## Performance Characteristics (continued)

### Calibration factor uncertainty

The typical measurement uncertainties listed are not to be taken as the maximum CF measurement uncertainties.

Frequency	25 ± 3 °C									
	N8481A	N8481B	N8481H	N8482A	N8482B	N8482H	N8485A	N8487A	N8486AR	N8486AQ
100 kHz to 10 MHz	–	–	–	0.91	1.48	0.89	–	–	–	–
10 to 30 MHz	0.82	1.42	0.77	0.78	1.43	0.79	0.82	–	–	–
30 to 500 MHz	0.77	1.48	0.89	0.77	1.49	0.89	1.24	1.33	–	–
500 MHz to 1.2 GHz	0.78	1.48	0.89	0.78	1.49	0.89	1.26	1.35	–	–
1.2 to 6 GHz	0.91	1.58	1.06	0.89	1.56	1.02	1.35	1.41	–	–
6 to 14 GHz	1.26	1.77	1.46	–	–	–	1.66	1.61	–	–
14 to 18 GHz	1.59	1.92	1.73	–	–	–	1.83	1.73	–	–
18 to 26.5 GHz	–	–	–	–	–	–	2.67	2.26	–	–
26.5 to 33 GHz	–	–	–	–	–	–	3.32	2.58	2.68	–
33 to 34 GHz	–	–	–	–	–	–	–	2.80	3.19	3.14
34 to 35 GHz	–	–	–	–	–	–	–	2.80	3.19	3.40
35 to 40 GHz	–	–	–	–	–	–	–	2.80	3.19	3.14
40 to 45 GHz	–	–	–	–	–	–	–	3.66	–	3.19
45 to 50 GHz	–	–	–	–	–	–	–	4.23	–	3.26

Frequency	25 ± 3 °C
	N8488A
100 kHz to 50 MHz	1.70
50 to 100 MHz	1.60
100 MHz to 2 GHz	1.58
2 to 12.4 GHz	1.75
12.4 to 18 GHz	1.92
18 to 26.5 GHz	2.43
26.5 to 50 GHz	4.56
50 to 67 GHz	5.30
67 to 70 GHz	5.81

## Performance Characteristics (continued)

### Calibration factor uncertainty (continued)

The typical measurement uncertainties listed are not to be taken as the maximum CF measurement uncertainties.

Frequency	25 ± 10 °C									
	N8481A	N8481B	N8481H	N8482A	N8482B	N8482H	N8485A	N8487A	N8486AR	N8486AQ
100 kHz to 10 MHz	–	–	–	1.28	2.40	0.99	–	–	–	–
10 to 30 MHz	1.47	1.98	1.39	1.03	1.84	0.86	0.94	–	–	–
30 to 500 MHz	1.03	1.91	1.10	1.03	1.83	0.98	1.43	1.84	–	–
500 MHz to 1.2 GHz	0.97	1.91	1.15	1.08	1.94	1.00	1.52	2.10	–	–
1.2 to 6 GHz	1.23	1.97	1.42	1.81	2.68	1.19	1.68	2.36	–	–
6 to 14 GHz	1.85	2.69	3.87	–	–	–	2.26	2.87	–	–
14 to 18 GHz	2.17	3.20	7.01	–	–	–	2.47	3.14	–	–
18 to 26.5 GHz	–	–	–	–	–	–	3.75	3.77	–	–
26.5 to 33 GHz	–	–	–	–	–	–	4.79	4.17	3.48	–
33 to 34 GHz	–	–	–	–	–	–	–	4.55	4.07	5.02
34 to 35 GHz	–	–	–	–	–	–	–	4.55	4.07	4.99
35 to 40 GHz	–	–	–	–	–	–	–	4.55	4.07	5.02
40 to 45 GHz	–	–	–	–	–	–	–	5.40	–	5.17
45 to 50 GHz	–	–	–	–	–	–	–	6.02	–	5.20

Frequency	25 ± 10 °C
	N8488A
100 kHz to 50 MHz	2.83
50 to 100 MHz	1.98
100 MHz to 2 GHz	1.84
2 to 12.4 GHz	2.45
12.4 to 18 GHz	2.89
18 to 26.5 GHz	3.52
26.5 to 50 GHz	4.99
50 to 67 GHz	6.46
67 to 70 GHz	7.29

## Performance Characteristics (continued)

### Calibration factor uncertainty (continued)

The typical measurement uncertainties listed are not to be taken as the maximum CF measurement uncertainties.

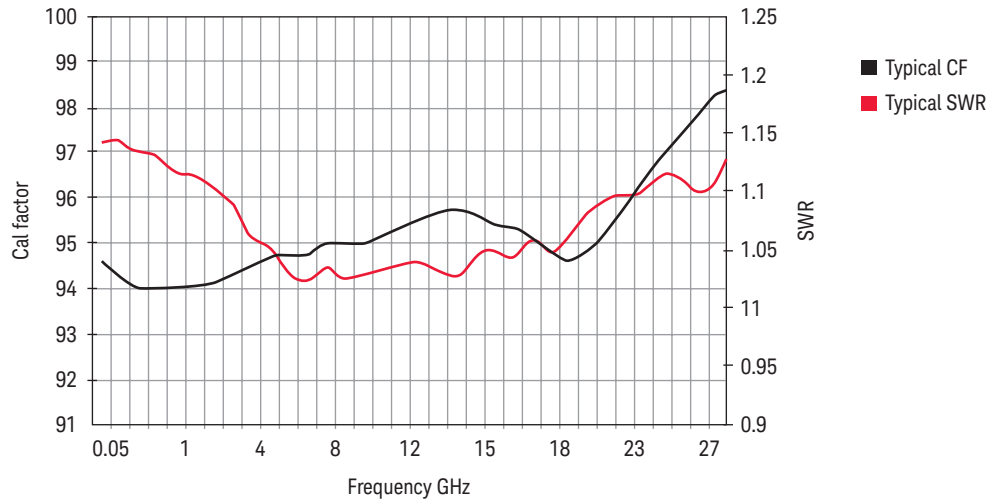
Frequency	0 ± 55 °C									
	N8481A	N8481B	N8481H	N8482A	N8482B	N8482H	N8485A	N8487A	N8486AR	N8486AQ
100 kHz to 10 MHz	–	–	–	1.59	2.67	1.41	–	–	–	–
10 to 30 MHz	4.46	3.64	2.83	0.91	1.73	0.86	1.25	–	–	–
30 to 500 MHz	1.57	2.22	1.44	1.16	1.77	1.03	1.98	2.14	–	–
500 MHz to 1.2 GHz	1.65	2.49	1.60	1.54	2.12	1.07	2.07	2.45	–	–
1.2 to 6 GHz	2.04	2.85	1.96	1.99	3.91	1.40	2.40	2.65	–	–
6 to 14 GHz	2.62	3.81	4.81	–	–	–	2.99	3.17	–	–
14 to 18 GHz	3.27	4.30	9.74	–	–	–	3.35	3.41	–	–
18 to 26.5 GHz	–	–	–	–	–	–	4.70	4.04	–	–
26.5 to 33 GHz	–	–	–	–	–	–	6.41	4.43	3.76	–
33 to 34 GHz	–	–	–	–	–	–	–	4.84	4.25	6.04
34 to 35 GHz	–	–	–	–	–	–	–	4.84	4.25	6.04
35 to 40 GHz	–	–	–	–	–	–	–	4.84	4.25	6.04
40 to 45 GHz	–	–	–	–	–	–	–	5.70	–	5.86
45 to 50 GHz	–	–	–	–	–	–	–	6.19	–	6.59

Frequency	0 ± 55 °C
	N8488A
100 kHz to 50 MHz	3.69
50 to 100 MHz	2.63
100 MHz to 2 GHz	2.40
2 to 12.4 GHz	2.61
12.4 to 18 GHz	3.15
18 to 26.5 GHz	4.50
26.5 to 50 GHz	5.67
50 to 67 GHz	7.18
67 to 70 GHz	8.69

## Performance Characteristics (continued)

### Typical CF and SWR versus frequency

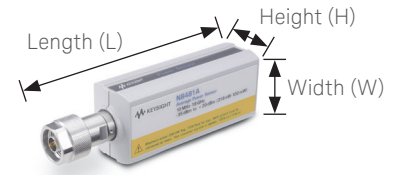
The chart below shows supplemental characteristics intended to provide additional information, useful in applying the power sensor by giving typical but not warranted performance parameters.



## Performance Characteristics (continued)

### General specifications

Dimensions and weight	
Dimensions (W x H x L)	N8481A/82A: 38 mm W x 30 mm H x 130 mm L N8485A: 38 mm W x 30 mm H x 121 mm L N8487A: 38 mm W x 30 mm H x 121 mm L N8488A: 38 mm W x 30 mm H x 115 mm L N8486AR: 38 mm W x 62 mm H x 152 mm L N8486AQ: 38 mm W x 62 mm H x 152 mm L N8481B/82B: 83 mm W x 114 mm H x 283 mm L N8481H/82H: 38 mm W x 30 mm H x 174 mm L
Weight	N8481A/2A: Net: 0.181 kg (0.40 lb) Shipping: 0.90 kg (1.98 lb) N8485A: Net: 0.183 kg (0.40 lb); Shipping: 0.90 kg (1.98 lb) N8487A: Net: 0.154 kg (0.34 lb); Shipping: 0.874 kg (1.92 lb) N8488A: Net: 0.162 kg (0.36 lb); Shipping: 0.881 kg (1.94 lb) N8486AR: Net: 0.202 kg (0.45 lb); Shipping: 0.922 kg (2.03 lb) N8486AQ: Net: 0.204 kg (0.45 lb); Shipping: 0.924 kg (2.03 lb) N8481B/82B: Net: 0.684 kg (1.51 lb); Shipping: 1.404 kg (3.09 lb) N8481H/82H: Net: 0.234 kg (0.52 lb); Shipping: 0.954 kg (2.10 lb)
Operating environment	
Temperature	0 to 55 °C
Humidity	Maximum: 95% RH at 40 °C non-condensing
Altitude	Up to 4600 m (15,000 ft)
Storage conditions	
Temperature	-40 to 70 °C
Humidity	Up to 90% RH at 65 °C non-condensing
Altitude	Up to 4600 m (15,000 ft)
Other	
Connector <sup>1</sup>	N8481A/82A: N-type (male) N8485A: 3.5 mm (male) N8487A: 2.4 mm (male) N8488A: 1.85 mm (male) N8481B/82B: N-type (male) N8481H/82H: N-type (male) N8486AR: Waveguide flange UG-599/U N8486AQ: Waveguide flange UG-383/U
Programming language	Standard: SCPI code-compatible to E-Series sensors Option CFT: SCPI code-compatible to 8480 Series sensors
Safety and EMC compliance	IEC 61326-2002/EN 61326:1997+A1:1998+A3:2003 Canada: ICES-001:2004, ICES/NMB-001:2004 Australia/New Zealand: AS/NZS CISPR11:2004
Calibration interval	1 year
Warranty <sup>1</sup>	3 years



1. See "Ordering Information" for available options



## Ordering Information

### Power sensors

Standard power sensors	Description	Frequency range	Power range
N8481A	Standard N8481A model with EEPROM feature	10 MHz to 18 GHz	-35 to +20 dBm
N8482A	Standard N8482A model with EEPROM feature	100 kHz to 6 GHz	-35 to +20 dBm
N8485A	Standard N8485A model with EEPROM feature	10 MHz to 26.5 GHz	-35 to +20 dBm
N8487A	Standard N8487A model with EEPROM feature	50 MHz to 50 GHz	-35 to +20 dBm
N8488A	Standard N8488A model with EEPROM feature	10 MHz to 67 GHz	-35 to +20 dBm
N8481B	Standard N8481B model with EEPROM feature	10 MHz to 18 GHz	-5 to +44 dBm
N8482B	Standard N8482B model with EEPROM feature	100 kHz to 6 GHz	-5 to +44 dBm
N8481H	Standard N8481H model with EEPROM feature	10 MHz to 18 GHz	-15 to +35 dBm
N8482H	Standard N8482H model with EEPROM feature	100 kHz to 6 GHz	-15 to +35 dBm
N8486AR	Standard N8486AR model with EEPROM feature	26.5 to 40 GHz	-35 to +20 dBm
N8486AQ	Standard N8486AQ model with EEPROM feature	33 to 50 GHz	-35 to +20 dBm
Other sensor options	Description		
Option CFT	N8480 sensor without the calibration factor table stored in the EEPROM. Calibration factor data is provided on the label attached to the power sensor		
N8485A-033	N8485A model with EEPROM feature with extended frequency range, 10 MHz to 33 GHz		
Standard-shipped	Description		
Shipped as standard with every power sensor	<ul style="list-style-type: none"> <li>- Certificate of Calibration</li> <li>- Operating and Service Guide</li> <li>- Product Reference CD (contains Migration Guide, Operating and Service Guide, firmware upgrades for EPM, EPM-P, and P-Series power meters, and upgrade procedures)</li> </ul>		

## Ordering Information (continued)

### Accessories, calibration and documentation options

Connectors	Description
Option 100	<ul style="list-style-type: none"> <li>– Type-N (male) connector for N8481A/N8482A/N8481B/N8482B/N8481H/N8482H</li> <li>– 3.5 mm (male) connector for N8485A</li> <li>– 2.4 mm (male) connector for N8487A</li> <li>– 1.85 mm (male) connector for N8488A</li> <li>– Waveguide connector for N8486AR/N8486AQ</li> </ul>
Option 200	APC-7 (male) connector for N8481A only
Cables	Description
11730A	For EPM Series power meters: 1.5 m (5 ft), grey
11730B	For EPM Series power meters: 3 m (10 ft), grey
11730C	For EPM Series power meters: 6.1 m (20 ft), grey
11730D	For EPM Series power meters: 15.2 m (50 ft), grey
11730E	For EPM Series power meters: 30.5 m (100 ft), grey
11730F <sup>1</sup>	For EPM Series power meters: 61 m (200 ft), grey *operates up to 45 °C
E9288A	For EPM and EPM-P Series power meters: 1.5 m (5 ft), blue
E9288B	For EPM and EPM-P Series power meters: 3 m (10 ft), blue
E9288C	For EPM and EPM-P Series power meters: 10 m (31 ft), blue
N1917A	For P-Series power meters: 1.5 m (5 ft)
N1917B	For P-Series power meters: 3 m (10 ft)
N1917C	For P-Series power meters: 10 m (31 ft)
Calibration	Description
Option 1A7	ISO 17025 calibration with test data
Option A6J	ANSI Z540 calibration with test data
Warranty	Description
Option R-51B-001-3C	Return to Keysight Technologies Warranty - 3 years
Option R-51B-001-5C	Warranty Assurance Plan - Return to Keysight Technologies - 5 years
Documentation	Description
Option OB1	English language Operating and Service Guide
Option ABJ	Japanese localization Operating and Service Guide

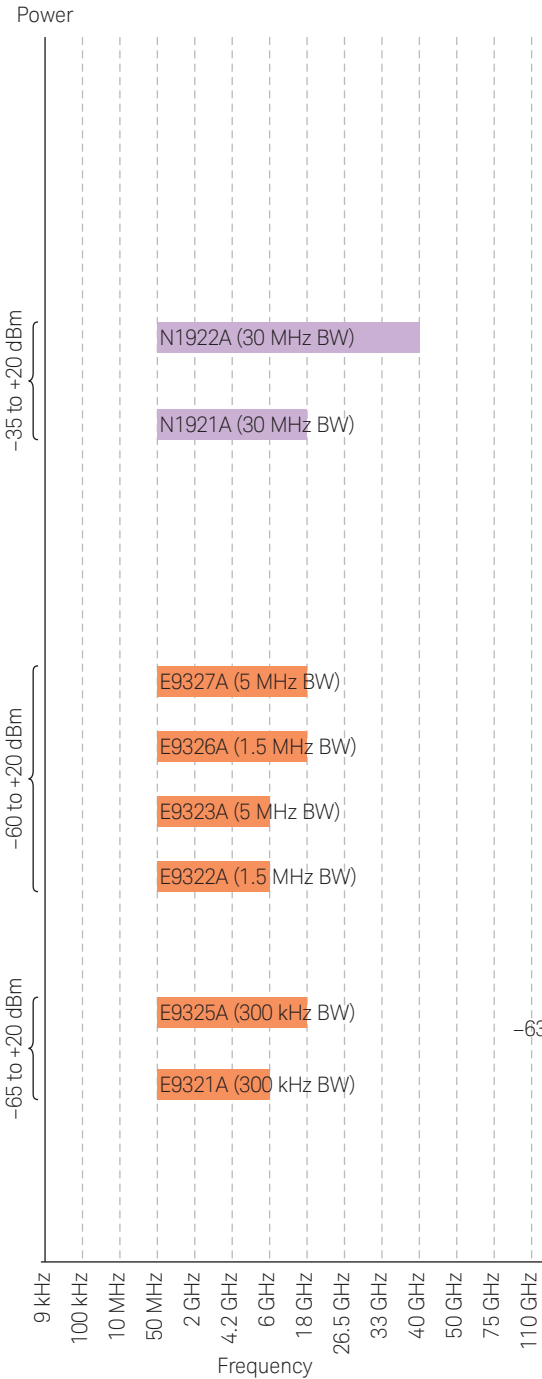
1. Only applicable for E4418/19B power meters

## Where Does the N8480 Fit in Keysight's Average Power Sensors Offering?

Signal characteristics >	CW	Modulated			Wireless standards			
	CW	Pulse/averaged	AM/FM profiled					
Typical application examples >	Metrology lab	Radar/navigation	Mobile radio	TDMA GSM EDGE NADC IDEN	cdmaOne <i>Bluetooth</i> <sup>®</sup>	W-CDMA cdma2000 <sup>®</sup>	802.11a/b/g MCPA HiperLan2 WiMAX	
Sensor technology	<b>Thermocouple sensors</b> 8480A/B/H, N8480A/B/H/R/Q, 8486A, N8486AR/AQ	●	●	●	● Average only	● Average only	● Average only	● Average only
	Diode sensors 8480D, V8486A, W8486A	●	●	●	● Average only	● Average only	● Average only	● Average only
	Diode sensors compensated for extended range E4412A/3A	●		FM only				
	Two-path diode-stack sensors E9300 Series	●	●	●	● Average only	● Average only	● Average only	● Average only

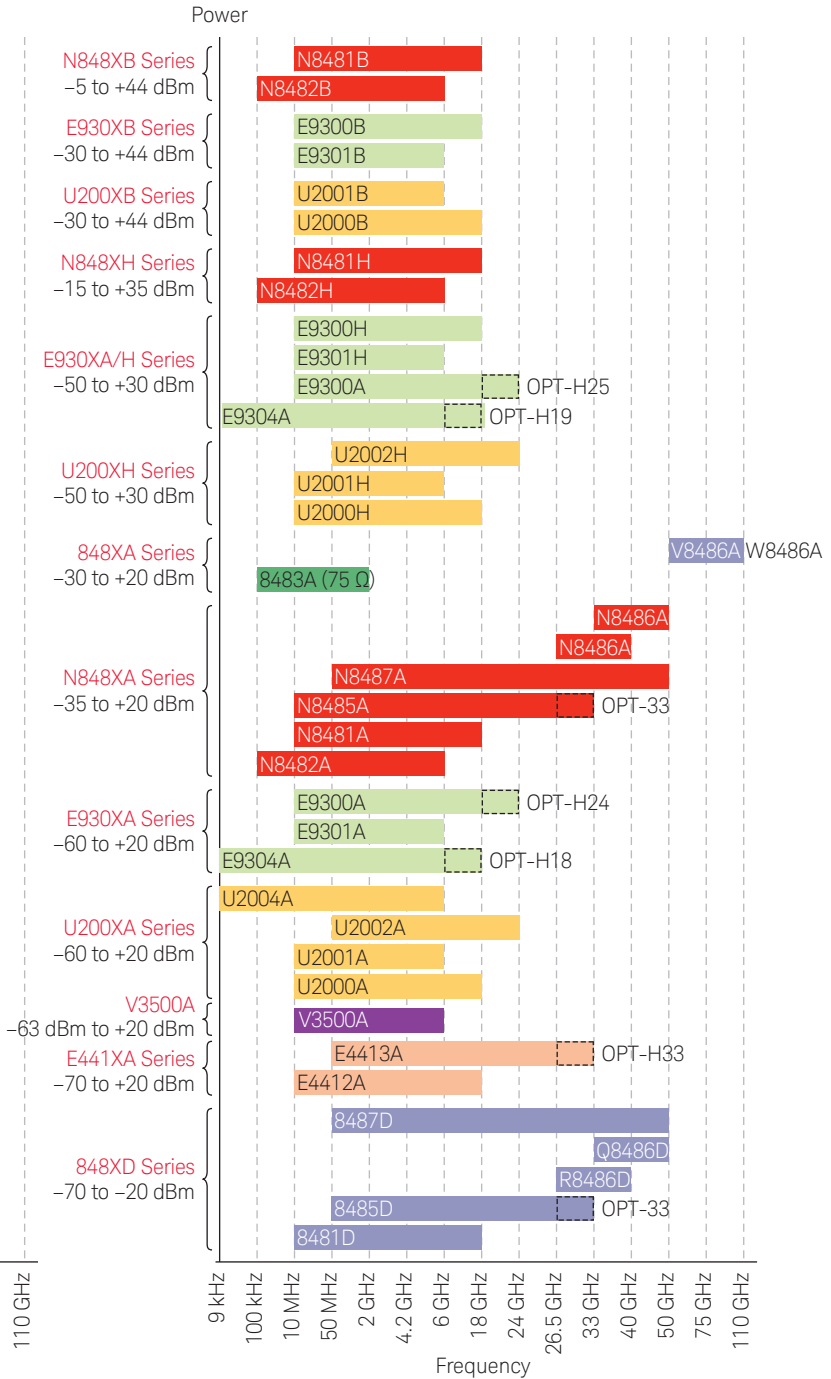
# Where Does the N8480 Fit in Keysight's Average Power Sensors Offering?

Peak-and-average power sensors  
(breakdown by dynamic range)



- Legend
- N192x peak-and-average sensors compatible with P-Series power meters
  - E932x peak-and-average sensors compatible with EPM-P and P-Series power meters

Average power sensors  
(breakdown by dynamic range)



- Legend
- N848X average thermocouple sensor
  - 848XD average diode sensor
  - 848X thermocouple sensor
  - E441X 1-path diode CW-only sensor
  - E930X 2-path diode true-average sensor
  - U200X USB sensors
  - V3500A handheld RF power meter

## Compatible Power Meters

The N8480 Series power sensors perform accurate, repeatable average power measurements with the following power meters:

### Keysight N1911A/12A P-Series power meters

- Single (N1911A) and dual (N1912A) channels
- High resolution color display
- 30 MHz video bandwidth
- 100 MSa/s continuous sampling rate
- Time-gated and free-run measurement modes
- Rise time, fall time, pulse width, time to positive occurrence, and time to negative occurrence measurements
- Includes predefined configurations for WiMAX, HSDPA, and DME
- GPIB, LAN, and USB interfaces
- Code-compatible with EPM-P and EPM Series power meters
- Optimized for peak power measurements and CCDF statistical analysis with the P-Series power sensors
- Also compatible Compatible with all E-Series, N8480 Series, and 8480 Series power sensors



### Keysight E4416A/17A EPM-P Series power meters

- Single (E4416A) and dual (E4417A) channels
- 5 MHz video bandwidth
- 20 MSa/s continuous sampling rate
- Time-gated and free-run measurement modes
- Includes predefined configurations for GSM, EDGE, NADC, iDEN, *Bluetooth*, IS-95 CDMA, W-CDMA, and cdma2000
- GPIB, RS-232/422 interfaces
- Code-compatible with EPM Series power meters
- Optimized for peak power measurements with the E9320 E-Series power sensors
- Also compatible with the E9300 and E4410 E-Series, 8480, and N8480 Series power sensors



### Keysight N1913A/14A EPM Series power meters

- Single (N1913A) and dual (N1914A) channels
- Two optional USB channels available for four-channel measurements
- Frequency range of 9 kHz to 110 GHz
- Power range of -70 to +44 dBm (depending on the attached power sensor)
- Fast measurement speed of 400 readings/s
- Industry's first color LCD screen for average power meters
- USB and LAN/LXI-C connectivity on top of the standard GPIB
- Automatic frequency/power sweep measurements with the optional trigger IN/OUT feature
- Code-compatible with legacy E4418B/9B EPM Series, 436A, 437B, and 438A power meters (43X compatibility only with option N191xA-200)
- Optimized for average power measurements with the U2000, E9300 and E4410, N8480, and 8480 Series power sensors



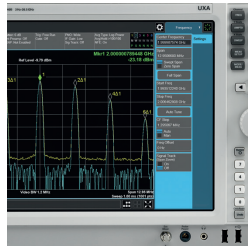
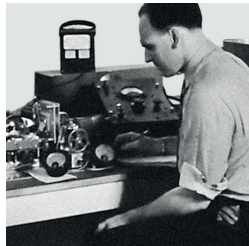
1. Note: The N8480 Series is also compatible with the E4418B/19B Series EPM power meters

## Compatible Power Meters

To get your existing power meters up-and-running in supporting the N8480 Series, just download their firmware upgrades online at [www.keysight.com](http://www.keysight.com) > Technical Support > Drivers & Software > Firmware Update

Power meter	Model number	Compatible firmware revision
EPM Series power meters	E4418B	A1.09.01 and above
	E4419B	A2.09.01 and above
	N1913A	A.01.00 and above
	N1914A	A.01.00 and above
EPM-P Series power meters	E4416A	A1.05.01 and above
	E4417A	A2.05.01 and above
P-Series power meters	N1911A	A.05.02 and above
	N1912A	A.05.02 and above

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